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FOREWORD & ACKNOWLEDGEMENTS

The 4th **I**nternational **C**onference on **R**esearch in **A**pplied **M**athematics and **C**omputer **S**cience (**ICRAMCS 2022**) is aimed to bring researchers and professionals to discuss recent developments in both applied mathematics and computer science and to create a professional knowledge exchange platform between mathematicians, computer science and other disciplines. This conference is the result of international cooperation bringing together African and European universities. It is a privileged place for meetings and exchanges between young researchers and high-level African and international decision makers in the fields of mathematics and applied computing.

This conference has several major objectives, in particular:

- To bring together doctoral students and research professors in the fields of applied sciences and new technologies.
- To consolidate the scientific cooperation between the university and the socio-economic environment in the field of applied sciences.
- To allow young researchers to present and discuss their research work before a panel of specialists and university professors.
- To contribute to the development of a database, which can help decision makers to opt for a better management strategy.

The abstracts of these conference proceedings were presented at the 4th International Conference on Research in Applied Mathematics and Computer Science (ICRAMCS 2022). These conference proceedings include abstracts that underwent a rigorous review by two or more reviewers. These papers represent current important work in the field of Mathematics & Computer Science and are elaborations of the ICRAMCS conference reports.

These abstracts are provided for all presenters who have submitted abstracts and have registered as of February 01, 2022. Although every effort has been made to ensure accurate reproduction of these abstracts, the conference organizers cannot be held accountable for inaccuracies that may have occurred in their reproduction. Any changes made after February 01, 2022 to either the content of the abstracts or presentation status will not be included in these proceedings.

We wish to acknowledge the conference program committee and reviewers, for their substantial contributions and our institutions, for their support.

Sincerely,

On behalf of Organizing Committee of ICRAMCS 2022
Prof. Youssef EL FOUTAYENI
Laboratory Analysis, Modeling and Simulation LAMS
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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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EXISTENCE RESULTS FOR RENORMALIZED SOLUTIONS TO NON-COERCIVE NONLINEAR ELLIPTIC EQUATIONS INVOLVING A HARDY POTENTIAL AND WITH L 1 -DATA

Communication Info

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Keywords:
(1) Nonlinear elliptic equation,
(2) Hardy potential.
(3) Renormalized solutions.
(4) Lower order terms.

Abstract

Using the framework of renormalized solutions is motivated by the lack of regularity of the weak solution also the distributional formulation is not strong enough to provide uniqueness. This notion was introduced by DiPerna and Lions [1] for the study of Boltzmann equations (see also [2, 3]). Our aim is to prove the existence of solutions for an elliptic problem with nonlinear, no-coercive operator and L 1 –data, without adding a suitable term. The main difficulties which arise in proving existence results are the lack of coercivity and the effect of the singular term (the Hardy potential) that creates, in general, an obstruction to the existence of a solution. To overcome this difficulty, we proceed by suitable approximations to eliminate the singularity and by proving an a priori estimates for the approximate solutions and its gradients in Lorentz–Marcinkiewicz spaces.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A new Stochastic Diffusion process based on the Rayleigh density function

Communication Info

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Keywords:
Stochastic Rayleigh
Diffusion process estimation
Discrete sampling,
Mean function,
Simulated annealing
Likelihood function

Abstract

In this work we present a model of a stochastic diffusion process based on the Rayleigh distribution function. (its trend is proportional to the rayleigh probability density function). In the first part we start by obtaining the probabilistic characteristics of this model as the explicit expression of the process by applying the Ito formula. The conditional mean and mean function is analyzed to obtain fits and predictions using simulated data. Then we developed the statistical inference of the model by estimating these parameters through the maximum likelihood methodology. Finally, in order to highlight the usefulness of this methodology, we include the results obtained from several simulation examples.

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A mixed finite element approach for factional viscoelastic wave propagation in-time- domain

Communication Info

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Keywords:
Fractional derivative, mixed finite element, energy dissipation, stability analysis, viscoelastic wave propagation, Zener's model

Abstract

In this paper, we consider a fractional-order viscoelastic wave described by the Caputo fractional derivative[1,2]. These viscoelastic models are shown to be effective in modeling the attenuation of waves, especially the approximation of quality factor Q [3]. This study focuses on the numerical modeling of wave propagation in viscoelastic media with a fractional Zener model. We present a family of models which generalize Zener's model. For the numerical resolution, we extend a mixed finite element method proposed in [4]. This method combines mass lumping with a centered explicit scheme for time discretization. For the resulting scheme, we prove a discrete energy decay result and provide a sufficient stability condition. For the numerical simulation of viscoelastic waves, various numerical results are presented.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Global stability Analysis of an HCV Model with Antibody Response and Therapy

Communication Info

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Keywords:
(1) Cell-to-cell
(2) Cure rate
(3) Antibody response
(4) Therapy
(5) Global stability

Abstract

Hepatitis C virus (HCV) is one of the major health problems in the world [1]. Recently, Pan et al. have proposed a hepatitis C mathematical model with non-cytolytic cure and both modes of transmission, namely virus-to-cell and cell-to-cell in the presence of antibody response [2]. Our contribution, however, is to study this model along with therapy. The model includes four nonlinear differential equations, describing the interaction between the uninfected cells, infected cells, the hepatitis C virions and the antibody response. We will prove the positivity and the boundedness of the problem. We will determine the basic reproduction number and the three equilibria and study their stability. Numerical simulations have been performed in order to illustrate the theoretical results and the effect of therapy in reducing the infection .

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Finite element modeling of steel-concrete adhesion

Communication Info

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Keywords:
(1) Composite structure
(2) Interfaces
(3) Numerical model
(4) Finite element

Abstract

Composite structures must fulfil all possible requirements and not just mechanical strength. During the cracking process, the stress is gradually redistributed between steel and concrete in reinforced concrete, through the interface between these two materials. This redistribution of stresses has a direct impact on the final state of cracking, and should therefore be taken into account in the modelling. There are different numerical models that can represent the influence of the steel-concrete connection. However, their use is currently not compatible with applications related to large-scale structures (mesh difficulty, calculation cost, etc.). In this contribution, the hypothesis of a perfect combination (same displacement) between steel and concrete is always used.

A first series of works assimilates the steel-concrete interface to a finished thick sheath between the two materials, which takes into account their interactions. This means introducing a new "steel-concrete interface" material [1]. Another choice of modelling introduces finite elements of zero thickness between the mesh of the steel and the concrete whose behavior allows to represent the interactions between the two materials [2].

We propose here to develop a new model of finite element bonding between steel and concrete that can not only represent the physical phenomena that occur at the interface between the two materials, but also be compatible with the constraints of modelling large-scale structures.

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HOMOGENIZATION OF SUBWAVELENGTH STRATIFIED VISCOELASTIC MEDIA INCLUDING FINITE SIZE EFFECT

Communication Info

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Keywords:
(1) homogenization
(2) matched asymptotic expansion,
(3) effective jump conditions.
(4) viscoelastic

Abstract

We propose a homogenization method based on a matched asymptotic expansion technique to obtain the effective behavior of a two-dimensional linear viscoelastic periodically stratified slab which accounts for the finite size of the slab. The problem is considered for shear waves and the wave equation in the harmonic regime is considered.
The obtained effective behavior is that of a homogeneous anisotropic slab associated with jump conditions, for the displacement and the normal stress at the boundaries of the slab. These jump conditions are implemented in a numerical scheme in the case of layers associated with Neumann boundary conditions and compared to the results of the direct problem.

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Two-dimensional extension of a penalization method for Neumann or Robin boundary conditions

Communication Info

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Keywords:
(1) Fictitious domain method
(2) Penalization
(3) Neumann or Robin boundary conditions
(4) Moving space
(5) Climate change

Abstract

In a previous paper [1], a fictitious domain penalization method to take account of Neumann or Robin boundary conditions has been proposed and analyzed mostly in one dimensional space. Here, we present a n-dimensional extension of this method. The existence and uniqueness of the solution of the penalized problem are obtained using the approach of Droniou [2] for non-coercive linear elliptic problems. The convergence of the penalization method with respect to the penalization parameter η is investigated numerically in two dimensions using adequate finite differences or finite elements suitable for advection dominated problems. The numerical tests suggest a convergence of order $O(\eta)$ as in the one-dimensional case. Finally, we outline the application of this method in the context of a time-dependent reaction-diffusion equation with a moving spatial domain to study the persistence or extinction of a population under climate change [3].

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Chromatic identities on maximal triangle-free graphs

Communication Info

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Keywords:
(1) Packing coloring
(2) Packing chromatic number
(3) Chromatic index
(4) Triangle-free graphs

Abstract

A graph is maximal triangle-free if no edge may be added without producing a triangle. A triangle-free graph is maximal triangle-free if and only if its diameter is two. The neighborhood of every vertex in triangle-free graphs is an independent set. Then, in such graphs, it is evident that $\Delta(G) \leq \alpha(G)$, where $\Delta(G)$ and $\alpha(G)$ stand for the maximum degree and the independence number of a graph G, respectively.

In 1964, Vizing [1] showed that every graph G has edge-chromatic number $\chi'(G)$ either $\Delta(G)$ (known as Class I graphs) or $\Delta(G)+1$ (known as Class II graphs). Deciding the class of a given graph is $\mathcal{NP}$-complete problem [2], even when restricted to triangle-free graphs with $\Delta = 3$ [3].

A k-packing coloring of a graph G with vertex set V, for some integer k, is a mapping $f : V \to \{1, 2, \ldots, k\}$ such that for any two distinct vertices u and v from V : if $f(u) = f(v) = i$, then $d_G(u, v) > i$, where $d_G(u, v)$ is the distance between u and v in G. The packing chromatic number $\chi_\rho(G)$ of a graph G is the smallest integer k such that the graph G has a k-packing coloring [4].

A well-known upper bound of $\chi_\rho(G)$ for some graph G is $|G| - \alpha(G) + 1$ with equality if the diameter of G is two [4].

In this work, we prove the existence of class I maximal triangle-free graph where the parameters α, Δ and χ_ρ coincide, i.e maximal triangle-free graph G such that $\alpha(G) = \Delta(G) = \chi_\rho(G) = \chi'(G)$.

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Persistence and sheaf theory for time series analysis: The case of dysarthria in AVC patients

Communication Info

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Keywords:
(1) Persistent homology
(2) Sheaf theory
(3) Time series analysis

Abstract

Topological data analysis [1] relies primarily on persistent homology [2] to extract robust features from point cloud data. The general pipeline consists in constructing a filtered complex and computing homology of the filtration, this results in persistence modules, which we generally represent with persistence diagrams or barcodes. We interpret each interval in the barcode as a topological feature of the data and we interpret its length as the measure of the robustness of that feature. Performing topological data analysis however might present great challenges when working with large datasets. One of which is the complexity of computation both at the level of the complex construction and the persistence diagrams/barcodes computation. The aim of this work is two folds: On one hand, we address this complexity problem by using sheaf theory [3] [4] as a tool for passing from local to global properties as we study the isomorphism between gluing of local persistence modules and the global persistence module. On the other hand, we apply our results to analyze times series data [5] of AVC patients suffering from dysarthria and monitor their condition progress.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A theorem on the uniqueness of the solution of a linear complementarity problem

Communication Info

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Keywords:
(1) Linear Complementarity
(2) Existence and uniqueness of LCP
(3) interval matrix

Abstract

In the fields of operations research and optimization, linear complementarity problems are widely recognized, but these problems are often difficult to solve, it is impossible to ensure the existence and the uniqueness of a solution of linear complementarity problem associated with any matrix M and vector q. It is well known that the regularity of the matrix M alone does not guarantee the existence and uniqueness of the solution. In this paper, we consider two matrices M, $D \in \mathbb{R}^n$, such that D is a positive matrix and we formulate a theorem, which proves the existence and uniqueness of the solution of a linear complementarity problem LCP(q, M) if the following two conditions are verified: i) the interval matrix $\mathcal{M}$ is regular (the notion of interval matrix $\mathcal{M}$ will be defined later in this paper), and ii) $|I - M| \leq D$.

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Global weak solutions of the fractional model in magneto-elastic interactions

Communication Info

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Keywords:
(1) ferromagnets,
(2) fractional derivative,
(3) Landau Lifshitz equation,
(4) elasticity

Abstract

The paper deals with global existence of weak solutions to a three-dimensional mathematical model describing magnetoelastic interactions. The model is described by a fractional generalization of the harmonic map heat flow coupled to an evolution equation for the displacement:

$$\begin{cases} m_t = \vartheta m \times H_{eff} - \mu m \times (m \times H_{eff}) \\ \rho u_{tt} - div\left(S(u) + \frac{1}{2}\,\mathcal{L}(m)\right) = 0 \end{cases}$$

The first equation (1), well known in the literature, is the Landau-Lifshitz equation and the second equation (2) describes the evolution of the displacement. We prove global existence by using Faedo-Galerkin/Penalty method. Some commutator estimates are used to prove the convergence of nonlinear terms.

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MODELING THE DYNAMICS OF OBESITY USING A DISCRETE TIME MODEL

Communication Info

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Keywords:
(1) Obesity epidemic
(2) Mathematical modeling
(3) Optimal control.

Abstract

The aim of this work is to propose a discrete mathematical model to study the behavioral dynamics of a population affected by the disease of obesity. Thus, the population under study is divided into six compartments: susceptible (S), exposed (E), slightly obese(I1), moderately obese (I2), very obese (I3), and recovered (R). To fight this disease, we used four controls: Awareness through education and media, food and sports programs, medical treatment with drugs, and treatment with surgical intervention. The discrete time Pontryagin maximum principle is used to characterize the optimal controls. The numerical simulation via MATLAB confirms the performance of theoretical results.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Contrôle optimal de la compétition entre deux informations qui circule dans les réseaux

Communication Info

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Keywords:

(1) Les réseaux sociaux
(2) Contrôle optimal
(3) le passe vaccinale

Abstract

Au cours de la dernière décennie, Les réseaux sociaux sont l'un des moyens de communication les plus influents et qui atteignent le monde entier [1]. Nous désirons modéliser la compétition entre deux informations qui circule dans les réseaux sociaux, comme le cas des élections ou les deux parties commencent de partager des fiches publicitaires (des troles ...) et de toute sorte d'informations qui peuvent permettre de gagner. Chaque fois que vous ouvrez facebook, twiter, ... Des fiches publicitaires de différents produits qui illustrent la compétition entre les différentes entreprises pour réaliser un grand nombre de vente et élargir la zone de vente. Pour cela nous allons ajouter de nouveaux compartiments, celui des épandeurs de la première l'information qui peut être la publicité du premier produit, des vidéos qui encourage des grèves contre le passe vaccinale.

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The robust shrinkage estimator of a spherical symmetry with residual under the balanced loss functions

Communication Info

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Keywords:
(1) *shrinkage estimation*
(2) *modifications of bala*
(3) *spherically symmetric*

Abstract

This paper considers the problem of estimating the mean vector of d-dimensional spherically symmetric distributed X when the scale parameter is known but when a residual vector U is available: more precisely, let (X, U) $\epsilon\ \mathbb{R}^{d+k}$ be a random vector around $(\theta, 0)\ \epsilon\ \mathbb{R}^{d+k}$. The loss functions is assumed to be modifications of balanced loss functions the form: $(i)\ \ \omega\rho(\|\delta - \delta_0\|^2)+(1-\omega)\rho(\|\delta-\gamma(\theta)\|^2)$ and $(ii)\ \ \ell\big(\omega(\|\delta-\delta_0\|^2)+(1-\omega)(\|\delta-\gamma(\theta)\|^2)\big)$ where δ_0 is a target estimation of $\gamma(\theta)$, and where ρ and ℓ are increasing and concave functions. For $d \geq 4$ and the target estimator $\delta_0(X)$=X, we provide the estimators of the form $\delta_{(\omega,g)}(X) = X + a \parallel U \parallel^2 g(X)$ dominate $\delta_0(X)$=X and are minimax where we suppose there exists a nonpositive function h(.) such that h(X) is subharmonic and $\mathbb{E}_{(R,\theta)}[R^2 h(W)]$ is nonincreasing with $W \sim U_{(R,\theta)}$, $\mathbb{E}_\theta[|h(X)|] < \infty$ and such that g(X) is weakly differentiable and also satisfies : (i) div(g(X)) ≤ h(X) and (ii)$\| g(X) \|^2 + 2h(X) \leq 0$

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The interactive behavior of prey-predator model by using the switching prey

Communication Info

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Keywords:
(1)Prey Switching
(2)Game Theory
(3)Linear Complementarity Problem
(4)Generalized Nash Equilibrium Problem

Abstract

In this work, we model the relationship between prey and predators by studying the interactive behavior of this prey-predator model and using the change of prey. The objective is to maximize the profit function of each predator by seeking the strategy provided by each predator to maximize its profit. To do so, we maximize this utility function being constrained by balance equations between biomass and trophic, and we show that this last problem is completely equivalent to finding the Generalized Nash Equilibrium Point. To calculate it, we use the conditions of KKT and we show that it is indeed a Problem of Linear Complementarity.

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ICRAMCS 2022
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Estimating social contact matrices using a modified social force model and socio-cultural data

Communication Info

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Keywords:
(1) Contact Matrix
(2) Demographic and behavioral characteristics
(3) Crowd Dynamics model

Abstract

Mixing patterns are central determinants of the transmission of many infections. In fact, surveys like the POLYMOD research [1-3] are used to estimate contact matrices. We present an alternative technique in this paper, which entails modeling population interactions in diverse places of activity while considering the socio-cultural and demographic characteristics of the community under investigation. The findings show that the proposed method allows for the precise calculation of community-specific contact matrices, which can then be utilized to develop reliable epidemiological models.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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LA KW-Complexité pour les Groupes

Communication Info

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Keywords:
(1) Covering type
(2) KW-complexité
(3) L'aire sytolique

Abstract

Le covering type est un invariant combinatoire introduit par Karoubi & Weibel en 2016. Etudié sur les espaces topologiques $ K $ et noté $ ct(K) $, c'est le nombre minimal de sommets que contient la triangulation minimale d'un espace $ Y $ homotopiquement équivalent à $ K $. Dans cet exposé, je vais parler de la $ KW $-complexité pour les groupes de présentations finies qui mesure la difficulté de ces groupes. Elle est définie comme étant le minimum de tous les $ ct(X) $ pour tout espace topologique $ X $ vérifiant $ \pi_1{X}=G $. On souhaiterait ensuite relier cette complexité simpliciale avec d'autres invariants de type géométrique tels que l'aire systolique des groupes.

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ICRAMCS 2022
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Study of Numerical STABILITY AND BIFURCATION ANALYSIS IN A SYSTEM OF NEUTRAL DIFFERENTIAL EQUATIONS

Communication Info

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Keywords:
(1)Neutral differential equation
(2) system neutral delay differential equations
(3) Asymptotic stability and Hopf bifurcation

Abstract

Neutral Delay Differential Equations (NDDEs)is a natural generalization of Delay Differential Equations (DDE) and, also there is a wide classes of partial Differential Equations witch can be transformed as a NDDEs (for example [1] and the references therein).

In this communication, we a present studies numerical asymptotic and Hopf bifurcations occurs at the origin in certain system neutral delay differential equations by θ -Method discretization for θ in (0,1). We give necessary and sufficient conditions on the parameters, to obtain the numerical asymptotic stability, preserving the theories asymptotic stability conditions in [2] and [3]. Finally, some numerical simulations examples are carried out to support the analytic results.

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ICRAMCS 2022
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Nonlinear dynamics of the Moroccan exchange rate: ARFIMA(p,d,q)-EGARCH(p,q)-M model

Communication Info

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Keywords:
(1) Volatility
(2) Non linearity
(2) Leverage effect
(3) Long memory

Abstract

In an environment characterized by the predominance of uncertainty and informational imperfections, the study of the volatility of foreign exchange returns is of great importance in the decision-making process of players intervening in this market.

What matters in this work is not to prove the existence of exchange rate volatility, but to determine the profile of this volatility by entering into a nonlinear dynamic. To be able to answer this problem while taking into account the stylized facts characterizing the financial series, we will adopt an econometric model ARFIMA (p,d,q)-EGARCH-M. Such modeling allows us to test on the one hand, the hypothesis of the existence of a long memory in the dynamics of the exchange rate return which contradicts the hypothesis of market efficiency in the weak sense. On the other hand, the model built aims to capture at the same time the asymmetrical effect of shocks on the volatility of the exchange rate (leverage effect), and allow this volatility to intervene in the equation of the average conditional on the exchange yield.

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ICRAMCS 2022
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A Multispecies Cross-Diffusion Model for Territorial Development

Communication Info

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Keywords:
(1) Agent-Based Model
(2) Phase Transition
(3) Cross-Diffusion
(4) Movement Ecology
(5) Segregation Model
(6) Pattern Formation

Abstract

We develop an agent-based model on a lattice to investigate territorial development motivated by markings such as graffiti, generalizing a previously-published model to account for K groups instead of two groups. We then analyze this model and present two novel variations. Our model assumes that agents' movement is a biased random walk away from rival groups' markings. All interactions between agents are indirect, mediated through the markings. We numerically demonstrate that in a system of three groups, the groups segregate in certain parameter regimes. Starting from the discrete model, we formally derive the continuum system of $2K$ convection-diffusion equations for our model. These equations exhibit cross-diffusion due to the avoidance of the rival groups' markings. Both through numerical simulations and through a linear stability analysis of the continuum system, we find that many of the same properties hold for the K-group model as for the two-group model. We then introduce two novel variations of the agent-based model, one corresponding to some groups being more timid than others, and the other corresponding to some groups being more threatening than others. These variations present different territorial patterns than those found in the original model. We derive corresponding systems of convection-diffusion equations for each of these variations, finding both numerically and through linear stability analysis that each variation exhibits a phase transition.

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March 24-26, 2022 | Casablanca, Morocco

Kolmogorov bounds in the CLT of the LSE for Gaussian Ornstein Uhlenbeck processes

Communication Info

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Keywords:
(1)Rate of convergence of CLT
(2)Gaussian Ornstein-Uhlenbeck processes
(3)Least squares estimator
(4)Malliavin calculus

Abstract

We consider the Ornstein-Uhlenbeck (OU) process defined as the solution to the equation $dX_t = -\theta\, X_t dt + dG_t$, $X_0 = 0$, where $\{G_t, t \geq 0\}$ is a Gaussian process with stationary increments, whereas $\theta > 0$ is unknown parameter to be estimated. We provide an upper bound in Kolmogorov distance for normal approximation of the least square's estimator of the drift parameter θ on the basis of the continuous observation $\{X_t, t \in [0,T]\}$, as $T \to \infty$. Our method is based on a combination of Malliavin calculus and Stein's method for normal approximation. We apply our result to fractional OU processes of the first and second kind. This talk is based on a joint work with M. F. Baldé and K. Es-Sebaiy [1].

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Gaussian And Hermite Ornstein-Uhlenbeck Processes

Communication Info

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Keywords:
(1) Gaussian and Hermite Ornstein-Uhlenbeck processes
(2) Auto-covariance function
(3) Stationarity and ergodicity.

Abstract

In the present paper we study the asymptotic behavior of the auto-covariance function for Ornstein-Uhlenbeck (OU) processes driven by Gaussian noises with stationary and non-stationary increments and for Hermite OU processes. Our results are generalizations of the corresponding results of Cheridito et al. [3] and Kaarakka and Salminen [6]. These facts play an important role in stochastic analysis and in different applications, and for these reasons the topic has been extensively studied in the literature. For instance, they can be used to study different parameters describing such Gaussian or Hermite processes. This talk is based on the published work K. Es-Sebaiy [1]

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ICRAMCS 2022

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Stationary solutions to a non-Newtonian flow with viscous heating effects of the power law fluid in 3D.

Communication Info

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Keywords:
(1) Navier-Stokes equations
(2) Viscous heating
(3) Non-Newtonian fluid
(4) Power law
(5) Weak solution

Abstract

We consider the stationary flow of a heat conducting power law shear thinning fluid in a bounded domain in R^3. At least one weak solution has been demonstrated, which means that there is a suitable velocity field which has finite energy and there is a non-negative temperature field. Its regularity is a consequence of the L^3-forcing term generated by the viscous heating.

The existence of solutions for this system was proved for the stationary case in [1] and for the non-stationary in [2], where the temperature belongs only to each of the Sobolev spaces $W^{1,s}, 1 \leq s < 2$. In the case of $\Omega \subset R^2$, at least one weak solution was proved in [3]. In this paper we follow the same techniques as in [1] to prove existence not only when $\Omega \subset R^2$ but also when $\Omega \subset R^3$.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Regular solution for a generalized Landau-Lifshitz-Bloch equation

Communication Info

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Keywords:
(1) Landau-Lifshitz-Bloch equation
(2) Compressible Heisenberg equation
(3) Galerkin's approximation
(4) Regular solution

Abstract

The Landau-Lifshitz-Bloch equation (LLB) describes the evolution of magnetic spin in ferromagnetic materials in high temperature. It is proposed by Garanin in [4], and is discussed by many writers, see for example [1,5,6]. Furthermore, in [3] Fivez derived the compressible Heisenberg chain equation which also is studied in many papers, including [2,7]. Moreover in [5] The authors take an equation generalizing at the same time the (LLB) equation and the compressible Heisenberg chain equation, which in dimension one take the form:

$$u_t = k_1 u_{xx} + (G(u)u \times u_x)_x - k_2(1 + \mu|u|^2)u. \quad (1)$$

With $G(u) = A + B|u|^q$, A, B, k_1, k_2, μ are nonnegative constants, and u is a magnetization functional vector.
In this communication, we prove a local in time existence and uniqueness of regular solution for the equation (1) in a bounded domain of $\mathbb{R}^3$.
In order to prove the existence of this solution we use the Galerkin approximation to construct approximate solutions, then we establish a priori estimates on these solutions, and we make a passage to the limit by using compactness properties.

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Analytical and probabilistic properties of Fractional Laplacians on a bounded open subset of $\mathbb{R}^N$

Communication Info

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Keywords:
(1) Fractional Laplacian
(2) Fractional heat equation
(3) Random walk

Abstract

During the past few decades, problems involving the fractional Laplacian are extensively studied in the literature.
In the full space $\mathbb{R}^N$, there are several equivalent definitions of the Fractional Laplacian. However, different fractional Laplacians can be defined on a bounded open subset $\Omega \neq \mathbb{R}^N$.

In this talk, we present some properties of the fractional Laplacians, and compare the *definitions* of these operators and their *probabilistic interpretations*.
More precisely, our goal is to highlight and describe how random walks with long jumps are related to fractional heat equations. Indeed, the information coming from the boundary and the exterior of domain arises different fractional Laplace operators, namely, the regional fractional Laplacian, the spectral fractional Laplacian, the restricted fractional Laplacian or the peridynamic fractional Laplacian.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Anderson Acceleration method for a reactive transport with sorption in porous media

Communication Info

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Keywords:
(1) Reactive transport
(2) Porous media
(3) Monotone method
(4) Degenerated model
(5) Nonlinear problem
(6) Anderson Acceleration

Abstract

This work deals with the numerical solution of a nonlinear degenerated model arising from the mathematical modeling of reactive transport in porous media, including equilibrium sorption. The model is a simplified, yet representative, version of multicomponents reactive transport models. Our approach is based on the Nonlinear Two Point Flux Approximation (NTPFA) for the diffusion term, and an upwinding scheme to handle advective term. The discrete nonlinear system is solved by the Picard method that preserves the positivity of the solution on each iteration. Our aim is, on the one hand, to introduce a regularization step for dealing with non-Lipschitz sorption rates (Freundlich type). On the other hand, we employ the Anderson Acceleration method (AA) to accelerate the convergence of the Picard iteration, while still satisfying the monotonicity of the scheme, a property well desired for this problem. These results are illustrated by some numerical experiments showing the performance of the AA method in terms of computation time.

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Density functional theory for two dimensional homogeneous materials

Communication Info

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Keywords:
(1) DFT
(2) 2D materials
(3) Model reduction

Abstract

We study Density Functional Theory models for systems which are transitionally invariant in some directions, such as a homogeneous 2-d slab in the 3-d space. Our interest comes from the recent developments of two-dimensional materials, such as graphene and phosphorene in the physics community [1]. Such systems, have been studied in [2] in the framework of Thomas-Fermi type models and in [3] in the framework of the reduced Hartree-Fock model. In this work, we focus on the simple case where the system is homogeneous, in the sense that it commutes with all translations in the plane, and we derive reduced equations in the remaining orthogonal variable. We show how the different terms of the energy are modified and we derive reduced equations in the remaining direction. In the Thomas-Fermi model, we prove that there is perfect screening, and provide precise decay estimates for the electronic density away from the slab. In Kohn-Sham models, we prove that the Pauli principle is replaced by a penalization term in the energy. In the reduced Hartree-Fock model in particular, we prove that the resulting model is well-posed, and provide some properties of the minimizer. Some on our results can be found in [4].

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Modeling and computation of residence time in semi-enclosed domains: the case of Nador lagoon

Communication Info

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Keywords:
(1) Finite volume method
(2) Non-Homogeneous Riemann Solver
(3) Unstructured meshes
(4) Residence time
(5) Nador lagoon

Abstract

Using the concepts of the Constituent-oriented Age and Residence time Theory [1,2], we propose in this study to compute timescales related to the water renewal in semi-enclosed domains. The modelling system is based on an Eulerian approach [1] and consists of two coupled model components: (i) the shallow-water equations for the hydrodynamical model and (ii) a transport equation for the passive tracer. The full system is incorporated into a high order finite volume solver on unstructured meshes. The advection process is approximated by a Non-Homogeneous Riemann Solver (SRNH) which can handle the topography variations [3]. Our objective is to study recirculation problems in the Nador lagoon and in particular to measure the residence time of water inside the lagoon. An adequate numerical study would determine the necessity and indeed the eventual location of other passes between the lagoon and the Mediterranean permitting to reduce the residence time of a given tracer.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Contact with Damped Response of an Electro-Viscoelastic Rod

Communication Info

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Keywords:
(1) Quasistatic contac problem
(2) Variational formulation
(3) Point fix theorem

Abstract

We consider a mathematical model which describes the quasistatic contact of electroviscoelastic rod with an obstacle. We use a modified Kelvin-Voigt viscoelastic constitutive law in which the elasticity operator is nonlinear and locally Lipschitz continuous, taking into the account the piezoelectric effect of the material.
We model the contact with a general damped response condition. We establish a local existence and uniqueness result of the The solution by using arguments of time-dependant non-linear equations and Schauder fixed point theorem and obtain a Global existence for small enough data. We also establish the the continuous dependance of the solution with respect to the contact boundary conditions.

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Rothe time-discretization method for a nonlinear parabolic *p(u)*-Laplacian problem with Fourier-type boundary condition and L_1-data

Communication Info

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Keywords:
(1) Entropy solution
(2) *p(u)*-Laplacian
(3) Semi-discretization
(4) Rothe's method

Abstract

Let $\Omega \subset \mathbb{R}^d, (d \geq 3)$ be an open bounded domain with a connected Lipschitz boundary $\partial\Omega$, η is the unit outward normal in $\partial\Omega$ and let T be a fixed positive real number. Our aim of this paper is to prove the existence and uniqueness results of entropy solutions for the non-linear parabolic problem

$$\begin{cases} \frac{\partial u}{\partial t} - \operatorname{div}\left(a(x,u(x,t),\nabla u(x,t))\right) + \alpha(u) = f \ \text{in} \ Q_T :=]0,T[\times\Omega, \\ a(x,u(x,t),\nabla u(x,t))\dfrac{\partial u}{\eta} + \lambda u = g \ \text{on} \ \Sigma_T :=]0,T[\times\partial\Omega, \\ u(.,0) = u_0 \ \text{in} \ \Omega. \end{cases} \tag{0.1}$$

where α is a strictly increasing continuous real function defined on $\mathbb{R}$ and λ is a positive real number, the datum f, g and u_0 are non-regular functions. The operator $\operatorname{div} a(x,u,\nabla u)$ is called $p(u)$-Laplacian.

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Strongly nonlinear elliptic unilateral problems without sign condition and with free obstacle in Musielak-Orlicz

Communication Info

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Keywords:
(1) Musielak-Orlicz-Sobolev Spaces
(2) Unilateral problems
(3) Measurable obstacle

Abstract

In this research, we prove the existence of solutions to an elliptic problem containing two lower order terms, the first nonlinear term satisfying the growth conditions and without sign conditions and the second is a continuous function on R. Note also the right hand side is assumed to be merely integrable. In the present paper, we deal with an existence result for a nonlinear elliptic unilateral problems associated to the following equation:

$$A(u)-\operatorname{div}(\Phi(u)) + g(x,u,\nabla u)=f \text{ in } \Omega$$

where Ω is a bounded Lipchitz open subset of R^N (N≥ 2) which satisfies the segment propriety and A(u)=-diva(x,u,∇u) is a Leray-Lions operator defined on A : D(A) ⊂(Ω)→(Ω) where and are two complementary Musielak-Orlicz functions. The lower order term Φ is a continuous function on R, g is a nonlinearity which satisfies the classical sign condition and natural growth condition. The right hand side f is assumed to belongs to (Ω).

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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AUTOMATIC CONTINUITY OF N-HOMOMORPHISMS BETWEEN COMPLETE p-NORMED ALGEBRA

Communication Info

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Keywords:
(1) banach algebra
(2) n-homomorphism
(3) automatic continuity

Abstract

In Automatic Continuity theory we are concerned with algebraic conditions on a linear map between Banach spaces which make this map automatically continuous. This theory has been maint développer un the contexte of banach algebras,and there are excellent account on Automatic continuity theory [2,3,5].
An n-homomorphism between algebras is a linear map $\theta : A \to B$ such that $\theta(a_1a_2...a_n) = \theta(a_1)\theta(a_2)...\theta(a_n)$ for all elements $a_1, a_2..., a_n \in A$.
We obtain some results on automatic continuity of n-homomorphisms between certain topological algebras, as well as Banach algebras.The main results are the extensions of Johnson's theorem as well as a theorem due to C.E. Rickart for n-homomorphisms.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Resolvent Conditions and Power Boundedness on Locally Convex Spaces

Communication Info

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Keywords:
(1) Locally convex spaces
(2) Resolvent condition
(3) Quotient-bounded
(4) Universally bounded Operator

Abstract

In this paper, we present two resolvent conditions for universally bounded operators on locally convex spaces: The Kreiss resolvent condition (see e.g. [4]), and The uniform resolvent condition (see e.g. [7]). We extend some results from the case of Banach spaces to the locally convex spaces. We will connect these conditions to the following condition

$$\sum_{n=1}^{+\infty} \left\| T^n \right\|_P \leq B, \qquad (1)$$

which is of course stronger than the power boundedness. More precisely, we extend the result of O. Nevanlinna [7, Proposition 1.3], to the class of universally bounded operators acting on locally convex spaces. Also, we study a variant of Kreiss resolvent condition and we show that it implies condition (1).

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On a class of super-recurrent operators

Communication Info

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Keywords:
(1) Hypercyclicity
(2) Recurrence
(3) Super-recurrence

Abstract

An operator T acting on a Banach space X is said to be recurrent if for each open subset U of X, there exist some number λ and a positive integer n such that the set $T^n(U)$ meets the set U. In this note, we introduce and study the notion of super-recurrence of operators. We investigate some properties of this class of operators and show that it shares some characteristics with supercyclic and recurrent operators. In particular, we show that if T is super-recurrent, then $\sigma(T)$ and $\sigma_p(T^*)$, the spectrum of T and the point spectrum of T^* respectively, have some noteworthy properties. At the end, we study the super-recurrence on finite-dimensional spaces.

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Sur le cône copositif et les applicationsqui le preservent

Communication Info

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Keywords:
(1) Cône Copositif
(2) Congruence monomiale
(3) Matrice Monomiale

Abstract

Dans $M_n(IR)$, l'espace des matrices carrées réelles d'ordre n, une matrice positive est toute matrice dont les coefficients sont positifs et de même pour un vecteur de IR^n, il est dit positif si toutes ses composantes sont positives. On dit qu'une matrice est monomiale si elle a exactement un coefficient non nul dans chaque ligne et chaque colonne.
Soit S_n l'ensemble des matrices symétriques réelles de $M_n(IR)$. Le cône copositif noté C_n est l'ensemble de toutes les matrices M appartenant à S_n telles que M^tAM est positif pour tout vecteur A positif.
Une congruence monomiale f est une application linéaire définie sur S_n, pour laquelle, il existe une matrice monomiale positive M, telle que $f(X)=M^tXM$, pour toute matrice X de S_n. Une telle application vérifie évidemment $f(C_n)=C_n$. Nous allons présenter une étude qui caractérise les applications sur S_n qui préservent le cône copositif C_n.

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Analysis on weighted simplicial complexes

Communication Info

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Keywords:
(1) Weighted 3-simplicial complex
(2) Laplacian
(3) Essential self-adjointness

Abstract

In this communication, we construct a new framework that's we call the weighted 3-simplicial complex. On this new weighted framework, we construct the 0-cochains Laplacian, the 1-cochains Laplacian, the 2-cochains Laplacian, the 3-cochains Laplacian and the cochains Laplacian. We introduce the χ-completeness of a weighted 3-simplicial complex and we use it to ensure essential self-adjointness for our new five weighted 3-simplicial complex Laplacians.

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Contribution à l'Etude des Indicatrices Sphériques des courbes régulières

Communication Info

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Keywords:
(1) Indicatrice Sphérique
(2) Hélice Générale
(3) Hélice Oblique
(4) Repère de Serret-Frenet
(5)Repère de Bishop

Abstract

Dans ce travail, on contribue à l'étude des courbes sphériques et plus particulièrement de certaines Indicatrices Sphériques d'une courbe régulière.
Soit $\varphi = \varphi(s)$ une courbe régulière de courbures non nulles. On désigne par (T, N, B) son repère de Frenet, par κ, τ ses invariants de Frenet, par (T, M_1, M_2) son repère de Bishop et par k_1, k_2 ses invariants de Bishop.
Dans cette étude, on determine le repère de Frenet ainsi que les invariants de Frenet des Images Sphériques du repère de Bishop de la courbe $\varphi = \varphi(s), notées: s \to T(s), s \to M_1(s)$ et $s \to M_2(s)$, ainsi que l'Image Sphérique du vecteur rotation instantanée de ce repère, notée: $s \to C(s)$.
Moyennant cette étude et une nouvelle caractérisation des courbes sphériques, on prouve de nouvelles caractérisations de l'hélice générale et de nouvelles caractérisations de l'hélice oblique.
Pour illustrer ces résultats, on étudie l'exemple de l'hélice circulaire et celui des courbes de précession constante.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

On Compositional dynamics on spaces of analytic functions

Communication Info

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Keywords:
Hypercyclicity, Supercyclicity, Transitivity, Recurrence, Super-Recurrence

Abstract

In this work, we investigate super-recurrence, super-rigidity, and uniformly super-rigidity of composition operators acting on $H(\Omega)$ the space of holomorphic functions on Ω, where Ω is either the whole complex plane $\mathbb{C}$ or the punctured plane $\mathbb{C}\setminus\{0\}$. We deduce the form of the symbol ϕ that generates a superrecurrent, super-rigid, uniformly super-rigid composition operator $\mathbb{C}_\phi$ acting on $H(\Omega)$.

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Sur le Spectre Taylor et le Spectre Taylor essentiel de la transformée d'Aluthge Sphérique

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Keywords:
(1) Spherical Aluthge transforms
(2) Taylor spectrum
(3) Taylor essential spectrum

Soit T=(T_1, T_2) un 2-uplet d'opérateurs sur un espace de Hilbert H, et soient $T_i = V_i P$ (i $\epsilon\{1, 2\}$) sa décomposition polaire (i.e, P=$\sqrt{T_1^* T_1 + T_2^* T_2}$, $\begin{pmatrix} V_1 \\ V_2 \end{pmatrix}$ un isométrie partielle, tel que $\cap_{i=1}^{2} Ker(V_i) = \cap_{i=1}^{2} Ker(T_i)$=Ker(P)).
La transformée d'Aluthge sphérique de T est le 2-uplet (nécessairement commutatifs)

$$T^{\wedge} = \left(\sqrt{P}\, V_1 \sqrt{P}, \sqrt{P}\, V_2 \sqrt{P}\right)$$

Nous étudions le spectre Taylor est le spectre Taylor essentiel de la transformée d' Aluthge sphérique $T^{\wedge}$.

Communication Info **Abstract**

References

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Left and right multiplication operators and (m, n)-isosymmetries

Communication Info

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Keywords:
(1) n-isometries
(2) m-symmetries
(3) (m, n)-isosymmetries
(4) Elementary operators
(5) Hilbert-Schmidt class

Abstract

Let H be a complex Hilbert space, B(H) the algebra of all bounded linear operators on H and (C_2 (H), $||.||_2$) the ideal of Hilbert-Schmidt operators. For A, B ∈ B (H), let L_A ∈ B(B(H)), and R_B ∈ B(B(H)) be the left and the right multiplication operators, respectively. The two-sided multiplication $M_{A,B}$ ∈ B(B(H)) is defined by $M_{A,B}(X)=(L_A R_B)(X)=AXB$ and the generalized derivation $\delta_{A,B}$ ∈ B(B(H)) is defined by $\delta_{A,B} = (L_A - R_B)(X)=AX-XB$.
The aim objective of this presentation is to study the transmission of property of being (m, n)-isosymmetry from operators A and B to their elementary operators L_A, R_B, $M_{A,B}$ and $\delta_{A,B}$ defined on C_2 (H).

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ICRAMCS 2022
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On singular values of Integration operators on weighted Bergman spaces

Communication Info

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Keywords:
(1) Weighted Bergman spaces
(2) Integration operators (generalized Volterra operators)
(3) Toeplitz operators
(4) Schatten classes
(3) Singular values

Abstract

We devote this talk to the Integration operator on weighted Bergman spaces. We will give asymptotic estimates of the singular values of such operators on Bergman spaces associated with weights not necessarily radial. Several important classes of weights that have appeared in the literature before are examples of the weights considered in our work.

Recall that the singular values of a compact operator T between two complex Hilbert spaces are the square root of the eigenvalues of the positive operator T*T.

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Numerical range of quaternionic right linear bounded operators

Communication Info

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Keywords:
(1) Quaternionic Hilbert space
(2) normal operator
(3) numerical range
(4) numerical radius

Abstract

In this paper, we prove that for a right linear bounded operator on a quaternionic Hilbert space, the norm and the numerical radius are equal if and only if the norm and the spectral radius are equal. We also show that the spherical spectrum of a quaternionic bounded operator is included in the closure of its numerical range, and we show that the numerical range of an operator on a quaternionic Hilbert space is not necessarily convex. For a quaternionic bounded normal operator, we prove that the convex hull of the closure of its numerical range is equal to the convex hull of its spherical spectrum. Finally, we give some inequalities between the numerical radius, the spectral radius and the norm of a right linear bounded operator, and we prove also that the norm and the numerical radius of a quaternionic bounded hyponormal operator are equal.

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Some results about operator perturbation for K-frames in Hilbert C*-modules

Communication Info

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Keywords:
(1) Hilbert C*-modules
(2) K-frames
(3) Semi-regular operator

Abstract

Frame theory is a new and applicable part of harmonic analysis and plays an important role in many areas and fields, from applied mathematics to engineering applications such as sampling theory, filter bank theory and image processing. The theory of regularities has been examined in connection with various classes of bounded linear operators, Fredholm theory and commutative Banach algebras. Meanwhile, one of the most important problems in the studying of frames and its extensions is the stability of these systems under the operator perturbation. Saphar introduced the concept of the algebraic core for an operator T that is the greatest subspace M of X for which T(M)=M. In this paper, we provide a way as follows for studying the operator perturbation of K-frames. Firstly, we devote to study the invariance of K-frames under semi-regular operators in Hilbert C*-module and then we try to construct some news K-frames by certain operators with specific properties.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Spectrum of Banach-valued holomorphic functions

Communication Info

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Keywords:
(1) Spectrum
(2) Banach-valued holomorphic function
(3) pluripolar and polar sets

Abstract

Let A be an unital complex Banach algebra and D be a non empty open domain in the complex plan C. Let f be a holomorphic function from D into A. We set:

$$\Sigma(f) = f^{-1}(\mathrm{Sing}(A)),$$

where Sing(A) is the set of non invertible elements in A.

In this talk, we give a description of Σ(f) using the classical spectrum of f(z) (z∈D). Moreover, we give a partial positive answer to the following problem which was posed by B. Aupetit: If the usual spectrum σ(f(z)) is polar for all z∈D, is it true that Σ(f) is polar?

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Quelques méthodes d'approximations dans les mathématiques Arabe entre (IXe -XVe s.)

Communication Info

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Keywords:
(1) Approximation;
(2) Racine;
(3) Fraction.

Abstract

Dans cette communication nous présentons quelques procédés d'approximation dans les ouvrages mathématiques Arabe dans la période allant du IXe siècle au XVe siècle et qui nous sont parvenus.

Dans cette étude, nous nous concentrerons uniquement sur les procédures d'approximation des fractions sourdes, procédures d'approximation de racine carrée, de racine cubique et d'ordre supérieur, et nous verrons les différentes méthodes d'approximation entre les mathématiques en Orient et en Occident musulman.

Les études récentes qui ont été réalisées autour de l'œuvre arithmétique d'al-Khwarizm (m.850) et des travaux de Ḥabaš̲ al-Ḥāsib (IXe s.), Abū al-Wafā Būzhjānī (m. 997) d'al-Samaw'al al-Maghribī (m. 1174), de Sharaf al-dīn al-Ṭūsī (XIIe s.), et de Naṣīr al-dīn al-Ṭūsī (m. 1274), puis al-Ḥasan al-Nišabūri(m. vers 1330) et d' al-Kāshī (m. 1429) ont été les éléments de base de cet exposé.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Calculation of the hydrographic zero in the port of Mohammedia "Atlantic facade of Morocco

Communication Info

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Keywords:
(1) Hydrographic Zero
(2) Tides
(3) Sea level variation
(4) Port of Mohammedia

Abstract

The Hydrographic Zero (HZ) should be, according to the recommendations of the International Hydrographic Organization (IHO), as close as possible to the lowest astronomical sea level. The "astronomical" characteristic indicates that it is not a directly observed level but calculated from the tidal generating force due to the gravitational actions of the Moon and the Sun [6]. They occur during the summer and winter solstices, on June 21 and December 21. Thus, to properly observe and calculate the tides we must take into consideration the period called Saros which is equivalent to a period of about 18 years 11 days and 7 hours and 50 seconds)[3]. The extreme levels of the tides are thus considered repetitive after the Saros. The perimeter of the study covers the region of Mohammedia-Casablanca on the northern Atlantic coast of Morocco. The tide gauge of observation of the data is installed in Mohammedia and the available data are recorded from this tide gauge that is the most considerable technique for sea level observation, it has started with the use of tide poles in 1770s and expanded to the Analogue Data Recorder (ADR) in the 1880s [1-2]. We present a harmonic analysis of the tide gauge records to update the (HZ) which measurements must be related to the General levelling of Morocco (NGM). During this study, we will collect the main meteorological parameters, make the harmonic analysis of the records, analyze the residual fluctuations [4-5] and redefine the (HZ). The purpose of this work is to understand the trend of sea level variation over the study area during this century which is directly related to climate change. Thus the updating of extreme sea levels for a long period has become essential and necessary subject of the work.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Stable and unstable manifolds for a class of partial functional differential equations with lack of compactness

Communication Info

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Keywords:
(1) Partial functional differential equations
(2) Semigroup
(3) Mild solutions
(4) Variation of constants formula
(5)Stable and unstable manifolds
(6)Invariant manifolds

Abstract

The suggestion of this work is to investigate the existence of stable and unstable manifolds near hyperbolic equilibrium for some nonlinear partial functional differential equations with finite delay. We start by studying the spectral decomposition of the linearized equation with an assumption more useful than the usual assumption related to the compactness. Next, we use this decomposition with the variation of constants formula given in [1], to study the stable and unstable manifolds for nonlinear equation as well as we get the estimations of solutions on these manifolds. As a consequence, we obtain a stability result on the zero solutions of the nonlinear equations. For illustration, we apply our results to the transport model.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Mathematical analysis and prediction of an epidemic using machine learning

Communication Info

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Keywords:
(1) Epidemic model.
(2) Fractional derivatives.
(3) Equilibrium points.
(4) Machine learning.

Abstract

The aim is to explore a COVID-19 SEIR model involving Atangana-Baleanu-Caputo type (ABC) fractional derivatives [2]. Existence, uniqueness, positivity, and boundedness of the solutions for the alternative model are established. Some stability results of the proposed system are also presented. To fully comprehend the dynamics of a pandemic with relevance to artificial intelligence (AI), we have used data-driven estimation methods like long short-term memory (LSTM) [1],[3]. The developed results are explained using figures which show the behaviour of achieved results.

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Existence of weak solutions for a class of nonlocal parabolic p(u)-Laplacian problem

Communication Info

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Keywords:
(1) p(u)-Laplacian
(2) Weak solutions
(3) Generalised Sobolevspaces
(4) Parabolic problem

Abstract

In this paper, we consider the existence of weak solutions for some parabolic p-Laplacian problem in the case where the exponent p may depend on the unknown solution itself. We consider the situation when p is a nonlocal quantity. Namely, we study the following parabolic problem:

$$u_t - div(|\nabla u|^{p(b(u))-2}\nabla u) = f + g(u)|\nabla u|^{p(b(u))-1}$$
$$in\ \Omega_T = \Omega \times (0,T)$$

where Ω is a bounded domain of $R^{N\geq 2}$, $T > 0$, f is a given data and g is a bounded continuous function belongs to $L^1(R)$. The motivation to study these nonlocal problems relies in the fact that, in reality the measurements of some physical quantities are not made pointwise but through some local averages.

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On spherical barycentric coordinates

Communication Info

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Keywords:
(1) Barycentric
(2) Spherical
(3) Coordinates

Abstract

The spherical barycentric coordinates are another variant of barycentric coordinates that express a point x inside an arbitrary spherical polygon P as a positive linear combination of P 's vertices. In addition, we use the contour lines plot of the resulting coordinates to provide a direct comparaison between the classical and the new coordinates. Furthermore, we follow the same procedure as in [8] to develop the 3D mean value coordinates for arbitrary polygonal meshes using the previously constructed spherical barycentric coordinates and this allows us to express the 2D barycentric coordinates for arbitrary polygons using 3D barycentric coordinates of the origin 0. Finally, we use the 3D mean value coordinates (as an application) in shapes deformation.

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ICRAMCS 2022

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Non linear parabolic problem with fractional diffusion and non-local gradient

Communication Info

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Keywords:
(1) Fractional Laplacian
(2) Schauder Fixed Point
(3) Non-Local Gradient

Abstract

Our work deals with the nonlocal version of Hamilton-Jacobi equation with nonlocal gradient term.
The main considered problem is the following system:

$$\begin{cases} u_t + (-\Delta)^s u = |(-\Delta)^{\frac{s}{2}} v|^p + f(x,t) & \text{in}\Omega_T \\ v_t + (-\Delta)^s v = |(-\Delta)^{\frac{s}{2}} u|^q + g(x,t) & \text{in}\Omega_T \\ u(x,0) = v(x,0) = 0 & \text{in}\Omega \\ u(x,t) = v(x,t) = 0 \quad \text{in}(\mathbb{R}^N \setminus \Omega) \times (0,T) \end{cases} \tag{1}$$

Where Ω is a bounded domain in $\mathbb{R}^N$, p,q≥1 and f, g are nonnegative data.
By $(-\Delta)^s$ we denote the fractional Laplacian given with

$$(-\Delta)^s u(x) := a_{N,s}\ \text{P.V.} \int_{\mathbb{R}^N} \frac{u(x)-u(y)}{|x-y|^{N+2s}}\, dy,\ s \in (0,1),$$

Our aim is to show under which conditions on the given data and the exponent p, q we get the existence of a nonnegative weak solution for the system (1). In some particular cases, we are able to prove that these conditions are optimal.
These results are part of the paper [1].

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ICRAMCS 2022
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Hybridization of Divide-and-Conquer Technique and Neural Network Algorithm for Better contrast enhancement in Medical images

Communication Info

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Keywords:
(1) Medical image
(2) Contrast enhancement
(3) Divide-and-Conquer Algorithm
(4) Neural Network Algorithm

Abstract

The aim of this work is to propose a new method for optimal contrast enhancement of a medical image. The main idea is to improve the Divide-and-Conquer method to enhance the contrast, and highlight the information and details of the image, based on a new conception of the Neural Network algorithm. The divide-and-Conquer technique is a suitable method for contrast enhancement with an efficiency that directly depends on the choice of weights in the decomposition subspaces.

A new hybrid algorithm was used for the optimal selection of weights, considering the optimization of the enhancement measure (EME).

To evaluate the proposed model's effectiveness, experimental results were presented showing that the proposed hybrid technique is robustly effective and produces clear and high contrast images.

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A coupled model of the fluid flow with nonlinear slip Tresca boundary

Communication Info

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Abstract

We present in this work the unsteady Stokes equations coupled with the heat equation and provided with nonlinear slip boundary conditions of the Tresca type. Where both the viscosity and the diffusion coefficients depend on the temperature. We use an implicit Euler diagram in time and we discretize the problem in space by the finite element method.
We demonstrate optimal error estimates between the continuous solution and the discrete solution. Some numerical experiments confirm the interest of this approach.

Keywords:
Stokes equations, convection-diffusion equations, finite element discretization,nonlinear slip boundary conditions, variational inequality

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REGULARITY FOR THE FRACTIONAL HEAT EQUATION AND APPLICATION

Communication Info

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Keywords:
(1) Fractional Diffusion
(2) Fractional gradient
(3) Shauder fixed point
(4) A priori estimates
(5) Bessel space

Abstract

The aim of our work is to study the nonlocal version of the Kardar-Parisi-Zhang equation with fractional gradient. More precisely, we consider the nonlocal problem

$$(P)\begin{cases} u_t + (-\Delta)^s u = |(-\Delta)^{\frac{s}{2}} u|^q + f & \text{in } \Omega_T = \Omega \times (0,T), \\ u(x,t) = 0 & \text{in } (\mathbb{R}^N \setminus \Omega) \times (0,T), \\ u(x,0) = u_0(x) & \forall x \in \Omega, \end{cases}$$

Where Ω is a bounded domain in $\mathbb{R}^N$ with N>2s, q≥1 and f, u_0 are nonnegative measurable functions.
Here , by $(-\Delta)^s$ we mean the fractional Laplacian which is given by

$$(-\Delta)^s u(x,t) := a_{N,s} PV \int_{\mathbb{R}^N} \frac{u(x,t) - u(y,t)}{|x-y|^{N+2s}} dy.$$

And $a_{N,s}$ is a normalization constant. To prove the existence result for the problem (P), we need to analyse deeply the question of fractional regularity to the corresponding heat fractional equation with Dirichlet condition. The main tool that we used for this purpose, is a new estimate on the heat kernel noted by P(x,y,t).
The results of the present talk are part of the paper [1].

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Algebra Properties in Fourier-Besov Spaces and Their Applications

Communication Info

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Keywords:
(1) Besov spaces and Fourier-Besov-Morrey spaces
(2) LittlewoodPaley theory
(3) Well-posedness

Abstract

The Fourier-Besov-Morrey spaces were introduced by [1,2,3] in the context of active scalar equations with fractional subcritical dissipation .Later, these spaces were employed to investigate the global well-posedness of the Navier-Stokes-Coriolis system in [4], also these spaces belongs to a class whose definition of the norm is based on Fourier transform, but it is not contained in L^2. In this communication, we present some properties and embddings in the framework of Fourier-Besov-Morrey and we will estimate the norm of the product of two scale functions in Fourier-Besov spaces. As applications of these algebra properties, we establish the global well-posedness for small initial data and local well-posedness for large initial data of the quasi-geostrophic (QG) equation [5].

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Contribution des Composantes des architectures dans la performance au sein des réseaux de neurones

Communication Info

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Keywords:
(1Neural networks
(2) Convolution
(3) Optimization

Abstract

L'amélioration continue que connaissent les réseaux de neurones profonds, est essentiellement liée à l'apparition de nouvelles approches basées sur de nouvelles architectures, comme VGG16, Inception-v4, ResNet-50, et qui sont des réseaux de neurones appliqués notamment pour la reconnaissance image, la détection des objets, ou les systèmes autonomes. Le but de ce travail est d'analyser la structure des réseaux de neurones sur plusieurs niveaux, à savoir le nombre de couches cachés, les blocks convolutifs, les blocks récurrents, et les fonctions d'activations, et de mesurer par la suite la contribution de ces différents éléments dans la performance des modèles.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Combinaison des méthodes multicritères d'aide à la décision avec les réseaux de neurones artificiels

Communication Info

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Keywords:
(1) Méthodes multicritères d'aide à la décision
(2) Aide à la décision
(3) RNA: Réseaux de neurones artificiels.

Abstract

Le développement rapide des méthodes multicritères d'aide à la décision, se traduit par un grand nombre d'applications dans différents domaines [1]. Elles apportent des éléments de réponse au problème de l'évaluation selon de multiples points de vue souvent contradictoires. Autres catégories des modèles décisionnels, ce sont les méthodes intelligentes, parmi eux, il excite les réseaux de neurones, qui tentent d'imiter le cerveau humain en collectant et en traitant des données [2].

Dans cette communication, nous présentons une combinaison des méthodes multicritères d'aide à la décision avec les réseaux de neurones artificiels, dans le but de résoudre un problème de prédiction dans le domaine de la santé et plus précisément dans le domaine des maladies infectieuses.

Nous avons développé le programme PYTHON pour l'exécution du code qui implémente les réseaux neuronaux. Nous comparons différents modèles de ces réseaux afin d'adopter le plus performant entre eux.

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A kinetic model for crowd motion: Influence of geometry of domain on the emergency

Communication Info

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Keywords:
(1) Kinetic theory
(2) Pedestrians
(3) Emergency evacuation
(4) Monte Carlo method

Abstract

In the current paper, a kinetic theory approach is considered to model the emergency evacuation of pedestrians from a bounded domain includes walls, exits, and obstacles. The interactions of a person with other pedestrians are modeled by using tools of game theory. The heterogeneity of individual behaviors is introduced into the model by an activity variable. Numerical simulations are based on a Monte Carlo particle method. They are presented to study the influence of the bottleneck and square domain, and the shape of obstacles on emergency evacuation.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Mathematical Modeling of the spread of Alcoholism addiction : Optimal control approach.

Communication Info

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Keywords:
(1) Mathematical modeling
(2) Alcohol addiction
(3) Optimal control theory;

Abstract

In this work, we propose a mathematical model that describes the dynamics and treatment of alcoholism. In this model we present some interactions between different classes of drinkers, namely, potential drinkers (P), moderate drinkers (M), heavy drinkers (H), poor heavy drinkers (Tp), rich heavy drinkers (Tr), and quitters of drinking (Q). We also focus on the importance of the treatment within addiction treatment centers aiming to find the optimal strategies to minimize the number of drinkers and maximize the number of heavy drinkers who join these addiction treatment centers. We use three controls which represent awareness programs through media and education for the potential drinkers, the efforts to encourage the heavy drinkers to join addiction treatment centers, and psychological support with follow-up for the individuals who quit drinking. We use Pontryagin's maximum principle to characterize these optimal controls. The resulting optimality system is solved numerically by Matlab. Consequently, the obtained results confirm the performance of the optimization strategy.

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Numerical solution of the intuitionistic fuzzy nonlinear Volterra–Fredholm integro-differential equations by using Picard's method

Communication Info

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Keywords:
(1) Intuitionistic fuzzy number
(2) generalized hukuhara difference
(3) intuitionistic fuzzy solution
(4) existence and uniquness theorem
(5) Picard's iterative method

Abstract

In this paper, our main objective is to find the solution of the nonlinear Volterra-Fredholm integro-differential equation with intuitionistic fuzzy initial conditions under generalized H-differentiability, the existence and uniquness of intuitionistic fuzzy solutions for this problem are explored in a theorem, and we proved that the approximate solution converge to the exact solution, we also give an example to illustrate the efficiency of this method under generalized H-differentiability. The basic ideas of this approach should be used to solve the many intuitionistic fuzzy problems engineering in general and mechanics and physics in particular. The computations in this paper were performed by the application of the Matlab.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A Class of Central Unstaggered Schemes for nonlocal Conservation Laws: Applications to Traffic Flow models

Communication Info

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Keywords:
(1) Finite volume methods
(2) Traffic flow models
(3) Central Schemes

Abstract

In this paper, we present a new class of central unstaggered finite volume methods for approximating solutions of nonlocal conservation laws. The proposed method is an extension of the non-oscillatory central scheme of Nessyahu and Tadmor (NT). In contrast to the NT scheme, the method we develop evolves the numerical solution on a single grid but implicitly uses ghost cells to avoid the resolution of the Riemann problems at the cell interfaces. We apply our method and solve the one-dimensional nonlocal traffic flow problems. The numerical results we present, show the desired accuracy, high resolution, non-oscillatory nature and compare very well with those obtained using the original NT method, thus confirming the proposed method's efficiency.

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A Comparative Study of Some Algebraic Decoders

Communication Info

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Keywords:
(1) Error-correcting code
(2) Algebraic decoder
(3) Complexity
(4) Bit error rate

Abstract

The error-correcting codes (ECC) have a crucial role in enhancing and ameliorating communication capability and quality. There are various methods for achieving the goals, one of which uses decoding algorithms to locate conveyed data through a communication channel or stored on physical media, which is generally caused by noise. The decoding problem is an NP-hard problem [1]. Algebraic, heuristic, meta-heuristic, and machine learning-based decoders are developed to detect and correct errors [2]. In this work, we focus on algebraic decoders like the permutation decoding algorithm, the Ordered Statistic Decoding, the GOSMLD decoder, and the Berlekamp-Massey decoder use the algebraic properties of codes to detect the location of errors [3-5]. The objective of this work will then be to synthesize and compare significant results that have dealt with the algebraic decoding problems in terms of complexity and bit error rate (BER) in the form of a review of the literature to consider them in our future research.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Generalized Solution of Non-homogeneous Wave Equation

Communication Info

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Keywords:
(1) Colombeau algebra
(2) Generalized solution
(3) association

Abstract

The algebras of Colombeau are constructed by J. F. Colombeau [2][3], as factor algebras of infinite powers of the space C^{∞} modulo a particular class of ideals. Elements of these algebras are classes of nets of smooth functions [4]. This theory was been used for solving the linear and nonlinear partial differential equations with singularities [1], for example M. Oberguggenberger and Y.G. Wang, studied the Delta-waves for semi linear hyperbolic Cauchy problems [7]. In this communication, we are interested to study the non-homogeneous wave equation in generalized function algebra, we give a result of existence and uniqueness of generalized solution with initial data are distributions, then we study the association concept with the classical solution.

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ICRAMCS 2022
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Rainfall prediction using neural network and Kalman filter

Communication Info

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Keywords:
(1) Rainfall
(2) Prediction
(3) Kalman filter
(4) Machine learning

Abstract

Rainfall prediction is one of the most important tools for water management. Scientists have developed several techniques in recent years to analyze and predict rainfall [1]. The sophisticated nature of rainfall data affects the accuracy of the prediction. We present a method for rainfall prediction in the region of El Jadida located in Morocco. The prediction of rainfall in this region is presented using a hybrid model, which combines the Kalman filter [2] and Machine learning using two different approaches [3]. Four other models (ARIMA, Holt-Winter, ANN) [4, 5] were applied to the daily rainfall in the region of El Jadida. The simulation results using MATLAB and R software show that the proposed model is more effective than other used models.

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ICRAMCS 2022

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Variational Study of a Generalized Thermo Viscoplasticity Problem

Communication Info

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Keywords:
(1) Viscoplastic,
(2) Temperature,
(3) Variational inequality,
(4) Cauchy-Lipschitz method

Abstract

In this work we consider two uncoupled quasistatic problems for thermo viscoplastic bodies. The thermo viscoplasticity effect is characterized by the coupling between the mechanical, and the thermal properties of material. In the model, both the elastic and the plastic rate of deformation depend on a parameter θ which may be interpreted as the absolute temperature. The boundary conditions considered here as displacement-traction conditions as well as unilateral contact conditions. We establish a variational formulation for the model and we prove the existence of a unique weak solution to the problem, reducing the isotherm problem to an ordinary differential equation in a Hilbert space.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A fuzzy epidemiological model of the Omicron mutation inCoronavirus 19 disease

Communication Info

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Keywords:
(1) Fuzzy epidemiologymodel,
(2) equilibirium point
(3) analysis of the bifurcation
(4) fuzzy base member

Abstract

Since late 2019, Corona disease is still spreading to this day, and more than that, several mutations have appeared for this disease, which has caused concern to humanity, and the last mutant called omicron is considered the most dangerous and prevalent of the mutations that preceded it. Moreover, Omicron shows a viral concentration in the lungs that is ten times higher than that in the other variants. In this work we have built a new system of equations that mathematically model the new surge of corona (Omicron). In addition, we can consider the rates of transformation of the disease and the rate of recovery are fuzzy and we associate a membership function with each rate, it will help us to study our epidemiological model well. We are interested in our work in the existence, stability, analysis and bifurcation of the fuzzy model, and the identification of the fuzzy base member; Moreover, we are concerned with disease control in the mysterious epidemic regime.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Torsion Section of Elliptic curves over the Ring $\mathbb{Q}[e],\ e^2 = e$.

Communication Info

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Keywords:
(1) Elliptic curves.
(2) Torsion section
(3) Finite ring

Abstract

Let E be an elliptic curve over Q. Mazur[4] has classified the torsion group of an elliptic curve on Q. Since the work on torsion groups has been developed by several mathematicians, we have in [1,2,3] the classifications of torsion group over quadratic extensions of Q, and [5,6] for quadratic cyclotomic fields.
In this paper, we will study the torsion section of elliptic curves on the ring L=Q[e] with $e^2 = e$. We take a different approach for this ring by first establishing an isomorphism between the elliptic curve given by a Weierstrass equation $Y^2Z = X^3 + aXZ^2 + bZ^3$over L, and well-defined elliptic curves on the rational field, then we classify the groups that can appear as E(L)_{tors} (up to isomorphism).

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On the rank of induced map in homotopy and homology for fibration

Communication Info

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Keywords:
(1) Rational homotopy theory
(2) Fibration
(3) Homology
(4) Homotopy

Abstract

In rational homotopy theory there are a lot of conjectures dealing with the question of how large the cohomology algebra of a space has to be under certain conditions. An example of those conjectures is Hilali's, which is based on the size of the rationally elliptic spaces. A space X is said to be elliptic if the dimensions of cohomology and homotopy are both, i.e., $dim\ \prod_*(X) * (X)\otimes\mathbb{Q} < \infty$ and $dim\ H * (X;\ \mathbb{Q}) < \infty$.

Let $F \to X \xrightarrow{f} Y$ be a fibration of rationally elliptic CW-complexes. Denote by $Im\ \prod_*(f) = \oplus_i\ Im\ \{\prod_i(f) : \prod_i(X) \to \prod_i(Y)\}$ and $Im\ H_*(f) = \oplus_i\ Im\ \{H_i(f) : H_i(X) \to H_i(Y)\}$. The topological aspect of this paper is centred around the following question: when $rank\ \prod_*(f) \leq rank\ H_*(f)$?. We prove this question for certain reasonable cases.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existence and Uniqueness of a Capacity Solution to a nonlinear Parabolic-Elliptic System

Communication Info

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Keywords:
(1) Thermistor problem
(2) Sobolev Lebesgue spaces
(3) Capacity solution

Abstract

In this work, we study a much more general version of a thermistor problem than the one considered by Xu in [1]; Precisely, we assume that the diffusion function a(x, t, u, ∇u) depends also on u and define a Leray–Lions operator of order p ≥ 2. Since capacity solutions are obtained by approximating techniques, the proof of the existence theorem relies on the introduction of a sequence of approximate problems. Then, it is shown that the sequence of solutions to these smooth problems converge (up to a subsequence) in a certain sense to a capacity solution. As a consequence, we get the existence and uniqueness of a capacity solution to a coupled nonlinear parabolic–elliptic in Sobolev Lebesgue spaces.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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STUDY THE EXISTENCE OF SOLUTIONS ON A TIME SCALE FOR NONLINEAR IMPULSIVE DYNAMIC EQUATIONS

Communication Info

Keywords:
(1) Fixed point.
(2) nonlinear impulsive dynamic equations.
(3) time scales.

Abstract

Certainly, the Lyapunov direct method has been, for more than 100 years, the main tool for the study of stability properties of ordinary, functional, partial differential and difference equations. Nevertheless, the application of this method to problems of stability in differential and difference equations with delay has encountered serious difficulties if the delay is unbounded or if the equation has unbounded terms. Recently, Burton, Furumochi, Zhang, Raffoul, Islam, Yankson and others have noticed that some of these difficulties vanish or might be overcome by means of fixed point theory In this paper we use fixed point method to prove asymptotic stability results of the zero solution of a nonlinear neutral difference equation with variable delays. An asymptotic stability theorem with a sufficient condition is proved. The obtained results improve and generalize those due to Raffoul (2006) [1], Yankson (2009) and Islam and Yankson (2005) [6].

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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SEQUENTIAL PARETO SUBDIFFERENTIAL CALCULUS SUM RULE

Communication Info

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Keywords:
(1) Set-valued convex mappings
(2) Pareto subdifferential
(3) Regular subdifferentiability
(4) Set-optimization

Abstract

The aim of this paper is to provide a general description of the (weak and proper) subdifferential of the sum of convex set-valued mappings in terms of sequences without any constraint qualifications. It is well known that in order to investigate optimality conditions for vector optimization problems, we often formulate a corresponding scalar optimization problem by using a scalarization approach. Nevertheless, such scalar convex program requires a qualifications conditions, but we know that generally, the qualification conditions do not always hold. This manner of facts leads many authors to investigate sequential optimality conditions for characterizing optimal solutions for vector or scalar convex optimization problems in terms of some limits of sequences in exact sudifferentials at some nearby points without any constraint qualifcations

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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On the existence of renormalized solutions of nonlinear elliptic problem with generalized growth and measure data

Communication Info

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Keywords:
(1Musielak Oricz sobolev spaces
(2) Elliptic problem
(3) Renormalized solutions , truncations

Abstract

In this note we will prove the existence of a renormalized solutions for the following nonlinear boundary value problem :

$$\begin{cases} \boldsymbol{B(u) - div\big(F(x,u)\big) = \mu \quad in\ \Omega} \\ \boldsymbol{u = 0 \quad in\ \partial\Omega} \end{cases}$$

Where Ω is a bounded domain of $\mathbb{R}^N, N \geq 2, B(u) = -\boldsymbol{div\big(b(x,u,\nabla u)\big)}$ is a leray-lions operator defined from the space $W_0^1 L_\varphi(\Omega)$ into its dual $W^{-1}L_\varphi(\Omega)$, with φ *and* $\bar{\varphi}$ are two complementary Musielak-Orlicz functions and where b is a function satisfying The following conditions :

$b: \Omega \times \mathbb{R} \times \mathbb{R}^N \to \mathbb{R}^N$ is a Carathéodory function .

$|\boldsymbol{b(x,s,\xi)}| \leq k_1(d(x) + \bar{\varphi}_x^{-1}(P(x,k_2|s|)) + \bar{\varphi}_x^{-1}(\varphi(x,k_3|\boldsymbol{\xi}|))$).

$$(\boldsymbol{b(x,s,\xi) - b(x,s,\xi')})(\boldsymbol{\xi - \xi'}) > \mathbf{0}$$

$$\boldsymbol{b(x,s,\xi).\xi \geq \alpha\, \varphi(x,|\xi|)}.$$

The lower term $\boldsymbol{F}$ is a Carathéodory function.

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A parametric study on the thermal performance of a building wall with a phase change material (PCM)

Communication Info

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Keywords:
(1) Phase change materials
(2) Building envelope
(3) Wall thermal performance

Abstract

Nowadays the energy demands for buildings is among the dominant consumers of energy and steadily increased very rapidly. In buildings, thermal comfort and maintaining indoor air quality are chief energy consumers. Integrating PCM into building envelope walls is an interesting solution that can enhance thermal inertia and improve indoor thermal comfort systems. [1-3]. This work presents a parametric study on the thermal performance of a building wall with a phase change material (PCM). Such as outdoor air temperature, indoor ambient temperature, PCM volume fraction, the optimal location of PCM layer, and PCM properties,[2-3-4-5].different effects of PCM parameters on the thermal performance of a building wall with a phase change material was analyzed and studied by numerical simulation.

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Quasilinear Periodic Equation with Arbitrary Growth Nonlinearity and Data Measures

Communication Info

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Keywords:
(1) Quasilinear
(2) Periodic solution
(3) Data Measures
(4) Deep Learning

Abstract

The aim of this paper is to present, on the one hand, the mathematical analysis of a class of quasilinear periodic equations with periodic boundary conditions and arbitrary nonlinearities with respect to the gradients of the solutions, and on the other hand a numerical simulation based on Deep Learning techniques. The classical techniques to show the existence of solutions based on a priori estimates in C^{α} do not perform here, and a new technique is developed to show the existence and uniqueness of weak periodic solutions. The classical numerical methods based on difference or finite element approximation do not give good results because of the strong nonlinearity and the data which are only Radon measure. Here again we present a new approximation approach based on deep neural networks. Several numerical examples are given here that show the efficiency and robustness of our approach.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

An alternating direction method of multipliers for total variation inverse problems using the conditional gradient.

Communication Info

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Keywords:
(1) Ill-posed problem
(2) Inverse problem
(3) Total variation
(4) ADMM
(5) Conditional gradient.

Abstract

In this paper, we study the ill-posed problem using the total variation regularization. To solve such a problem, we use an alternating direction method of multipliers to split our problem to two interactive sub-problems. The novelty of our paper is in the use of the conditional gradient total variation method (CGTV) [1] we have recently introduced. The second splitting sub-problem is solved by transforming the obtained optimization problem to a general Sylvester matrix equation and then an orthogonal projection method is used to solve the obtained matrix equation. We give the proof of the convergence of this method. Some numerical examples and applications to image restoration are given to illustrate the effectiveness of the proposed method.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Entropy solutions for nonlinear parabolic unilateral problems with diffuse measure data

Communication Info

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Keywords:
(1) Entropy solutions
(2) Measure data
(3) Parabolic unilateral equation

Abstract

We study both existence and regularity results of *entropy* unilateral solutions for nonlinear parabolic problems governed by a general *Leray-Lions* operators, an initial datum and diffuse measure as a right-hand side that does not charge the sets of zero parabolic p-capacity, whose model is:

$$\begin{cases} u - g \geq \Psi & a \cdot e \ in \ \Omega \times (0;T) \\ u_t - \Delta_p u = \mu & in \ Q \\ u_{t=0} = u_0 \ \ in \ \Omega \qquad u = 0 & on \ \partial\Omega \times (0;T) \end{cases}$$

where ς is an open bounded subset of $\mathbb{R}^N (N > 2)$ and $T > 1; 1 < p < N \cdot$ p is the p Laplace operator, u_0 is an integrable function, θ is a *diffuse* measure and g belongs to $L^p\left(0;T;W_0^{1;p}(\Omega)\right) \cap L^\infty(\Omega)$ ·This parabolic equation appears in the weak theory where it is known as the *Boccardo-Gallouët* problem, see [1](and also [2]). A modification of the above equation is studied in [3] in the framework of duality solutions where some regularity properties are obtained (see also [4]) Recall that when the data are bounded: it suffices to use a distributional approach to transform the equation into a regularized problem which can be solved by *Leray-Lions* techniques, see [5].

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A deflected weak subgradient method for solving a system of nonconvex nonsmooth equations

Communication Info

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Keywords:
(1) Weak deflected subgradient method
(2) System of nonsmooth equations
(3) Multi-stream heat exchangers

Abstract

The system of nonsmooth equations arises in many applications such as nonlinear complementary problems, variational inequality problems, bilevel programming problems, and many real-world problems in mechanics and engineering [1]. In this paper, we consider the box-constrained system of nonsmooth equations, and we propose a solution method for solving this problem which is based on the weak subgradient concept and the deflected technique. Our method enhances the efficiency by introducing a deflected weak subgradient to weaken the zigzagging phenomena that slows the convergence of the weak subgradient method. Also, the proposed algorithm is implemented in the MATLAB environment and comparative results of numerical experiments are reported. Finally, the method is used to solve the nonsmooth equations arising from multi-stream heat exchangers [4, 5].

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Homographic Approximation for regularized Signorini problem with nonlocal friction in electro-elasticity: Existance and uniqueness results.

Communication Info

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Keywords:
(1) homographic approximation
(2) nonlinear electro-elasticity
(3) regularized variational formulation
(4) Shauder fixed point theorem.

Abstract

In this paper, we are concerned with the study of the homographic approximation for the regularized Signorin problem with nonlocal Coulomb friction law in nonlinear electro-elasticity in contact with a conductive foundation. The homographic approximation is a bounded penalty method introduced by C.M. Brauner and B. Nicolaenko in the linear case (see [4]). The purpose of this paper is to apply the bounded penalty method to the regularized variational formulation which is equivalent to the original problem (see [6]). We prove the existence and uniqueness of a weak solution of the penalized problem, using the techniques of elliptic variational inequalities and the arguments of Shauder fixed point theorem.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE

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Spatio-temporal SIR model with Robin boundary condition and lockdown

Communication Info

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Keywords:
(1) SIR MODEL
(2) Lockdown policy
(3) Parabolic equations

Abstract

The current study deals with a spatiotemporal SIR model with a nonlinear Robin boundary condition and lockdown policy. When the number of infected people in a given region exceeds a certain threshold, the presented model imposes a lockdown policy. Furthermore, we demonstrate the model's well-posedness by an optimization approach as well as the asymptotic behavior of the solutions in order to give some results of stability. We also present the Numerical experiments associated to the problem which are carried out to highlight theoretical conclusions.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Global dynamics of a SIR epidemic model with vaccination and treatment

Communication Info

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Keywords:
(1) SIR epidemic model
(2) Global stability
(3) Vaccination
(3) Treatment

Abstract

In this communication, we propose a susceptible-infected-recovred epidemic model with generalized incidence rates, distributed delay , vaccination and treatment. The wellposedness of the suggested model is established in terms of existence, positivity and boundedness of solutions. By constructing suitable Lyapunov functionals, the global asymptotic stability of the disease-free and endemic equilibrium are established depending on the basic reproduction number R_0.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A class of fractional differential history-dependent hemivariational inequalities with application to thermo-viscoleastic

Communication Info

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Keywords:
(1) Differential hemivariational inequality
(2) Rothe method
(3) Fractional Caputo derivative

Abstract

The aim of this work is to study a class of fractional differential history-dependent hemivariational inequalities. By using the Rothe method and exploiting the surjectivity of multivalued pseudomonotone operators to prove existence of solution. We apply the above result in the problem we investigate the contact problem for a nonlinear thermo-viscoelastic body to history-dependent with time fractional Kelvin-Voiget constitutive law and adhesion. This describing the both viscolastic and thermal effects wich is important in the sense of mathematical. Here the contact is presented in the form of multivalued normal compliance and friction is described with a subgradient of a locally Lipschitz mapping, and the constitutive relation is displayed by the fractional Kelvin-Voigt law. Then, we derive the variational formulation of this problem which is of the form of differential history-dependent hemivariational inequalities for which we apply our results.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existence and uniqueness of weak solution for a nonlinear parabolic equation related to image processing

Communication Info

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Keywords:
(1) Nonlinear diffusion
(2) Parabolic equation
(3) Image restoration
(4) Edge detection
(5) Hilbert space

Abstract

Image restoration is an essential preprocessing step for many image analysis applications. The techniques based on partial differential equations, such as the heat equations, are receiving considerable attention in image restoration. However, designing PDEs requires high mathematical skills and good insight into the problems. In this work, a nonlinear diffusive filter for image denoising and edge detection based on a nonlinear partial differential equation is studied analytically and tested numerically. Existence, uniqueness and regularity of the solution for the proposed mathematical model are established in an Hilbert space. We describe briefly the numerical scheme which was used in experimentations and present some experimental results on natural images.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

EXISTENCE AND MULTIPLICITY RESULTS FOR DISCRETE 2n-TH ORDER PERIODIC BOUNDARY VALUE PROBLEM

Communication Info

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Keywords:
(1) Discrete boundary value problems
(2) Critical point theory
(3) Variational methods

Abstract

Let n≥1 be a positive integer. Sufficient conditions are given for the existence of multiple solutions to a discrete 2n-th order periodic boundary value problem consisting of the equation:

$$\sum_{k=0}^{n}(-1)^{k}\Delta^{k}(h_{k}\,(t-k)\Delta^{k}u(t-k)) = f(t,u(t)),$$

$$t \in [1;N]_{Z},$$

and the boundary condition (BC):

$\Delta^{i}u(-(n-1)) = \Delta^{i}u(N-(n-1)),\ i \in [0;2n-1]_{Z}$,

where N ≥ n is an integer, $[1;N]_{Z}$ denotes the discrete interval {1,2,3,...,N}, Δ is the forward difference operator defined by Δu(t) =u(t+1)-u(t), $\Delta^{0}u(t) = u(t)$ and $\Delta^{i}u(t) = \Delta^{i-1}(\Delta u(t))$, for i=1,2,3,...,2n.

The functions h_{k}, $k \in [1;n]_{Z}$ and f are assumed to satisfy the following conditions throughout this work:

i) $h_{k} \in C([-(k-1);N]_{Z},R)$, $k \in [0;n]_{Z}$ are some fixed functions such that $h_{k}(-l)=h_{k}(N-l)$, $\forall k \in [1;n]_{Z}, \forall l \in [0;k-1]_{Z}$.

ii) $f \in C([1;N]_{Z}\times R, R)$ is a continuous function in the second variable.

Using variational methods for proving our results.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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One radius mean value property for Dunkl harmonic Distributions

Communication Info

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Keywords:
(1) Harmonic functions;
(2) Mean value property;
(3) Liouville's theorem

Abstract

Let Δ_k is the Dunkl Laplacian. A continuously twice differentiable function u defined on IR^d is said to be $\Delta_k$harmonic on IR^d if Δ_k u=0.

It is proved in [2] (see also [1]) that a continuous function u is Δ_k-harmonic on IR^d if and only if, for every r>0,

$(\sigma_r^k *_D u)(x)=u(x)$, pour tout $x \in IR^d$. (1)

Here $\sigma_r^k *_D u$ denotes the Dunkl-convolution of the function u and the generalized normalized surface-area measure σ_r^k.

This paper deals with the question whether it is sufficient for the Δ_k-harmonicity of u on IR^d to have (1) for just one radius r>0.

For d=1 and k=0, the answer is NO (consider u(x)=sin(x) and r=2Π). If however d=2 and k=0, an affirmative answer is given by Hansen [3] for continuous bounded functions. In the present work, we answer this question in dimension three or more and for arbitrary k>0.

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Potential Method in the Coupled Theory of Viscoelastic Triple-Porosity Materials

Communication Info

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Keywords:
(1) Viscoelasticity
(2) Triple-porosity materials
(3) Potential method

Abstract

In this talk, the linear coupled theory of viscoelasticity for triple-porosity materials is considered and the non-classical internal and external boundary value problems (BVPs) of steady vibrations are investigated. Namely, the fundamental solution of the system of steady vibration equations of the considered theory is constructed. The uniqueness theorems for the solutions of the BVPs of steady vibrations are proved. The surface and volume potentials are constructed and their basic properties are established. The BVPs are reduced to the always solvable singular integral equations. The existence theorems for classical solutions of the internal and external BVPs of steady vibrations are proved by means of the potential method (for details on the potential method see [1]).

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Mathematical modeling and analysis of a nonlinear system describing corruption

Communication Info

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Keywords:
(1) Basic reproductive number
(2) Corruption
(3) Equilibrium State
(4) Optimal control theory

Abstract

We suggest a nonlinear mathematical model to study the behavior of corruption in a society. The model is proved both epidemiologically and mathematically well-posed. We proved that all solutions of the model are positive, the corruption-free and endemic equilibrium are obtained and the condition for the stability of the corruption-free equilibrium state was determined, the local stability analysis of the mathematical model of corruption was done, and the corruption reproduction ratio R_0 is computed using the next-generation matrix method [1]. The analysis shows that the system has a locally asymptotically stable corruption-free equilibrium point when the reproduction number is less than one. The model was expanded by recasting it as an optimal control problem [3], using two time-dependent controls to assess the impact of corruption on the human population, that is, anti-corruption campaigning through media and publicity, and exposure. With Pontryagin's maximum principle [2], the conditions needed for the optimal control of the transmission of corruption were obtained.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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BI-NONLOCAL FRACTIONAL $p(x)$-LAPLACIAN PROBLEM VIA KRASNOSELKII'S GENUS AND NEUMANN BOUNDARY CONDITION

Communication Info

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Keywords:
(1) Bi-nonlocal problem
(2) Nonlinear nonlocal Neumann boundary conditions
(3) Genus theory

Abstract

In this work, we are concerned with a class of a bi-nonlocal problem involving the generalized integro-differential operator of elliptic type ⇜with singular kernel K) with nonlocal nonlinear Neumann boundary conditions.

By the Krasnoselkii's genus theory, we show the existence of infinitely many solutions in a general fractional Sobolev space with variable exponent.

Motivated by previous contributions in that context, we treat a new kind of a bi-nonlocal problem based on the Clarke's theorem, which is the main tool used to prove our main result.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A mathematical model and optimal control analysis for scholar Drop out

Communication Info

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Keywords:
(1) Scholar drop out
(2) Mathematical model
(3) Equilibria
(4) Stability
(5) Optimal control

Abstract

We proposed and analyzed a non-linear mathematical model for scholar Drop out and we advanced an optimal control policy for this model by considering three variables namely the numbers of school-age children who are in school, school-age children who are out of school, and school-age children in non-formal education. The model is examined using the stability theory of differential equations. The optimal control analysis for proposed scholar Drop out model is performed using Pontryagin's maximum principle. The conditions for optimal control of the problem with effective use of implemented policies to reintegrate children who have dropped out of school into formal education are derived and analyzed.

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La domination, l'indépendance et l'irredondance dans les graphes

Communication Info

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Keywords:
(1) Graphe des diviseurs de zéro d'un anneau commutatif
(2) Anneau local
(3) Nombre d'irredondance supérieur
(4) Nombre d'indépendance

Abstract

L'une des études la plus connue dans la théorie des graphes est l'étude de la domination, l'indépendance et l'irredondance dans les graphes, un excellent traitement de cette étude est donné par Haynes et autres.

On définit R par l'anneau commutatif unitaire d'unité 1≠0, et l'ensemble des diviseurs de zéro par Z(R) et le graphe des diviseurs de zéro de R par Γ(R), c'est le graphe simple, fini, non orienté, sans boucles ni arêtes multiples, dont les sommets sont les éléments de l'ensemble Z(R)* et, pour tous x , y ∈ Z(R)* , il existe une arête reliant x et y si et seulement si xy=0. Ce concept concernant le graphe des diviseurs de zéro a été introduit pour la première fois par Beck en 1988 dans son étude de la coloration d'un anneau commutatif.

Dans ce travail, on va définir les différents indices concernant la domination, l'indépendance et l'irredondance dans les graphes et on va classifier les anneaux finis avec le nombre d'irredondance supérieur est inférieur ou égal à deux.

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Existence and uniqueness results for Hilfer Langevin fractional pantograph differential equation and inclusion

Communication Info

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Keywords:
(1) Hilfer fractionnal derivative.
(2) Pantograph fractional differential inclusions.
(3) Fractional Langevin inclusion.

Abstract

This paper discuss the existence and uniqueness of solution for Hilfer Langevin fractional pantograph differential equation and inclusion, [1][2] which are a special class of delay differential equations. The novelty of this work is that it is more general than the works based on the derivative of Caputo and Riemann-Liouville, because when $\beta = 0$ we get the Riemann-Liouville fractional derivative and when $\beta=1$ we get the Caputo fractional derivative [3]. In the first, we give some definitions, theorems, lemmas that are used through this manuscript. secondly, we give our existence results, based on Krasnoselskii's fixed point, and Banach's contraction principle. After that we investigate the inclusion version, and to obtain the existence result we use the Leray–Schauder alternative [4]. Finaly, we give an illustrative example to support our results.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Directed signature scheme over group ring

Communication Info

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Keywords:
(1) Directed signature
(2) Discrete logarithm problem
(3) Factorization search problem

Abstract

A directed signature allows only a designated verifier to check the validity of the signature, and any third party can verify the signature with the help of the designated verifier or the signer as well. Directed signature schemes are used in some special situations involving signature privacy. This work present a new directed digital signature scheme in a non-commutative group over group ring, the security of the proposed scheme based on the difficulty of the discrete logarithm problem DLP and the factorization search problem FSP. The scheme is very efficient since it requires only minimal operation both in signing and verifying logarithms. We prove that our signature scheme is secure against the known key attacks.

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Stochastic Pareto type VI diffusion model: statistical inference and simulation

Communication Info

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Keywords:
(1) Stochastic diffusion model
(2) Simulation
(3) Statistical inference
(4) Simulated annealing

Abstract

In this work, we consider a stochastic model [1] based on the generalized Pareto curve and concretely Pareto of type VI curve [2]. First, we will describe some probabilistic properties of the proposed process. Then, we will address the problem of parameter estimation using maximum likelihood [3]. Since a complex system of equations appears, with a solution that cannot be guaranteed by classical numerical methods [4], we recommend the use of metaheuristic optimization algorithms [5] and specifically simulated annealing algorithm [6]. Finally, in order to validate our results, the methods described are applied to simulated data.

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Analyse non linéaire par éléments finis des butées lamifiées élastomères en état de déformations planes

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Keywords:
(1) Butées lamifiées
(2) Hyperélasticité
(3) Analyse non linéaire
(4) Grandes déformations
(5) Eléments finis.

Abstract

Ce papier a pour objet la prédiction par éléments finis du comportement des butées lamifiées élastomères, soumis à de grandes déformations. Ces lamifiés élastomères jouent un rôle important dans les industries modernes, en particulier dans les industries aéronautiques et spatiales. L'importance accordée à l'étude de ces composants ne cesse de croître d'autant plus que les méthodes classiques de caractérisation basées sur les approches empiriques et expérimentales deviennent de plus en plus coûteuses, en particulier dans les applications de pointes. D'où l'intérêt des démarches numériques de caractérisation en Conception Assistée par Ordinateur. Dans un premier temps nous présentons l'approche du problème de l'équilibre en élasticité non linéaire incompressible. Cette approche est basée sur la fonctionnelle énergie potentielle modifiée pour tenir compte de l'incompressibilité. La résolution du système linéarisé qui en découle se fait à l'aide de la méthode itérative de Newton-Raphson avec la formulation Lagrangienne totale. Après validation de notre logiciel développé pour la conception en bureau d'étude, en utilisant des exemples avec solution analytique, nous abordons l'étude d'un exemple industriel constitué d'un lamifié de suspension utilisé dans l'hélicoptère. L'analyse de la répartition des contraintes est faite en détail dans les couches élastomères. En effet, c'est au niveau de ces couches qu'il y a apparition d'une éventuelle fissure.

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A finite element approximation of a current-induced magnetization dynamics model

Communication Info

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Keywords:
(1) Ferromagnetism
(2) magnetization dynamics
(3) spin polarized current
(4) finite elements

Abstract

Micromagnetics is a continuum theory describing magnetization patterns inside ferromagnetic media. The dynamics of a ferromagnetic material are governed by the Landau-Lifshitz equation.
This equation is highly nonlinear and has a non-convex constraint. In this work, a finite element approximation of a current-induced magnetization dynamics model is proposed. The model consists of a modified Landau-Lifshitz-Gilbert (LLG) equation incorporating spin transfer torque. The scheme preserves a non-convex constraint, requires only a linear solver at each time step and is easily applicable to the limiting cases. As the time and space steps tend to zero, a proof of convergence of the numerical solution to a (weak) solution of the modified LLG equation is given. Numerical results are presented to show the effect of the injected current on magnetization switching.

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Commutativity Of Banach Algebras And Differential Identities

Communication Info

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Keywords:
(1) Banach algebras
(2) Open subset
(3) Commutativity

Abstract

Let B be a Banach algebra with center $Z(B)$. Our aim through this paper is to study the commutativity of B if some specific algebraic identities on non-empty open subsets of B are holds. Our topological approach is based on Baire's category theorem and some properties of functional analysis. Among our results, we have proved that a prime Banach algebra B must be commutative if there are non-empty open subsets $H_1 and\ H_2$ of B such that for all $(x, y) \in H_1 \times H_2$ there are strictly positive integers n, m such that $x^n o y^m \in Z(B)$. Furthermore, we include some examples to show that various restrictions in the hypothesis of our results are not superfluous.

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A Finite Volume Morphodynamic Model with Porosity for Flood Modeling

Communication Info

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Keywords:
(1) Shallow water equations
(2) Morphodynamics
(3) Porous media
(4) Finite volume method
(5) Unstructured grids
(6) Non-Homogeneous Riemann Solver
(7) Flood modeling

Abstract

We present a finite volume method [4] for the numerical solution of morphodynamic model with porosity on unstructured triangular meshes [1,4] using a Non-Homogeneous Riemann Solver [2]. The model is based on coupling the shallow water equations with porosity for the hydrodynamics model can be attributed to the variation of bed properties [3] of the flow system. The numerical fluxes are reconstructed using a modified Roe's method involving the sign of the Jacobian matrix in the morphodynamic system. A well-balanced discretization is used for the treatment of source terms in the system [5]. Numerical tests are presented for the computation of flow in a channel with several obstacles. The results confirm the capability of the solver to provide accurate simulations for shallow water equations with porosity over movable beds.

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Feedback stabilization for a class of non-homogenous bilinear time-delay systems of neutral type

Communication Info

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Keywords:
(1) Bilinear systems
(2) Non homogenous systems
(3) Time delay
(4) Neutral systems
(5) Exponential stabilization
(6) Strong stabilization

Abstract

In this paper, we consider the question of feedback stabilization for a class of non-homogenous bilinear time-delay systems of neutral type, evolving on a real Hilbert state space. Then, we provide necessary and sufficient conditions for weak and strong stabilization via bounded feedback control. In the case of strong stabilization, an explicit decay rate estimate is established. Furthermore, we consider the decomposition of the state space via the spectral properties of the systems to discuss the exponential stabilization. Finally, applications to hyperbolic and parabolic functional differential equations of neutral type are provided

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On stability analysis study and strategies for optimal control of a mathematical model of

Communication Info

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Keywords:
(1) Equilibrium point
(2) Optimal control
(3) Reproduction number

Abstract

*In this work, we are studying the analysis of a viral hepatitis C model. This epidemic remains a major problem for global public health, in all communities, despite the efforts made. The model is analyzed using the stability theory of systems of nonlinear differential equations. Based on the results of the analysis, the proposed model has two equilibrium points: a disease-free equilibrium point E_0 and an endemic equilibrium point E *. The equilibrium stability analysis has shown that the system is locally asymptotically stable when the basic reproduction number R_0<1 and it is locally asymptotically stable, also when R_0>1 under certain conditions. The basic reproduction number R_0 is calculated using the Next Generation method. The positivity of the solutions and their bornitude have been proven, the existence of the solutions has also been proven . Optimal control of the system was studied by introducing three types of intervention: Awareness, early detection, isolation and treatment. The maximum principle of Pontryagin was used to characterize the optimal controls found. Numerical simulations were carried out with a finite numerical difference diagram and using OCTAVE to confirm acquired logical results.*

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Strong stabilisation with decay estimate for a class of distributed bilinear time-delay systems of neutral type

Communication Info

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Keywords:
(1) linear systems
(2) Neutral systems
(3) Time delay

Abstract

The question of feedback stabilization for retarded distributed bilinear systems has been studied in various works; Berrahmoune [2], El Houch et al. [3] and Ouzahra [4].

This paper is concerned with the problem of feedback stabilization for a class of distributed bilinear time-delay systems of neutral type, evolving on a Hilbert state space. To achieve this, we propose a continuous and bounded feedback control that guarantees the strong stabilization. Sufficient conditions in term of observation estimates are given to ensures strong stabilization. Moreover, in this case, an explicit decay estimate is established. Finally, applications to hyperbolic and parabolic equations are provided.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Mathematical modeling and optimal control for a discrete-time model of Covid-19 variants

Communication Info

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Keywords:
(1) Covid-19 model withfour variant
(2) Discrete mathematical modeling
(3Optimal control

Abstract

Our objective is to propose a discrete mathematical model which describes the dynamics of the different compartments. We used three controls which represent: 1) awareness programs through the media and civil society to encourage uninfected people to stay away from infected people, as well as to encourage individuals to get vaccinated, 2) encourage people infected with variants of Covid-19 to self-isolate at home or join quarantine centers and encourage severe cases to go to hospitals, 3) use medical treatment and support psychological to increase the immunity of individuals infected with different variants and reduce their number in hospitals and in isolation centers. We use the principle of Pontryagin's maximum principle in discrete time to characterize these optimal controls. The resulting optimality system is solved numerically using Matlab. Therefore, the results obtained confirm the performance of the optimization strategy.

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Universal formulas for feedback stabilization of multi-input non linear stochastic systems

Communication Info

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Keywords:
(1) Stochastic stability
(2) Stochastic control lyapunov function
(3) feedback law

Abstract

The goal of this communication is to study the problem of stabilization in probability of multi-input non linear stochastic systems when both the drift and diffusion terms are affine in the control. The coefficients of stochastic systems in this communication are only continuous not necessary Lipchitz. Under the assumption that a stochastic control lyaponov function is known and based on the generalized stochastic lyaponov theorem[4], we derive a sufficient conditions for the global asymptotic stabilization in probability by a continuous feedback control. We propose a constructive method to explicitly design the state feedback. This work generalize the previous works [1,2,3]. An illustrative example is given to verify the effectiveness of the result.

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Routes to the chaos of the 5D model of a thermo-hydrodynamic system in a porous medium

Communication Info

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Keywords:
(1) équation de Navier-Stokes
(2) Darcy's law
(3) exposants de Lyapunov
(4) explosion homoclinique

Abstract

In this paper, we study the dynamics of a fluid in a porous medium subjected to a temperature gradient. The system is described by a heat equation coupled to the Navier-Stokes equations under the Boussinesq-Darcy approximation introduced by B. Saltzman. We use spectral analysis to reduce our problem to a system of five ordinary differential equations which we have solved using the fourth order Runge-Kutta method [1]. The numerical results show that from a critical value of the Rayleigh number, the system passes from stationary convection to chaos via a doubling of period or by a homoclinic explosion, for certain values of the number of Rayleigh and the shape parameter, in accordance with results found in articles [2-4]. These results are confirmed by bifurcation diagrams and curves of the Lyapunov exponents as a function of the parameters of the problem [5].

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A fractional mathematical modeling and control optimal approach of the COVID-19 and quarantine impact on the spread of electronic game addiction among children and youth in Morocco

Communication Info

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Keywords:2
(1) Fractional Mathematical Model,
(2) Electronic game addicts, addicts.

Abstract

In this article, we propose a continuous-time model as a fractional order that describes the transmission dynamics of COVID-19 and the impact of the quarantine on the spread of addiction to electronic games. Also, we propose an optimal strategy through using awareness campaigns that aim at sensitizing people about the dangers of the covid-19 disease and awareness of the dangers of electronic games through written and visual media. Also, creating rehabilitation centers for electronic games addiction. To characterize optimal controls, we use the Pontryagin's Maximum Principle and the optimally system solved by an iterative method. Finally, some numerical simulations are performed to verify the theoretical analysis using Matlab software.

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Les ensembles maximaux de sortie admissible pour une classe des systèmes linéaires.

Communication Info

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Keywords:
(1) Contrôlabilité
(2) Les ensembles maximaux
(3) Systèmes linéaires

Abstract

Considérons le système linéaire $\frac{dx}{dt} = Ax$, où A est une application linéaire de $X = L^2(\Omega)$ générant un semi-groupe $\big(S(t)\big)_{t>0}$et $(\phi_i)_{i\geq 0}$ est une base orthogonale de X formée par des vecteurs propres de A, et soit y_i est la fonction de sortie correspondante. Soit l'ensemble maximal de sortie $\$\chi = \{x_0 \in X; y_i \in M \ \ \forall\, i \geq 0\}$ avec M est un ensemble donné de IR^q, Dans cet exposé, nous approximons chaque élément x de X et nous nous intéressons par la caractérisation de l'ensemble $\$\chi_N = \{x_0 \backslash in\ \boldsymbol{vect}(\phi_1, .., \phi_N)\ ;\ y_i \in M\ \forall\, i \geq 0\}$. En utilisant certaines conditions de stabilité et d'observabilité, nous trouvons que l'ensemble χ_N peut être déterminé par un nombre fini d'itérations. Finalement nous donnons un processus algorithmique pour générer l'ensemble χ_N.

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Detection of internal soil erosion in hydraulic structures by hole erosion test.

Communication Info

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Keywords:
(1) Erosion
(2) soil
(3) HET

Abstract

Soil erosion is a complex phenomenon which yields at its final stage to insidious fluid leakages under the hydraulic infrastructures known as piping and which are the main cause of their rupture. The Hole Erosion Test is commonly used to quantify the rate of piping erosion. In this work, The Hole Erosion Test is modelled by using Fluent software package. The aim is to predict the erosion rate of soil during the hole erosion test.

The hole erosion test (HET) is widely performed for determining soil erosion characteristics; viz. critical shear stress, erosion rate coefficient, and erosion rate index. Refinements to measurement/estimation of water head drop in the hole through the specimen, which is essential in accurate interpretation of HET, were proposed.

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Necessary and sufficient conditions for the null controllability of a degenerate/singular

Communication Info

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Keywords:
(1) Controllability
(2) Degenerate/Singular system
(3) Moment method

Abstract

The main purpose is to study the controllability properties of a coupled system of degenerate/singular parabolic equations [1,4] with a control acting on only one equation. In particular, we consider well posedness (by transposition) of the problem and then we analyze both approximate and null controllability results using the associated adjoint problem expression. Moreover, we try to give an estimate of the control cost [2] based on the existence of the so-called biorthogonal familly. Our proofs rely on the use of the moment method (developed by Fattorini and Russell) which is a pure spectral approach, together with some properties of Bessel functions (solution of the Sturm Liouville particular problem) their zeros and biorthogonal families.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Function on function. Conditional models.

Communication Info

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Keywords:
(1) Derivatives of the conditional density
(2) Conditional mode
(3) Kernel estimation
(4) Functional data analysis

Abstract

We develop new estimation results for the functional relationship between a regressor and a response which are functions indexed by time or by spatial locations. The regressor is assumed to belong to a semi-metric space (E,d) whereas the responses belong to a Hilbert space F.
First, we build a double-kernel estimator of the conditional density function, via a Nadaraya-Watson method. Then, we deduce a conditional mode estimator as the value that maximizes the conditional density estimator. Then, we establish the strong uniform consistencies, with rates, of the two constructed estimators. In this context, we wished to set up these preliminary results which will certainly motivate several works on this same object.

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Online Abrupt Change Detection in the Presence of Unknown Parameters

Communication Info

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Keywords:
(1) Abrupt changes detection
(2) Convex minimization
(3) Statistical process control

Abstract

The detection of abrupt changes in the properties of a data sequence has a wide range of applications such as in robotics, finance, and data mining [1]. In the most difficult setting of this problem, change detection must be performed sequentially with new observations being constantly received over time. Further, the parameters of both the pre-and post-change distributions may be unknown. In this paper, we propose an improved scan statistic of the two-sample t-statistic [2], under the assumption that the observations follow a normal distribution. The key idea of our algorithm is to estimate the unknown parameters of the normal distributions, by modeling a conditional probability of observations. This modeling can be then reduced to the resolution of a convex minimization problem of energy function at each time instant [3]. Numerical results show that our proposed algorithm is effective in identifying anomaly with a low mean delay compared to the state-of-the-art algorithms [2,4,5,6].

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Parameter Estimation for Stochastic Partial Differential Equations Driven by an Additive Multi-Order Fractional Brownian Motion

Communication Info

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Keywords:
(1) nth order fractional Brownian motion
(2) Cylindrical multi-order fractional Brownian motion
(3) Consistency
(4) Asymptotic normality
(5) Stochastic evolution equations

Abstract

We investigate the parameter estimation problem for a diagonalizable stochastic evolution equation driven by an additive noise that is white in space and fractional in time. The fractional component in the noise is described by the so-called multi-order fractional Brownian motion (fBm) W^H with Hurst sequence $H=(H_1,H_2,H_3,\cdots)$, introduced in [1] as an extension of higher order fBm's (see, [2,3]). By using the spectral approach and Girsanov's formula (e.g. [4,5]), we study the maximum likelihood estimator as the number of Fourier modes becomes sufficiently large. A necessary and sufficient conditions for consistency and asymptotic normality are presented in terms of the eigenvalues of the operators in the equation.

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A Stochastic Fractional Calculus with Applications to Variational Principles

Communication Info

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Keywords:
(1) fractional derivatives and integrals;
(2) stochastic processes;
(3) calculus of variations

Abstract

We introduce a stochastic fractional calculus. As an application, we present a stochastic fractional calculus of variations, which generalizes the fractional calculus of variations to stochastic processes. A stochastic fractional Euler–Lagrange equation is obtained, extending those available in the literature for the classical, fractional, and stochastic calculus of variations. To illustrate our main theoretical result, we discuss two examples: one derived from quantum mechanics, the second validated by an adequate numerical simulation.

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A New discrete Bat algorithm for Vehicle routing problem

Communication Info

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Keywords:
(1) Metaheuristics
(2) TSP
(3) BAT ALGORITHM

Abstract

Bat algorithm is a new population-based optimization method, that belong to the swarm intelligence class of metaheuristics. It was proposed by Yang [1] in 2010, and since its introduction, it has been used in several works for solving continuous and discrete problems, due to its simple implementation and powerful performance. Many discrete versions of BA were proposed to solve Routing problems like the IBA for Traveling salesman problem TSP [3], also adapted to Vehicle routing problem VRP and some of its variants [4]. However, despite its good performance, DBA sometimes get trapped in local optima. In this work, we propose a new version of the discrete bat algorithm to solve the VRP [2], where the diversification aspect of the metaheuristic is enhanced in order to overcome stacking in local optima drawback.

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On k-para-Kähler Lie algebras a subclass of k-symplectic Lie algebras

Communication Info

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Keywords:
(1) k-symplectic Lie algebras
(2) Left symmetric algebras
(3) R-matrices

Abstract

k- para-Kähler Lie algebras are a generalization of para-Kähler Lie algebras (k = 1) and constitute a subclass of k-symplectic Lie algebras. In this paper, we show that the characterization of para-Kähler Lie algebras as left symmetric bialgebras can be generalized to para-Kähler Lie algebras leading to the introduction of two new structures which are
different but both generalize the notion of left symmetric algebra. This permits also the introduction of generalized S -matrices. We determine then all the k-symplectic Lie algebras of dimension (k + 1) and all the six dimensional 2-para-K¨ahler Lie algebras.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Pure semi simple abelian group

Communication Info

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Keywords:
(1) Abelian goups
(2) direct sums of cyclic groups
(3) p−group
(4) direct summand
(5) pure semi simple abelian group

Abstract

If B subgroup of an abelian A, B is called Pure subgroup if the intersection of B and nA equals nB for all n ∈ N*. We know that direct summand is pure subgroup but in the other way, the result is not true. For that we construct an abelian group such that a pure subgroup isn't direct summand. After we introduce a pure semi simple abelian group. An abelian group is said a pure semi simple abelian if every pure subgroup is direct summand, finally we characterize pure semi simple abelian group in the category of torsion abelian groups.

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ICRAMCS 2022

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The extension property for a category of mixed module

Communication Info

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Keywords:
(1) Integral domain, module
(2) injective envelope
(3) torsion and torsion-free element.

Abstract

The characterization of automorphisms having the extension property in the category of modules is an open problem. In earlier works [2,1] the authors solved this problem in the category of direct sum of cyclic torsion-free modules over a BFD and in the category of a direct finite sum of cyclic modules with torsion over a UFD. It is natural to see what happens in other categories. In this paper we extend the result in [1] to a category of a direct finite sum of cyclic modules with torsions. Let A be an Integral Domain. Consider a direct finite sum $M = Ax \oplus \bigoplus_{i=1}^{i=n} At_i$ of cyclic modules over A such that x is a torsion-free and $t_1, \dots t_n$ are torsion elements. Let α be an automorphism of M. We give a necessary and sufficient condition such that α satisfies the extension property.

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ABOUT THE DETERMINANT OF TOURNAMENTS

Communication Info

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Keywords:
(1) Tournament
(2) skew-adjacency matrix
(3) principal submatrix
(4) determinant

Abstract

A tournament is a digraph in which every pair of vertices is jointed by exactly one arc. If (x, y) is an arc then we say that x dominates y and we write x → y. An n-tournament is a tournament with n vertices.

Given an n-tournament T with vertex set {v1, . . . , vn}, the skew-adjacency matrix of T is the n × n zero-diagonal matrix S = [sij], such that sij = 1 if vi dominates vj and sij = −1 if vj dominates vi. We define the determinant det(T) of T as the determinant of S. It is well-known that the determinant of S is zero or a square of an odd integer.

In this talk we are particularly interested in the study of determinant of tournaments.

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Continued fraction representation of the generalized operator entropy

Communication Info

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Keywords:
(1) Continued fraction
(2) positive definite matrix
(3) Generalized operator Entropy

Abstract

Recently, the extension of continued fractions theory from real numbers to the matrix case has seen several development and interesting applications [3]. The real case is relatively well studied in the literature.

However, in contrast to the theoretical importance, one can find in mathematical literature only a few results on the continued fractions with matrix argument. The direct calculation of the Generalized operator entropy proves difficult by the appearance of rational exponents of matrices [1,2,4]. The main motivation of this work is to overcome these difficulties and to present a practical and efficient method for this calculation using its representation by the matrix continued fraction. At the end of our paper, we deduce a continued fraction expansion of the Bregman [5] operator divergence.

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Un cas particulier de la conjecture homologique sans boucle pour algèbres artiniennes de radical de Jacobson d'indice 3

Communication Info

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Keywords:
(1) Representation theory
(2) Associative algebras
(3) Homological algebras

Abstract

A est une algèbre Artinienne ;on désigne par mod(A) la catégorie des A-modules de type fini ;on s'intéresse à calculer la dimension globale notée dim.g.A de l'algèbre A et de voir si elle est finie ou non ;ainsi il est énoncé la conjecture disant que : dim.g.A < ∞ implique le carquois d'extension est sans boucle i.e $Ext_A^1(S,T) = 0$ le problème qu' a été attaqué par AuslanderReiten fondateurs de la théorie de représentation des algèbres via l'équivalence : La catégorie Db (modA) a des triangles ⇐⇒ dim.g.A < ∞ On considère le carquois dont les sommets sont les A-modules simples non isomorphes et les flèches sont conditionnés par $Ext_A^1(S,T) = 0$ pour tous A-modules simples S et T avec $Ext_A^1(S,T)$ est le groupe abélien d'extension des classes des suites exactes courtes commençant par T et finissant par S ;cette conjecture a été démontrée pour certaine classe des algèbres comme la monômiale et la bisérielle et les algèbres avec deux modules simples dont le radical de Jacobson est d'indice 3 et notre objectif est la démontré en cas d'algèbre graduée par son radical avec $Rad(A)^3 = 0$.

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The Realization of k-Uniform Hypergraphs by Tournaments

Communication Info

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Keywords:
(1) Uniform hypergraphs
(2) Tournaments
(3) 3-Cycles

Abstract

We say that a 3-uniform hypergraph H = (V, H) is realizable if there exists an tournament with the same vertex set V for which the set of 3 cycles is exactly the hyperedges of H. Boussaïri et al. [1] considered the problem of the characterization of 3-uniform hypergraphs. For 4-uniform hypergraphs, we consider the realization by taking the diamonds of tournaments. Recall that a diamond is the 4-tournament with a unique 3-cycle. We show that the problem of determining whether a 4-uniform hypergraph is realizable, can be reduced to one for 3-uniform hypergraphs. Moreover, we prove that the two decision problems are polynomially equivalent.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Distance between spectra of tournaments

Communication Info

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Keywords:
(1) Tournament
(2) Skew-spectrum
(3) Spectral distance
(4) Slater index

Abstract

An n-tournament T is a digraph with n vertices $\{v_1,\ldots,v_n\}$ in which every pair of vertices is joined by exactly one arc. The skew-adjacency matrix of T is the n × n zero-diagonal matrix $S = [s_{ij}]$, such that $s_{ij} = 1$ if v_i dominates v_j and $s_{ij} = -1$ if v_j dominates v_i. The distance between two n-tournaments T and T' is the number d(T, T') of pairs $\{i, j\}$ from {1, ..., n} for which the arc between i and j does not have the same direction in T and in T´. The spectral distance λ(T, T') between tournaments is defined as an Euclidean distance between the spectrum of T and that of T'. For this communication, we are particularly interested in the spectral distance between a tournament T and a transitive tournament R.

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ICRAMCS 2022

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On the spectral and skew-spectral monomorphy of graphs

Communication Info

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Keywords:
(1) Graph
(2) Adjacency matrix
(3) Seidel adjacency matrix
(3) Spectral monomorphy

Abstract

Let G be a simple graph with vertex set V.

With respect to an ordering $v_1, v_2, \ldots\ldots v_n$ of V , the adjacency matrix of G is the $n \times n$ symmetric matrix $A = [a_{ij}]_{1\leq i,j\leq n}$ in which $a_{ij} = 1$ if $\{v_i, v_j\}$ is an edge

And $a_{ij} = 0$ otherwise. The Seidel adjacency matrix of G is the $n \times n$ symmetric matrix $S = [s_{ij}]_{1\leq i,j\leq n}$ in which $s_{ij} = -1$ if $\{v_i, v_j\}$ is an edge , -1 if it is not.

The characteristic polynomial of G is defined as the characteristic polynomial of its adjacency matrix and the skew characteristic polynomial of G is defined as the characteristic polynomial of its Seidel adjacency matrix. We say that the graph G is k-spectrally (resp. k-skew spectrally) monomorphic if all its subgraphs with k vertices have the same characteristic polynomials (resp. skew characteristic polynomials). In this work, we characterize the class of k-spectrally (resp. k-skew spectrally) monomorphic graphs of order n, whenever 2≤k≤n-2.

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ICRAMCS 2022
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Characterization of doubly regular tournaments by spectral monomorphy

Communication Info

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Keywords:
(1) Tournament
(2) Doubly regular tournament
(3) Adjacency matrix
(4) Characteristic polynomial

Abstract

A tournament is said to be k-spectrally monomorphic if all the k×k principal submatrices of its adjacency matrix have the same characteristic polynomial.
In a given tournament, if all pairs of vertices jointly dominate the same number of vertices, then this tournament is
called doubly regular. There are many structural and spectral characterizations of doubly regular tournaments [4, 12, 17, 16]. We give another characterization of this class using the k-spectral monomorphy.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Regular n-tournaments that are not (n − 1)-spectrally monomorphic

Communication Info

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Keywords:
(1) Tournament
(2) Adjacency matrix
(3) Characteristic polynomial
(3) Spectral monomorphy

Abstract

The aim of this presentation is to show that there are an infinitely many regular n-tournaments that are not (n−1)-spectrally monomorphic.
The smallest example has 7 vertices. To obtain an infinite family of counter-examples, we use the following construction.
Let T_1, T_2 and T_3 be three regular n-tournaments with disjoint vertex sets $V_1 = \{v_1, \ldots, v_n\}$, $V_2 = \{v_{n+1}, \ldots, v_{2n}\}$ and $V_3 = \{v_{2n+1}, \ldots, v_{3n}\}$ respectively. Consider the 3n-tournament T with vertex set $V = V_1 \cup V_2 \cup V_3$, obtained from T_1, T_2 and T_3 by adding arcs from V_1 to V_2, V_2 to V_3 and V_3 to V_1. Then, the 3n-tournament T is regular. Moreover, if at least one of the three tournaments T_1, T_2 and T_3 is not (n − 1)-spectrally monomorphic then T is not (3n − 1)-spectrally monomorphic.

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Kannan-type contractions on modular spaces

Communication Info

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Keywords:
(1) Fixed point theory (2) Kannan contractions (3) Modular spaces

Abstract

Recently, Karapinar introduced in [2,4] a new class of maps named the interpolative Kannan-type contractions. After that Aydi et al. considered another class of maps named the interpolative CRR-type contractions in [3]. The authors mentioned above have proved that when the space is complete these maps always have a fixed point. The fixed-point theorem for interpolative Kannan-type contractions is proved in [2], and the theorem concerning interpolative CRR-type contractions is proved as a corollary of a more general theorem in [3] (page 5, corollary 3). In addition, to the existence of a fixed point, some information on the behaviour of Picard sequences for arbitrary initial point is given in [5]. In our talk [1], we're going to introduce a new definition of Kannan-type contractions in a modular space and expose some results on it.

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Fixed point results in modular function space endowed with a digraph using ρ-a.e.-Opial property

Communication Info

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Keywords:
(1) Directed graph
(2) Function modular spaces
(3) Fixed-Point

Abstract

In this communication we first give a fixed point result for ρ-contraction, G-monotone multivalued mappings in modular function space, and under some assumptions on the digraph we establish the existence of an approximate fixed point sequence for ρ-nonexpansive, G-monotone multivalued mappings, which generalize all results obtained in [5].

As a corollary we get an existence of fixed point result for ρ-nonexpansive, G-monotone multivalued mappings when the values are ρ-compact or ρ-a.e. compact.

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On the minimum number of Fox colorings of knots

Communication Info

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Keywords:
(1) Fox coloring
(2) Minimum number of colors
(3) 17-colorable knot

Abstract

One of the main problems of knot theory is the classification of knots; therefore, knot invariants are constructed to distinguish between different knots. One of these invariants is the p-colorings of knots. Around 1960 R. Fox [2] introduced a method of coloring diagrams of knots by $\mathbb{Z}_p$ (the integers modulo p). Harary and Kauffman [3] defined the minimum number of colors of a p-colorable knot where p is an odd prime, which is also a knot invariant, and it is hard to calculate, in general. For this reason and in order to estimate the minimum number of colors for knots T. Nakamura and al. [4] proved that any non-trivial p-coloring requires at least $\lfloor \log_2 p \rfloor + 2$ colors. We investigate Fox colorings of knots that are 17-colorable. Precisely, we prove that any 17-colorable knot has a diagram such that exactly 6 among the seventeen colors are assigned to the arcs of the diagram.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Upper Hamiltonian numbers, upper traceable numbers and radio *k*-labeling numbers of circulant graphs

Communication Info

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Keywords:
(1) Radio *k*-labeling numbers
(2) Upper Hamiltonian numbers
(3) Upper traceable numbers
(4) Circulant graphs

Abstract

Graph theory is a branch of discrete mathematics. Motivated by problems in radio channel assignments, we consider radio k-labeling of graphs [1]. For a graph G and an integer k≥1, a radio k-labeling of G is an assignment f of integers to the vertices of G such that

$$|f(x) - f(y)| \geq k + 1 - d_G(x, y),$$

for any two distinct vertices x and y, where $d_G(x, y)$ is the distance between x and y in G. The radio k-labeling number is the minimum of $\max\{f(x): x \in V(G)\}$ over all radio k-labeling f of G.

The aim of this work is to determine the radio k-labeling number of a special case of cayley graphs: the circulant graph $C_n(1, k) = (V_n, E_n)$, where $V_n = Z/nZ$ is the vertex-set and $E_n = \{(i, i \pm 1), (i, i \pm k) / i \in Z/nZ\}$ is the edge-set, where the calculations are performed modulo n.

In this paper, we provide exact values for upper Hamiltonian numbers [2] and upper traceable numbers [3] of circulant graphs. We also present an application on radio k-labeling number for circulant graphs. And we finish by establishing exact radio labeling numbers of circulant graphs.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existence of fixed points in conical shells of a Banach space for sum of two operators and application in ODEs

Communication Info

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Keywords:
(1) Fixed point index
(2) Cone
(3) Sum of operators
(4) Green function
(5) ODEs

Abstract

For applicability reasons, we often search for existence and localization of positive fixed points which may represent positive solutions for various nonlinear problems posed in a Banach space. Several fixed point theorems, including Krasnosel'skii type and Leggett-Williams type theorems in cones, have being established (see [2-5]).In this communication the functional Expansion-Compression fixed point theorem of Leggett-Williams type developed in [1] is extended to the class of mappings of the form T + F, where (I − T) is Lipschitz invertible map and F is k-set contraction. The arguments are based upon recent fixed point index theory in cones of Banach spaces for this class of mappings. As illustration, our approach is applied to prove the existence of nontrivial nonnegative solutions for three-point BVP.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Well-posedness of fixed-point problem for rational type contraction in complete metric spaces with an application

Communication Info

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Keywords:
(1) Fixed point
(2) Metric space
(3) Dynamic programming
(4) Control theory

Abstract

Fixed point theory fascinated many researchers since 1922 with the famous Banach's fixed point theorem called Banach contraction principle, see [1]. This theorem provided a technique for solving a variety of applied problems in mathematical sciences and engineering. Subsequently, the superb result of Banach was extended and generalized by several authors using various contractive conditions in different spaces.

The aim of this paper is to prove for rational type contraction in complete metric spaces that fixed point problem is well-posed. Example is provided to illustrate the validity of our results. Afterwards, we apply our theorem to study the possibility of optimally controlling the solution of an ordinary differential equation via dynamic programming.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Kannan fixed point theorem in the variable exponent sequence spaces lp(.) with a graph

Communication Info

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Keywords:
(1) The variable exponent sequence spaces lp(.)
(2) Fixed point theory
(3) Graph theory
(4) G-monotone Kannan mapping.

Abstract

The variable exponent sequence spaces lp(.) find their roots in the celebrated work by Orlicz [1] where he introduced the vector space

$$lp(.) = \{x_n \subset \mathbb{R}^N; \sum_{n=0}^{\infty} |\lambda x_n|^{p(n)} < \infty, \text{ for some } \lambda > 0\},$$

where {p(n)} ⊂ [1, ∞). They inspired the formal definition of a modular introduced by Nakano [2]. This vector space is a special case of the variable exponent spaces Lp(.). Toward the second half of the twentieth century, it was realized that these variable exponent spaces constituted the right framework for the mathematical formulation of a number of problems for which the classical Lebesgue spaces were inadequate.

We open, this communication, by presenting some definitions and basic facts about the space lp(.). And, by combining the fixed point theory and the graph theory, we present Kannan fixed point theorem in the variable exponent sequence spaces lp(.) with a graph. Inspired by the ideas given in [3, 4, 5, 6], we investigate the existence of the fixed point for mappings satisfying a G-monotone Kannan mapping in the variable exponent sequence spaces lp(.) endowed with graph.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Altering points in partial metric spaces via C-class functions

Communication Info

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Keywords:
(1) Fixed point
(2) Altering point
(3) Partial metric space
(4) Set-valued mapping
(5) C-class functions

Abstract

This work deals with the problem of finding the altering points $(\bar{x}, \bar{y}) \in X \times Y$ such that:

$$\begin{cases} \bar{x} \in G(\bar{y}) \\ \bar{y} \in F(\bar{x}) \end{cases}.$$

Where X, Y are two partial metric spaces and $F: X \rightrightarrows Y$, $G: Y \rightrightarrows X$ are two set-valued mappings. By using C-class functions, we extend and generalize the results of [**D. K. Nedelcheva**, Altering Points in Partial Metric Space. In Proceedings of the 21th International Conference on Geometry, Integrability and Quantization (2020) 221-231] and the results of [**A. H. Ansari, A. Benterki and M. Rouaki**, Some local fixed point results under C-class functions with applications to coupled elliptic systems. Journal of Linear and Topological Algebra (JLTA), 7(03), (2018) 169-182] for a composition of two set-valued mappings.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Introduction to valued quasi-metrics in a C* algebra and some fixed-point theorems

Communication Info

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Keywords:
(1) C*-algebra valued spaces,
(2) forward and backward convergence,
(3) fixed point theorem.

Abstract

The theory of fixed points has passed with important transition through classical and modern analyses. Banach was the first one who managed to conduct research in this frame work. After a lot of experiments, he found out the principles of the fixed-point theory. Later on, many mathematicians have carried on working on this theory to come up with clear analyses and explanation. Quasi-metric space is one of the most remarkable metric spaces. Wilson [4] was the founder of the abstraction of the quasi-metric spaces. To defend some fixed-point results, several writers use that model of analyses. Quasi-metric spaces have numerous recent applications both in pure and applied mathematics, for example, in the questions of existence and uniqueness of Hamilton–Jacobi equations [2], in rate-independent [2] models for plasticity [3], shape-memory alloys [3], models for material failure. In this communication, we introduce a new notion of quasi distance with values in a C-algebra which generalizes the concept of quasi-metric and we obtain some fixed point.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

The Generalized Interpolative Contractions

Communication Info

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Keywords:
(1) fixed point
(2) (ϕ,ψ)-orthogonal interpolative contractions
(3) complete O-metric space.

Abstract

In this talk, we introduce (ψ,ϕ)-orthogonal interpolative contractions which generalize interpolative contractions [1], [2], [3] and unify several interpolative contractions in the orthogonal metric spaces. We show that every interpolative contraction is an orthogonal interpolative contraction but not conversely. We investigate different conditions on the functions ψ,ϕ to show the existence of fixed-points of set-valued (ψ,ϕ)-orthogonal interpolative Kannan type contractions, set-valued (ψ,ϕ)-orthogonal interpolative Chatterjea type contractions, set-valued (ψ,ϕ)-orthogonal interpolative Ciric-Reich-Rus's type contractions and set-valued (ψ,ϕ)-orthogonal interpolative Hardy-Roger's type contractions. We also present an application to resolve a fractional differential equation and some examples in support of the obtained results.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Some fixed-point theorems on a Menger space with two families of distribution functions

Communication Info

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Keywords:
(1) Menger space
(2) Caristi contraction
(3) fixed point

Abstract

The notion of a probabilistic metric space was introduced by Menger [2] in 1942 as a generalization of the notion of metric space. In an abstract set X, instead of associating a nonnegative number-the distance d(p,q)- with every pair of elements p and q, one can associate a distribution function F(p,q) and, for any positive number x, interpret F(p,q)(x) as the probability that the distance from p to q be less than x. Many fixed-point theorems presented in Menger spaces were inspired by their corresponding results on metric spaces. One of the most attractive extensions is the random version of Caristi's fixed-point theorem established by Zhang et al. [6] In 1991. In this work, we propose a generalization and an improvement of the above result by considering a system of Caristi-type contractions defined in a product of two Menger spaces.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existence Results for Coupled Systems of Fractional Integro-Differential inclusions with Fixed and Nonlocal Anti-Periodic Boundary Conditions

Communication Info

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Keywords:
(1) Fractional integro-differential inclusions.
(2) Coupled system.
(3) Fixed point.

Abstract

Differential inclusions are found to be of great utility in studying dynamical systems and stochastic processes [1]. In [1] Ahmad et al. investigated the existence of solutions for a boundary-value problem of coupled fractional differential inclusions supplemented with coupled boundary conditions. Slama et al. [3] investigated the existence, uniqueness and stability of solutions for coupled system of two Caputo fractional derivatives of different orders. In this paper we investigate the existence of solutions for coupled systems of fractional integro-differential inclusions with Fixed and Nonlocal Anti-Periodic Boundary Conditions. By applying standard fixed point theorems for multivalued maps, we derive some existence results for the given problem when the multi-valued maps involved have convex and non-convex values.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Existence result for semi linear fractional differential equations with state dependent delay and non-instantaneous impulses

Communication Info

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Keywords:
(1) Almost sectoriel operators
(2) Measure of noncompactness
(3) Resolvent of operators

Abstract

Impulsive differential equations have become important in recent years in some mathematical models of real processes and phenomena studied in physics, chemical technology, population dynamics, biotechnology, and economics. From the view point of general theories, Hernandez and O'Regan introduced a new class of evolution equations with not instantaneous impulses. The existence of solutions for non-instantaneous impulsive fractional and integer order differential equations has also been studied see the paper [1,4,5]. In this communication, we have studied the existence of mild solutions for a new class of impulsive semilinear fractional differential equations with state dependent delay and non-instantaneous impulses in Banach spaces. The new results are obtained using suitable fixed-point theorems and the technique of measures of noncompactness.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Fixed Point theory in the stability of fractional boundary value problems

Communication Info

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Keywords:
(1) Banach contraction
(2) Caputo derivative
(3) Ulam-Hyers- Rassias stability

Abstract

The Banach contraction principle (also known as the Banach fixed point theorem) is a powerful tool in operator theory (cf. [1], [2]). Fractional calculus is considered a powerful tool in describing complex systems with a wide range of applicability in many fields of science and engineering. The behavior of many systems can be described by using fractional differential equations with boundary conditions (cf. [3]).

In this talk, based upon Banach contraction principle, we discuss the uniqueness of solution and the stability of a class of fractional boundary value problems involving Caputo derivatives. In particular, we present sufficient conditions for the Ulam-Hyers and Ulam-Hyers-Rassias stabilities of that class of nonlinear fractional boundary value problem on an appropriate space's framework.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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New Types of Fractional Contraction

Communication Info

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Keywords:
(1) Fixed point
(2) $\mathcal{F}$-metric space
(3) Fractional Contractions

Abstract

The propose talk introduces a new class of contraction and establish some new results for such contraction under the improved approach of contractive condition in the context of F metric spaces. The motivation of this talk is to observe the solution of fractional order differential equation with one of the boundary conditions using fixed point technique in metric space.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Proximal Bundle Algorithms for DC Constrained DC Programs

Communication Info

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Keywords:
(1) DC programs
(2) proximal point method
(3) Bundle method
(4) Method of centers

Abstract

A DC programming problem is defined as the problem of minimizing a difference of two convex functions. In this work, we propose new methods based on the method of centers, on the proximal point algorithm and on the idea of bundle methods, for solving such problem. First, we introduce proximal point algorithms, in which, at each iteration, an approximate prox-regularized parametric subproblem is solved inexactly to obtain an approximate solution to the original problem. Based on this approach and the idea of bundle methods, we propose implementable proximal bundle algorithms, in which the objective function of the last mentioned prox-regularized parametric subproblem is replaced by an easer one. We prove the convergence and present numerical tests to illustrate their behavior.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Optimal Configuration of Points on the Sphere with a Modified Particle Swarm Optimization

Communication Info

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Keywords:
(1) Thomson problem
(2) Mathematical programming
(3) Metaheuristic
(4) Particle Swarm Optimization.

Abstract

The problem of finding the optimal configuration of points on a surface of the unit sphere, known also as Thomson Problem, is a good benchmark test of global optimization[1,2]. Smale[3] has listed a variant of this problem, in his famous article of 18 unsolved mathematical problems, as worthy of focus for this century.

Particle Swarm Optimization (PSO) [4,5] is a stochastic population-based algorithm, inspired by the behavior of social creatures. PSO is effective and promising optimization method.

In this work, we tackle the proposed problem by developing a new modified PSO. Simulation results are given to illustrate the efficiency of the presented algorithm.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Doubly biased Maker-Breaker minimum degree K game

Communication Info

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Keywords:
(1) Maker-Breaker
(2) Biased games
(3) Minimum degree K game

Abstract

In the (a:b) Maker-Breaker minimum degree K Game played on the complete graph K_n , two players, called Maker and Breaker, alternately claim a and b edges previously unclaimed elements of the edge-set of K_n. Maker wins the game if he is able to occupy a graph with minimum degree K, and the objective of the Breaker is to prevent him to succeed. Gebauer and Szabó proved in [2] that Maker can win (1:b) minimum degree K Game with $K < \frac{\ln(\ln n)}{3}$, if $b = (\ln n - \ln\ln n - (2K+3))\frac{n}{ln^2(n)}$.
We study the doubly biased (a : b) Maker-Breaker minimum degree K Game played on the complete graph , where both a and b can be greater than one. For $a = o(\sqrt{\frac{n}{\ln n}})$, we prove that the Maker wins if

$$b \leq \frac{a(n-K+\frac{(a-1)}{2}\ln(\frac{n}{a^2\ln(n)})-\frac{n}{aln\,n})}{\ln(n)+2K+a-1+\ln(\ln(n))}.$$

The presented bound is not only a generalization of the Game but also an improvement of the bound given by Gebauer and Szabó, in the special case a=1 and $K < \frac{\ln(\ln n)}{3}$, to

$$b = (\ln n - \ln\ln n - (2K+1))\frac{n}{ln^2(n)}.$$

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Optimization of Deep Convolutional Neural Network Architecture

Communication Info

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Keywords:
(1) Deep Neural Networks
(2) Architecture Optimization
(3) Binary optimization

Abstract

Recently, convolutional neural network (CNN) has revolutionized the artificial intelligence field. Furthermore, its development has become a very active research area. This is due to its unavoidable achievements in most real world applications. However, the determination of an optimal CNN architecture is still unclear until now. Furthermore, the choice of CNN architectures previously proposed is based only on experiments. To deal with this issue, we suggest, in this work, a mathematical modelling for CNN Architecture Optimization and training in terms of a mixed integer nonlinear optimization problem with linear constraints. We adopt the genetic algorithm to solve the resulting model. To further evaluate our suggested mathematical modeling, we conduct various experiments on two benchmark datasets. Numerical results confirm that our proposal achieves improvement in terms of optimization and classification performance.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Dualité et conditions d'optimalité pour les problèmes de minimisation vectorielle à contrainte convexe renversée

Communication Info

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Keywords:
(1) Optimisation globale
(2) Dualié
(3) Conditions d'optimalité

Abstract

Ce travail est consacré à l'étude d'un problème (P) de minimisation d'une fonction vectorielle convexe F définie sur un convexe fermé X de R^p et à valeurs dans R^k, sous contrainte convexe renversée $g(x)\geq 0$, $x\in X$, où g est définie sur R^p à valeurs dans R. Notre but est de donner des conditions d'optimalité nécessaires pour le problème (P) en utilisant la dualité de Fenchel-Lagrange. Cette dualité a été introduite dans [4] pour les problèmes de minimisation qui sont convexes. Afin d'appliquer cette dualité, nous avons premièrement procédé à la décomposition du problème (P) en une famille de sous problèmes vectoriels convexes**.** Ensuite, sous des hypothèses appropriées, nous avons établi la dualité forte de Fenchel-Lagrange et donné des conditions d'optimalité pour les problèmes scalarisés des sous problèmes. Finalement, via les résultats obtenus pour les problèmes scalarisés, nous avons donné des conditions nécessaires d'optimalité pour les solutions proprement efficientes de (P) au sens de Geoffrion [1]. Ces conditions d'optimalité sont exprimées en fonction des cônes normaux et des sous différentiels au sens de l'analyse convexe. Ces résultats sont nouveaux dans la littérature des problèmes de minimisation vectorielle à contrainte convexe renversée.

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ICRAMCS 2022
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Hopfian Abelian Groups In the Category Algebraically Compact

Communication Info

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Keywords:
(1) Hopfian abelian group
(2) Endomorphism
(3 Algebraically compact

Abstract

An abelian group A is called Hopfian if every epimorphism of A is an automorphism.
We know that direct summand of Hopfian abelian group is also Hopfian abelian group.
Does this result remain valid for the torsion part of an Hopfian abelian group? the response isn't true.
For this we construct an abelian Hopfian group such that its part torsion isn't Hopfian.
Finally, we characterize a Hopfian abelian group in the category of algebraically compact abelian group, and in the category of divisible abelian group.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Some results concerning generalized permuting f-n-derivations on lattice

Communication Info

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Keywords:
(1) Lattice
(2) Modular lattice
(3) Distributive lattice
(4) generalized *f- n*-derivations

Abstract

The notion of Lattice theory first introduced by Birkhof [1]. The properties of lattices were studied by some authors [4]. The notion of derivation for lattice is introduced by X.L. Xin et al [2] and some related properties are discussed. Multiderivations (e.g., bi-derivations, 3-derivations, or n-derivations, in general) have explored by some authors. Our research was mainly motivated by studies in [5,6]. In this communication, we introduce the notion of permuting f-n-derivations on lattice and the notion of generalized permuting f-n-derivations on lattice associated with permuting f-n-derivations and investigates some related properties. We also characterized the distributive and modular lattices by generalized permuting f-n-derivations.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Commutativity with algebraic identities in special classes near-rings

Communication Info

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Keywords:
(1) Prime near-rings
(2) Derivations
(3) Commutativity

Abstract

Near rings are generalized rings, since addition is not commutative and the most important fact is only one distributive law is needed. Upon comparing with the standard class of rings, endomorphism rings of abelian groups, we can see that ring theory describes a "linear theory of group mappings", while near rings deal the general "nonlinear theory." In the present manuscript, we have generalized the results which have been established for "abelian group mappings" to "non-abelian group mappings." We shall add to this body of results several commutativity theorems for near-rings admitting suitably-constrained derivations and we provide examples to show that the assumed restrictions cannot be relaxed.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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On Nilpotent Homoderivations In Prime and Semi-prime Rings

Communication Info

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Keywords:
(1) Nilpotent Homoderivations
(2) Prime and Semi-prime Rings
(3) Leibniz Formula

Abstract

In [1] El Sofy introduced the concept of homoderivations in a ring as an amalgamation of both homomorphisms and derivations, that is.
An additive mapping on a ring R is called a homoderivation if it satisfies the following rule:
$h(xy)=h(x)h(y)+h(x)y+xh(y)$ for all x, y in R. Our goal in this paper is to study nilpotent homodrivations and to provide results about their index of nilpotency in prime and semi-prime rings with torsion restrictions or restrictions on the characteristic of the ring. Hence, we will extend the results of Chung and Luh [2-4], Martindale and Miers [5] and Jensen [6] on the study of nilpotency of derivations to homoderivations.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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On invertible tournaments

Communication Info

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Keywords:
(1) Tournament
(2) Skew-adjacency matrix
(3) Characteristic polynomial
(4) Determinant

Abstract

We say that a tournament T is invertible if the inverse of its skew-adjacency matrix is a skew-adjacency matrix of a tournament. This tournament is said to be the inverse of T. Invertible tournaments are inherently unimodular, that is the determinant of their skew-adjacency matrices is equal to 1. Moreover, its principal minors are necessarily subject to some conditions. In this talk, we give a characterization of invertible tournaments and present some families of such tournaments [1].

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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On monogenity of certain number fields defined by trinomials of type $x^{2^r} + ax + b$

Communication Info

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Keywords:
(1) Power integral basis
(2) Trinomials
(3) Theorem of Ore
(4) Prime ideal factorization
(5) Common index divisor

Abstract

Let $K = \mathbb{Q}(\theta)$ be a number field generated by a complex root θ of a monic irreducible trinomial $F(x) = x^{2^r} + ax + b \in \mathbb{Z}[x]$. Jhorar and Khanduja provide some explicit conditions on a, b, and n for $(1, \theta, \ldots, \theta^{2^r-1})$ to be a power integral basis in K. But, if θ does not generate a power integral basis of $\mathbb{Z}_K$, then Jhorar's and Khanduja's results cannot answer on the monogenity of K. Also, Ben Yakkou and El Fadil studied the non-monogenity of certain number fields defined by trinomials of type $x^n + ax + b$. More precisely, when θ does not generate a power integral basis, they gave sufficient conditions on a and b for certain n for K to be not monogenic. However, the obtained results cannot be applied in the case $n = 2^r$ and cannot decide about the monogenity of K. In this paper, based on Newton polygon techniques, we deal with the problem of non-monogenity of K. Finally, we illustrate our results by some computational examples.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Application of Secret Sharing Scheme in Many Linear codes over $\mathbb{Z}_p R_1 R_2$

Communication Info

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Keywords:
(1) Linear Codes
(2) Secret sharing schemes
(3) Simplex and Macdonald codes

Abstract

The class of Simplex and Macdonald codes is a very important class of linear codes from both theoretical and practical points of view see [1], [2], and [3], being easier to implement due to their rich algebraic structure, such that these codes related to the concept of secret sharing schemes, which have important applications in many cryptographic applications, secure multiparty computations, and threshold cryptography, as the secret can be recovered once a subset of the participants shares their information see [4]. In this paper, we present simplex and MacDonald codes over $\mathbb{Z}_p R_1 R_2$. The properties of these codes are studied, particularly the weight enumerators and Gray images of the simplex and MacDonald codes over the ring $\mathbb{Z}_p R_1 R_2$. We use the dual of the Gray images of simplex and MacDonald codes over the ring $\mathbb{Z}_p R_1 R_2$ to obtain secret sharing schemes. We draw on many properties to understand the access structure of these secret sharing schemes.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Generalized tournaments matrices with the same principal minors

Communication Info

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Keywords:
(1) Generalized tournament matrices,
(2) principal minors
(3) weighted oriented graphs
(4) clans

Abstract

Let T be a tournament, that is, an orientation of the complete graph, and let A be its adjacency matrix. A subset X of the vertex set V is called a clan, if for every z ∈ V \ X, the arcs between X and z have the same direction. Bousaïri et al. [5] proved that two tournaments have the same 3-cycles iff one is obtained from the other by a sequence of clan reversals. Matricially, this result result can be stated as follows: two tournament matrices have the same principal minors of order 3 iff they are related by a sequence of clan reversals.
A generalized tournament matrix M is a nonnegative matrix that satisfies $M + M^t = J - A$ where J is the all ones matrix and I is the identity matrix. Using an extension of the notion of clans into matrices, we characterize generalized tournament matrices with the same principal minors of orders 2, 3, and 4. In particular, it is proven that the principal minors of orders 2, 3, and 4 determine the rest of the principal minors.

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Some identities in quotient rings

Communication Info

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Keywords:
(1) Generalized derivation
(2) SCP map
(3) Prime ring

Abstract

Let R be an associative ring, P a prime ideal of R. In this paper, we study the structure of the ring R/P and describe the possible forms of the generalized derivations satisfying certain algebraic identities on R. As a consequence of our theorems, we first investigate strong commutativity preserving generalized derivations of prime rings, and then examine the generalized derivation acting as (anti)homomorphism in prime rings. Some commutativity theorems also given in semi-prime rings.

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ICRAMCS 2022
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Pullback diagrams and Kronecker function rings

Communication Info

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Keywords:
(1) Star operation,
(2) ring extension
(3) Prufer extension
(4) pullback diagram

Abstract

We study properties of Kronecker function ring extension with respect to a star operation to generalize the classical notion of Kronecker function ring. The classical Kronecker function ring construction associates to a domain R a Bezout domain. Let R be a subring of a ring S, and let be a star operation on the extension R ⊆ S. In their book [Manis Valuations and Prufer Extensions II, Lectures Notes in Mathematics, Vol. 2103 (Springer, Cham, 2014)], Knebusch and Kaiser develop a more general construction of the Kronecker function ring of R ⊆ S with respect to. We characterize in several ways, under relatively mild assumption on R ⊆ S, the Kronecker function ring as defined by Knebusch and Kaiser. In particular, we focus on the case where R ⊆ S is a flat epimorphic extension or a Prufer extension.

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Numerical radius inequalities for operators.

Communication Info

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Keywords:
(1) *Numerical radius*
(2) *spectral norm*
(3) *Aluthge transform*

Abstract

In this work we give new bounds for the numerical radius of operator. Also, we refine and improve some numerical radius inequalities of operator, for instance :

1) $\frac{1}{4}\left\|A^*A+AA^*\right\| \le w^2(A) \le \frac{1}{2}\left\|A^*A+AA^*\right\|,$.
($Kit\tan eh$ 2005).

2) $w(A) \le \frac{1}{2}\|A\| + \frac{1}{2}w(\tilde{A}),$ ($Yamazaki$ 2007), where $\tilde{A} = A^{\frac{1}{2}}UA^{\frac{1}{2}}$ is Aluthge transform of A.

3) $w(A) \le \frac{1}{2}\sqrt{\left\|A^*A+AA^*\right\| + 2w(A^2)},$
($Abu-Omar\ and\ Kit\tan eh$ 2015).

4) $w^r(B^*A) \le \frac{1}{2}\left\|(A^*A)^r + (B^*B)^r\right\|,$ ($Dragomir$ 2009).

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Divisibility test by prime numbers via the osculation function

Communication Info

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Keywords:
(1) Test of Divisibility,
(2) Osculation function,
(3) Prime numbers.

Abstract

For many years, prime numbers attract the attention of many mathematicians around the world, see for example the story of the theory of numbers in [4,5]. Everywhere in nature and in life, prime numbers are very often used. There are a number of well-known open questions regarding prime numbers. The creation of a real rule, trick or test of divisibility by a prime number is a very difficult elementary problem, we can for example refer to [1-3, 6-9]. In [2], the author proposed a divisibility rule by positive integer using general osculation functions. In [6], the author proposed, for all primes other than 2 and 5, a simple test for divisibility based upon units digits, her aim is to find a way of going from a number with s digits (in base 10) to one with s - 1. In this article, especially using base 10 and by developing some properties on osculation function in special cases, we study new divisibility theorems by primes numbers and we discuss some tests.

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Quelques Constructions des Codes Linéaires Sur L'anneau $\mathfrak{R}$

Communication Info

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Keywords:
(1) Additive codes
(2) Gray Map
(3) Matrice génératrice

Abstract

La théorie des codes correcteurs d'erreurs est utilisée pour sécuriser la transmission d'information, il est intéressant de note que tous les canaux de communication comportent des erreurs, alors les chercheurs sont intérêts de construire des codes de plus en plus performants voir [1],[2] et [4]. Pour cela on introduit des codes correcteurs sur un nouvel anneau $\mathfrak{R} = \overline{\mathcal{R}_1}\overline{\overline{\mathcal{R}_2}}\overline{\overline{\overline{\mathcal{R}_3}}}$avec $\overline{\mathcal{R}_1} = \mathbb{Z}_q + v_1\mathbb{Z}_q$ est un anneau commutatif avec $u^2 = 1$,$\overline{\overline{\mathcal{R}_2}} = \mathbb{Z}_q + v_1\mathbb{Z}_q + v_2\mathbb{Z}_q$ et $\overline{\overline{\overline{\mathcal{R}_3}}} = \mathbb{Z}_q + v_1\mathbb{Z}_q + v_2\mathbb{Z}_q + v_3\mathbb{Z}_q$ sont anneaux commutatif avec ${v^2}_i = \xi_i v_i$, $\xi_i \epsilon \mathbb{Z}_q$et $v_i v_j = v_j v_i$, pour $1 \leq i \neq j \leq 3$. On utilise les résultats obtenus par [3] et [5], on donne une autre façon de voir ces codes en construisant leur matrice génératrice. Donc une nouvelle présentation de ces matrices. Un autre aspect intéressant des codes sur cet anneau est de définir le Gray Map

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Produit double tordu de deux groupoïdes riemanniens

Communication Info

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Mots-clés :

(1) Groupoïdes riemanniens
(2) Produit tordu
(3) Groupoïdes d'action

Abstract

Dans [1], R. L. Bishop et B. O'Neill ont introduit le produit tordu de deux variétés riemanniennes, opération ayant été généralisée ensuite par le produit double tordu.

Dans ce travail, on étudie les conditions sur les fonctions de distorsion pour que le produit double tordu de deux métriques riemanniennes au sens de del Hoyo et Fernandes [2] sur deux groupoïdes de Lie soit une métrique riemannienne sur le groupoïde de Lie produit.

On s'attarde plus particulièrement sur le cas où les deux groupoïdes de Lie considérés sont des groupoïdes d'action.

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ICRAMCS 2022

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Modules Over Hopf Superalgebras

Communication Info

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Keywords:
(1) Hopf superalgebra
(2) Classification
(3) Module

Abstract

Module over superalgebras appear in many areas of mathematics and physics, this notion allows to study the concept of supersymmetry in theoretical physics and they play a more important role in superlinear algebra than superspaces [2, 3, 4, 6].
Aissaoui and Makhlouf classified the Hopf superalgebras in dimension 4 and they obtained five Hopf superalgebras such that each Hopf superalgebra in dimension 4 is isomorphic to one of these five Hopf superalgebras [1].
In this communication, we present the module structures of finite dimensional Hopf superalgebras in the graded case, in particular, we determine the module structures for all hopf superalgebras obtained in the classification given in [1].

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ICRAMCS 2022

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On structure and commutativity of 3-prime near-rings

Communication Info

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Keywords:
(1) Prime near-rings
(2) Derivations
(3) Commutativity

Abstract

There has been an ongoing interest concerning the relationship between the commutativity of a 3-prime near-ring N and the behavior of an additive mapping as derivation or generalized derivation on N. We shall add to this body of results several commutativity theorems for near-rings admitting some differential identities under which near-rings are rings.
Moreover, an example is given to prove that the necessity of the 3-primeness hypothesis imposed on the various theorems cannot be marginalized.

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Sur le problème du pricing des options

Communication Info

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Keywords:
(1) Équation intégro-différentielle partielle
(2) Option européenne
(3Processus de diffusion avec saut

Abstract

Le but de ce travail est de présenter un modèle qui s'intéresse aux problèmes d'évaluation des options européennes sur un actif financier dans le cas où les cours des sous-jacents suivent un processus de diffusion avec saut. Ce modèle, qui fait référence au modèle CEV introduit dans [1], est une extension du modèle SGV [2] dont la volatilité est fonction dépendante de façon logarithmique du prix de l'actif sous-jacent, se veut être intermédiaire entre les modèles dont la volatilité est une fonction puissance du prix du sous-jacent et le modèle classique de Black-Scholes [3] dont la volatilité est considérée constante. La modélisation mathématique permet d'établir un lien entre le prix d'option et une Équation de Dérivées Partielles comportant un terme non local d'intégral. En effet, nous présentons une approche de résolution numérique combinant des méthodes de discrétisation pour la partie différentielle de l'équation avec des méthodes d'intégration numérique pour évaluer le terme de saut qui introduit l'operateur intégral. Enfin, nous analysons les différents résultats numériques obtenus afin d'appréhender la performance et l'efficacité de cette approche.

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LSTM for Stock Market Prediction from Financial Time Series

Communication Info

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Keywords:
(1) Deep Learning
(2) Recurrent Neural Network
(3) Long Short Term Memory

Abstract

Cryptocurrency is a digital currency that can be used goods and services much of the interest in these unregulated currencies is to trade for profit. People invest a lot of monetary funds into them so as to earn gains. That's why there is a growing interest in studying the general dynamics of Bitcoin and in general of digital currencies. But it has never been easy to predict future stock markets values with higher accuracy. The purpose of our current study is fundamentally using Deep Learning via Long Short Term Memory to forecast the price of the most widely traded digital currencies i.e. Bitcoin and Vechain. The main objective of this paper is to see in which precision a LSTM can predict and compart LSTM with other types of RNN also useful in data prediction of time sequence via memory Gated-Update and Reset.

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L'allocation optimale des limites de police et des franchises avec quelques résultats sur le modèle mixte

Communication Info

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Keywords:
(1) Limites de police
(2) Les franchises
(3) Modèle mixte

Abstract

L'objectif principal de ce travail est d'introduire et d'étudier les ordres stochastiques des produits scalaires de vecteurs aléatoires. Nous étudions le problème de trouver l'utilité maximale attendue pour certaines fonctionnelles sur les portefeuilles d'assurance impliquant une randomisation supplémentaire (indépendante). De plus, des applications des limites de police et des franchises sont obtenues, nous considérons le produit scalaire de deux vecteurs aléatoires qui sépare l'effet gravité et l'effet fréquence dans l'étude de l'allocation optimale des limites de police et des franchises. À cet égard, nous obtenons l'ordre de l'allocation optimale des limites de police et des franchises lorsque la structure de dépendance des sinistres est inconnue.

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Modeling Financial and COVID19 crisis in Moroccan FX Market

Communication Info

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Keywords:
(1) CRISIS SIMULATION
(2) SVAR
(3) FOREIGN EXCHANGE

Abstract

This study presents a model for simulating the financial crisis linked to the Flexiblization process in Morocco. Using the Structural VAR model and specially defined constraint matrix, we determine a model containing the significant variables of the Moroccan FX market ecosystem. We then simulate a crisis linked to the flexibilization process and the COVID-19 pandemic. The results of these simulations provide market actors with advanced insights into the different impacts of the financial crisis on the Moroccan FX market, making it easier to put in place immediate and effective remedial plans to ensure the resilience of the Moroccan economy.

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Exploring the impact of contaminations and Vaccinations on FX markets during the pandemic

Communication Info

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Keywords:
(1) COVID-19
(2) DCC GARCH
(3) FOREIGN EXCHANGE

Abstract

This study delivers a refreshed assessment of the effect of COVID-19 cases and vaccinations on capital markets up to mid-2021. We adopt an approach to compare the impact of COVID-19 on financial markets via using a DCC GARCH model and data from countries with various economies. Our findings indicate that COVID-19 cases and vaccinations significantly affected most countries in our panel. We also found that positive market sentiment concerning the pandemic's development dominated across all countries in the study with minor exceptions.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Nonlinear dynamics of delayed Solow model with structured population

Communication Info

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Keywords:
(1) Solow model
(2) Hopf bifurcation
(3) Delayed differential equation

Abstract

The relationship between demographic change and economic growth is a topical subject that has always attracted the interest of researchers. Given the fluctuations in economic and demographic variables, studying and analyzing the direct relationship (cause and effect relationship) between economic growth and population is a complex one. In the same line, the present communication aims at analyzing this relationship by increasing the dynamic of the Solow economic growth model with two demographic variables and considering one time delay. The study investigates the stability of positive equilibrium and the existence of limit cycles by using Hopf bifurcation theorem. The role of the time delay in the variables of the proposed model and possible links between the mat various phases (stability, limit cycle and instability) are also examined in this study. Finally, to illustrate our analytical results.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Modélisation et analyse mathématique de la contagion du risque de liquidité dans le système Bancaire

Communication Info

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Keywords:
(1) Analyse mathématique
(2) Risque de liquidité
(3) Modèle de contagion dynamique épidémique

Abstract

Dans ce travail, nous étudions un modèle mathématique décrivant la contagion du risque de liquidité dans le système bancaire basé sur la simulation du modèle épidémique SIR. Le modèle se compose de trois équations différentielles ordinaires illustrant l'interaction entre les banques susceptibles ou affectées par le risque de liquidité et tendant vers la faillite. Nous avons démontré la naissance et la positivité des solutions, et nous avons mathématiquement analysé ce système pour montrer comment contrôler la stabilité du système bancaire. Des simulations numériques ont été illustrées pour étayer les résultats analytiques et prouver les effets des différents paramètres du système étudiés sur la contagion du risque de liquidité.

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[1] Luoyang City, Henan Province, China, 471000 Reputation risk contagion and control of rural banks in China based on epidemic model Wu Yu* School of Economics Henan University of Science and Technology, Received 6 June 2014, www.tsi.lv.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Estimation de la Prime de Crédibilité Sous la Fonction de Perte Quadratique et la Fonction de Perte Linex

Communication Info

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Keywords:

(1) Akash distribution
(2) Lindley distibution
(3) Prime bayésienne

Abstract

Dans cette communication, nous considérons les distributions d' Akash[1] et de Lindley[2] comme des distributions conditionnelles de $X_n|\theta$, nous nous concentrons sur l'estimation de la prime bayésienne sous deux fonctions de perte (quadratique[3] qui est symétrique, linex[4] qui est asymétrique), en utilisant des prieurs non informatifs et informatifs (l'extension des prieurs de Jeffreys et Gamma) respectivement. En raison de sa difficulté et de sa non-linéarité, nous utilisons une approximation numérique pour calculer la prime bayésienne. Ces méthodes sont comparées en utilisant l'erreur des fonctions de perte par une étude de simulation avec différentes tailles d'échantillon.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Optimization of classification of fraud detection with combination of sine cosine algorithm and neural networks

Communication Info

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Keywords:
(1) Artificial Intelligence
(2) Hybridization
(3) Neural Networks
(4) Sine Cosine Algorithm
(5) Deep Learning.

Abstract

Recently, several studies and researches have been elaborated in order to slow down and detect frauds before its applications [1]. Fraud detection allows decision makers to make money and protect their customers from possible fraudulent attacks. In our case we will focus on credit card fraud. For that we will proceed to a hybridization of sine cosine algorithms [2] and neural networks in order to optimize the quality of classification problems and detection of fraud. The proposed method allows us to design an optimal neural network architecture, while maintaining the diversity of the population . The characteristic of this method is to recomponent the best search strategy in order to have the best possible optimization. To assess the efficiency of the proposed algorithm, experimental results are presented. The hybridization technique used produces two desirable effects, a better result of fraud detection and a fairly low margin of error.

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ICRAMCS 2022
INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Analyse de l'impact des transferts de fonds des MRE sur la croissance économique du Maroc à l'aide d'un modèle vectoriel autorégressif (VAR)

Communication Info

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Mots-clés :
(1) transferts de fonds
(2) Croissance économique
(3) pays en développement
(4) Maroc
(5) MRE
(6) VAR

Résumé

La problématique des transferts de fonds des migrants revêt une importance particulière dans la littérature économique. Les transferts de fonds sont considérés comme étant une source de financement importante pour la majorité des pays en développement, et le Maroc ne fait pas l'exception. il est, en effet, l'un des pays qui reçoit le plus de transferts de fonds dans le monde. Le transfert de fonds des migrants joue un rôle important dans la réduction de la pauvreté [1], l'amélioration du niveau de vie des pauvres dans les pays en développement [2] et contribuent à stimuler la consommation et les investissements domestiques [3].
L'objet de cette communication est d'analyser les retombées socio-économiques de rapatriements des épargnes des Marocains Résidents à l'Etranger (MRE), ensuite l'évolution des montants des transferts et les facteurs qui l'influencent. Par la suite, on, analysera l'impact des transferts de fonds des MRE sur la croissance économique du Maroc à l'aide d'un modèle vectoriel autorégressif (VAR) appliqué à des données annuelles allant de 1980 à 2018.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Analysis of Casablanca Stock Market Topology Based on Hierarchical Clustering and Network Theory

Communication Info

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Keywords:
(1) Hierarchical Clustering
(2) Dynamic Time Warping
(3) Network Analysis
(4) Financial Crisis
(5) Casablanca Stock Exchange Market

Abstract

Numerous data analysis approaches are currently being used to analyse data within different domains. Among all these approaches, clustering and network analysis are the most used. They are typically adopted in order to group data based on their similarities and assess the interrelations between them. The aim of this study is to apply the Agglomerative Hierarchical Clustering implemented on Dynamic Time Warping distance matrix to investigate the dynamics within Casablanca Stock Exchange, a survey that was performed over various trends deducted from Bai and Perron (2003) Break-point tests to analyse the sectorial indices topology within frames characterized by dissimilar tendencies. In effect, tracking the evolution of the clusters composition over time allow us to build a growing undirected weighted network of Casablanca Stock Exchange sectorial indices to identify the interrelations between sectors. Knowing that the nodes represent sectors and the edges are proportional to the strength of the interrelations between sectors. A research that leads us to illustrate the evolution of the market topology and demonstrate the interrelations between the sectorial indices over time. Finally, by networking analysis it appears that the Oil and Gas sector plays the most influential role in the Casablanca Stock Exchange Market.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Pricing American option under Exponential Lévy jump-diffusion model using Random Forest

Communication Info

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Keywords:
(1) Lèvy Jump-diffusion model
(2) Random Forest regression
(3) Longstaff and Shwartz algorithm

Abstract

In this communication, we aim to propose a new hybrid version of the Longstaff & Schwartz algorithm under an exponential Lèvy jump diffusion model using Random Forest regression and we will compare this model to the classical model of Longstaff and Schwartz in terms of computation time and accuracy. In a second step, we will build the evolution of the option price according to the number of paths and we will show how this approach shows numerically the convergence of the option price toward an equilibrium price when the number of paths tends to a considerable number. At the end of the paper, we will validate both approaches on a real market (Microsoft "MSFT" put option as an example).

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Alos type approximative pricing of the two-factor stochastic volatility model with double exponential jumps

Communication Info

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Keywords:
(1) Stochastic volatility
(2) Jump diffusion
(3) Decomposition
(4) Two factor
(5) Option pricing

Abstract

We study the two-factor stochastic volatility jump (2FSVJ) model and obtain a decomposition formula and its approximative form via Ito calculus techniques. This model is a generalisation of several models in literature such as the Heston [4] and Bates [5] models thus the aim of this study is to extend works in literature like [1], [2] and [3]. We derive the error bounds and provide numerical illustrations of the pricing accuracy and computational advantage of our method under double exponential jumps using Python. Our pricing method is correct to within 0.3 of the Cosine Fourier method.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Modélisation et analyse mathématique de la contagion du risque dans le système bancaire avec retard

Communication Info

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Keywords:
(1) Analyse mathématique
(2) Risque de liquidité
(3) Modèle de contagion dynamique épidémique
(4) équations différentielles en retard

Abstract

Ces derniers temps, toutes les banques mondiales sont menacées par le problème de risque de contagion. Ce phénomène représente une menace financière pour les banques et peut conduire à des conséquences en cas de négligence ou de sous-estimation. Dans ce travail, nous étudions un modèle mathématique qui décrit la contagion du risque dans le système bancaire avec retard basé sur une simulation d'épidémie de SIR avec retard. Le modèle se compose de trois équations différentielles ordinaires illustrant l'interaction entre les banques susceptibles ou affectés par le risque et tendant vers la faillite. Nous avons démontré la naissance et la positivité des solutions et on a mathématiquement analysé ce système pour montrer comment contrôler la stabilité du système bancaire. Des simulations numériques ont été illustrées pour étayer les résultats analytiques et pour prouver les effets de différents paramètres du système étudié sur le risque de la contagion dans le système bancaire.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Modèle d'Evaluation d'Options Américaines : Transition Energétique au Maroc

Communication Info

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Keywords:
(1) Options Américaines
(2) Modèle CEV
(3) Problème de complémentarité linéaire

Abstract

Dans cette présentation, nous utiliserons les options de vente américaines comme outil pour aider le projet marocain lié à la transition énergétique car nous savons que les énergies fossiles telles que le pétrole sur au bord de l'extinction, le Maroc se doit donc prendre les mesures nécessaires à leur sécurité énergétique au cours des prochaines années. Nous nous sommes basés sur le modèle à élasticité de variance constante, nous avons ajouté un taux de dividende à l'équation différentielle stochastique de notre modèle et après une discrétisation nous avons pu trouver un problème de complémentarité linéaire qui a une solution unique, cette solution est le prix de l'option de vente Américaine. Nous avons montré l'efficacité de l'utilisation des options de vente Américaines à travers une application aux options pétrolières.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Modelling the adoption of Bitcoin by using the stochastic Weibull diffusion model

Communication Info

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Keywords:
(1) Weibull diffusion model
(2) Estimation
(3) Optimization method
(4) Bitcoin

Abstract

The goal of this study is to provide a new diffusion model for modelling S-shaped-type behavior patterns, [3], in which the mean function is proportional to the Weibull cumulative distribution function (CDF), see Bergman [1]. In addition, its transition density can be found explicitly, which allows to analyse inference from the discrete sampling of trajectories. The main characteristics of the process will be analysed and the maximum likelihood estimation of parameters will be performed through discrete sampling. In order to solve the likelihood equation, we propose a hybrid optimization method combining Salp Swarm Algorithm (SSA), [4] and Variable Neighborhood Search (VNS), [2]. Finally, an application of the adoption of Bitcoin is provided. This application demonstrates the predictive capabilities of the process.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Viability Analysis for a waste to energy model

Communication Info

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Keywords:

(1) Household waste recovery
(2) Nonlinear dynamical systems
(3) Viability theory

Abstract

The need to switch to green energies becomes more pressing in this day in age, and the growing consumption leading to a large waste production comes in handy in terms of using it and processing it into green and renewable energy.
Furthermore, the domain has not benefited from the mathematical modelling approach. At an earlier work [1], we sought an investment policy that would maximize the profit yielded by selling the energy produced. We further have tried to include learning effects for renewable energy technology. Which will underline the importance of assessing if profit maximization [2] is the best objective, or could we settle for a more conservative point of view like in [3,4,5,6]? (i.e try to sustain the activity under some viable constraints for as long as we could).

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Prey-Predator model with the tide effect

Communication Info

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Keywords:
(1) High tides
(2) Low tides
(3) Bioeconomic model

Abstract

The main objective of this work is the study of the effects of high tides and low tides on fishing effort, catches as well as profits in a bioeconomic model of populations of Sardina pilchardus, Engraulis encrasicolus and Xiphias gladius in Moroccan areas. To achieve this objective, we studied the stability of the equilibrium points of our biological model then we added in our model the effect of the tides in the fishing effort which maximizes the profits of the fishermen under the constraint of the conservation of the biodiversity of these marine species using the generalized Nash equilibrium in the resolution of the bioeconomic model. As results, we were able to give the best fishing times according to the tides of each month of the whole year which will allow us to achieve better yields. Hence the importance of introducing the effect of high and low tides in bioeconomic models.

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SIARD Model and Effect of Lockdown on the Dynamics of COVID-19 Disease with non Total Immunity

Communication Info

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Keywords:
(1) Covid19 / ODE,
(2) SIARD model
(3) basic reproduction number / stability

Abstract

We propose a new compartmental mathematical model describing the transmission and the spreading of COVID-19 epidemic with a special focus on the non-total immunity. The model (called SIARD) is given by a system of differential equations which model the interactions between five populations "susceptible", "reported infectious", "unreported infectious", "recovered with/without non total immunity" and "death". Depending on the basic reproduction number, we prove that the total immunity induces local stability-instability of equilibria and the epidemic may disappear after a first epidemic wave and more epidemic waves may appear in the case of non-total immunity. Using the sensitivity analysis we identify the most sensitive parameters. Numerical simulations are carried out to illustrate our theoretical results. As an application, we found that our model fits well the Moroccan epidemic wave, and predicts more than one wave for French case.

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A brief review of some mathematical models in epidemiology

Communication Info

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Keywords:
(1) Dynamical systems
(2) Epidemiological modeling
(3) Differential equations

Abstract

The current COVID-19 pandemic has proven the urging need for developing mathematical models arising in epidemiology in the aim of understanding the dynamics of infectious diseases. In order to model an epidemic, different approaches can be adopted. Mainly, the deterministic approach and the stochastic one. Recently, a huge amount of literature has been published using the two approaches. The aim of this work is to familiarize future researchers and Ph.D students with the usual framework used for compartmental models in epidemiology and introduce variant tools used in the mathematical and numerical analysis of each one of those models, as well as the general related types of existing, ongoing and future possible contributions.

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MATHEMATICAL MODEL OF ANAEROBIC DIGESTION WITH LEACHATE RECIRCULATION

Communication Info

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Keywords:
(1) Mathematical modelling
(2) Anaerobic digestion
(3) Biogas

Abstract

Waste management is more relevant than ever, and producing renewable energies while limiting green- house gases are part of the environmental challenges of humanity. It is imperative to consider optimized systems for integrated and sustainable waste management, to meet environmental, economic and social needs. This involves, on the one hand, minimizing the landfill rate over the medium and long term, as well as the harmful effects of greenhouse gas emissions, and, on the other hand, optimizing energy yields while respecting the constraints of treatment costs. In developing countries, household waste is mainly composed of organic matter and its energy recovery is of great interest. Many new technologies have been developed to optimize energy yields, in particular the anaerobic digestion process. Our mathematical model describes the two-step anaerobic digestion process (hydrolysis/acidogenesis and methanogenesis) with two types of substrate and leachate recirculation to produce green energy. The dynamic system obtained makes it possible to predict the evolution of the quantities of methane and carbon dioxide over time. It admits an infinity of non-hyperbolic equilibria but presents properties of asymptotic convergence. Thanks to this model, by carrying out simulations, we were able to highlight the influence of the recirculation of leachate and of the initial quantity of organic matter on the production of biogas.

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Global dynamics for a non autonomous model with stage structure and adaptative behavior

Communication Info

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Keywords:
(1) Poincaré Map
(2) Monotone Systems
(3) Global Dynamics

Abstract

Diapause and insecticide resistance is a pest survival process. To better understand these traits, we discuss a structured model with two life stages, juveniles and reproducing adults. The life cycle of the population is divided into three periods: Prediapause, Diapause, and Post-diapause stage. The overlapping generations are described by delay differential equations. The model is not autonomous. We present a systematic study using monotone systems theory. The dynamics are described in terms of an index R obtained by the spectral radius of the Poincaré operator of the linearized problem around the extinction equilibrium. When R<1, the trivial solution is globally asymptotically stable. When R>1, the positive periodic solution is globally asymptotically stable. Numerical simulations confirm the obtained theoretical results.

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Persistent homology, application to structure protein analysis in the case of COILED SERINE

Communication Info

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Keywords:
(1) Persistent homology
(2) COILED SERINE
(3) flexibility rigidity index
(4) optimal characteristic distance

Abstract

Persistent homology has shown a lot of success when it comes to applications in biology since this latest use metrics only for measuring similarities, neglecting these geometric details and focusing on the global shape is the key point making the success of persistent homology.
In this work we will be confirming the latest assumption by analyzing the structure of COILED SERINE and giving a substitute of the optimal characteristic distance that can be used in flexibility rigidity index when it comes to atomic rigidity functions, we will also analyze interesting patterns in the binding site of the beta sheet generated from the pdb file 2JOX. We will be detecting and giving a simple description of different patterns generated by using javaplex and Kepler Mapper generating barcodes and persistent diagrams as a summary statistics.

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Mathematical Modeling of the Error Propagation

Communication Info

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Keywords:
(1) Modeling
(2) Apprenticeship error
(3) Dynamical system

Abstract

The main objective of this study is to create and implement a mathematical model reflecting the propagation of an apprenticeship error in an individual to all other individuals in a given population. Secondly, we will try to improve the model and find the limits of its management. In order to model this program, we will familiarize ourselves with the SciLab software, which will allow us to process the model. We do not have, for now, a model or a source of information on the distribution and propagation of apprenticeship errors. Let us note that there is a fundamental difference between the fault and the error. The fault, which may be due to a contingent element (temporary negligence, distraction, tired, etc.) is considered the responsibility of the learner.

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A predator-prey system of fishery model involving Stieltjes differential equations

Communication Info

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Keywords:
(1) Fishery
(2) Stieltjes differential equations
(3) Modeling
(4) g-derivative
(5) predator-prey

Abstract

We consider a population of fish subject to predator species (sharks, dolphins, rays...). In this context, we assume also that this population is subject to fishing activity. In order to protect the reproductive cycle and the newborns, it is assumed that fishing is restricted in some seasons of the year. Several models were considered to describe the dynamics of these populations, such as the Lotka-Volterra problem, using a classical analysis of dynamical systems. However, given the fact that the number of fish individuals presents sudden jumps during the hatching periods, and also that the number of fished individuals remains constant during the closed season, we suggest a new approach to treat such phenomena. To this aim, we introduce Stieltjes differential equations to prove the existence and uniqueness of solution [3] to our model. This will involve a derivation with respect to an adequate left-continuous nondecreasing function. Therefore, from one side, the right-hand side term is more concise. On the other side, several properties of the derivator are inherited by the solution: the discontinuity jumps and the periods of constancy.

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Covid-19 in the moroccan area: an optimal control approach with free terminal time

Communication Info

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Keywords:
(1) Optimal Control
(2) Covid-19
(3) Free terminal time

Abstract

In this work, we present an optimal control approach considering free terminal time that we apply on covid-19 model. We propose an extension of the classical susceptible-exposed-infectious-recovered (SEIR) model. The main goal of this work is to determine the optimal control strategy and the optimal duration of the vaccination compaign to eradicate the covid-19 epidemy in the moroccan area. Using real data of moroccan statistics is our way to attend the objective. We use Bootstrap as statistical method to improve reliability of the parameters estimates. We introduce into the model a saturated vaccination function, and we formulate a minimization problem where the final time is considered to be free. The optimality system with an iterative method based on the iterative Forward-backward sweep method is solved using Matlab. The numerical simulation results show the effectiveness of the vaccination strategy.

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A Normal distribution Approximation of the Final Size of a Multitype Collective Reed-Frost Model

Communication Info

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Keywords:
(1) epidemiological model
(2) collective Reed-Frost process
(3) final size of the epidemy
(4) Normal distribution

Abstract

The central problem for epidemic processes is the mathematical representation of the transmission mechanism of the infection and the study, for a given model, of the behaviour of the final size of the epidemic. In this research, we propose a Gaussian process approximation of the final size. We start with a presentation of the model, then we introduce inclusive processes by representing the collective process through the elimination of the infected in order to assimilate the epidemic process to the included process. Then, under some assumptions, and by application of Kurtz's theorem, we show, in both cases, depending on whether the number of initial infected is finite in each group or not, that the sequence of included random variables converges in distribution towards a normal distribution. This last convergence will allow us to deduce that the asymptotic distribution of the final size is normal.

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Dynamical behaviors of predator-prey model with prey harvesting

Communication Info

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Keywords:
(1) Predator-prey model
(2) Stability
(3) Limit cycle
(4) Bifurcation

Abstract

In this work, we consider a predator-prey model where the prey species is subjected to a non-smooth switched harvest. The model is a modified version of the classic Lotka-Volterra predator-prey model. To understand how the interaction of this two populations works and act accordingly to maintain the right ecological equilibrium, we study the effects of switched harvest on the dynamics of the predator-prey model and we investigate the existence and stability of multiple equilibria of this system, the asymptotic behavior of its solutions, the existence of periodic solution, we show the appearance of at least one limit cycle. We analyze the bifurcation which can appear when the values of parameters of the model vary.

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Modeling the Dynamics of an Epidemiological Model Using Monotone Dynamical System Theory

Communication Info

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Keywords:
(1) Monotone dynamical systems
(2) Cooperative systems
(3) Compartmental model
(4) Basic reproduction number
(5) Global asymptotic stability

Abstract

The relapse phenomenon in some infectious diseases is characterized by the acquisition of quiescent state of the individuals that have previously been infected, and with subsequent relapse to the infectious state. This recurrence of infections including diseases such as bovine tuberculosis and human herpes virus.
In this work, we study the global stability of epidemiological model with relapse, by using the monotone dynamical sytems, particularly, cooperative and irreducible systems of ordinary differential equations. We will illustrate our method on a model SEIRI. At last the this work, numerical simulations are presented to complement the theoretical results.

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Mathematical modelling of the anaerobic digestion process with acidogenic and methanogenic biomasses

Communication Info

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Keywords:
(1) Anaerobic digestion
(2) Biogas production
(3) Dynamical system
(4) Infinity non-hyperbolic equilibriums

Abstract

One of the most important sources of gas emissions is solid waste landfills. As part of the production of renewable energy and the minimization of greenhouse gas emissions, we are interested in this work in biogas produced by the process of decomposition of organic matter under anaerobic conditions in a controlled landfill. We present a mathematical model of anaerobic digestion with acidogenic and methanogenic biomasses. Then, we analyze the model and show that an infinity of non-hyperbolic equilibria induces an attractor. We give numerical results which highlight the impact of the mortality of acidogenic and methanogenic biomasses on the production of biogas.

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Mathematical analysis of an anaerobic co-digestion model with preference function and mortality

Communication Info

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Keywords:
(1) Anaerobic co-digestion
(2) Preference function
(3) Mortality
(4) Biogas production
(5) Dynamic system
(5) Attractor

Abstract

Anaerobic co-digestion is defined as the simultaneous anaerobic digestion of two or more substrates. Mixing several substrates has many advantages, it may namely increase the Biogas production. In our work, we propose a mathematical model to describe the anaerobic co-digestion of two substrates, with bacteria preference and mortality in closed mode. The existence and dissipativity of positive solutions are investigated. We show that trajectories have asymptotic behavior, and that the global attractor is composed of an infinity of non-hyperbolic equilibria. The choice of the growth function, especially for methanogenic bacteria, may completely change the performance of the process.

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Mathematical Modeling Of Cancer Resistance To Treatment

Communication Info

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Keywords:
(1) Cancer modeling
(2) Cancer resistance
(3) Cancer stem cells
(4) Optimal control

Abstract

It is commonly known that cancer often develops drug resistance and tumors grow back from the surviving cells. This "acquired" resistance phenomenon is due to the heterogeneity of a tumor. In this study, a controlled mathematical model with cancer stem cells (CSC) and n types of cancer cells (CC) is established bases on the model given in [1]. The differentiation probabilities to the different n types of CCs that are the n controls of the model. The model is proven to be well posed and the optimal control study of the problem has been carried out in two cases: with and without drug administration. The control existence has been checked [2], then has been characterized using Pontryagin's maximum principle [3] and the singular control has [4]. The results of the mathematical study of the model has also been numerically simulated under the assumption of n = 2 with a bang-bang control for better visualization of the results' significance.

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Dynamic Pricing in Technology market

Communication Info

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Keywords:
(1) Modelling Nonlinear dynamic pricing
(2) Pricing policy
(3) Control theory
(4) Numerical Analysis

Abstract

A central theme in the marketing of a product is to define a pricing policy that can lead to a market balance. This price dynamic has motivated the development of several mathematical models. The most adapted models to monopol market were introduced by Bass and by Robinson & Lakhani [1,2],[3]. In this work, we obtain an optimal pricing strategy for the Robinson & Lakhani model [3] by applying necessary optimality conditions. A numerical analysis using Apple's published data, confirms the theoretical result and validates the model.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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The impact of pollution rate variation on the evolution of marine populations.

F. Bendahou, I. Agmour, Y. El Foutayeni.

Communication Info

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Keywords:
(1) Biological model
(2) prey predator model
(3) Marines Populations

Abstract

In this Article, we propose a biological model for a migratory mammal species Balaenoptera physalus and the two small pelagic species Sardina pilchardus and Engraulidae. Phocoena is a cetacean species of the family Phocoenidae. The size of this population tends to decrease. The reasons for this decline may be due to marine pollution and death by drowning in fishing nets. This species has become very rare in the Mediterranean and has disappeared on other coasts. The two small pelagic species are also largely threatened by marine pollution.

We will extend our study by determining the equilibrium points of the biological systems in order to explain the behavior of the studied populations and to predict the stability of the equilibrium points of the system.

This work aim is to mathematically analyze the biological model of the predefined marine species taking into account the negative effect of pollution.

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Non-linear age-dependent population dynamics with fractional time derivative

Communication Info

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Keywords:
(1) Dynamics of population
(2) Age-structure
(3) Fractional derivative

Abstract

The model introduced by Gurtin and MacCamy in [1] to describe the dynamics of populations, is one of the most widely studied problems (see for example [3], [4]). In the present work we reconsidered this model with a fractional time derivative. Using the fractional Lagrange characteristic method, given by Jumarie Guy in [2], we showed that the given population problem is equivalent to a pair of integral equations where the unknown functions are the total population P(t), and the birth rate B(t). We used these equations to prove that the solution exists and is unique in a sufficiently small time interval, and we showed that under an additional condition the existence and the uniqueness of the solution are global. Then we studied the regularity of the solution.

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ICRAMCS 2022
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Lung monitoring with Electrical impedance tomography

Communication Info

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Keywords:
(1) electrical impedance tomography,
(2) forward problem,
(3) reconstructing algorithm,
(4) inverse problem.

Abstract

Electrical impedance tomography is a technique that allows to image the distribution of the conductivity of a domain from impedance measurements made at several points on its surface.

The method was initially developed by geophysicists for mineral prospecting (Maillet, 1947).

However, its biomedical applications were quickly recognized (Brown and Barber, 1984).

Electrical Impedance Tomography (EIT) is a non-invasive imaging technology that estimates the electrical conductivity distribution in a domain.

In this study, the conductivity is reconstructed from boundary voltage measurements by using a reconstructing algorithm known as the forward problem. Simultaneously, the image reconstruction can be obtained using the inverse problem to detect regional lung ventilation.

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Optimal control of an infected prey-predator model with modified Holling function response.

Communication Info

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Keywords:
(1) Prey-Predator model
(2) Epidemiology
(3) Prey refuge
(3) Optimal control

Abstract

This paper deals with a Lotka-Volterra prey-predator model with infected preys. We presume prey population has refuge as a defense mechanism to avoid predation, which was modeled by a constant incorporate in the modified Holling function. This model outlines interaction among susceptible, infected, treated, vaccinated prey population and predators, in addition to a strategy of vaccination and treatment as controls. We investigate existence, positivity and boundedness of the controlled dynamical system solutions and the existence of an optimal control. In the second part, we check whether there exists an optimal control strategy of vaccination and treatment aiming to eradicate the pandemic on Prey. In this framework, we conduct our study using a control objective function seeking to minimize the treatment and vaccination costs together with minimizing infected population and keeping the vaccination population near a suitable level ensuring the herd immunity.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Study of Hopf bifurcation of delayed tritrofic system: Dinoagellates, Mussels and Crabs

Communication Info

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Keywords:
(1) Stability analysis
(2) Hopf bifurcation
(3) Discrete delay

Abstract

Optimal use of marine resources is conditioned by a relevant understanding of the interactions that govern them in order to ensure marine sustainability and biodiversity.

First, our study is part of the construction of a bioeconomic model through a differential three-variable delay system by modeling a food chain made of a prey, a predator and a super predator; a delay signifying the existence of toxins. Indeed, it serves to model the time required for the allocation of species by poison. Then, the work turns towards an investigation of the points of equilibrium of the system for an analysis of its stability around these points using the theory of eigenvalues. In addition, the points of bifurcation associated with delays are determined equal to the critical time in which the system loses its stability, as for our model, it is the bifurcation of Hopf whose appearance of periodic solutions. So we define the direction of this bifurcation while analyzing the stability of the solutions.

Finally, numerical simulations are carried out to illustrate the theoretical results obtained.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Effects of a non-linear demand function on the global dynamics of the fish

Communication Info

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Keywords:
(1) demand function
(2) Stability
(3) Variable price

Abstract

Mathematical models in the field of fisheries can predict the qualitative evolution of predict the qualitative evolution of the fishery, in particular the fishery, in particular the major trends such as stock collapse or such as the collapse of the stock or its maintenance, the fishing effort, and even the increase or stabilization of the or stabilization of the market price.

We will analyze and discuss the importance of of using a linear demand function on the maintenance of on the maintenance of the fish stock and on its global dynamics, by exploiting the results obtained by work of P. Auger, R. Mchich and N. Raissi in [5].
We will therefore generalize these last results by a non-linear demand function.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Optimization of the Two Fishermen's Profits Exploiting Anchovies, Sardines and herrings

Communication Info

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Keywords:
(1) Dynamical System
(2) Biodiversity
(3) Optimization

Abstract

Scientists found that competition ensure the biodiversity of species, so the species that compete with each other for resources or territory, actually they ensure their evolution and breed, while the extinction is the natural phenomenon and survival is the special case.

In this work we propose to study three competitive species that are mostly harvested for food: Sardine, Herring fish and Anchovy [1][2] taking into consideration temperature factor and wind, these factors are studied by Markov chain process to guarantee the method of treatment of the different factors, based on the Data of past years, The main purpose of this work is to define the fishing effort that maximizes the profit of each fisherman taking into consideration of two factors.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Analysis of fractional order model to map vesicle dynamics in the rigid sphere

Communication Info

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Keywords:
(1) Red cells
(2) Caputo derivative
(3) Vesicle dynamics
(4)Fractional Adams methods.

Abstract

We used the fractional Caputo derivative in this paper to investigate the dynamics of a rigid particle in the shear plane that can map the deformation of a vesicle that replicates some properties of red cells.
The existence and uniqueness of the solution for the fractional model is proved
We also conduct a thorough analysis of equilibrium stability.
To identify the numerical solution and to corroborate the theoretical conclusions, we adopted a numerical technique based on the Adams-Bashforth-Moulton predictor-corrector scheme.

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ICRAMCS 2022
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Multi-objective Optimal Feedback Control in Biological Wastewater Treatment

Communication Info

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Keywords:
(1) Multi-objective optimal control
(2) Feedback control
(3) Differential inclusion
(5) Pareto front

Abstract

In this paper we propose a nonlinear mathematical model describing the process of biodegradation of organic pollutants by means of fungi. Several works were interested by this problem with open loop control. In this work, we try to find a strategy for wastewater station using multi-objective optimal control involving feedback control depending on the pollutant state variable. Two aspects are investigated, firstly we study the existence of solution of the dynamic with feedback control, by invoking the differential inclusion theory. Secondly, we prove that the Pareto front is convex, which leads to identify the Pareto optimum.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Modèle bioéconomique et épidémiologique de la population marine

Communication Info

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Keywords:
(1) Linear Complementarity
(2) SIR model
(3) Bioeconomic model

Abstract

Nous cherchons à étudier un modèle bioéconomique dans lequel les populations de proies sensibles et infectées (Horse mackrel : Trachurus Trachurus) sont exposées au prédateur (Thon), avec divers degrés d'exposition. En raison de la grande taille du prédateur, il se nourrit de ce type de proie en grand quantité, ce qui signifie sa transformation de la catégorie sensible à la catégorie infectée et inversement. Nous présentons le modèle biologique de la population Trachurus Trachurus sensibles et infectés avec la présence des prédateurs Thon ; en d'autres termes, nous résolvons un système de trois équations différentielles ordinaires, la première équation décrit la croissance naturelle de la population de poissons Trachurus sensibles et c'est une proie de la population de poissons Thon, la deuxième équation décrit la croissance naturelle de la population de poissons Trachurus infectés et c'est une proie de la population de poissons Thon, et la troisième équation décrit la croissance naturelle de la population de poissons Thon en tant que prédateur des Trachurus sensibles et infectés. L'existence des états stationnaires de ce système et leur stabilité sont étudiées à l'aide de l'analyse des valeurs propres.

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Contrôle optimal d'un modèle spatiotemporel SIR avec retard

Communication Info

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Keywords:
(1) Delayed SIR model
(2) Reaction diffusion equations
(3) System of PDEs

Abstract

La modélisation mathématique des maladies infectieuses au niveau cellulaire ou moléculaire est une science relativement nouvelle. Si l'épidémiologie a une longue histoire, ce n'est que récemment que les mathématiciens et les immunologistes ont commencé à collaborer pour créer des modèles susceptibles de prédire l'évolution d'une maladie. Avec une connaissance approfondie, non seulement des mathématiques appliquées, mais aussi de la biologie de la maladie, il est possible de construire des modèles très fiables, qui permettront de déterminer les meilleurs traitements, ainsi que l'impact respectif des facteurs qui influencent cette maladie. L'un des modèles les plus connus est le modèle à compartiments SIR. Mais ce dernier ne prend en compte ni le temps d'incubation ni le temps de rétablissement ni le temps nécessaire pour qu'un vaccin soit efficace. Dans notre travail, nous essayons de prendre en compte tous les retards associés à ces périodes.

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ICRAMCS 2022
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Etude d'un modèle multi-physique, application

Communication Info

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Keywords:
(1) Fishery models
(2)Agregation of variables
(3)Population dynamics

Abstract

A continuous time model is used to simulate the effects of reserve size on fishing catch. The model includes two time scales, a fast one associated to quick movements of fish between sites in comparison to a slow one corresponding to the growth of the fish population and the change of the fleet size. We take advantage of these two time scales to derive a reduced model governing the dynamics of the total fish stock and the fishing effort. The objective of this work is to examine the effects of marine reserves size on the levels of fish biomass and the catch in the long term. Studying this aggregated model, we show the existence of an optimal size of reserve marine that maximizes the total fish catch at equilibrium. Simulation results suggest that the establishment of a protected marine reserve will always lead to an increase in total fish biomass, an optimal size of a marine reserve can achieve to maximize the catch at equilibrium

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Weak and exponential stabilization of perturbed Semi-linear systems

Communication Info

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Keywords:
Semilinear systems; Optimal feedback control;
Exponential stabilization.

Abstract

The goal of this paper is to study stabilization of infinite dimensional semilinear systems evolving under external perturbation given by nonlinear operator. We give sufficient conditions, to ensure exponential and weak stabilization of such systems. Then we characterize stabilizing controls, that stabilizes the state, and minimizes a given performance cost. The obtained results are illustrated by simulations in the case of one-dimensional.

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ICRAMCS 2022
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A novel chaotic fractional orders system: Dynamic analysis, stabilization and synchronization via an active control

Communication Info

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Keywords:
(1) Fractional-order system
(2) Chaotic system
(3) Lyapunov exponent
(4) Stabilization
(5) Synchronization

Abstract

In this work, We introduce a novel chaotic fractional order system. Firstly, we studied some elementary properties such as dissipativity, Lyapunov exponent and Kaplan-York dimension. Also a necessary condition for the new proposed system to remain chaotic are given in the commensurate case. Secondly, an active control are applied to stabilize and synchronize our new fractional chaotic system. Finally we improve all our results that are we obtained analytically using Matlab simulation.

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New class of unimodal functions

Communication Info

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Keywords:
Weibull function, Lambert function, fixed point, Fold bifurcation, Flip bifurcation.

Abstract

In recent years, several researchers are interested in unimodal functions with Alley effect and many studies have been made to discover their dynamic properties of this type of function. They are used in several fields of science, in this case in the study of the evolution of populations (the Ricker model and the Baverton-Holt model). In our work, we present a new class of uni-modal functions, functions depending on three real parameters. We give the conditions of existence and stability of solutions or fixed points analytically using Lambert's W function, as well as some bifurcations obtained.

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Impact of cooperative behavior on the stability of a delayed predator-prey model with Holling functional response

Communication Info

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Keywords:
(1) Predator-prey model
(2) Time delay
(3) Hunting cooperation

Abstract

In this paper, we propose and analyze a delayed predator-prey model with Holling functional response taking into account cooperation behavior in predators. We investigate the effect of hunting cooperation on both the number and the level of positive steady states. We observe that the level of the positive equilibrium decreases when increasing the hunting cooperation parameter. Then we study the impact of the delay as well as the cooperation in hunting on the dynamics of the system. We prove that the presence of delay in the attack rate induces stability switches around the coexisting equilibrium when predators cooperate. In addition, we consider the discrete delay as a bifurcation parameter and prove that the model undergoes a Hopf-bifurcation at the coexisting equilibrium when the delay crosses some critical values. Numerical simulations are presented to confirm our analytical findings

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Solvability and exponential stability of impulsive neutral stochastic integro-differential systems driven by fractional Brownian motion with delay and Poisson jumps

Communication Info

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Keywords:
(1) Neutral stochastic functional integro-differential equations
(2) Resolvent operator
(3) fractional Brownian motion

Abstract

In this manuscript, the existence, uniqueness, and asymptotic behavior of a class of impulsive neutral stochastic integro-differential systems driven by a fractional Brownian motion in a separable Hilbert space with delay and Poisson jumps are studied. The results are obtained, using the theory of resolvent operators, stochastic analysis and a fixed-point strategy. Finally, an illustrative example is provided to show the effectiveness of the obtained result.

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Fractional Derivative Controllability of an Output of a Linear System

Communication Info

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Keywords:
(1) Controllability
(2) Fractional derivative
(3) Control optimal

Abstract

The aim of this paper is to explore the concept of enlarged controllability in case of where the output function is a Caputo fractional derivative. Moreover, we characterize the minimum energy control which leads a linear parabolic system to a fractional derivative of a final state between two known functions.
Two approaches are used to solve this problem. The first is the Lagrangian multiplier method, and the second is based on sub-differential theory. Moreover, we give an algorithm for the computation of the optimal control. The obtained results are illustrated throw numerical simulations.

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Mathematical analysis of an SIR epidemic model with discrete delay and general incidence rate

Communication Info

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Keywords:
(1) Epidemic model
(2) Discrete time delay
(3) Lyapunov function
(4) Global stability

Abstract

In this paper, we propose the global dynamics of an SIRSI epidemic model with discrete latent period and general nonlinear incidence function.
By analyzing the corresponding characteristic equations, the local stability of the endemic equilibrium is established. By using suitable Lyapunov functionals and LaSalle's invariance principle, the global stability of the disease-free equilibrium and the endemic equilibrium are established for the SIRSI epidemic model with discrete latent period.

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Sociological model of obesity and optimal control strategy

Communication Info

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Keywords:
(1) Optimal control
(2) Pontryagin's maximum principle
(3) Numerical Simulations

Abstract

Overweight and obesity have been a major health problem in the world. Social contagion is an important factor in the development of obesity. We propose a model that approaches obesity from a mathematical point of view by using ideas from epidemiological models to describe the spread of the obesity as a contagious disease.

Our aim is to study the optimal control strategy of a mathematical model of obesity and to investigate, in continuous time, optimal control strategy in which the controls are: sensibilisation, treatment and surgery.

Our objective is to find the best strategy to reduce the number of Obesity individuals. So, the Pontryagin maximum principle is used to characterize the optimal control. The numerical simulation is carried out using MATLAB.

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Bilinear Boundary Optimal Control of a Nonlinear Kirchhoff Plate Equation

Communication Info

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Keywords:
(1) Kirchhoff Plate Equation
(2) Boundary bilinear control
(3) Optimal control problem.

Abstract

The aim of this work is to study optimal control of a nonlinear Kirchhoff plate equation, where the control enters the system bilinearly through the boundary. The question is to obtain a distributed control that drives such a system from an initial state to a desired one in finite time, and minimizes a quadratic functional cost. Our purpose is to prove for a closed convex set that an optimal control exists. Then, using the differentiability of the cost functional with respect of the control, we establish the characterization by deriving necessary conditions that an optimal control must satisfy.

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Stabilization of a reaction-diffusion equation involving distributed delay

Communication Info

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Keywords:
(1) Feedback stabilization
(2) Retarded functional differential equations
(3) Estimate decay
(4) Polynomial stability

Abstract

The decomposition method [1], permits to divide a system into two uncoupled subsystems, one of which is stable without applying controls, while the other one is unstable. We adopt the same approach to establish the feedback stabilization of a reaction-diffusion model with a distributed delay and homogeneous Neumann boundary condition. The speed of convergence has been provided.

The weak stabilization of the problem without delay has been established in ([2], Example 3.3). Based on decomposition method, the strong stabilization has been provided ([3], Example 2.5), while for the homogenous [4] and non-homogenous [5] case with a discrete delay, the strong stabilization has been established with an estimate decay.

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Exponential stabilisation for delayed bilinear systems by feedback control

Communication Info

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Keywords:
(1) Bilinear systems
(2) Exponential stabilisation
(3) Time delay

Abstract

The problem of exponential stabilization for the following distributed bilinear system with time delay $r > 0$:

$$\begin{cases} \dot{y}(t) = Ay(t) + v(t)By(t-r), t \geq 0 \\ y(t) = \varphi(t), \quad t \in [-r, 0], \end{cases}$$

has been studied by several authors, with or without delay, in finite dimension as well as in infinite dimension [1-3].

In this communication, we show the exponential stabilization of system (1) under sufficient conditions, using a new feedback control, and we generalize the previous results of other researchers.

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Exact controllability for fractional neutral evolution systems

Communication Info

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Keywords:
(1) Exact controllability
(2 Fractional systems
(3) Neutral evolution systems

Abstract

The contribution of this paper is to study the exact controllability and the optimal control of a class of fractional neutral evolution equations with non-local conditions:

$$\begin{cases} {}^{c}\boldsymbol{D}_{t}^{\alpha}[\boldsymbol{x}(t)-\boldsymbol{h}(t,\boldsymbol{x}_t)]=\boldsymbol{A}\boldsymbol{x}(t)+\boldsymbol{f}(t,\boldsymbol{x}_t)+\boldsymbol{B}\boldsymbol{u}(t) \\ \boldsymbol{x}_0(v)+\left(\boldsymbol{g}(\boldsymbol{x}_{t_1}),\ldots,(\boldsymbol{x}_{t_n})\right)(v)=\boldsymbol{\varphi}(v) \\ t\in[0,T]\,;v\in[-r,0] \end{cases}$$

where ${}^{c}\boldsymbol{D}_{t}^{\alpha}$ denotes Caputo fractional derivative of order $\alpha \in (0, 1)$, $0 < \boldsymbol{t_1} < \cdots < \boldsymbol{t_n} \leq T$, $T > 0$; $A : D(A) \subseteq X \to X$ is a closed linear operator with dense domain D(A) and generates a compact and uniformly bounded C_0 semi-group $\{T(t)\}t\geq 0$ on a Banach space X. The control function $u(\cdot)$ is given in L^2 (0, T;U); U is a reflexif Banach space. $B \in L(U, X)$ is a linear continuous bounded operator from U to X . f, h : $[0, T] \times C \to X$ and $g : C^n \to C$ are given functions satisfying some assumptions, $\varphi \in C$ and define $\boldsymbol{x_t}$ by

$\boldsymbol{x_t}(v) = x(t + v)$, for $v \in [-r, 0]$.

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Feedback stabilization of non-homogeneous bilinear systems with a finite time delay

Communication Info

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Keywords:
(1) Feedback stabilization
(2) Non-homogeneous delayed bilinear systems
(3) Delay feedback control

Abstract

This paper investigates the feedback stabilization of non-homogeneous delayed bilinear systems evolving in Hilbert state space. More precisely, under an observability-like assumption, we prove the exponential and strong stability of the solution by using bounded feedback control. Partial stabilization is discussed as well. The proof of the main results is based on the decomposition method. The decay estimates of the corresponding solution are obtained. Finally, some examples are presented.

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Controllability of a stochastic forward parabolic degenerate under the action of two controls force

Communication Info

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Keywords:
(1) Forward/backward stochastic parabolic degenerate equations
(2) Carleman estimates
(3) Null controllability

Abstract

In this communication, we adapt the duality technique HUM to study the null controllability of the following stochastic forward parabolic degenerate equation with two controls :

$$\begin{cases} dy = [(ay_x)_x + F + 1_\omega h]\,dt + (G+H)dW(t) \text{ in } Q \\ Cy = 0 \qquad on \ \sum \\ y(0,.) = y_0(.) \qquad in\ (0,1) \end{cases}$$

Where (h,H) is the pair of controls.

For this purpose, we need to establish a new Carleman estimate for the adjoint backward stochastic parabolic degenerate equation with a weighted function which does not vanish at time t=0.

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Dynamique d'un endomorphisme de dimension trois symétriquement découplé

Communication Info

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Keywords:
(1) cycles
(2) Bifurcation

Abstract

Dans ce travail on abordera l'étude du plan de phase d'une transformation ponctuelle dans la dimension trois et nous présentons quelques résultats obtenus sur la dynamique de cette transformation ponctuelle tridimensionnelle symétriquement découplée et on mettra en évidence l'existence d'attracteurs chaotiques. La construction des cycles de la transformation tridimensionnelle seront obtenus à partir de l'une de ses composantes unidimensionnelle.

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Calcul et dimensionnement des bacs de stockage selon l'API 650& Etude de la Corrosion

Communication Info

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Keywords:
(1) Bacs de stockage
(2) Programmation
(3) Corrosion
(4) Dimensionnement
(5) Montage

Abstract

Les réservoirs représentent des structures métalliques qui permettent de stocker les produits en toute sécurité. Leurs domaines d'application sont très nombreux. Dans le domaine des produits chimiques, les accidents liés au stockage des produits dangereux sont les accidents le plus désastreux dans les grands sites industriels. Il est alors nécessaire de prévoir les risques accidentels dès la phase de conception.
Le travail qui suit alors consiste à réaliser le calcul, le dimensionnement et le montage des bacs de stockage en incluant les fondations dans la partie génie civil suivant la norme API650 [1],[2],[3] pour vérifier les calculs effectués par le sous-traitant et les automatiser en exploitant un langage de programmation ainsi que on va étudier la corrosion et trouver des solutions pour résourdre ce problème afin d'augmenter la durée de vie des bacs.

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Some Applications For The Spectral Theory For The Pencil Of Operators In Hilbert Spaces

Communication Info

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Keywords:
(1) Spectral theory
(2) Stability theory
(3) Pencil of operators
(4) Implicit systems

Abstract

In Control Theory, we often use the systems in the form $x'(t) = Tx(t) + F(t, x(t))$; $t \geq 0$, where T is a linear operator. Since 1970 many mathematicians as M. Benabdallah, A.G. Rutkas and A.A. Soloviev and others [3,4,5] were interested in general to implicit or degenerate systems of the form $Ax'(t) = Bx(t) + f(t, x(t))$, $t \geq 0$, where A and B are two linear operators. Furthermore, A is not necessarily invertible. In this work, we have generalized the famous theorem of Liapunov for the spectrum of the pencil $\lambda A - B$, $\lambda \in \mathbb{C}$ of the bounded operators A and B in Hilbert spaces H. Using the spectral theory operators and an appropriate conformal mapping, then we have applied the achieved results to study the stabilization for the corresponding implicit differential equations of the form $Ax'(t) = Bx(t) + Cu(t)$, $t \geq 0$, $x \in H$.

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Ulam-Hyers stability of fractional multivariable-order neural networks with time-varying external inputs

Communication Info

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Keywords:
(1) Variable-order Atangana-Beleanu-Caputo operator
(2) Multivariable-order neural networks
(3) Ulam-Hyers stability

Abstract

As it is well known, the results of combining neural networks with fractional calculus are rather impressive, due to its memory and heredity features [1][2]. However, variable-order fractional operators were just recently developed and formally defined, because of its ability to formulate evolutionary governing equations, these operators have been successfully used to the modeling of complicated real-world issues [3][4]. The concern was what impact fractional variable-order calculus would have on such systems particularly on the stability analysis. To this aim, we investigate in this communication Ulam-Hyers stability of fractional multivariable order neural networks with time-varying external inputs and Atangana-Beleanu-Caputo derivative, where the state equations have fractional variable orders ranging from 0 to 1. The characteristics of fractional variable calculus and the particular solution of the problem are used to present innovative features of the Ulam-Hyers stability theorem for fractional multivariable order neural networks with time-varying external inputs. To highlight the value of the gathered findings, an illustrative example is presented using the Adams-Bashforth-Moulton scheme for fractional variable-order systems [5].

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Feedback Stabilization of the Lotka-Volterra Diffusion Model by bilinear controls

Communication Info

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Keywords:
(1) Feedback control
(2) Lotka-Volterra model
(3) Exponential stabilization

Abstract

The question of why individuals disperse has taken the interests of ecologists and evolutionary biologists for many decades. Up to now, by the virtue of mathematical models, there is a wide range of researches directed to better understanding of the mechanism behind the evolution of dispersal; see [2, 3,] and references therein. In this work, we consider a system of semilinear parabolic partial differential equations with Dirichlet boundary data arising from the Volterra-Lotka model with diffusion. We establish the exponential stabilization of the considered system, which models situations in which two interacting species *y* and *z* inhabit the same bounded region. Using two controls that act in a multiplicative way on both species, we will show that the system decreases exponentially towards the equilibrium states. The role of the two commands is to control the propagation of the two species.

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k-REGULARIZED SOLUTIONS FOR ABSTRACT VOLTERRA EQUATIONS

Communication Info

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Keywords:
(1) Semigroups
(2) Volterra integral equations
(3) Regularized resolvent families
(4) Favard spaces

Abstract

The aim of this work is to introduce the domain and the Favard spaces of order α where $\alpha \in]0, 1]$ for k-regularized resolvent family, extending some of the well-known theorems for semigroup and resolvent family.

Furthermore, we show some relationship between the Favard temporal spaces and the Favard frequentiel spaces for scalar Volterra linear systems in Banach spaces, extending some results in [1, 2, 3].

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Markov Decision Process modeling-based for Multi-Ship Collision Avoidance System

Communication Info

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Keywords:
(1) collision avoidance,
(2) COLREG,
(3) markov decision process
(4) Bellman equation
(5) Optimal policies
(6) Gradient method

Abstract

The continuous increase of maritime traffic amplified the severity of the collision risk issue in the maritime domain. Therefore, the calculus and optimization of ship navigation without collision risks have been known as a major challenge for the scientific researches' community. The topic is covered as an optimal control problem with state constraints using nonlinear model predictive control [1], [2] in order to consider the nonlinearity of the ship motion nature, other researchers rely on calculating risks of collisions in ocean navigation by meta-heuristic methods [3], [4] or by neural networks [5], [6] in order to cover multi-ship collision risk situations. This work proposes a Markov Decision Process modeling-based approach to resolve the conflict avoidance algorithm for an autonomous ship. The gradient method solves the Bellman Optimality Equation to select the optimal policies and then the algorithm generates a sequence of optimal actions to avoid multi-ship collision avoidance with respect to COLREG rules.

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Dynamics of HBV infection model with DNA-containing capsids, logistic hepatocyte growth and adaptive immune response

Communication Info

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Keywords:
(1) Hepatitis B viral infection
(2) Logistic hepatocyte growth
(3) Optimal control
(4) Pontryagin's minimum principle
(5) Adaptive immune response
(6) Numerical simulation.

Abstract

In this work, we present a delay-differential equation model with optimal control and logistic hepatocyte growth. This model describes the interactions between the hepatocytes, the free hepatitis B virus (HBV) with DNA-containing capsids and the adaptive immune response.
Both the treatment and the intracellular delay are incorporated into the model. Existence, positivity and boundedness of solutions are investigated. In addition, the existence and the stability of the diseases free equilibrium and the endemic equilibrium points can exist under specific conditions Also, the existence of the optimal control pair is established and the Pontryagin's minimum principle is used to characterize these optimal controls. The optimal controls represent the efficiency of drug treatment in inhibiting viral production and preventing new infections. The optimality system is derived and solved numerically using the forward and backward difference approximation. The obtained results show that the optimal treatment strategies reduce the viral load and then increase the uninfected hepatocytes, this improves the patient life quality.

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Study of the stability of a class of epidemiological systems (SIR)

Communication Info

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Keywords:
(1) Lyapunov function
(2) LaSalle's invariance principle

Abstract

In the literature, Lyapunov's method has been successfully used to prove the global stability of equilibrium points. The method consists in finding a Lyapunov function, positive definite such that its derivative along the trajectories is negative definite [1]. If the derivative is only negative semi-definite, LaSalle's invariance principle extends Lyapunov's principle in this case [2]. In this presentation, we will apply LaSalle's principle of invariance to prove the asymptotic global stability of equilibrium points.

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Null controllability for a degenerate and singular Schrödinger equation

Communication Info

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Keywords:
(1) Schrödinger equation
(2) Boundary controllability
(3) Degenerate and singular Schrödinger equation

Abstract

In this work, we deal with the boundary controllability for a one-dimensional degenerate and singular Schrödinger equation with degeneracy and singularity occurring at the boundary of the spatial domain in a bounded interval. More precisely the paper proves the exact controllability with L^2-boundary control. the result holds for an arbitrarily small time. To this aim, we first prove direct and inverse inequalities of the corresponding adjoint problem by making use of the multiplier method, an adapted Hardy-Poincaré inequality to the complex case and an adapted Poincaré inequality. As a consequence, by the Hilbert Uniqueness method, we derive the desired null controllability result which is equivalent to the exact boundary controllability in the case of Schrödinger equation.

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Modélisation Mathématique et Contrôle Optimal de l'activité de pêche dans l'océan Atlantique Marocain : Avec fonction d'exploitation générale Cobb-Douglas.

Communication Info

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Keywords :
(1) Contrôle optimal.
(2) Le principe du maximum discret de Pontryagin.
(3) Maximiser le profit.

Abstract

La prospérité du secteur de la pêche maritime au Maroc ces dernières années a entraîné une augmentation des efforts de recherche pour réduire les dépenses du royaume. Dans ce travail nous avons construit un modèle multirégional en temps discret pour décrire la dynamique de pêche de la Sardine (Sardina Pilchardus) et du Chub Marckel (Scomber Colias) dans trois zones de la Côte Atlantique. En fait, l'objectif principal de ce travail est de discuter de l'efficacité du paramètre de contrôle dans la maximisation du profit c'est-à-dire la maximisation du prix et la minimisation de l'effort de pêche et, la sauvegarde de l'équilibre entre la population marime et l'activité de pêche. Afin de calculer le système optimal, nous utilisons une version discrète du maximum principal de Pontryagin. La simulation numérique est réalisée sous Matlab. Par conséquent, les résultats obtenus confirment la performance de l'optimisation.

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Stabilization of an axially moving system via ADRC

Communication Info

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Keywords:
(1) Axially moving system
(2) Active Disturbance Rejection Control
(3) Exponential stability

Abstract

In this work, we discuss the stabilization problem of an axially moving system [1], moving between two rolls, where the right roll is fixed while the left one, with its mass taken into account, is free to move and subject to an external bounded disturbance [2]. The main objective of this work is to suppress the resulting vibration caused by the movement of the system and the effect of the external disturbance located at the left roll. To this end, we design a control force via the ADRC approach [3] to, first, estimate the disturbance in real-time using a state observer and, then, cancel its effect in the following loop. The well-posedness of the resulting closed-loop system is proved using the semigroup theory [4]. Moreover, the exponential stability is established using the Lyapunov method [5], where we construct a suitable function to use along the trajectory of the closed-loop system. Finally, we present a numerical example to illustrate the validity of our theoretical results.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Simultaneous Stabilization of Nonaffine Systems: A Constructive Method for Polynomial Systems

Communication Info

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Keywords:
(1) Quadratic nonlinear systems
(2) Simultaneous stabilization
(3) Control Lyapunov Function
(4) State feedback

Abstract

In practical control designs, due to systems' uncertainty, failure modes or systems with various modes of operation, the simultaneous stabilization problem that consists in designing a single controller to simultaneously stabilize a family of systems is frequently encountered. Since it is one of the important research topics in the area of control, the simultaneous stabilization problem has received wide consideration. Up to now, many interesting results have been obtained for the simultaneous stabilization of linear systems, while there are fewer works for simultaneous stabilization control design of nonlinear systems, see [1,2,3,4] and references therein. Till now, to our knowledge, no studies have been reported about the simultaneous stabilization of polynomial systems that are quadratic inputs. The aim of this communication is to address this issue. Motivated by the approach in [3,4], and based on the control Lyapunov functions approach (see [5,6]), we present sufficient condition for the existence of simultaneously stabilizing feedback laws for a collection of quadratic input nonlinear systems. Furthermore, we develop a constructive method for designing such a feedback. The feedback is explicitly computed and an illustrative example is presented.

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Evolution inclusions with the maximal monotone operator and nonconvex-valued perturbations

Communication Info

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Keywords:

(1) Differential inclusion
(2) Maximal monotone operator
(3) set-valued perturbation

Abstract

The study of evolution inclusions governed by time-dependent maximal monotone operators are a subclass of differential evolution inclusions, which contains sweeping processes as a special case, that is differential inclusions governed by the normal cone to closed and convex moving sets, since this normal cone is a maximal monotone operator. Such problems arise in the modeling of dynamical systems, in mechanics and optimal control theory and in economics. In this communication, we study the existence of solutions for evolution inclusions governed by time-dependent maximal monotone operators with nonconvex perturbations depending on all the variables.

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Control of a degenerate and singular wave equation in non-cylindrical domain

Communication Info

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Keywords:
(1) Control
(2) Wave equation
(3) Hardy-Poincaré inequalities
(4) HUM

Abstract

In this talk, we discuss the controllability problem for a one-dimensional degenerate and singular wave equation in cylindrical and non-cylindrical domains. Exact controllability is proved in the range of both subcritical and critical potentials and for sufficiently large time, through a boundary controller acting away from the degenerate/singular point. By duality argument, we reduce the problem to an observability estimate for the corresponding adjoint system, which is proved by means of the multiplier method and some Hardy-type inequalities.

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Compact finite difference scheme for Euler-Bernoulli beam equation with a simply supported boundary conditions

Communication Info

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Keywords:
(1) Euler-Bernoulli equation
(2) Compact finite difference method
(3) Numerov's algorithm
(4) Stability analysis

Abstract

The Euler-Bernoulli beam equation plays a very important role in various engineering applications. It is a parabolic differential equation of fourth-order which describes the transverse displacement of a beam. In this paper, a fourth-order compact finite difference method is developed to solve numerically this equation. First, the approximation by fourth-order compact finite difference is applied for the spatial derivative, secondly, the Crank-Nicolson approximation of order two is applied to the obtained temporal differential system. The proposed scheme is of the fourth-order in space and of the second order in time and it is unconditionally stable. Some examples are proposed and numerical results are presented to show the efficiency of the scheme and comparisons are made with other methods existing in the literature.

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Le contrôle des systèmes distribués

Communication Info

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Keywords:
(1) Théorie du contrôle
(2) Système d'évolution
(3) Contrôle optimal

Abstract

Dans ce travail, on s'intéresse à l'étude de la contrôlabilité d'un système distribué que l'on rencontre en physique, chimie ou en biologie. Ce type de systèmes évolue dans le temps et l'espace. On établit un résultat d'existence et d'unicité du contrôle optimal, garantissant la contrôlabilité du système considéré. En conséquence, on applique ces résultats pour l'identification de certains paramètres intervenant dans le second membre de notre système.

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HUM Method in Regional Boundary Controllability Problems for Fractional Systems.

Communication Info

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Keywords:
(1) Time-Fractional Systems
(2) Semi-Linear Systems
(3) Boundary Regional Controllability
(4) Fixed point Theory

Abstract

The main goal of this work is to study the boundary regional controllability for time-fractional semi linear systems. The problem of controllability of semi-linear systems, which is a link between linear systems and nonlinear ones, were widely studied by many authors [1, 2]. The time-fractional semi-linear system arises in describing "memory effect" which occurs in many phenomena in real worlds [3]. The regional controllability of time-fractional semi linear systems is achieved in [4], for the boundary regional controllability, we employ an extension of Hilbert Uniqueness Method (HUM) introduced firstly by Lions in [5] and the Schauder fixed point theorem. Then we present numerical simulations obtained using the above main result in the form of an algorithm.

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Regional Boundary Observability for Time-Fractional Systems

Communication Info

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Keywords:
(1) Fractional Linear Systems
(2) Regional Observability
(3) Control Theory

Abstract

The main objective of this work is to study and investigate regional boundary observability for a class of linear time-fractional systems involving the Riemann-Liouville fractional derivative, for more information about regional boundary observability for classical systems see [1],[4], and for fractional systems see [2]. To be more precise, the purpose is to find and reconstruct the initial state of the considered fractional system on a suitable or desired subregion of the boundary of the evolution domain. For that, we use an extension of the Hilbert uniqueness method (HUM) introduced in [3], which enables us to transform the reconstruction problem into a solvability problem of the form $AX = b$. Some successful numerical examples were simulated and given at the end in order to illustrate the efficiency of the proposed approach.

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Simulation of Poiseuille flow around a square obstacle by SRT-LBM

Communication Info

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Keywords:
(1) SRT, LBM
(2) Square obstacle
(3) Poiseuille Flow
(4) Reynolds Number

Abstract

In this paper, the single-relaxation time (SRT) lattice Boltzmann method is used to simulate in two-dimension a channel flow around a square obstacle [1-2]. Simulation of such flows requires appropriate boundary conditions. In this work, the bounce-back boundary conditions are applied to the bottom and top walls, at the inlet, conditions of Zou and He [3], however, at the outlet a simple extrapolation is employed [4]. The streamlines are plotted for Reynolds numbers varying from 1 to 2000. The results are compared with those of the literature [5], and the study proves that the SRT-LBM approach confirms its effeteness to simulate such flow.

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Existence results of renormalized solutions for nonlinear parabolic equations with possibly singular measure data

Communication Info

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Keywords:
(1) General measure data
(2) p(.)-parabolic capacity
(3) Renormalized solution

Abstract

We study the existence of renormalized solutions to a nonlinear parabolic boundary value problem with a general and possibly singular measure data, whose model is

$$(P)\begin{cases} \dfrac{\partial b(u)}{\partial t} - \Delta_{p(x)}u = \mu & in\ Q := \Omega \times (0,T), \\ b(u)(t=0) = b(u_0)(x)\ in\ \Omega, \\ u(x,t) = 0 & on\ \partial\Omega \times (0,T), \end{cases}$$

where Ω is an open bounded subset of $\mathbb{R}^N (N \geq 2)$, $T > 0$, b is an $C^1 - function$, $\Delta_{p(x)}u := div\big(|\nabla u|^{p(x)-2}\nabla u\big) (1 < p_- \leq p(x) \leq p_+ < N)$ is the p(x)-Laplacian operator which, roughly speaking, behaves as $|\nabla u|^{p(x)-1}$, μ is a bounded Radon measure with bounded total variation on Q and $b(u_0)$ is an integrable function. We provide the assumptions, the notions of solution we are adopting and the statements of the existence result in the generalized Sobolev spaces with variable exponent using some specific decompositions on the data.

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Parabolic systems driven by general differential operators with variable exponents and degenerate nonlinearities: Application to image restoration

Communication Info

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Keywords:
(1) Parabolic system equation
(2) variable exponents
(3) degenerate nonlinearities
(4) image restoration

Abstract

Partial differential equations are a precise, elegant, rich, and captivating subject, which is quite old, and its history is broad and deep. They gained considerable attention not only for the linear case but also, they are involving nonlinear terms. During the last decade, theoretical studies of partial differential equations have given birth of a new type of problems called 'variable exponent', which means that the equation and their operator has a variable growth condition.

The present communication is devoted to the study of existence and uniqueness of weak solution to the nonlinear parabolic system, with singular lower order term of asymptote-type in a more general form. We also present applications of this type of model to the restoration of images with multiplicative noise.

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Cubic generalized Hermite spline interpolation

Communication Info

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Keywords:
(1) Generalized Spline
(2) Hermite Interpolation.
(3) Derivative.

Abstract

In this paper, a new method of generalized cubic Hermit interpolation based on generalized spline functions is proposed. The associated interpolation operator reproduces the space spanned by the generalized functions and an optimal Hermite interpolation methods based on the aforementioned optimization process is established. All the numerical examples presented in this paper always show that there exists an optimal parameter so that the corresponding interpolant improves the existing results. This proves that these proposed Hermite interpolants are efficient and robust. The most advantageous advantage of this Generalized Hermite interpolant is that on the practical side, the numerical tests could be done by using only one software program.

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Numerical Solution of a Thermoelastic Contact Problem

Communication Info

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Keywords:
(1) Thermoelastic Material
(2) Thermal Contact
(3) Finite Element Method
(4) Penalty Method
(5) Numerical Simulations

Abstract

We consider a frictionless contact problem in which the material's behavior is modeled with a thermoelastic constitutive law, the contact is modeled with normal compliance including the thermal conductivity condition in which the heat exchange boundary condition is affected by normal displacement on contact boundary, see [1] for details. In the present work we focus on numerical simulations of the problem. To this end, we introduce a discrete scheme, based on the finite element method. Then we treat the contact conditions by using a penalized approach and a version of Newton's method, see [2]. Finally, we present numerical simulations which illustrate the behavior of the solution with respect to the thermal contact conditions.

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Existence of Solution for $p(x)$- Kirchhoff- Type System

Communication Info

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Keywords:
(1) Elliptic system, Mountain Pass Theorem,

Abstract

This paper is concerned with existence of solutions to a class of p(x)- Kirchhoff of systems type:

$$\begin{cases} M(A(x,\nabla u))div\big(a(x,\nabla u)\big) = \dfrac{\partial F(x,u,v)}{\partial u} & in\ \Omega, \\ M(A(x,\nabla v))div\big(a(x,\nabla v)\big) = \dfrac{\partial F(x,u,v)}{\partial v} & in\ \Omega, \\ u = v\ in\ \mathbb{R}^N \setminus \Omega, \end{cases}$$

Where $\Omega \subset \mathbb{R}^N$, $M \in C^0(\mathbb{R})$, $F \in C^1(\Omega \times \mathbb{R}^2, \mathbb{R})$, $div\big(a(x,\nabla u)\big)$ *is a* $p(x)-$ *Laplace type operator* and $a(x, z)$ **:$\Omega \times \mathbb{R}^N \to \mathbb{R}^N$ is the continuous derivative with respect to z of the mapping** $A(x, z)$ **:$\Omega \times \mathbb{R}^N \to \mathbb{R}$, A=A(x, z), i.e. a(x, z)=∇_zA(x, z).**
The main tools are the variational approach combined with the Mountain pass geometric theorem.

References

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Sharp well-posedness and ill-posedness for the 3-D micropolar fluid system in critical Fourier-Besov-Morrey Spaces

Communication Info

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Keywords:
(1) Fourier-Besov-Morrey spaces
(2) 3-D micropolar fluid system
(3) well-posedness
(4) ill-posedness

Abstract

In this work, we study the Cauchy problem of the incompressible micropolar fluid system in $\mathbb{R}^3$. Zhu and Zhoa [4] proved that the Cauchy problem of the incomprissible micropolar fluid system is locally well-posed in the Fourier-Besov spaces and globally well-posed in these spaces with small initial data. Weipeng Zhu [5] considered the critical case and showed that this problem is locally well-posed in critical Fourier-Besov spaces and is globally well-posed in these spaces with small initial data. Furthermore, by using a similar argument he also proved that this problem is ill-posed in the Besov spaces. In the present paper, we show that this problem is locally well-posed in Fourier-Besov-Morrey spaces and is globally well-posed in these spaces with small initial data we also prove that this problem is ill-posed in some cases.

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Numerical analysis of variational inequality modeling a thermopiezoelectric locking material

Communication Info

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Keywords:
(1) Variational inequalities
(2) Thermo- piezoelectric
(3) Locking material
(4) Tychonoff fixed point
(3) finite element method

Abstract

The aim of the present paper is to investigate a new class of elliptic variational inequalities arising in the modelling of the contact problem of thermo-piezoelectric ideally locking materials. Here, the contact is described by the Signorini unilateral condition, the locking material character makes the solution belongs to the convex set. We deliver the variational formulation of the problem. By employing the Tychonoff fixed theorem for multivalued operator, the existence of the solution established. Moreover, we introduce and analyse the finite element method to the problem. Finally, we derive the error estimate and convergence result.

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A Collocation Method For Solving Boundary Value Problems Using A Cubic Spline Quasi-interpolant

Communication Info

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Keywords:
(1) Hermite B-splines
(2) Super-convergence
(3) Second-order boundary
(4) Quasi-interpolant
(5) Collocation method

Abstract

Cubic spline collocation method based on quasi-interpolant is used to approximate solutions of second-order boundary value problems. We describe super-convergent quasi-interpolant of degree three and we give the associated spline collocation method for such problems which provides a very interesting accurate approximation. The proposed method allows to approximate the solution as well as its first and second derivatives at different values of x_i, i=0,...,n, with an optimal order of convergence. Numerical results verify the order of convergence predicted by the analysis. This process has a great potential to be implemented in more complex systems, where there are no exact solutions available except approximations.

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Solution of the minimum compliance problem using Domain decomposition method

Communication Info

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Keywords:
(1) Domain decomposition
(2) Topology optimization
(3) Minimum compliance

Abstract

Topology optimization has received recently a widespread fame in industry as well as in academia for its importance in determining the best distribution of materiel within a structure during its conceptual design stage. Several approaches have been proposed in this field including the pioneering paper of Bendsoe and Kikuchi [1] where they introduced the microstructure homogenization. However, despite the significant progress, that topology optimization has seen in theoretical side and the tremendous development in industry, an ever-present bottleneck in the application of topology optimization is the inherent largescale feature, which represents a major issue when real-world structural problems are concerned, thus, domain decomposition methods [2] are shown to be efficient to handle such issue. In the present work, Domain decomposition method-based Lagrange multipliers is considered, the emphasis is given on the novel formulation of the topology optimization problem

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Résolution d'Un Problème Inverse Pour Une Équation Aux Dérivées Partielles Parabolique

Communication Info

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Keywords:
(1) Algorithme génétique
(2) Équation aux dérivées partielles
(3) Modèle adjoint
(4) Optimisation
(5) Problème inverse
(6) Régularisation

Abstract

D'après J.B. Keller [1], deux problèmes sont dits inverses l'un de l'autre si la formulation de l'un met l'autre en cause. La reformulation d'un problème inverse sous la forme de la minimisation d'une fonctionnelle d'erreur entre les mesures réelles et la solution du problème direct conduit à un problème non convexe. La fonction objectif peut posséder plusieurs minimums locaux, un algorithme de descente prend fin à la rencontre du premier minimum local. Pour résoudre ce problème, on peut utiliser la régularisation de Tikhonov [6] ou une approche hybride [3]. Dans ce travail, nous allons présenter une étude mathématique et numérique d'un problème inverse associé à la détermination de la condition initiale d'une EDP parabolique. Nous exposons également les deux approches de résolution.

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GLOBAL EXISTENCE AND ENERGY DECAY OF SOLUTION FOR VISCOELASTIC WAVE EQUATION WITH P-LAPLACE TERM AND DYNAMIC BOUNDARY CONDITIONS.

Communication Info

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Keywords:

(1) Viscoelastic wave equation
(2) p-Laplace equation
(3) Strong Damping.
(4) Dynamic boundary condition

Abstract

Viscoelastic equations are one of the most important topics in scientific understanding as they are also very useful in modeling many problems in mathematical physics. In our work we are interested in the study of viscoelastic equations with p-laplacian term, where in the last 50 years, the study of this type of equations has grown due to the study of longitudinal vibrations of a rod obeying a nonlinear voight model, see for instance [1,2,3,4,5] and the references therein.
The objective of this work is to study the global existence and the uniform decay of the solution of a viscoelastic equation with p-Laplacian term with dynamic boundary conditions. The global existence of the solution was obtained by the theory of potential wells and the result of the general decay of energy of solution was established by introducing appropriate energy and Lyapunov functionals.

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A discrete mathematical modelling and optimal control of migration dynamics among the political parties in Morocco

Communication Info

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Keywords:
Interconnected political party, Spread political party, optimal control, Pontryagin's maximum principle.

Abstract

In this paper, we define a discrete model of the dynamic of interconnected political party in morocco. The model classifies the members into three compartements. S: the susceptible to leave there political party, I: the leading members of the political party who work within the party to enlarge it by attracting people to join their political party and A: the non-influential members of political party who support their political party in legislative elections. The objective of this work is to treat the modeling and control the system that describes the dynamics of the interconnected party and the changing of individual from one party to another. The main goal of this optimal control strategy is to find the optimal control needed in a target party to spread it. The characterization of the sought optimal control is derived based on Pontryagin's maximum principal. Numerical examples are given to illustrate the obtained results.

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Image Denoising Based on a modified Perona-Malik model using Fractional Derivative

Communication Info

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Keywords:
(1) Perona-Malik model
(2) image processing
(3) fractional derivative

Abstract

Image processing technology is a popular practical technology and has important research value for many areas.

In this work, and in order to improve the quality of images, we propose to modify the classical Perona-Malik model, by replacing the integer differential operator (ordinary derivative) with the fractional differential operator.

The numerical resolution of the proposed model is based on the finite difference method, we analyse efficient numerical methods for this fractional model, and we give practical experiments with natural images which have been corrupted by Gaussian noise .

Finally, we compare our model with other denoising models, and showing that the proposed model has good performance in visual quality, high signal to noise ratio (SNR) , Peak signal to noise (PSNR)

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Heat transfer in a wavy porous enclosure

Communication Info

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Keywords:
(1) Natural convection
(2) Porous media
(3) Cavity
(4) Darcy model
(5) Wavy wall

Abstract

In this work a numerical study of natural convection flow and heat transfer in a wavy cavity saturated with porous media is carried out. The vertical walls are kept at constant temperatures, where higher temperature is applied on the left wall, while the right wavy wall is cooled at a lower temperature. Both horizontal walls are adiabatic. The Darcy model with Boussinesq approximation is adopted for the fluid flow through the porous medium. The non-dimensional governing equations with the stream function-temperature formulation are discretized by using ADI (Alternating direction implicit) method for a range of aspect ratio, wavy wall amplitudes, number of undulations and different values of Rayleigh-Darcy number. Results show that the heat transfer is strongly impacted by the governing parameters of the studied problem. Besides, it was revealed that different flow regimes may appear depending on the Rayleigh number and the aspect ratio.

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RBFPUM solver for steady state flows in heterogeneous groundwater formations

Communication Info

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Keywords:
(1) Darcy flow
(2) RBFPUM
(3) log-normal hydraulic conductivity

Abstract

Simulating steady state flows in heterogenous aquifers is one of the most widely studied problems and several numerical approaches are investigated. Finite difference, finite element, discontinuous Galerkin, spectral, and random walk methods are tested on benchmark flow problems in [1]. The quality of the methods is assessed for increasing number of random modes and for increasing variance of the log-hydraulic conductivity fields. Despite the advances in numerical methods computing accurate flow solutions for highly heterogenous formations, those methods face computational challenges in terms of code efficiency and computational resources [4]. In this communication, we present radial basis function partition of unity method to solve this problem as used in [3] and we look to exploit the innovative properties of this method to overcome the problems encountered when using different methods studied in [1] and [4].

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On a p(x)-Kirchhoff fourth order problem involving Leray-Lions type operators

Communication Info

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Keywords:
(1) Leray-Lions type operators
(2) No flux boundary condition
(3) p(x)-Kirchhoff type problems

Abstract

The aim of this work is to study the existence and the multiplicity of nontrivial weak solutions for a class of p(x)-Kirchhoff type problems involving Leray-Lions operators and a changing sign weight under no flux boundary condition. By using the mountain pass type theorem and the Ekeland's variational principle, we obtain at least two nontrivial weak solutions; moreover, by following the steps described by the Fountain Theorem, we will find an infinitely many weak solutions.

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Regularity results for solutions of linear elliptic degenerate boundary-value problems in Besov-Morrey Spaces

Communication Info

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Keywords:
(1) A priori estimate
(2) degenerate elliptic problmes
(3) Besov-Morrey spaces

Abstract

The purpose of this paper is to give an a-priori estimate near the boundary for solutions of some higher order degenerate elliptic problems in Besov-Morrey spaces $N^{S}{}_{p,q,u}(\mathbb{R}^{n+1})$ involing two class of linear elliptic degenerate higher-order operators. This work extends some results found in Holder spaces, Sobolev spaces, Besov spaces and type-Besov spaces. The methods used in this dissertation are mainly based on harmonic analysis techniques, they consist on the one hand, in giving a dyadic characterization of Besov-Morrey spaces thanks to the Littlewood-Paley decomposition, on the other hand, in reducing the problem by means of a partial Fourier transformation to an isomorphism theorem for an ordinary differential equation, which allows us to estimate the "almost tangential" derivatives of solution, then using some interpolation inequalities we evaluate the normal derivatives.

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Problems of the Coupled Theory of Thermoelasticity for Double-Porosity Materials

Communication Info

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Keywords:
(1) Thermoelasticity
(2) Double-porosity materials
(3) Potential method

Abstract

The mathematical models of multi-porosity media represent a new possibility for the study of important problems of engineering, technology and mechanics [1]. In this work, the linear model of thermoelasticity for double-porosity materials is presented in which the coupled phenomenon of the concepts of Darcy's law and the volume fraction of pore network is proposed. Then, the basic internal and external boundary value problems (BVPs) of steady vibrations are investigated. Indeed, the fundamental solution of the system of steady vibration equations is constructed. Green's identities are obtained and the uniqueness theorems for the classical solutions of the BVPs are proved. The basic properties of the surface and volume potentials are established. The BVPs are reduced to the always solvable singular integral equations for which Fredholm's theorems are valid. Finally, the existence theorems for classical solutions of the internal and external BVPs are proved by means of the potential method and the theory of singular integral equations.

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Sur une classe d'ouverts compact pour la convergence de Hausdorff

Communication Info

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Keywords:
(1) Optimisation de Forme
(2) Hausdorff
(3) Existence de Minimum

Abstract

En l'optimisation de forme, la question d'existence d'une solution (un ouvert de lR^N, N≥2 qui minimise une fonctionnelle donnée) est souvent une question délicate. Pour cela, on ajoute des contraintes sur la classe d'ouverts considérée afin de pouvoir prouver l'existence d'un minimum.

On propose d'introduire une classe de domaine de lR^N, N≥2, qui satisfait une propriété géométrique portant sur la normale intérieure (localement). On va aussi donner des relations qui vont lier les trois convergences (au sens de Hausdorff, compact, et fonctions caractéristiques) dans cette classe de domaines, ce qui va nous permettre de prouver l'existence de minimum pour notre problème.

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Heat diffusion analysis in 2D square plate considering variations of material properties

Communication Info

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Keywords:
(1) Heat transfer
(2) Conduction
(3) Thermal analysis
(4) Temperature
(5) Steady state

Abstract

Applications involving heat diffusion analysis occur in many critical areas of science and is commonly used to assess the temperature distribution within conductive media when the existing boundary conditions, thermo-physical properties of the material body, or the intensity of the heat source within it is known.

This paper is devoted to study the numerical solutions of heat diffusion problem through a rectangular plate domain of different materials properties.

The results of temperature distribution throughout the plate within time interval chosen have been computed numerically and illustrated graphically.

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On Some Estimations For A New Generalization Of Tsallis Relative Operator Entropy

Communication Info

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Keywords:
(1) Hermite-Hadamard inequality
(2) Tsallis relative mixed operator entropy
(3) operator inequalities
(4) operator means

Abstract

In this work, we provide firstly a new generalization of the classical Hermite-Hadamard inequality.
Then, we introduce a new operator $\widetilde{T}_{(p,\mu,\nu)}(A/B)$, that we call Tsallis mixed relative operator entropy, for two positive invertible operators defined on a complex Hilbert space. If $\mu = 1$ and $\nu = 0$, $\widetilde{T}_{(p,\mu,\nu)}(A/B)$ coincides with the well-known Tsallis relative operator $T_p(A/B)$[1-3].
We have been able to give this generalization, by virtue of some fundamental results of operator theory in particular those related to operator inequalities and operator means [4,5], for self-adjoint operators.
Finally, by applying our new Hermite-Hadamard inequalities for $\tilde{T}_{(p,\mu,\nu)}(A/B)$, it was possible to refine and to extend some results already stated for $T_p(A/B)$ in the literature as in [6,7] for instance.

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Well-posedness and a general decay for a nonlinear damped porous thermoelastic system with second sound and distributed delay terms

Communication Info

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Keywords:
(1) Porous system
(2) Well-posedness
(3) Second sound
(4) Distributed delay

Abstract

As a continuity to the study by M. M. Al-Gharabli et al in [4], we consider a one-dimensional porous thermoelastic system with second sound, distributed delay term and nonlinear feedback. We show the well-posedness, using the semigroup theory, and establish an explicit and general decay rate result, using some properties of convex functions and the multiplier method. Our result is obtained under suitable assumption on delay, and without imposing any restrictive growth assumption on the damping term.

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An ARIMA Model for Modeling and Forecasting the Dynamic of Univariate Time Series: The case of Moroccan Inflation Rate

Communication Info

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Keywords:
(1) ARIMA
(2) Box-Jenkins Methodology
(3) Forecasting

Abstract

The main aim of this research paper is to implement the Autoregressive Integrated Moving Average model ARIMA(p,d,q) [1], [2] to forecast the dynamic of the Moroccan inflation rate.
To this end, we have used Box Jenkins approach [3] on historical information series. Empirical findings revealed that ARIMA's adapted specification is raised as an ARIMA (0,1,1) since its model provides better forecasting for our target process.
This model could be utilized to forecast future inflation rates. Also, this result can be used by public decision-makers to better adapt their future decisions to the country's economic situation.

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Mathematical Behavior of Solutions For a Wave Equation With Delay

Communication Info

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Keywords:
(1) Mathematical behavior
(2) Wave equation
(3) Time delay

Abstract

This work deals with a nonlinear wave equation with delay term. We establish the mathematical behavior of solutions like existence, decay.. etc. Generally, time delays often appear in many practical problems such as thermal, economic phenomena, biological, chemical, physical, electrical engineering systems, mechanical applications and medicine. In recent years, the control of problems with time delay effects has become an active and attractive research area. It has shown that delay can be a source of instability and even an arbitrarily small delay may destabilize a system which is uniformly asymptotically stable in the absence of delay unless additional conditions or control terms have been used.

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Convergence d'un schéma volumes finis pour un modèle d'écoulement diphasique non-isotherme en milieux poreux

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Mots-Clés :
(1) Volumes finis
(2) Vertex-Centered
(3) Milieux Poreux
(4) Diphasique non-isotherme

Abstract

Dans ce travail, nous étudions un schéma volumes finis de type « vertex centered » totalement implicite pour un modèle d'écoulement diphasique non-isotherme immiscible et incompressible dans un milieu poreux. Le problème est modélisé [3] par la loi de conservation de la masse pour chaque phase, la loi de Darcy-Muskat, la loi de pression capillaire et la conservation de l'énergie. La formulation du modèle utilise le concept de la pression globale dont l'analyse mathématique a été récemment étudié dans [1]. Il s'agit d'un système couplé de trois équations aux dérivées partielles fortement non-linéaires. La première est une équation de Saturation, la deuxième est une équation de la Pression et la dernière est une équation de l'énergie dont l'inconnue principale est la Température. Afin de discrétiser ces trois équations du modèle considéré, nous utilisons un schéma d'Euler implicite en temps et un schéma volumes finis [4,5] « Vertex-Centered » en espace sur un maillage non structuré. Parmi les propriétés théoriques de notre schéma, nous avons établi le principe du maximum pour la saturation et la température, ainsi que l'existence d'au moins une solution pour le schéma numérique. Enfin, sur la base d'estimations a priori, des arguments de compacité tels que dans [2], nous prouvons la convergence de l'approximation numérique vers une solution faible du problème.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A fractional system of the chemotherapy treatment model with the Atangana-Baleanu derivative

Communication Info

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Keywords:
(1) Fractional derivative
(2) Fractional integral
(3) Derivative of Atangana-Baleanu
(4) Adams-Bashforth method
(5) Lagrange approximation
(6) chemotherapy treatment model
(7) locally asymptoticly stable

Abstract

In this work, we are going to calculate the tumor free equilibrium point FE, the coexisting equilibrium point CE, and we are going to study the stable asymptotic locality of the FE point. We are also going to study the existence and uniqueness of the solution of the tumor system of cancer treatment via chemotherapy under the fractional derivative of Atangana-Baleanu in the sense of Caputo. Moreover, we are going to apply the Adam-Bashforth numerical method developed by Abdon Atangana and Kolade M. Owolabi to this model of cancer treatment.

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Existence and uniqueness of renormalized solution for quasilinear noncoercive elliptic problem

Communication Info

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Keywords:
(1) Anisotropic Sobolev spaces
(2) Quasilinear elliptic equations
(3) non-coercive problems
(4) renormalized solutions

Abstract

This paper is devoted to the study of the following non-coercive quasilinear elliptic problem

$$\begin{cases} \boldsymbol{Au = f(x) - div\, F(x,u)} & \boldsymbol{in}\ \ \Omega \\ \boldsymbol{u = 0} & \boldsymbol{in}\ \partial\Omega \end{cases}$$

In the anisotropic Sobolev space, where Ω is a bounded open set of $R^N (N \geq 2)$, with $1< p < N$ and $f \in L^1(\Omega)$ *and* $F(x,u)$ satisfying only some growth condition. We show the existence and uniqueness of renormalized solutions for this non-coercive elliptic equation, and we will conclude some regularity results.

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ICRAMCS 2022
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The numerical solutions of 2D Euler equations by using a FVC scheme

Communication Info

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Keywords:
(1) Characteristics FVC (scheme)
(2) Euler equations
(3) 2D Riemann problem
(4) Wave interactions.

Abstract

A new scheme for the approximation of the spatial derivative terms in the framework of the finite volume method has been proposed in this paper. This scheme uses the velocity component normal to the control volume interface as the characteristic velocity of the conservative variables of our equation system. The method is simple, accurate and avoids the resolution of Riemann problems in the time integration process. The scheme has been shown to be effective on the shallow water equations through a recent study see e.g. [1, 2], and it is very simple and easy to implement. In this work, the scheme has been applied to solve the two-dimensional Euler equations on unstructured triangular meshes. The solutions are monotonic and the normal shock wave profiles are sharp. Contact discontinuities and shock wave profiles are captured with a higher level of accuracy and robustness. The results are compared with those of the Roe scheme [3, 4], and with some analytical solutions.

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Regularity results for degenerate problem with singular gradient, lower order term and variable exponents

Communication Info

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Keywords:
(1) Degenerate Problem
(2) Variable exponents.
(3) Singular term

Abstract

In this communication, we prove the existence and regularity of weak solutions for a class of nonlinear elliptic equations with degenerate coercivity and singular lower-order terms with natural growth with respect to the gradient and $L^{m(\cdot)}$ data. The functional setting involves Lebesgue-Sobolev spaces with variable exponents. The corresponding results in the case $p(x)=2$ are developed in [1].

We approximate the problem by a sequence of non-degenerate and non-singular nonlinear elliptic problems. Then, we prove both a priori estimates and convergence results on the sequence of approximating solutions. In the end, we pass to the limit in the approximate problems.

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Convergence of a Finite Volume Scheme for a Parabolic System Applied to Image Processing

Communication Info

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Keywords:
(1) Image Processing
(2) Perona-Malik Equation
(3) Finite Volume Method
(4) Convergence

Abstract

We analyze a finite volume scheme for a nonlinear reaction–diffusion, which is a modified Perona–Malik nonlinear image selective smoothing equation. We establish the existence and uniqueness of solutions to the finite volume scheme, and we prove that it converges to a weak solution. The convergence proof is based on L_2 a-priori estimates and using Kolmogorov's compactness theorem. The numerical simulations are done to verify the efficiency and effectiveness of the scheme.

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Mathematical modelling of spillways (hydraulic of dams) using RANS and volume of fluid equations

Communication Info

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Keywords:
(1) Spillways
(2) turbulence modeling
(3) CFD

Abstract

Recently, numerical simulation has been gaining importance as a tool for the characterization of complex flows, such as those occurring in spillways. There are several types of these spillways; in this study, we will discuss the issues in relation with side weir spillway [1-2]. The lateral outflow mechanism of side weirs is investigated using physical and numerical modelling (3D). In particular, the effects of flow depth, approaching velocity, lateral outflow direction, slope, discharge head, discharge coefficient, and the water surface profile. This study aims to validating numerical simulations and providing an overview of the turbulence modelling [3-5] (RANS, LES), the scales of turbulence (from big eddies to Kolmogorov scale)using kepsilon, k-w, k-w sst and other models in order to model the interaction near and far from the wall and how we can model multiphase flow (VOF)[6–8] in the inception point.

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Interfacial Contact Model in a Dense Network of Elastic Materials

Communication Info

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Keywords:
(1) Apollonian packing
(2) Elastic material
(3) Boundary layers
(4) Γ-convergence
(5) Fractal interface

Abstract

We consider a dense network of elastic materials modeled by a dense network of elastic disks. More specifically, we consider a dense network of elastic disks in the unit disk D(0,1) of R^2 obtained from an Apollonian packing of elastic circular disks by removing disks of small sizes. We suppose that the disks are pressed against each other to form small rectilinear contact zones where a perfect adhesion occurs on thinner zones. We use Γ-convergence methods in order to study the asymptotic behavior of the structure with respect to a vanishing parameter describing the thickness of the small perfect contact lines between materials. We derive an effective boundary condition on the residual fractal interface obtained by removing the Apollonian network of disks from D(0,1).

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Compactness properties of limited operators

Communication Info

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Keywords:
(1) Limited operators
(2) Banach lattices
(3) Order continuous norm
(4) Weakly compact operators
(5) Compact operators
(6) Dunford-Pettis* property

Abstract

This communication is devoted to study the class of limited operators on Banach lattices (that is Banach spaces with partial order), this class of operators was introduced by studied by a number of authors, in particular Bourgain [3]. This communication studied the relation between the "limited (ness)" and "weak compactness" properties. More precisely, if every limited operator from a Banach lattice E into a Banach space X is weakly compact (resp. compact) then the norm of dual of E is order continuous or X has the (DB) (resp. Gelfand –Philips) property. Also, it is proved that if every weakly compact from a Banach lattice E into a Banach space X is limited then the norm of dual of E is order continuous or X has the Dunford-Pettis* property.

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Hyperstability of cubic functional equation

Communication Info

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Keywords:
(1) Hyperstability
(2) Cubic functional equation
(3) banach space
(4) fixed point theorem

Abstract

The stability problem of the functional equation was evoked by Ulam in 1940.
In mathematical modeling of physical problems, the deviations in measurements will result with errors and deviations can be dealt with the stability of equations.
Hence, the stability of equations is essential in mathematical models.
In this paper, we prove the hyperstability of a cubic functional equation on a restricted domain. The method of the proof of the main theorem is motivated by an idea used by Brzdek in 2013 And further by Piszczek, it is based on a fixed point theorem for functional spaces obtained by Brzdek [1-2].

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ON THE DISJOINT WEAK BANACH-SAKS OPERATORS

Communication Info

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Keywords:
(1) Disjoint weak Banach-Saks property
(2) order continuous norm
(3) Schur property
(4) almost Banach-Saks operator
(5) weak Banach-Saks operator.

Abstract

We introduce and study a new class of operators that we call disjoint weak Banach-Saks operators. We establish some characterizations of this class of operators by different types of convergence (norm convergence, unbounded order convergence, unbounded norm convergence and unbounded absolutely weak convergence) as well as by the positive weakly null sequences. Consequently, we give a new characterization of the disjoint weak Banach-Saks property by the positive disjoint weakly null sequences. Furthermore, we study the relationship between this class and other classes of operators.

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Donoho-Stark's and Hardy's Uncertainty Principles for the Short-time Quaternion Offset Linear Canonical Transform

Communication Info

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Keywords:
(1) Quaternion Fourier transform
(2) Quaternion offset linear canonical trans- form
(3) Uncertainty principle.

Abstract

The quaternion offset linear canonical transform (QOLCT) which is time- shifted and frequency-modulated version of the quaternion linear canonical transform (QLCT) provides a more general framework of most existing signal processing tools. For the generalized QOLCT, the classical Heisenberg's and Lieb's uncertainty principles have been studied recently. In this paper, we first define the short-time quaternion offset linear canonical transform (ST-QOLCT) and drive its relationship with the quaternion Fourier transform (QFT). The crux of the paper lies in the generalization of several well-known uncertainty principles for the ST-QOLCT, including Donoho-Stark's uncertainty principle, Hardy's uncertainty principle, Burling's uncertainty principle, and Logarithmic uncertainty principle.

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Factorization theorem for positive p-nuclear operators

Communication Info

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Keywords:
(1) Banach lattice
(2) Pietsch domination theorem
(3) Tensor norm.

Abstract

In this talk, we introduce and study the concept of positive Cohen p-nuclear multilinear operators between Banach lattice spaces. We prove a natural analog to the Pietsch domination theorem for this class for the proof we use the full general Pietsch Domination Theorem recently presented by Pellegrino et al. and we see that for every multilinear positive operator T there is an unique positive linear operator T_L , in the main result of this talk we justify the introduction of positive Cohen p-nuclear m-linear operators as it establishes a direct connection with their linearization. Moreover, we give like the Kwapień ' s factorization theorem. Finally, we investigate some relations with another known classes.

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A Note on Subdifferentials of Convex Multi-composite Functionals

Communication Info

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Keywords:
(1) Subdifferential calculus
(2) Multi-composed convex functions
(3) Karush-Kuhn-Tucker type optimality conditions

Abstract

Motivated by the recent contribution of Wanka and Wilfer [1], the purpose of this paper is to derive a calculus rule of convex subdifferentials (called the multi-composition rule) devoted to characterize the subdifferential of multi-composed convex functions defined on Banach spaces. This type of calculus recovers the classical sum rule as well as the classical composition rule in convex subdifferential calculus (see for instance [2]). As an application of the main result of this paper, necessary and sufficient Karush-Kuhn-Tucker type optimality conditions for constrained convex minmax location problems with perturbed minimal time functions and set-up costs will be established.

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THE DRAZIN INVERSE FOR BOUNDED LINEAR OPERATORS

Communication Info

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Keywords:
(1) Bounded linear operators
(2) Banach spaces
(3) Drazin inverse

Abstract

We will present an elementary introduction to Drazin inverse (respectively generalized Drazin inverse) for bounded linear operators and we will also give some recent results of Koliha and P.Aiena, characterize the different Theorems yielded on complex Banach spaces.

Furthermore we present some of the most important characterisation of Drazin inverse (respectively generalized Drazin inverse); in particular, the Drazin invertibility of a bounded linear operator T, equivalent to the finiteness of the ascent and descent of T, also, equivalent to, T is the direct sum of two operators, where the first one is nilpotent, and the second one is invertible.

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*-K-operator for Hom*A(X)

Communication Info

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Keywords:
(1) Frame
(2) *-K-operator frame
(3) Hilbert C*-module
(4) Pro-C*-algebra

Abstract

Duffin and Schaeffer introduced the notion of frame in nonharmonic Fourier analysis in 1952 [1]. In 1986 the work of Duffin and Schaeffer were reintroduced and developed by Grossman and Meyer [2]. The concept of frame on Hilbert space has already been successfully extended to pro-C*-algebras and Hilbert modules. Many properties of frames in Hilbert C*-modules are valid for frames of multipliers in Hilbert modules over pro-C*-algebras [3]. The aim of this talk is to introduce the notion of *-K-operator frame, which is a generalization of K-operator frame in Hilbert pro-C*-algebra. We present the analysis operator, the synthesis operator and the frame operator. We also give some properties, and we study the tensor product of *-K-operator frame for Hilbert Pro-C*-modules (see [4-7]).

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On Uncertainty Principles for Quaternionic Offset Linear Canonical Transform

Communication Info

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Keywords:
(1) Quaternionic offset linear canonical transform
(2) uncertainty principles
(3)Miyachi's theorem

Abstract

The quaternionic offset linear canonical transform(QOLCT)[1]can be defined as a generalization of the quaternion linear canonical transform(QLCT)[3]which is also a generalization of the linear canonical transform using quaternion algebra.
In harmonic analysis, the classical uncertainty principles states that a non-trivial function and its Fourier transform can not both very rapidly deceasing.
In this work, to characterize simultaneous localization of a signal and its Quaternionic offset linear canonical transform, we provide some different uncertainty principles, including Miyachi's theorem[2], a generalization of hardy's theorem[1], and other uncertainty principles as: Amrein-Berthier-Benedicks[4], Donoho-stark[4], and Bonami-Demange-Jaming's theorem[5].

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P-adic Discrete Semigroup Of Contractions

Communication Info

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Keywords:
(1) Non-archimedean Banach spaces
(2) spectral operator
(3) discrete semigroup of contractions

Abstract

T. Diagana provided a brief conceptualization of a non-archimedean counterpart of the classical C_0-*semigroups* in connection with the formalism of linear operators on free Banach and non-Archimedean Hilbert spaces. This family motivated by the solvability of *p*-adic differential and partial differential equations, as strong (mild) solutions to the Cauchy problem related to several classes of differential and partial differential equations arising in the classical context can be explicitly expressed through *C*0-semigroups. Let $A \in B(X)$ be a spectral operator on a non-Archimedean Banach space over $\mathbb{C}_p$. In this paper, we give a necessary and sufficient condition on the resolvent of A so that the discrete semigroup consisting of powers of A is contractions.

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FRAMES IN $l^2(H)$

Communication Info

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Keywords:
(1) Frames for $l2(H)$
(2 Infinite frames for H
(3) Fusion frames

Abstract

The notion of a frame for Hilbert spaces was introduced by Duffin and Schaeffer [5]. This was done while probing into some questions in non-harmonic Fourier series. This idea seemed to have been unnoticed outside of this area until Daubechies, Grossmann and Meyer brought it into light in 1986. the latter's showed that Duffin and Schaeffer's definition was an abstraction of the concept introduced by Gabor in 1946 for doing signal analysis.. In this communication, we will give sufficient conditions for an infinite family in $l^2(H)$ to be a frame for H, where $l^2(H)$ is the space of square summable sequences in H, and H is a finite-dimensional complex Hilbert space. We also show that infinite-frames for H are equivalent to frames for $l^2(H)$. We equally give a characterization of frames in $l^2(H)$ using the synthesis operator.
We finally construct frames for $l^2(H)$ from frames for smaller spaces using the fusion frame theory.

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Controlled K-g-frames in Hilbert C*-modules

Communication Info

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Keywords:
(1) Controlled frame
(2) g- frame
(3) K-g-frame
(4) Hilbert C*-module

Abstract

Frames for Hilbert spaces were introduced by Duffin and Schaefer in 1952 to study some deep problems in nonharmonic Fourier series by abstracting the fundamental notion of Gabor for signal processing. Controlled frames in Hilbert spaces have been introduced by P. Balazs to improve the numerical efficiency of iterative algorithms for inverting the frame operator. This talk is devoted to studying the controlled K-g-frames in Hilbert C*-modules, some useful results are presented. Also, the concept of controlled K-g-dual frames is given. Finally, we discuss the stability problem for controlled K-g-frames in Hilbert C*-modules.

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Some characterizations of l-weakly compact sets using the unbounded absolute weak convergence and applications

Communication Info

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Keywords:
(1) L-weakly compact sets.
(2) order continuous Banach lattices.
(3) unbounded absolute weak convergence.
(4) Weakly sequentially lattices operations.
(5) order weakly compact operators.

Abstract

In this work, we study the L-weakly compact sets using the unbounded absolutely weakly convergence, we give some characterizations of order (L)- Dunford-Pettis operators and order weakly compact operators. We give a generalization of Theorem 4.34 [1], also generalizations of some results given in [5] are obtained. As applications, we characterize Banach lattices under which weakly convergence implies uaw-convergence. On the other hand, some new characterizations of order continuous Banach lattices are obtained.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

On geometry of the Mus-Cheeger-Gromoll metric

Communication Info

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Keywords:
(1) Horizontal lift
(2) Vertical lift
(3) Cheeger-Gromoll metric
(4) Tangent bundle

Abstract

The geometry of the tangent bundle TM is equipped with Ishihara [17], A. Salimov, A. Gezer, and N. Cengiz (see [2], [9]]), etc. The rigidity of the Sasaki metric has incited some geometers to construct and study other metrics on Sasaki metric has been studied by many authors K. Yano and S TM. J. Cheeger and D. Gromoll has introduced the notion of Cheeger-Gromoll [3].
In [4] we have defined a metric on TM called the vertical rescaled generalized Cheeger-Gromoll metric. Motivated by the above studies, we introduce a new class of natural metrics denoted by G and called the Mus-Cheeger-Gromoll metric on the tangent bundle TM. We calculate its Levi-Civita connection and Riemannian curvature tensor. We study the geometry of (TM;G).

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Spectrum and Spectral radius of a bb-bounded operator in a topological vector space

Communication Info

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Keywords:
(1) *Operator bb-bounded.*
(2) *Uniform convergence on bounded sets*.
(3)*Uniformly bounded on a set*
(4) *Spectral radius.*
(5) Invertibility of an operator.

Abstract

we study the class of bb-bounded linear operators in topological vector spaces, endowed with a topology that we will define. We extend some properties concerning spectral radius, introduced by Troitsky in [5], for this class of operators. We give sufficient conditions for the completeness of the topological vector space of this class of operators. We show that Gelfand's formula for the spectral radius and the Neumann series can be interpreted naturally for bb-bounded operators on topological vector spaces. Finally, as an application, we give sufficient conditions for the invertibility of a bb-bounded linear operator.

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ICRAMCS 2022
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Fixed point theorems for ψ-contractive mapping in C*-algebra valued rectangular b-metric spaces

Communication Info

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Keywords:
(1) C*−algebra
(2) C*−algebra valued rectangular b-metric
(3) contractive mapping

Abstract

In this talk, we present a new insight of C*-algebra valued rectangular b-metric spaces in the perspective of the fixed-point theory using contractive mapping. Using contractive mapping in the rectangular b-metric spaces, we discussed the existence and the uniqueness of the fixed point with mapping satisfying a contractive condition. As a result, we obtained an interesting and important result for the general case of C*-algebra valued metric spaces. In particular, we study some fixed-point theorems in the C*-algebra valued rectangular b-metric spaces using a positive function.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Solving the linear moment problems for nonhomogeneous lineair recursive sequences

Communication Info

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Keywords:
(1) Linear moment problem,
(2) *K*-moment problem,
(3) Hankel matrix,
(4) nonhomogeneous linear recursive sequences.

Abstract

In view of its fundamental role in various fields of mathematics and applied science, the linear moment problem has been extensively studied in the literature. Especially, it has been shown that this problem is useful for some topics in physics, such that the quantum dynamical systems. Recently, the linear moment problem has been investigated in the literature, by various methods.
The present talk aimed to explore the linear moment problem for the real sequences defined by the nonhomogeneous linear recursive relation. Various properties are provided, especially, those related to the Hankel matrices. Some considerations in connection with *K*-moment problem, for the nonhomogeneous recursive, are discussed.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Sequential optimality condition of approximate proper efficiency for a multiobjective fractional programming problem

Communication Info

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Keywords:
(1) sequential optimality conditions
(2) multiobjective fractional programming problem

Abstract

In the absence of any constraint qualifications, we develop sequential optimality conditions for a constrained multiobjective fractional programming problem characterizing an approximate properly efficient solution. This is achieved by employing a powerful combination of conjugate analysis and the concept of approximate subdifferential. In order to present an example illustrating the significance of the sequential conditions, we establish the exact optimality conditions under a qualification condition.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A parametric functional equation originating from number theory

Communication Info

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Keywords:
(1) Functional equation
(2) Number theory
(3) Multiplicative function

Abstract

Let S be a multiplicative semigroup. The aim of this work is to determine the general solution $f : \mathbb{R}^2 \to S$ of the following parametric functional equation

$$f(x_1x_2 + \alpha x_2y_2, x_1y_2 + x_2y_1 + \beta y_1y_2) = f(x_1, y_1)f(x_2, y_2),$$

for all $(x_1, y_1), (x_2, y_2) \in \mathbb{R}^2$ where α and β are two real parameters.

This equation generalizes some functional equations arising from number theory and it is connected with the characterizations of the determinant of matrices. As further results in this work, we give the matrix solutions of our equation.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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G-atomic submodules for operators in Hilbert C*-modules

Communication Info

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Keywords:
(1) g-fusion frame
(2) K-g-fusion frame
(3) g-atomic submodule

Abstract

Basis is one of the most important concepts in Vector Spaces study. However, Frames generalize orthonormal bases and were introduced by Duffin and Schaefer in 1952 to analyze some deep problems in nonharmonic Fourier series by abstracting the fundamental notion of Gabor for signal processing. In 2000, Frank-Larson introduced the concept of frames in Hilbert C*-modules as a generalization of frames in Hilbert spaces. The basic idea was to consider modules over C*-algebras of linear spaces and to allow the inner product to take values in the C*-algebras.

In this talk, we introduced the notion of a g-atomic submodule for an adjointable operator and resolution of the identity operator on Hilbert C*-modules, also we give some properties. Finally, we study the concept of frame operator for a pair of g-fusion Bessel sequences.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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The Logarithmic Sobolev Inequality on the circle $Z/2\pi Z$

Communication Info

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Keywords:
(1) Sobolev's inequality
(2) Logarithmic Sobolev inequality
(3) Heat semigroup

Abstract

In this work, we introduce the basic notions of the hypercontractivity property of semigroups and functionals inequalities (Sobolev inequality, logarithmic Sobolev inequality, and the spectral gap inequality). We will focus the study on the characteristics and property of the logarithmic Sobolev inequality for the uniform measure on the circle $Z/2\pi Z$, by using the heat semigroup technics and integration by parts. It is note worthy that the previous inequality proved by Weissler [5], by virtue of a complicated calculation and also by Rothaus [3] by a variational method.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Duality for multi-objective fractional bilevel programming problems with extremal-value function

Communication Info

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Keywords:
(1) Multi-objective optimization
(2) Fractional programming problems
(3) Bilevel programming problems
(4) Conjugate duality
(5) Perturbation theory
(6) Composed programming problems

Abstract

Given a multi-objective fractional bilevel programming problem (P) with an extremal-value function, we introduce, by using the Fenchel-Moreau conjugate of the functions involved, a suitable dual problem. Under a standard constraint qualification and some convexity as well as monotonicity conditions we establish the necessary and sufficient optimality conditions and we prove the existence of strong duality for the problem (P). Finally, we present an example illustrating the main result of this paper.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

K-g-fusion frames in Hilbert C*-modules

Communication Info

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Keywords:
(1) Fusion Frame
(2) g-fusion Frame
(3) K-g-fusion
(4) Hilbert C*-module

Abstract

Frame Theory had a great revolution in recent years. This theory has several properties applicable in many fields of mathematics and engineering and plays a significant role in signal and image processing, which leads to many applications in informatics, medicine and probability. Frame theory has been extended from Hilbert spaces to Hilbert C*-modules and began to be studied widely and deeply. The basic idea was to consider module over C*-algebra instead of linear spaces and to allow the inner product to take values in the C*-algebra.

In this talk, we introduce the concepts of the g-fusion frame and the K-g-fusion frame in Hilbert C*-modules and we give some properties. Also, we study the stability problem of the g-fusion frame. The presented results extend, generalize and improve many existing results in the literature.

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Pettis Integrability in $L^1_{E'}[E]$ Related to the Truncation

Communication Info

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Keywords:
(1) Convergence
(2) Gelfand integral
(3) Pettis integral
(4) Truncation

Abstract

Several authors studied the Pettis integrability of Banach space valued functions ([4],[5],[6],[8],[9]) and especially of dual Banach space valued functions [1] and [10]. In this communication we are interested by Pettis integrability for scalarly integrable function of $L^1_{E'}[E]$, E being a separable Banach space. Our study is based on the truncation technique that has been adopted in [2], [3] to state some Komlós type theorems for Bochner integrable functions and in [7] to provide a Komlós type theorem in $L^1_{E'}[E]$.

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A NOTE ON MULTIPLY RECURRENT OPERATORS

Communication Info

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Keywords:
(1) Recurrent Operator
(2) Multiply recurrent vector
(3) Topologically multiply recurrent operator

Abstract

The notion of recurrence has been introduced first in 1890 by Poincaré with the Poincaré recurrence theorem (see [6]) and generalized after that by Furstenberg in 1976 to Multiple recurrence theorem (see [5]). These two notions have been studied structurally in the linear dynamic by G. Costakis et al. in [4] and Cardeccia et al. in [3]. In this communication, we study the notion of multiply recurrent vector for an operator on a Banach space X. We give a characterization of topologically multiply recurrent for an operator on X by means of the set of all multiply recurrent vectors. We also prove that T is topologically multiply recurrent operator then λT and T^p are topologically multiply recurrent for all λ a complex number of modulus 1 and p a positive integer.

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ICRAMCS 2022

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Estimations sur le φ-Ordre des Solutions Méromorphes des Équations Différentielles Linéaires dans le Plan Complexe

Info de communication

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Mots Clés:
(1) Équations différentielles linéaires
(2) Solution méromorphe
(3) φ Ordre de croissance

Résumé

Dans ce travail, on étudie la croissance des solutions méromorphes des équations différentielles $\boldsymbol{A_k f^{(k)} + A_{k-1} f^{(k-1)} + \cdots + A_1 f' + A_0 f = 0}$, $\boldsymbol{A_k f^{(k)} + A_{k-1} f^{(k-1)} + \cdots + A_1 f' + A_0 f = F}$, où $\boldsymbol{A_0}(\not\equiv 0), \boldsymbol{A_1}, \ldots, \boldsymbol{A_k}(\not\equiv 0)$, $\boldsymbol{F}(\not\equiv 0)$ sont des fonctions méromorphes ayant un φ-ordre fini dans le plan complexe. En utilisant le concept du φ-ordre, on étend et on améliore les résultats précédents dus à Belaïdi [1], Saidani et Belaïdi [6] obtenus sur l'ordre p-itératif des solutions.

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ICRAMCS 2022

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Punctuel Spectrum for Finite Rank Perturbation of Diagonal Operator in Non-Archimedean Banach Space of Countable Type

Communication Info

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Keywords:
(1) punctual spectrum
(2) non-archimedean Banach space
(3) finite Rank operator

Abstract

In this work we study the punctual spectrum for operator of the form $A = D + F$, where D is a bounded diagonal operator and F is an operator of finite Rank at most m. Namely, under some suitable assumptions, we will show that the spectrum σ(T) of bounded linear operator T is given by

σ(T)=σe(D)∪σp(T), where σe(D) is the essential spectrum of D and σp(T) Is the point spectrum of T, that is the set of eigenvalues of T given by σp(T)={λ∈ρ(D) : detM(λ)=0} with M(λ) being the m × m square matrix M(λ)=(bij)i,j=1,..m whose coefficients are given by bij = δij + ⟨Cλvi, vj ⟩d for i, j = 1, ..., m and Cλ = (D − λI)

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A nonlocal Kardar–Parisi–Zhang system

Communication Info

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Keywords:
(1) Fractional Laplacian
(2) Nonlinear elliptic systems
(3) KPZ equation
(4) Non local gradient

Abstract

We study, in this work, a class of nonlinear fractional systems of KPZ-type with variant forms of a non local gradient.

$$\begin{cases} (-\Delta)^s u &= |Gv|^q + \lambda f, & \text{in } \Omega, \\ (-\Delta)^s v &= |Gu|^p + \mu g, & \text{in } \Omega, \\ u = v &= 0 & \text{in } \mathbb{R}^N \setminus \Omega \end{cases} \tag{0.1}$$

where Ω is a bounded domain of $\mathbb{R}^N$, p, q ≥ *1*, λ, μ ≥ *0*, 0 < s <1 and f, g are measurable nonnegative functions.
The operator $(-\Delta)^s$ is the classical fractional Laplacian defined by :

$$(-\Delta)^s u(x) := a_{N,s}\ \text{P.V.} \int_{\mathbb{R}^N} \frac{u(x)-u(y)}{|x-y|^{N+2s}}\, dy,\ s \in (0,1),$$

with $a_{N,s}$ is a normalization constant.
G is a nonlocal fractional gradient defined by :

$$Gu(x) := \mathbb{D}_s(u)(x) = \left(\frac{a_{N,s}}{2} \int_{\mathbb{R}^N} \frac{|u(x)-u(y)|^2}{|x-y|^{N+2s}} dy \right)^{\frac{1}{2}}.$$

Our main goal is to get existence and non-existence results for system (0.1). More precisely, we aim to find conditions on the data that allow us to prove the existence of nonnegative weak solutions to system (0.1). Moreover we establish non-existence results by proving that our assumptions on the data are optimal. The results presented here are part of the paper [1].

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The Linear Complementarity Problem

Communication Info

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Keywords:
(1) Algebraic topology
(2) Rational homotopy theory
(3)Rational cohomology
(4) Sullivan minimal model

Abstract

Let f:X→Y be a map of rationally elliptic CW-complexes. Let denote by Ker $\pi_{*}(f)\otimes\mathbb{Q}$= Ker $\{\pi_{i}(f)\otimes\mathbb{Q}:\pi_{i}(X)\otimes\mathbb{Q}\to\pi_{i}(Y)\otimes\mathbb{Q}\}$ and similarly Ker $H_{*}(f)\otimes\mathbb{Q}$= Ker $\{H_{i}(f)\otimes\mathbb{Q}:H_{i}(X;\mathbb{Q})\to H_{i}(Y;\mathbb{Q})\}$. Recently and motivated by Hilali conjecture [1], T. Yamaguchi and S. Yokura proposed a generalization of this conjecture, wich states that dim Ker $\pi_{*}(f)\otimes\mathbb{Q}\leq$ dim Ker $H_{*}(f)\otimes\mathbb{Q}+1$. Our aim in this talk is to recall some results about it.

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Stability of a generalization of Wilson's equation on monoid

Communication Info

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Keywords:
(1) D'Alembert's functional equation, Hyers–Ulam stability.
(2) monoid
(3) involution
(4) Wilson's functional equation,

Abstract

Given a character v: G → C \ {0} and an involution σ of a monoid M we study the
solutions f, g: M −→ C of the functional equation

$$f(xy) + v(y)f(x\sigma(y)) = 2f(x)g(y), \quad x, y \in M,$$

from the theory of trigonometric functional equations.

1) We show that g satisfies $g(xy) + v(y)g(x\sigma(y)) = 2g(x)g(y)$ if f not equal to 0.
2) We derive hyperstability results for the equation, when v is unitary.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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La Classe inversée comme outil innovant dans l'enseignement à distance

Communication Info

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Keywords:
(1) Classe inversée
(2) Enseignement à distance
(3) Didactique des mathématiques

Abstract

Dans ce contexte pandémique prolongé, nos systèmes éducatifs se sont trouvés dans l'obligation d'abandonner leurs pratiques habituelles et de s'adapter aux nouvelles exigences sanitaires. La situation imposa l'improvisation et l'adoption de méthodes nouvelles axées sur l'implication de l'apprenant, notamment l'enseignement à distance [1]. Notre projet de recherche consiste à faire appel au principe de la classe inversée pour mettre l'étudiant au cœur du système [2], les rôles traditionnels d'apprentissage sont donc modifiés selon le principe « les cours à la maison et les devoirs à la maison ».

Notre recherche s'articule autour de la problématique suivante : «Comment pouvons-nous rendre l'apprentissage hors-classe, notamment les contrôles et devoirs plus fiables et comment remédier aux tentatives de fraudes dans ce cas-là».

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existence Of Entropy Solutions For Some Nonlinear And Noncoercive Unilateral Elliptic Problems In Anisotropic Sobolev Spaces

Communication Info

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Keywords:
(1) Nonlinear elliptic equations
(2) Non-coercive problems
(3) Entropy solutions
(4) Obstacle problems

Abstract

This paper is concerned with the study of the existence results to the obstacle problem associated with the equation having degenerate coercivity, whose prototype is given

$$-\sum_{i=1}^{N}\frac{\partial}{\partial x_i}a_i(x,u,\nabla u)+F(x,\nabla u)=f(x,u) \quad in \quad \Omega.$$

Where Ω is bounded open set of $\mathbb{R}^N$ $(N \geq 2)$ and $f(.,s)$ satisfying some growth conditions. We show the existence of entropy solutions for this non coercive unilateral elliptic equation and we will conclude some regularity results.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existence results for elliptic problem involving the sixth order GJMS operator on compact manifold

Communication Info

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Keywords:
(1)Sixth order GJMS operator
(2) Variational method
(3) Sign-changing solutions
(4)Compact Manifold

Abstract

Given (M, g) be a smooth compact Riemannian manifold with boundary of dimension $n \geq 10$.
The goal of this work, is to study the existence of sign-changing solutions for the following Drichlet elliptic problem involving the sixth GJMS operator on (M, g)

$$\begin{cases} P_g u = \lambda f|u|^{2^{\#}-2}u & in\ M \\ u = \varphi_1, \dfrac{\partial u}{\partial \nu} = \varphi_2, \dfrac{\partial^2 u}{\partial \nu^2} = \varphi_3 & on\ \partial M \end{cases}$$

Where $\Delta_g . = -\mathrm{div}_g(\nabla .)$ is the Laplace-Beltrami operator, $\varphi_1,\ \varphi_2,\ \varphi_3 \in C^\infty(\partial M)$, $f \in C^\infty(M)$ is a positive function and P_g is the sixth order Graham-Jenne-Mason-Sparling operator (see Juhl [4]). $2^{\#} = \frac{2n}{n-6}$ is the Sobolev critical exponent, ν stands for the unit outward normal vector field to ∂M.

Our principal result is to extend the results of Bekiri-Benalili [2], for an elliptic problem involving the Paneitz-Branson type operator.
The existence result is assured by variational approach due to Yamabe [5], under geometric assumptions.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Study of Fractional Conformable nonlocal-delay differential Systems of second order in Banach spaces

Communication Info

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Keywords:
(1) conformable Fractional derivates
(2) nonlocal fractional differential
(3) system with delay .
(4) Cosine and Sine functions of operators

Abstract

This work is concerned with the study the existence and uniqueness of the global mild solution, for the problem of nonlocal fractional differential system with delay and conformable Fractional derivates of order $1 < \alpha < 2$, in Banach space , by using Cosine and Sine functions of operators and fixed point Theorems , we obtain various criteria on the existence and uniqueness of mild solutions.
The nonlocal condition when involved in physics it can give a better effect than the classical initial condition $x0(\tau) = \phi(\tau), \tau \in [-l, 0]$.
In [1], the autors study the problem, with the Caputo fractional. Using another technical approach, by conformable fractional with Measure of Noncompactness in Banach Spaces , we prove in this paper the problem has a mild solution.

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Entropy solutions for elliptic Schrödinger type equations under Fourier boundary conditions

Communication Info

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Keywords:
(1) Schrödinger type equations
(2) Lebesgue-Sobolev spaces with variable exponent
(3) Fourier boundary conditions
(4) Entropy solutions

Abstract

We consider the following quasilinear Fourier boundary-value problem of the type:

$$\begin{cases} -\operatorname{div}(a(x,|\nabla u|)\nabla u + |u|^{p(.)-2}u = f(x,u) & \text{in} \quad \Omega \\ \lambda u + a(x,|\nabla u|)\nabla u.\eta = g & \text{on} \quad \partial\Omega, \end{cases}$$

where Ω is a bounded open subset of $\mathbb{R}^N$, $(N \geq 3)$ with Lipschitz boundary $\partial\Omega$, η is the outer unit normal vector on $\partial\Omega$, p is continuous function and λ is positive constant. Under a suitable condition on f and $g \in L^1(\partial\Omega)$, we prove the existence of entropy solutions for a Schrödinger type equation in the variable exponent Sobolev spaces.

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Backward differentiation formula 3 finite difference scheme for sea ice equation

Communication Info

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Keywords:
(1) Sea-ice equation.
(2) Jacobian-free Newton Krylov method
(3) Backward differentiation formula method.

Abstract

Sea ice dynamics remains one of the most uncertain factors in the earth system model's ability to address the climate change problem. The difficulty in accurately and efficiently solving numerically the associated highly nonlinear partial differential equations is believed to be a big contributor to this uncertainty.

In this work, I will talk about a general description of viscous-plastic sea-ice equations, and show how we solve these equations discretized by the backward differentiation formula 3, by the Jacobian-free Newton Krylov solver.

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Existence Results for Neutral Fractional Integro-differential Equations with Delay

Communication Info

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Keywords:
(1) Neutral fractional integro-differential equations
(2) Measure of noncompactness
(3) Fréchet spaces

Abstract

In this work, we investigate the existence of mild solutions for neutral fractional integrodifferential equations with delay in Fréchet space. We use in the study a generalization of Darbo's fixed point theorem combined with measures of non compactness, this new version of Darbo's theorem in semi-normed space was introduced for the first time by Dudek in [2, 3]. The existence of mild solutions for fractional integro-differential equantions was treated by many researcher such as [1, 4, 5] and others in Banach space, while the idea of this work is to weaken the conditions of compactness by using measures of noncompactness to maintain the existence of solutions. An illustrating example of the main result has been included.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Conformable Fractional Cauchy Problem with a Measure of Non compactness in Banach spaces

Communication Info

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Abstract

The differential equation with the conformable fractional derivative is introduced by T. Abdljawad [2] and A. Kajouni et al. [1] gives a new form of this derivative and some application. This last derivative is the generalization of the classical derivative an important tool in the modeling of phenomena in several scientific fields such as physics, engineering, control theory, etc. In this work, we prove the existence of mild solution of conformable fractional differential equation with a measure non-compactness in Banach spaces, for the more about a measure non-compactness, we refer to [3]. The main results are based on semi-group theory combined with Darbo-Sadovskii fixed point theorem.

Keywords:
(1)Fractional Conformable derivative
(2)Measure of noncompactness

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ICRAMCS 2022
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New principle reduction for partial functional differential equation with the lack of compactness

Communication Info

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Keywords:
(1) Functional differential equations
(2) Compact operators.
(3) Compact almost automorphic solution.

Abstract

The aim of this communication is to establish a principle reduction for partial functional differential equations with the lack of compactness of the semigroup generated by the linear part. We use the compactness of the linear delay operator to prove that the semigroup generated by the linear part is quasi-compact. This property allows as to construct a reduced system that is posed in a finite dimension space. Through this result we investigate the existence of compact almost automorphic solutions for some partial functional differential equations. We apply our results to transport models and to the heat equation.

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ICRAMCS 2022
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On strongly quasilinear degenerate elliptic systems with weak monotonicity and nonlinear

Communication Info

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Keywords:
(1) Quasilinear elliptic systems
(2) weak solutions
(3) Young measures

Abstract

This article is devoted to studying the quasilinear elliptic system

$$-div\ a(x,u,Du) + b(x,u,Du) = v(x) + f(x,u) + div\ g(x,u)$$

on a bounded open domain, with homogeneous Dirichlet boundary conditions. We show that there is a weak solution to this system under regularity, growth, and coercivity conditions for a, but only with very moderate monotonicity assumptions. We prove the existence result by using Galerkin's approximation and the theory of Young measures. This system corresponds to a diffusion problem with a source v in a moving and dissolving substance, where the motion is described by g and the dissolution by f. The authors proved existence of a weak solution for this system under classical regularity, growth, and coercivity conditions for s, but with only very mild monotonicity assumptions. See also [1] for more results.

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ICRAMCS 2022
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Modelling wave agitation in harbors using high order Bernstein-Bezier finite

Communication Info

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Key words :
Finite elements, Bernstein-Bézier, Sum factorisation, Berkhof equation, perfectly matched layer.

Abstract

This work deals with a high-order Bernstein-Bézier finite element (FE) discretisation to accurately eval- uate the wave agitation for harbor models based on the linear elliptic mild-slope equation. Unbounded or partially unbounded domains should be dealt with by truncation of the (partially) infinite domain and prescription of an appropriate boundary condition allowing outgoing waves to leave the computa- tional domain without spurious reflection. Due to bathymetric effects, the wave far field is generally not known a priori, and a standard radiation condition can not be applied, unless the bathymetry outside the computational domain is approximated by a constant water depth. Here, the perfectly matched layer (PML), combined to high order Bernstein-Bézier finite elements [1], will be adapted to include exterior bathysphere effects. Although high order FEs possess many advantages over standard FEs, the computational cost of matrix assembly is a major issue in highorder computations. A key ingredient to address this drawback is to exploit the tensorial property of Bernstein polynomials, under the collapsed coordinates, and apply the sum factorisation method [2]. Additionally, an element-level static condensation of the interior degrees of freedom is performed to reduce the memory requirements. The performance of BernsteinBézier FEs combined with the PML approach, in terms of accuracy and conditioning, is investigated through benchmark tests dealing with wave scattering by a rigid cylinder and refractiondiffraction of long waves over a circular island with a parabolic shoal.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existence of solutions in the α-norm for some partial integrodifferential equations involving the nonlocal conditions

Communication Info

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Keywords:
(1) Integrodifferential equation
(2) Mild solution
(3) Fixed point theorem
(4) Nonlocal condition
(5) α-norm
(6) Resolvent operator

Abstract

The subject of interest of this communication is to study the global existence of mild solutions in global in α-norm for a class of nonlocal integrodifferential equations. We extend the works of K. Ezzinbi et al. [1-2], by restricting this equation in the Banach space X_α which stands for the domain of the fractional operator. Our analyses are based on the Leray-Schauder alternative and a fixed-point theorem of Sadovskii-Krasnosel'skii type and the theory of resolvent operators introduced by R. Grimmer [3].

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Nonlinear anisotropic elliptic problems with non-local boundary condition in weighted

Communication Info

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Keywords:
(1) non-local boundary conditions.
(2) variable exponent.
(3) Leray-Lions operator.

Abstract

In this paper, we are concerned with a show the existence of weak solutions for nonlinear elliptic anisotropic problem with non-local boundary conditions in the weighted variable exponent Sobolev spaces:

$$\begin{cases} -\nabla\, a(x,\nabla u) + |u|^{p_0(x)-2}u = f & in\ \Omega \\ u = 0 & on \quad \Gamma_D \\ \rho(u) + \int_{\Gamma_{N_e}} a(x,\nabla u)\eta \ni d \quad and\ u = const \quad on\ \Gamma_{N_e} \end{cases}$$

S. Ouaro and Soma studied the nonlinear elliptic problem with bounded data and general functions in 2017 [2] in 2018, they proved the existence and uniqueness of solution of the nonlinear elliptic problem involving a nonlocal boundary condition with variable exponent (see [1]).

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On a class of p(x)-biharmonic Dirichlet problems in Sobolev space with variable

Communication Info

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Keywords:
(1) p(x)-biharmonic operator
(2) p(x)-Laplacian-like operators
(3) capillarity phenomenon
(4) topological degree methods
(5) Sobolev space with variable exponent

Abstract

The purpose of the present paper is to study the existence of weak solutions for some p(x)-biharmonic type problems involving the p(x)-Laplacian-like operators, originated from a capillarity phenomenon, under Dirichlet boundary conditions. Using a topological degree for a class of demicontinuous operators of generalized (S_+) type and the theory of the Sobolev space with variable exponent, we obtain the existence of weak solutions of this problem. To our best knowledge, this paper is the first attempt in the study of p(x)- biharmonic type problems involving the p(x)-Laplacian-like operators via topological degree methods. Our results extend some recent work in the literature.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Some nonlinear parabolic problems with singular natural growth term

Communication Info

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Keywords:
(1) Nonlinear parabolic equations
(2) Singular problems
(3) Existence and regularity
(4) Lower order terms

Abstract

In this work, we study the existence and regularity results of solutions to nonlinear parabolic problems involved by a singular lower term having a natural growth. More precisely, we are studying the regularizing effect of this lower order term on the regularity of the solution and its gradient. This work motived by the following works [1, 2, 3].
To study our problem we must approximate by another non-singular, then we give some estimate for the solution of the approximate problem, and also we must prove that this solution is strictly positive inside of the cylinder $Q=\Omega\times (0,T)$. Finally, we pass to the limit in the weak formulation of the approximate problem to reach our goal.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Ground state solutions for a nonlocal system in Fractional Orlicz-Sobolev Spaces

Communication Info

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Keywords:
(1) Fractional Orlicz-Sobolev Spaces
(2) Nehari manifolds
(3) Ground state solutions.

Abstract

In this document, we consider an elliptic problem type system involving by the non-local fractional $a(.)$-Laplacian operator defined by J. F Bonder et A. M. Salort in [1], with boundary conditions type Dirichlet, where $a(.)$ is an Orlizc function (we refer to [2] and [3] for more detail). By using the minimization arguments on suitable Nehari manifolds, we get a ground state solutions.

The main difficulty in this work arises from the complicated method which we are applying to found the solution, Furthermore the non-homogeneities of the fractional $a(.)$-Laplacian operator.

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Stability Analysis of SEIR Model with Time Delay

Communication Info

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Keywords:
(1) SEIR epidemic model
(2) Time-delay
(3) Hopf bifurcation

Abstract

In this paper, we consider the impact of treatment time on the epidemic situation, and we present a differential equation model with time-delay according to the characteristics of COVID-19. Firstly, we investigate the existence and stability of the equilibrium by discussing the distribution of the eigenvalues of the corresponding characteristic equation. Secondly, we analyze the existence of Hopf bifurcation. Finally, we determine the direction of Hopf bifurcation and the stability of bifurcating periodic solutions.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Infinitely many solutions for a class of fractional equations with potential

Communication Info

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Keywords:
(1) Potential BO-ZK equation
(2) Infinitely many solutions
(3) Variational method

Abstract

In this paper, we deal with a nonlinear nonlocal equation involving an anisotropic operator and potential. No coerciveness assumption is required on the potential. We consider the cases when the nonlinear term is either asymptotically linear or superquadratic growth. By the variational method and the variant fountain theorems, the existence of infinitely many high or small energy solutions is established.

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Fractional Partial Random Differential Equations with delay

Communication Info

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Keywords:
(1) *Random differential equation*
(2) *Caputo fractional order derivative*
(3) *Unbounded delay*

Abstract

In the present work, we provide some existence results for the Draboux problem of partial fractional random differential equations with infinite delay in Banach space by applying the measure of noncompactness and a random fixed point theorem with stochastic domain.

We need in this work to introduce notation of the phase space B since we are working in the case of infinite delay, it has an important role in the study of both qualitative and quantitative theory for functional differential equations.

The idea is to transform our problem in problem of fixed point, then we condtruct an operator, we prove that this operator is a random operator with stochastic domain and it satisfies all conditions of the random fixed point theorem. Finally the stochastic fixed point of our random operator presents a random solution of our problem.

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ICRAMCS 2022

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Existence of weak solution for a nonlinear parabolic problem in weighted Sobolev space via optimization method

Communication Info

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Keywords:
(1) Nonlinear degenerate parabolic problem.
(2) Weak solutions.
(3) Weighted Sobolev space.

Abstract

Let $\Omega \subset R^N$ $(N \geq 2)$ be a bounded open set, T is a fixed positive number and p be a real number such that $1 < p < \infty$. Our aim in this work is to study the existence for weak solution in weighted Sobolev spaces of the nonlinear degenerate parabolic problem

$$\begin{cases} \frac{\partial u}{\partial t} - div\left(\omega\Phi(\nabla u - \Theta(u))\right) + |u|^{p-2}u = f & \text{in } Q :=]0;T[\times\Omega, \\ u = 0 & \text{on } \Gamma :=]0;T[\times\partial\Omega, \\ u(.,0) = u_0 & \text{in } \Omega, \end{cases}$$

where ω is a measurable positive and a.e finite function defined in R^N, is real function satisfying the following assumptions:

(H_1) $\omega \in L^1_{loc}(\Omega)$and $\omega^{\frac{-1}{p-1}} \in L^1_{loc}(\Omega)$.
(H_2) $\omega^{-s} \in L^1(\Omega)$ where $s \in \left(\frac{N}{P}, \infty\right) \cap (\frac{1}{p-1}, \infty]$.
(H_3) Θ *is a nondecreasing continuous real function defin* *on* R *such that* $\Theta(0) =$ 0 *and there exists positive constant* λ *such that* $|\Theta(x) - \Theta(y)| \leq \lambda|x - y|$ for all x,y$\in R$, $0 < \lambda < \frac{1}{2}$.
(H_4) $f \in L^\infty(Q)$.

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Existence results of problems involving both p(x)-Laplacian and p(x)-Biharmonic operators

Communication Info

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Keywords:
(1) Variational methods
(2) Eigenvalues
(3) p(x)-biharmonic operator
(4) p(x)-Laplacian operator
(5) Sobolev space
(6) Symmetric mountain pass lemma

Abstract

In this work, we study the existence of infinitely many weak solutions of the following problem involving both p(x)-Laplacian and p(x)-Biharmonic operators

$$(P_\lambda):\begin{cases} \Delta^2_{p(x)} - \Delta_{p(x)} - a(x)|u|^{\alpha(x)-2}u = \\ \lambda\left(b_1(x)|u|^{\beta(x)-2}u - b_2(x)|u|^{\gamma(x)-2}u\right) \\ u \in W^{2,p(.)}(\Omega) \cap W_0^{1,p(.)}(\Omega), \end{cases}$$

where Ω is a bounded domain of $IR^N$with smooth boundary, λ is a positive real, $p, \alpha, \beta$and γ are continuous functions on $\overline{\Omega}$, $\Delta_{p(x)}u = div\left(|\nabla u|^{p(x)-2}\nabla u\right)$ is the p(x)-Laplacian operator, $\Delta^2_{p(x)}u = \Delta\left(|\Delta u|^{p(x)-2}\Delta u\right)$ is the fourth order differential operator called p(x)-biharmonic, $a \in C(\overline{\Omega})$, $b_1 \in L^{s_1(x)}(\Omega)$ and $b_2 \in L^{s_2(x)}(\Omega)$ with s_1, $s_2 \in C_+(\Omega)$ and a, b_1 and b_2 are nonnegative functions. In the proof of our main result, we use variational methods and the known symmetric mountain pass lemma.

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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On estimates for the first Hankel-Clifford transform

Communication Info

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Keywords:
(1) First Hankel-Clifford transform
(2) generalized translation operator

Abstract

In this work, we obtain new inequalities for the first Hankel-Clifford transform in the space L^2 ((0, +∞), x μ), μ ≥ 0, using a generalized translation operator for proving these estimates in certain classes of functions characterized by a generalized continuity modulus.

In [1,2], Abilov et al. proved two estimates for the Fourier transform and for the Bessel transform on certain classes of functions characterized by the generalized continuity modulus. In this work, we prove the generalization of Abilov's results in the first Hankel-Clifford transform on the interval (0,+∞). For this work, we use a generalized translation operator. We point out that similar results have been established in the Jacobi transform and the Dunkl transform (see [5]). Now, we collect some basic facts on the first Hankel-Clifford transform, and more details about this transform can be found in [4]. Assume that $L^P_\mu = L^P_\mu((0,+\infty))$, $p \in [1, +\infty)$ and $\mu \geq 0$, as the space of all those real-valued measurable functions f on (0, +∞), such that $\|f\|_{L^P_\mu} = \int_0^\infty |f(x)|^P x^\mu dx < \infty$.

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Existence results for a class of Steklov problems with $(p(x), q(x))$ −Laplacian

Communication Info

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Abstract

This work discusses the elliptic problem

$$\begin{cases} -\Delta_{p(x)}(u) - \Delta_{q(x)}(u) = \lambda(x) f(x,u) & in\ \Omega \\ \left(|\nabla u|^{p(x)-2} + |\nabla u|^{q(x)-2}\right)\dfrac{\partial u}{\partial \nu} + |u|^{p(x)-2} + |u|^{q(x)-2} = \mu(x) g(x,u) & on\ \partial\Omega, \end{cases}$$

where $\Omega \subset \mathbb{R}^N$ $(N \geq 3)$ is a bounded domain with smooth boundary $\partial\Omega$ and ν is the unit outward normal vector on $\partial\Omega$. $p, q: \Omega \to \mathbb{R}$ are continuous functions such that $q(x) < p(x)$ for all $x \in \overline{\Omega}$. $\lambda \not\equiv 0, \mu \not\equiv 0, f: \Omega \times \mathbb{R} \to \mathbb{R}$ and $g: \partial\Omega \times \mathbb{R} \to \mathbb{R}$ are Carathéodory functions fulfilling appropriate conditions.

We show the existence of two nontrivial weak solutions, using mountain pass theorem (AR) and Ekeland's variational principle.

Keywords:
(1) $(p(x), q(x))$-Laplacian operator
(2) Steklov eigenvalue problem
(3) Ekeland's variational principle
(4) Mountain Pass Theorem

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Bounded positive solutions of a fractional iterative differential boundary value problem with an integral conditions

Communication Info

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Keywords:
Positive solutions
Fractional iterative differential equations
Schauder's fixed point

Abstract

iterative differential equation often arises in the modeling of a wide range of natural phenomena Such as disease transmission models in epidemiology, two body problem of classical electrodynamics, population models, physical models, mechanical models and other numerous models.

This work deals with a class of fractional order differential equation with iterative source terms and integral conditions. Some new results on the existence, uniqueness and continuous dependence of bounded positive solutions are established by virtue of Schauder's fixed point theorem and some properties of conformable fractional derivative. The main idea consists to convert the considered equation into an integral one before using fixed point theorem. Finally, we present an example to illustrate our main results

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Théorèmes de type Liouville pour les solutions stables à l'infini du système de Lane Emden

Communication Info

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Keywords:
(1) Systéme de Lane-Emden
(2) Solutions stables
(3) Stabilité en dehors d'un compact
(4) Equation *m*-biharmonique

Abstract

On considère le système de Lane-Emden

$$-\Delta u = v^p, \quad -\Delta v = u^\theta$$

dans R^N, on a répondu d'une manière positive à cette question : Tout en posant une condition additionnelle : (u, v) est une solution stable à l'infini, peut-on prouver la conjecture suivante du système de Lane-Emden:

Soit p, θ> 0. Si (p, θ) est sous-critique, i.e. Si (p,θ) satisfait

$$\frac{1}{p+1}+\frac{1}{\theta+1}>\frac{N-2}{N} \Rightarrow N < 2+\alpha+\beta \; avec$$

$$\alpha=\frac{2(p+1)}{p\theta-1}, \quad \beta=\frac{2(\theta+1)}{p\theta-1}, \quad p\theta>1$$

alors il n'existe pas de solutions pour le système ?.

On a obtenu des résultats de classification pour les solutions (radiales ou non) pour le système, qui sont juste stables à l'infini, et on a traité le cas où p, θ sont autorisés d'être inférieur à 1.

Un point clé pour notre approche est de remarquer une relation entre la stabilité du système et la stabilité de l'équation m-biharmonique

$$\Delta_m^2 u := \Delta(|\Delta u|^{m-2}\Delta u) = |u|^{\theta-1}u$$

Cela nous a permis de traiter le cas 0 < p < 1. Nos résultats améliorent quelques Travaux précédents [1],[2],[3],[4] et [5]

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ICRAMCS 2022

FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Random Coupled Systems of Fractional Integro-Differential equations with Fixed and Nonlocal Anti-Periodic Boundary Conditions

Communication Info

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Keywords:
(1) Fractional integro-differential system.
(2) Coupled system.
(3) Generalized Banach space.
(4) Random solution.

Abstract

Functional differential equations with random effects are stochastic generalizations of (classical) Functional differential equations and play a fundamental role in the theory of random dynamical systems. Slama et al. [4] investigated the existence, uniqueness and stability of solutions for coupled system of two Caputo fractional derivatives of different orders and a Riemann - Liouville type integral nonlinearity with Fixed and Nonlocal Anti-Periodic Boundary Conditions. Abbas et al. [1] give some existence and uniqueness result of random solutions for some coupled systems of Hilfer and Hilfer–Hadamard fractional differential equations with random effects. In the present paper, we investigate the existence of solutions for random coupled systems of fractional integro-differential equations with fixed and nonlocal anti-periodic boundary conditions.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Existance of weak solution for p-Kirchoff type problem by topological degree

Communication Info

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Keywords:
(1) Kirchho-type problems,
(2) Sobolev spaces,
(3) Berkovits topological degree

Abstract

In the present paper, we use the topological degre methods of Berkovits to prove the existence of weak solutions of the following p-Kirchhoff type problems with Dirichlet boundary condition 1)1

$$-M\left(\int_{\Omega}(A(x,\nabla u)+\frac{1}{p}|\nabla u|^{p})dx\right)\left[\operatorname{div}a(x,\nabla u)-|\nabla u|^{p-2}\nabla u\right]=\lambda H(x,u,\nabla u)$$

Where Ω is a smooth bounded domain, M is a positive function and H, a are the Carathéodory's functions that satisfy some assumptions. His equation is an extension of the classical d'Alembert's wave equation that takes into account the effects of length changes of the string produced by transverse vibrations. The problem (1) models several physical and biological systems where u describes a process which depends on the average of itself, such as the population identity, see [1].

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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On the nonlocal impulsive psi-Hilfer hybrid fractional differential equation

Communication Info

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Keywords:

(1) ψ-Hilfer derivative
(2) Nonlocal conditions
(3) Impulsive conditions

Abstract

Quadratic perturbations of nonlinear differential equations have attracted the attention of several authors. Differential equations perturbed in this way are called hybrid differential equations. These equations are interesting equations that form another step for solving problems in modeling field.

Impulsive differential equations are used to describe the evolutionary processes which abruptly change state at some point. This subject has received great importance and remarkable attention from researchers due to its rich theory and its applicability in various branches of science and technology.

In this work, we studied the existence of solutions and estimates on solutions of the nonlocal impulsive ψ-Hilfer hybrid fractional differential equation (nonlocal impulsive ψ-HHFDE). This work makes use of the classical technique of Dhage fixed point theorem. Further, an example is provided to illustrat our results.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Stepanov-Eberlein-weakly almost periodic functions and applications to some differential equations with nondense domain

Communication Info

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Keywords:
(1) Differential equations of neutral type
(2) Nondense domain
(3) Hille-Yosida operator
(4) Eberlein-weakly almost periodic functions

Abstract

In this manuscript, we use Eberlein-weakly almost periodic functions with two variable in the Stepanov sense [1] and we give a composition result. Using Banach fixed-point theorem and the obtained composition principle, we prove the existence and uniqueness of Eberlein- weakly almost periodic solution for the partial differential equation of neutral type with nondense domain in [2] when the forcing terms are assumed to be Eberlein-weakly almost periodic in a weaker sense, namely, the Stepanov sense. Our results extend previous several works [3,4]. Some examples are given for illustration.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Stability for Neutral-Type Neural Networks Systems with Random Switches in Noise and Delay

Communication Info

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Keywords:
(1 Neural networks
(2) Markovian jump systems
(3) Lévy noise
(4) Gaussian noise
(5) Neutral-type systems
(6) Time-varying delays
(7) General decay stability

Abstract

This talk focuses on existence, uniqueness and stability analysis of solutions for a new kind of delayed Markovian switched neutral-type neural networks systems with Markovian switched noises that combines many types of neural networks studied in the literature. After having presented the studied system, existence and uniqueness of solutions are shown under a Lipschitz condition. By using the Lyapunov Krasovkii functional, some stochastic analysis techniques and the M-matrix approach, stochastic and general decay stabilities are established. Finally, a numerical example is given to validate the main established theoretical results.

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A new hybrid matrix metaheuristic for solving job shop scheduling problem

Communication Info

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Keywords:
(1) Job Shop Scheduling Problem
(2) Metaheuristics
(3) Combinatorial optimization

Abstract

The deterministic Job Shop Scheduling Problem (JSSP) [1] is a well-known combinatorial optimization problem in operations research, and is omnipresent in many application domains as manufacturing, network and supply chains. JSSP is an NP-hard problem [2]. Therefore, finding optimal schedules to JSSP is very time consuming and usually impractical. Generally, we try to find a near-optimal solution using some heuristics, known as dispatching rules [3], or metaheuristics [4] such as Simulated Annealing, Tabu Search [5], ACO and Genetic Algorithms [12]. In this paper, we interest to the job-shop scheduling problem with minimizing makespan as objective. The purpose of this research is to propose a new hybrid matrix metaheuristic based on the iterated local search and a new matrix heuristic using permutational coding with repetition. Therefore, the need to choose appropriate neighborhood structure appears. Simulation is used to evaluate the quality of our metaheuristic.

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Tournaments with maximum number of diamonds.

Communication Info

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Keywords:
(1) Tournaments
(2) Diamonds
(3) Skew-conference matrices
(4) EW-matrices
(5) Spectrum

Abstract

A *diamond* is a 4-tournament which consists of a vertex dominating or dominated by a 3-cycle. Assuming the existence of skew-conference matrices, we give a complete characterization of n-tournaments with the maximum number of diamonds when $n \equiv 0 \pmod 4$ and $n \equiv 3 \pmod 4$. For $n \equiv 2 \pmod 4$, we obtain an upper bound on the number of diamonds in an n-tournament and we give a matricial characterization of tournaments achieving this bound.

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Biharmonic Homomorphism Between 3-dimensional Lie Groups

Communication Info

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Keywords:
(1) Harmonic maps
(2) Lie groups
(3) Biharmonic maps

Abstract

The theory of harmonic maps is old and rich and has gained a growing interest in the last decade. The theory of harmonic maps into Lie groups has been extensively studied related homomorphism in compact Lie groups by many mathematicians, in particular, harmonic maps into Lie groups and harmonic inner automorphisms of compact connected semi-simple Lie groups and intensively study harmonic and biharmonic homomorphisms between Riemannian Lie groups equipped with a left invariant Riemannian metric.

The author studied the classification, up to a conjugation by automorphism of Lie groups, of harmonic and biharmonic maps. The Lie group is unimodular if every left Haar measure is right Haar measure and vice versa.

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ICRAMCS 2022
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Strategic joining in the unobservable M/M/1 queue with differentiated vacations

Communication Info

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Keywords:
(1) Queueing systems
(2) Vacations
(3) Equilibrium strategies
(4)Social benefit.

Abstract

We study the strategic behavior of customers based on a reward-cost structure in a single server queueing system with differentiated vacations. The server takes type 1 vacation after a busy period and type 2 vacation after returning from a vacation (type 1 or type 2), and there is no customer waiting in the system. The customers decide whether to join or not the queue based on the available information upon their arrival. We consider two cases: Almost Unobservable case and Fully Unobservable case. For each case, we evaluate the equilibrium strategies and analyze the stationary behavior of the system. Through numerical results, we show the impact of information level and some system parameters on the joining probabilities and social benefit.

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THE MARKOVIAN BERNOULLI QUEUES WITH OPERATIONAL SERVER VACATION, STRONG DISASTER, AND LINEAR IMPATIENT CUSTOMERS.

Communication Info

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Keywords:
(1) Impatient time
(2) Bernoulli feedback
(3) Operational server vacation
(4) Generating function
(5) performance measures

Abstract

This paper studies the stationary analysis of a Markovian queueing system with bernoulli feedback, interruption vacation, linear impatient customers, strong disaster during the server's operational vacation period. Each customer has its own impatience time and abandons the system as soon as that time ends. When the queue is not empty, the server's operational vacation can be interrupted if the service is completed and the server starts a busy period with a probability $\bar{q}$ or continues the operational vacation with a probability q. A strong disaster forces simultaneously all present customers (waiting and served) to abandon the system permanently. We analyze this proposed model and derive the probabilities generating functions of the number of customers present in the system together with explicit expressions of some performance measures. Finally, numerical results are presented to show the influence of the system parameters measurements.

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Kendall interaction filter for variable interaction screening in high dimensional classification

Communication Info

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Keywords:
(1) Interaction screening
(2) Dimension reduction
(3) Classification
(4) Features ranking

Abstract

Accounting for important interaction effects can improve the prediction of many statistical learning models. In this work, we develop a new model-free interaction screening method, termed Kendall Interaction Filter (KIF), for the classification in high-dimensional settings. KIF method suggests a weighted-sum measure, which compares the overall to the within-cluster Kendall's tau of pairs of predictors, to select interactive couples of features. The proposed KIF measure captures relevant interactions for the clusters response-variable, handles continuous, categorical or a mixture of continuous-categorical features, and is invariant under monotonic transformations. We show that KIF enjoys theoretical consistency results and behaves favorably in the conducted empirical studies.

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M/G/1 Retrial Queue with Negative Arrivals And Unreliable server

Communication Info

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Keywords:
(1) Reliability
(2) Negative Arrivals
(3) Retrial Queues
(4) Stastionary distribution
(5) Passive and active breakdowns

Abstract

In this paper, we study a new version of an unreliable retrial queueing system with negative arrivals. We obtain the joint distribution of the server state and the number of orbiting customers in the system in term of generating functions using the supplementary variable method. Some performance measures are derived. From the reliability view point, we analyse the time to the first failure of the server through its relialibiliy function.

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Asymptotic properties for partial sums of LNQD random process and application in time series

Communication Info

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Keywords:
(1) Probability tail
(2) Exponential inequalities
(3) Complete convergence
(4) LNQD Random process
(5) Time series models

Abstract

The main purpose of this paper, is to discuss the complete convergence for sums of rowwise linearly negative quadrant dependent (LNQD, in short) random variables under suitable conditions, since independent and identically random variables are a special case of linearly negative quadrant dependent random variables. The exponential inequality plays an important role in various proofs of limit theorems. In particular, it provides a measure of the complete convergence for partial sums. The exponential inequality for negatively associated (NA, in short) random variables has been studied by many authors ; see, for example, [1-3], and so forth.

The main purpose of this work is to extend the exponential inequality for NA random variables to the case of LNQD random variables. Obtained result used in some time series process.

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Reliability for Zeghdoudi Distribution with an Outlier and Application

Communication Info

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Keywords:
(1) Zeghdoudi Distribution.

(2) Maximum Likelihood Estimator.

(3) Newton-Raphson Method,

(4) Outlier.

Abstract

This paper deals with the problem of estimating Reliability $P[Y < X]$where Y has zeghdoudi distribution with parameter a and X has zeghdoudi distribution with presence of one outlier with parameter c and the remaining $(n-1)$ random variables are from zeghdoudi distribution with parameter b. such that X and Y are independent. The maximum likelihood estimator of R is derived and some results of simulation studies are presented. At the end, we give an illustrative application of Zeghdoudi distribution with other distributions to show the flexibility of this distribution.

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Periodic solutions of Random nonlinear evolution inclusion in Banach spaces

Communication Info

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Keywords:
(1) evolution inclusion
(2) random integral solution
(3) periodic problem
(4) m-accretive operator.
(5) multivalued map
(6) continuous selection.

Abstract

In this paper, we present the existence results of random integral solutions of random periodic multivalued problems of the form

$$\begin{cases} x'(\omega,t) \in A(\omega)x(\omega,t) + F(\omega,t,x(\omega,t)), & t \in T := [0,b], \\ x(\omega,0) = x(\omega,b), & \omega \in \Omega \end{cases}$$

Where for every $\omega \in \Omega$, $A(\omega)$ is an m-accretive operator in a refexive Banach space X and $F : \Omega \times T \times X \to P(X)$ is a random multivalued map(perturbation).

In our work, we study three results of existence. First, when the multivalued nonlinearity is convex-valued, the second result when the multivalued is nonconvex-valued and finally, we study the existence for the set of extreme points of the multivalued.

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Local asymptotic normality for the FAR (1) with a periodic coefficient

Communication Info

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Keywords:
(1) Fractional autoregressive process
(2) Periodic coefficient
(3) LAN property
(4) Long memory
(5) Short memory

Abstract

This work is devoted to prove that the fractional autoregressive model of first order verifies the general condition of the local asymptotic normality (LAN).
Our model is a generalization case of the models proposed in 1987 by Gonçalves.
Firstly, we show the causality and invertibility conditions which prepare the way to prove the theoretical results then we conduct a simulation study to check the validity of the results presented

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Amelioration of the James-Stein estimator

Communication Info

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Keywords:
(1) James-Stein estimator
(2) Multivariate normal mean
(3) Shrinkage estimators
(4) balanced loss function

Abstract

In this work, we investigate the problem of estimating the mean of a multivariate normal distribution. We use shrinkage estimators includes the James-Stein estimator introduced by James and Stein [1], which are known to dominate the Maximum Likelihood Estimator (MLE) under mean square loss. However we consider a balanced loss function which weights the mean square loss and distance from the MLE. First, we establish the minimaxity property of the James–Stein estimator. Secondly, we deal with shrinkage estimators, different from the one obtained in Hamdaoui [2] and Benkhaled et al [3], which are not only minimax but also dominate the James-Stein estimator. In the end, we graphically illustrate some results given in this work.

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Performance analysis of a repairable system with mixed standbys via Generalized Stochastic Petri Nets

Communication Info

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Keywords:
(1) Generalized Stochastic Petri Nets
(2) Standby Redundancy
(3) Performance Measures

Abstract

Standby redundancy is a technique widely used to improve system reliability and availability. In general, standby components are classified into three types according to their failure rates: i) cold standby, ii) warm standby, and iii) hot standby. In this work, we study a repairable K-out-of-n retrial machine system with warm and cold standby components through a Generalized Stochastic Petri Net (GSPN). We assume that there are three reliable repairers. The life times of primary components and warm components are assumed to be exponentially distributed. A failed component is repaired immediately if at least one repairer is free; otherwise the failed component joins an orbit and waits for repair. From the GSPN and its tangible Reachability Set, we derive a Continuous Time Markov Chain. Then we obtain the main stationary probabilities and some performance measures.

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Statistical Inference for Models Driven by nth-Order Fractional Brownian Motion

Communication Info

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Keywords:
(1) fractional process.
(2) n order fractional. Brownian motion.
(3) Maximum likelihood estimator

Abstract

We consider the following stochastic equation

$$X(t) = \mu t + \sigma \int_0^t \varphi(s) dB_H^n(s), \quad t \geq 0.$$

where $\varphi(t)$ is a known function and $B_H^n(t)$ is the nth-order fractional Brownian motion as defined in [1]. We study the asymptotic behavior of estimators of the unknown parameters μ and σ^2 as the number of observations becomes sufficiently large. Two classes of estimators are presented and shown to verify both the consistency and the asymptotic normality when the number of observations tends to infinity.

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A non-parametric estimation of the conditional high-risk point for associated and functional data

Communication Info

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Keywords:
(1) maximum hazard function
(2) non parametric
(3) associated data

Abstract

The maximum of the conditional hazard function is a parameter of great importance in statistics studies, because it constitutes the maximum risk of occurrence of an earthquake in a given interval of time. Using the kernel non parametric estimates by Ferraty et al. [5], of the first derivative of the conditional hazard function,
The main contribution of this work is the study of The maximum of the conditional hazard function of the estimator of the conditional hazard function in case of associated data.
we establish a convergence properties of an estimate of the maximum in the context of associated and functional data.

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New lights on the correlation matrix implied by a recursive path model

Communication Info

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Keywords:
(1) Path analysis
(2) Finite Iterative Method
(3) Implied correlation matrix

Abstract

Path analysis is a statistical method for studying the causal relationships between standardized observed variables [1]. The specification and the estimation steps are crucial in the whole process. In fact, the relationships between variables and their status are specified. In addition, the model's parameters are estimated based on the so-called correlation matrix implied by the model [2-3]. Two methods are available to compute this matrix: Jöreskog's method and the finite iterative method. Many researchers recommend that the variances of all observed variables be fixed [4-5]. For instance, diagonal elements are equal to 1. As a consequence, the present paper aims to show that the two methods are identical. Furthermore, numerical studies and empirical simulations illustrating the advantages of this recommendation are also given.

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A γ-power stochastic Lundqvist-Korf diffusion process: Computational aspects and simulation

Communication Info

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Keywords:
(1) Stochastic Lundqvist-Korf diffusion process
(2) Maximum likelihood estimation
(3) Simulated annealing method
(4) Statistical inference in diffusion process
(5) Simulation

Abstract

In this work, we study a new stochastic γ-power Lundqvist-Korf diffusion process, defined from a non-homogeneous Lundqvist-Korf diffusion process [1]. First, we determine the probabilistic characteristics of the process, such as its analytic expression, the transition probability density function from the corresponding Ito stochastic differential equation [4] and obtain the conditional and non-conditional mean functions. We then study the statistical inference in this process [6]. The parameters of this process are estimated by using the maximum likelihood estimation method with discrete sampling [5], thus we obtain a nonlinear equation, which is achieved via the simulated annealing algorithm [2,3]. Finally, the proposed model is applied to simulated data.

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ICRAMCS 2020

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A stochastic threshold to predict extinction and persistence of a model SIRI with a general incidence rate

Communication Info

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Keywords:
(1) Stochastic perturbations,
(2) Extinction of disease,
(3) Persistence of disease
(4) General incidence rate.

Abstract

we present a stochastic epidemic model of SIRI with non-linear relapse. We demonstrate the necessary and sufficient conditions for the extinction and persistence of the disease. We also investigate the existence of a stationary distribution and the ergodicity of solutions. As a particular case of our procedure, under some conditions on the density of the noise, we extract the threshold $\mathcal{R}_{S}(g)$ for the disease. We shall focus in this work on a more detailed analysis of a stochastic epidemic model with a global incidence rate $g(S)I$. In addition, we will discuss the critical state of the situation when $\mathcal{R}_{s}(g)=1$. Finally, we will also provide some computer simulations to explain our theory of the findings as provided by different types of g functions.

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ICRAMCS 2022
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Generalized backwards stochastic differential equations with jumps in a general filtration

Communication Info

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Keywords:
(1) Generalized backwards stochastic differential equations.
(2) General filtration.
(3) Random measure.

Abstract

Generalized backward stochastic differential equations (GBSDE) is a class of backwards studied first by E.Pardoux and S.Zhang [1] where the filtration is generated by a Brownian motion, and next by E.Pardoux [2] for the discontinuous case. Both of this papers gives the existence and uniqueness results of this equations also a probabilistic formula for solutions of semilinear partial differential equations with Neuman boundary condition is presented in [1].
In this communication we study GBSDE with jumps in general filtration that supports a Brownian motion and a random measure. We give the existence and uniqueness results for this type of BSDE with generators monotone in y.

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Nonparametric estimation for fractional Black-Scholes processes with random effects

Communication Info

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Keywords:
(1) Random effects model
(2) Fractional Brownian motion
(3) Density estimator

Abstract

We present the problem of estimating the density from Stochastic Differential Equations with drift depending on random effects driven by normalized fractional Brownian motion. We extend the existing works given by El Omari et al. [1–3], which considered the problem of stochastic differential equations with random effects driven by fractional Brownian motion, but the Hurst parameter is considered known on the range (1/2,1). In this communication, we build estimators of density based on deconvolution tools that estimators depend on two tuning parameters which were selected in a data-driven way and study their mean integrated squared error when Hurst parameter H belongs to (0,1) and the number of subjects N tends to infinity.

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New Tail Probability Type Concentration Inequalities And Complete Convergence For END Random Variables

Communication Info

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Keywords:
(1) Concentration inequalities
(2) END sequence
(3) Complete convergence

Abstract

Let $\{Z_n, n\geq 1\}$ be negatively extended-dependent (END) random variables**.** The concept of general extended negative dependence (END, in short) random variables was proposed by [3] and The concept of complete convergence was given first by [1], In generally we can refer to [2] and [5]. The goal of this paper is to obtain some concentration inequalities for unbounded extended negatively dependent random variables by using the exponential inequalities see [4], Then we will use this concentration inequality for establishing the almost complete convergence for a sequence of extended negatively dependent random variables (END). We will applying these results to a linear model AR(1).

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Sequential estimation of a conditional probability

Communication Info

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Keywords:
(1) Conditional probability
(2) Stochastic approximation
(3) Conditional expectation

Abstract

The use of conditional probabilities has gained in popularity in various fields such as medicine, finance, imaging processing, and so on. This has occurred especially with the availability of large datasets that allow us to extract the full potential of the available estimation algorithms. Nevertheless, such a large volume of data is often accompanied by a significant need for computational capacity as well as a consequent compilation time. In this article, we propose a low-cost estimation method based on the stochastic approximation, which was proposed in Robbins Monro [1] and developed by professor Bennar [2], to replace the classical estimation method proposed in [3] and developed in [4-6]. We first demonstrate analytically the convergence of our method to the desired probability, then we perform a simulation to support our point.

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APPROXIMATE CONTROLLABILITY OF IMPULSIVE FRACTIONAL STOCHASTIC FUNCTIONAL DIFFERENTIAL EQUATIONS DRIVEN BY FRACTIONAL BROWNIAN MOTION WITH INFINITE DELAY

Communication Info

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Keywords:
(1) Approximate controllability,
(2) fractional Brownian motion.
(3) fractional neutral functional differential equations,

Abstract

In this paper, by using fractional power of operators and Schaefer's fixed point theorem, we study the approximate controllability of impulsive fractional stochastic functional differential equations with infinite delay driven by fractional Brownian motion in a real separable Hilbert space. As application, an example is provided to illustrate the obtained results.

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Modélisation des matières premières par un modèle de vasiček à volatilité stochastique.

Communication Info

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Keywords:
(1) Modélisation stochastique en finance
(2) Programmation mathématique
(3) Estimation de la volatilité

Abstract

En finance , le modèle de vasiček introduit par Alfons Vasiček[1], est un modèle mathématique décrivant l'évolution et les mouvements des taux d'intérêt et peut également être considéré dans sa version exponentielle, (modèle de Schwartz[5]), comme un modèle d'investissement stochastique , pour plus de détails sur ce modèle ,voir le livre de Vasiček[2]. Dans cette communication, nous présentons un travail de modélisation des matières premières par un modèle de vasiček à volatilité stochastique : une application à l'OR(XAU/USD), le but est d'étudier la volatilité [3,4]des prix de MP en utilisant deux méthodes , Method of Conditional Moments et Variance des rendements. Après la réalisation des calculs et d'observations nous avons constaté que la méthode MCM a été plus précise pour nos données sur le prix de l'Or. Nous avons effectué des prévisions qu'on a inséré dans le processus de Vasicek afin de générer les ln(St) ce qui nous a permis de faire des comparaisons afin de prendre des décisions intéressante au niveau de marché de MP.

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A non-homogeneous Vasicek diffusion model wih time depending in the speed mean reversion factor

Communication Info

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Keywords:
(1) Likelihood estimation
(2) Non-homogeneous Vasicek diffusion process
(3) Trend analysis

Abstract

The Vasicek stochastic model and its diverse extensions (the homogeneous and non-homogeneous cases) play an important role in modelling significant problems in the field of stochastic economics and finance, and especially in that of models of the short-term interest rate. This work aims to study a new stochastic model, based on a Vasicek non-homogeneous diffusion process, in which in the drift coefficient, the speed of mean reversion factor depends on deterministic time function. From the corresponding Itô stochastic differential equation, we obtain the probabilistic characteristics of the model as the transition probability density function and the trend functions. Finally, the statistical inference of the parameter is studied by considering discrete sampling and using the maximum likelihood method.

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Estimating Reliability of a Stress–Strength Model using Reciprocal Inverse Gaussian kernel

Communication Info

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Keywords:
(1) Stress-Strength
(2) Reliability
(3) Reciprocal Inverse Gaussian kernel (RIG)
(4) Bandwidth parameter

Abstract

Consider the problem of nonparametric estimation of system reliability R defined as R = P(X > Y) named as Stress-Strength reliability, where X and Y are random variables representing respectively, strength of a component and stress applied toit. Different parametric estimators are proposed, namely the maximum likelihood estimator, uniformly minimum variance unbiased estimator (UMVUE), and the Bayesian estimate of R, see for example, [1,2,3,4] and [5]. In this work, we have proposed a nonparametric method to estimate the reliability R of this model using the nonparametric Reciprocal Inverse Gaussian (RIG) kernel. Some asymptotic properties, such as bias, variance, and mean squared error (MSE) are established for the proposed estimator. Also, the selection of the optimal bandwidth parameter is discussed since it plays an important role in kernel estimation. Performances of the estimator are illustrated by simulation study.

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MODELISATION DES ACCIDENTS DE TRAVAIL GRAVES PAR LA THEORIE DES VALEURS EXTRÊMES

Communication Info

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Keywords:
(1) Sinistre grave
(2) Théorie des valeurs extrêmes
(3) lois hybrides (tronquées)

Abstract

L'objectif de cette étude est de modéliser les sinistres extrêmes, en particulier les accidents de travail à Tissemsilt avec une approche probabiliste, nous nous posons d'abord la question des critères pour définir un sinistre comme "extrême", soit le seuil à partir duquel un sinistre est considéré comme extrême. En général deux types de sinistres sont distingués : d'une part les sinistres graves à coût élevé et faible fréquence et d'autre part, les sinistres attritionnels à coût faible et fréquence élevée. Ce seuil doit être suffisamment grand pour pouvoir utiliser les résultats asymptotiques de la Théorie des Valeurs Extrêmes (TVE), mais pas trop élevé pour obtenir des estimations précises. Dans ce sens, plusieurs méthodes de détection du seuil ont été proposées par la théorie des valeurs extrêmes, nous verrons tout d'abord le QQ-plot pour détecter l'existence d'une queue épaisse, ensuite des méthodes graphiques classiques telles que : Mean-Excess Plot, Hill-Plot, QQ-estimateur et aussi une méthode analytique, analyse par scénario basé sur les avis des experts et la statistique bayésienne. Après avoir défini les seuils et répartir les sinistres en différentes catégories, nous allons analyser la fréquence et le coût des accidents de travail à Tissemsilt pour l'intérêt : d'une part de modéliser les sinistres graves séparément avec des lois hybrides (tronquées) afin d'estimer leur charge.

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An $M/M^{K}/1$ queue subject to two Bernoulli catastrophes with multiple vacation

Communication Info

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Keywords:
(1) Batch service
(2) Bernoulli catastrophe
(3) Multiple vacation
(4) Generating function
(5) System performance measures

Abstract

We have analyzed an $M/M^{K}/1$ subject to two different Bernoulli catastrophes under multiple vacation policy. We assume that initially there are K customers in the system, so thier service starts directly. We assume that catastrophes can occur when the server is in service (with probability p) or when it is on vacation (with probability q). This proposed model is solved using the appropriate generating functions, which gives steady state probabilities and some performance measures. Numerical results are sketched out to illustrate the effect of the system parameters on the main performance measures.

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Mean-field Reflected BSDEs with Infinite Horizon and Applications

Communication Info

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Keywords:
(1) Reflected BSDEs
(2) Mean-field
(3) Hamiltonian
(4) stochastic control

Abstract

We prove existence and uniqueness results of the solution for mean-field reflected backward stochastic differential equations (MF-RBSDE) with infinite horizon under a Lipschitz condition on the coefficient. Using the Snell envelope theory connected with the contraction method. We also apply these results to get the existence of optimal control strategy for the mean-field mixed stochastic control problem in infinite horizon. Moreover, Suppose that we have a system, whose evolution is described by the process X, which has an effect on the wealth of a controller. On the other hand the controller has no influence on the system. The process X may represent, for example, the price of an asset on the market and the controller a small share holder or a small investor. The controller acts to protect his advantages by means of $u \in U$ via the probability P^u, here U is the set of admissible controls. On the other hand he has also the possibility at any time $\tau \in \Im$ to stop controlling. The control is not free.

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Markovian lift for robust control of misspecified non-Markovian Gaussian SDE

Communication Info

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Keywords:
(1) Superposition of Ornstein-Uhlenbeck processes
(2) Integral-operator Riccati equation
(3) Seasonally varying river water temperature

Abstract

Markovian lift is a novel mathematical technique to embed a non-Markovian process to a Markovian one at the sacrifice of increasing the degree-of-freedom [1]. We consider a new optimal control problem of a non-Markovian linear stochastic differential equation (SDE) modeling river water temperature with its application to fisheries. Applying a Markovian lift to the SDE successfully leads to a system of finite-dimensional Markovian SDEs being consistent with the original one in the sense of law. This Markovian lift also enables us to obtain a numerically computable operator Riccati equation for a robust linear-quadratic control of the water temperature under the fear of model misspecification [2]. We provide several critical cautions on well-posedness and unresolved issues of the control problem. We finally apply the proposed model to an existing mountainous river.

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Stochastic endogenous economic growth model and GDP at risk calculus in Moroccan case

Communication Info

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Keywords:
(1) Endogenous Growth Theory
(2) Stochastic Modeling
(3) Technology Shock

Abstract

The aim of an aggregate economy is to minimize the distance between the Real Business Cycle (RBC) represented by the outputs' time path, and its trend line. The contribution of Mankiw et al. [4] who developed the Solow [6] exogenous model showed the importance of endogenous modeling by adding human capital first proposed by Lucas [3]. The challenge of this work is to develop a model of Gross Domestic Product (GDP) that verifies both the introduction of all the variables defining the determinants of (AD/AS) graph shifts and that takes into account the fluctuations around the quantity of full employment of resources throughout time, that are not captured by deterministic modeling. Our main result shows that by relying on the accumulation and shock of Productivity, we better approximate the real GDP outputs' time path.

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General partitioning algorithm for computing Markov chain steady state probability

Communication Info

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Keywords:
(1 Markov chain
(2) steady-state probability
(3) perfect simulation
(4) Monte Carlo simulation
(5) CFTP algorithm

Abstract

Our paper concerns a proposition of variants in the partitioning algorithm, initially proposed T.J. Sheskin [1]. In this paper we propose a generalization of the basic partitioning algorithm for computing Markov chain steady state probabilities, and we compare it with the standard coupling from the past (CFTP) which is created by Propp and Wilson [2,3,4]. Our proposal, besides being a mathematical curiosity, it gives answer to several possible modi_cations (variations) suggested, by the author of this algorithm.

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Viscosity Solutions of PDE with nonlinear Neumann Boundary Conditions and Reflected Generalized BSDE with two completely separated obstacles

Communication Info

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Keywords:
(1) Generalized BSDE
(2) Completely separated barriers
(3) Viscosity solutions
(4) PDE with Neumann Boundary Conditions

Abstract

In order to provide a probabilistic representation for a solution of a system of parabolic or elliptic semi-linear PDEs with Neumann boundary condition, Pardoux and Zhang in [1] introduced a new class of BSDE called Generalized BSDE. The kind of GBSDE with two reflecting barriers studied in [2] which the authors have proved under a monotonicity condition of the generators and a similar condition of the Mokobodski's, existence and uniqueness of the solution using a penalization method and they gave a probabilistic interpretation for a viscosity solution of a double obstacle PDE with Neumann boundary conditions. In this communication we present a general result of uniqueness and existence of the solution of the GBSDE with two reflecting barriers where those barriers are completely separated. As in application we prove that this solution is the unique viscosity solution of a problem with obstacles of PDE with Nonlinear Neumann Boundary condition.

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ICRAMCS 2022
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Effect of local thermal non-equilibrium on thermal boundary conditions in porous media

Communication Info

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Keywords:
(1) Local thermal non-equilibrium
(2) Range-Kutta solver
(3) Linear stability analysis

Abstract

The thermal boundary conditions with the local thermal non-equilibrium (LTNE) regime in porous media differentiate from those described for equilibrium one (LTE) [1-3]. Whatever the type of these boundaries in an LTNE the marginal stability curve may tend to behave as same as those of LTE if the two non-dimensional numbers H and γ result of the discrepancy in thermal conductivities of phases and the loss or gain of heat from one phase to another have specific values or limits [4-5]. The objective of this work is to analyze the problem of Lagziri et al. [4], by modelling the fluid phase at both rigid walls as adiabatic conditions. The difference between the temperature profile of the two phases leads to the appearance of the LTNE. The governing equations are handled via the normal modes method and the resulting eigenvalues problem is solved by using analytical and numerical procedures.

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The S-flat topology

Communication Info

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Keywords:
(1) S-prime spectrum
(2) S-Zariski topology
(3) S-flat topology

Abstract

For a commutative ring R with non-zero unit and a multiplicatively closed subset S of R, we introduce a new topology on the S-prime spectrum Spec_S R of R called the S-flat topology which is a generalization of the flat topology. If we take S a subset of the set of units in R, then the two topologies are equal. The algebraic descriptions of the topological properties like compactness irreducibility and Noetherianess are investigated. For instance, it is shown that every closed S-Zarisky is quasi-compact with respect to the S-flat topology and every S-flat irreducible closed subset has a generic point.

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Forecasting concentration PM2.5 levels with a hybrid CNN-LSTM model

Communication Info

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Keywords:
(1 Air quality
(2) PM2.5
(3) Forecasting
(4) deep learning
(5) CNN-LSTM

Abstract

During the last many years, with the development of the urban industry. Air quality problems directly affect the normal life of residents. Among air pollutants, fine particles (PM2.5) consist of suspended particles with a diameter of 2.5 μm or less. This pollutant can damage the respiratory and cardiovascular systems of the human body. A good forecasting model, to predict the level of PM2.5 concentration, can alert and help decision-makers adopt better prevention and safety strategies in order to save citizens' lives. In this paper, a CNN-LSTM hybrid model is proposed to predict the hourly PM2.5 concentration in Beijing based on pollutants, weather data, and data from adjacent monitoring stations. To compare the overall performance of CNN-LSTM with other deep learning models, three measurement indices, mean absolute error (MAE), root mean square error (RMSE), and R-squared (R^2) are applied to the experiments of this article. Compared to the traditional prediction model, the results prove that the model proposed in this article has greater precision and greater robustness.

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A Nonlocal Model For Reconstructing Images Corrupted By Cauchy Noise

Communication Info

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Keywords:
(1) Image restoration
(2) Cauchy noise
(3)Nonlocal p-Laplacian model
(4) Variable exponent

Abstract

Image restoration has been an active research topic in image processing and computer vision for years. Most existing image denoising techniques deal with the reconstruction of images corrupted by additive Gaussian noise, However in many practical applications, the noise in image is not always additive and cannot be modeled by Gaussian noise, e.g. the Cauchy noise, is a type of impulsive degradation, which often seems in technical applications. Recently, several approaches have been proposed to deal with Cauchy noise. In [1], Chang et al. use recursive Markov random field models to deal with images corrupted by Cauchy noise. Using non-Gaussian distributions, Loza et al. [2] introduced a statistical method in the wavelet domain for tackling the image fusion problem. Their technique accomplished significant results in fusion quality and noise reduction. By combining statistical methods with denoising approaches, Wan et al [6] invented a segmentation approach dedicated to RGB images corrupted by Cauchy noise, this approach provide a satisfactory performance. Subsequently Sciacchitano et al [5] suggested a variational method based on total variation (TV) for the restoration of images corrupted by Cauchy noise. To the best of our knowledge, no one in the literature has ever studied a nonlocal model to eliminate Cauchy noise. Therefore, in this work our contribution consists in proposing a nonlocal nonlinear model for the denoising of images degraded by Cauchy noise. Inspired by [3, 4], We use the combination of the non-local p-Laplacian equation with the variable exponent as a regularization term, for restoring images corrupted with Cauchy noise, which permits the use of different diffusion types depending on each pixel of the image in order to obtain a faster denoising process. To illustrate the effectiveness of our model, we provide experimental denoising results and compare it to some existing models in the literature.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Machine Learning et Deep Learning pour la thérapie de Cancer: Etat de l'art

Communication Info

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Keywords:
(1) Diagnostic medical
(2) Artificial Intelligence
(3) Machine Learning
(4) Deep learning

Abstract

Le cancer tue chaque jour plusieurs personnes dans le monde. Cependant, identifier la maladie à un stade précoce améliore considérablement les chances de traitement et de survie. Les algorithmes de Deep Learning (DL) et Machine Learning (ML) peuvent être utilisés pour l'analyse des informations médicales et ils sont utiles dans le diagnostic médical [1]. Caballe et al. [2] ont détaillé les avantages et les restrictions de l'utilisation des techniques ML dans le diagnostic médical. Au début de l'année 2020, DeepMind, le département d'intelligence artificielle de Google, a présenté un modèle d'apprentissage profond qui a apparemment amélioré les résultats d'un radiologue normal de 11,5 % et réduit la nécessité d'une deuxième analyse [3]. L'objectif principal de cette étude est de mettre en évidence les techniques de ML et DL utilisées dans les images médicales, en particulier le cancer.

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Comparative Study of Semantic Segmentation Methods: Drone Images as a Case Study

Communication Info

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Keywords:
(1) Semantic Segmentation
(2) Convolutional Neural Networks
(3) Segmentation quality

Abstract

In this work, we propose a comparative study between some semantic segmentation methods, especially, Convolutional Neural Network methods. These techniques are able to segment the images quickly with a high precision. Our objective is to compare the semantic segmentation images among Fully Convolutional Network (FCN) [1], UNet [2,3], Pyramid scene parsing network (PSPNet)[4] and other performant models to segment images in terms of quality and execution time. We found that UNet provides the best quality with a less execution time. We applied those approaches to segment semantic drone dataset images [5].

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Predicting stock prices: a comparison between machine learning and deep learning methods

Communication Info

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Keywords:
(1) Stock price prediction
(2) Machine learning
(3) Deep learning
(4) Root mean square error
(5) Mean square error
(6) Mean absolute error

Abstract

Financial institutions (e.g. banks, insurance companies, and asset management companies), as well as individual investors, face uncertainties in investment portfolios. These uncertainties that result from fluctuations in asset prices, impact the risk level of their financial portfolios and affect the decision-making process. However, forecasting stock market trends are one of the most challenging problems for investors and researchers [1]. This is due to the nature of inventory data that is dynamic, nonlinear, nonstationary, non-parametric, and volatile [2]. Prediction of realized volatility has generally been accomplished by statistical models such as the ARIMA and HAR but is nowadays being accomplished with neural network models. The purpose of this study is to compare the predicted results of stock prices, obtained with Machine Learning and Deep Learning algorithms. Our sample is made up of stocks belonging to different industries, based on a minimum of 4000 days of historical data. The open/ high/low/close prices and the volume of stock market metrics are used to calculate new variables that serve as inputs to the model. The performance of the models was assessed using standard indicators such as RMSE, MSE, and MAE.

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Un Algorithme de filtrage collaboratif basé sur la similarité de Jaccard pour la recommandation de POI

Communication Info

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Keywords:
(1) Système de recommendatior
(2) Point d'intérêt
(3) Filtrage collaboratif
(4) Calcul de similarité

Abstract

Un systeme de recommandation de points d'intérêt (POIs) est un service basé sur la localisation, qui offre des informations relatifs aux utilisateurs. Le filtrage collaborative (FC)[1] est l'un des techniques les plus utilisés dans les systèmes de recommandation de POIs [2, 3, 5]. Dans cet article, nous nous sommes intéressés à deux points, d'abord le choix de la mesure de similarité adequate pour détecter les utilisateurs similaires, ensuite la modélisation du FC en utilisant l'historique des check-ins de l'utilisateur. Enfin, nous proposons une nouvelle méthode de recommandation de POI basé sur la similarité de jaccard [4] pour recommander une liste de POI. Nos résultats expérimentaux sur un ensemble de données collectées à partir de Foursquare [6] montrent que l'approche proposée est plus performante que les autres méthodes de de base.

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ICRAMCS 2022
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Comparative studies of the SARIMA and LSTM models for sales forecasting of a product category in a Marketplace.

Communication Info

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Keywords:
(1) Time series
(2) Sales forecasting
(3) SARIMA
(4) SARIMAX
(5) Deep learning
(6) LSTM neural networks

Abstract

Sales forecasting is an essential tool for managing a Marketplace. Its importance is reflected in the fact that it can help suppliers to analyze products or services appreciated by customers in order to increase profits and to reduce costs and returns of products. This article compares SARIMA of Box-Jenkins models to the LSTM model of recurrent neural networks to predict sales of a product category. It aims to study these models with and without exogenous variables to see their influences on prediction. These variables are sales, holidays and seasons. Before the models are implemented, the article begins with a global statistical analysis to get a general idea of the nature and the existing relationship between the variables. In order to evaluate the performance of the models, it uses RMSE and MAPE as indicators of quality.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Forecasting of coronavirus disease in Morocco using ARIMA model and Facebook PROPHET

Communication Info

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Keywords:
(1) COVID-19
(2) Pandemic
(3) ARIMA
(4) FBProphet,
(5) Time series

Abstract

According to the European Centre for Disease Prevention and Control (ECDC)1, the 2019 new coronavirus (COVID-19), which originated in China, has spread rapidly among people living in different countries and has caused almost 287 million cases worldwide.

The coronavirus disease 2019 (COVID-19), caused by the virus SARS-CoV-2, is an acute respiratory disease that the World Health Organization has classed as a pandemic (WHO)2. The abrupt increase in infection rates and high death rates have put enormous strain on public healthcare systems. It has changed our daily life both directly and indirectly. This study proposes methods to assist healthcare systems expedite the decision-making process for targeted medical treatments in a more accurate, timely, and trustworthy manner. Through the use of ARIMA and Facebook's Prophet's Prediction Model, we will try to predict the expected trend of COVID-19 in Morocco. This research compares the performance and accuracy of Facebook's Prophet Forecasting Model with ARIMA Forecasting Model using a dataset of verified cases, fatalities, and recovered patients collected from the repository by the Center for Systems Science and Engineering (CSSE)3 at Johns Hopkins University (JHU). The forecast models are then compared to the previous month's actual data to see how well they performed. Our study shows that the FBProphet model is more accurate in predicting the prevalence of COVID-19. It can help guide the government's efforts to prevent the virus spread.

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The harmonization of scientific skills for the knowledge approved by artificial intelligence

Communication Info

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Keywords:
(1) Scientific skills assessment
(2) Artificial intelligence
(3) Decision tree
(4) Innovative learning

Abstract

The development of scientific skills allows learners to have an attitude of reflection and behavior towards different pedagogical situations that may occur [1-4]. Several researchers have been interested in proposing a process for evaluating scientific skills [5] which are C_1: Appropriate, C_2: Analyze and reason, C_3: Achieve, C_4: Validate and C5: Communicate. We are interested in the weightings of these scientific skills, the objective of which is to enable the teacher to make good decisions at the appropriate time. We present the most important scientific skills for the construction of Knowledge in a given session, using artificial intelligence based on the decision tree by implementing a program in Python. We are preoccupied about all scientific skills with significant weightings in order to achieve a balanced, complete and effective teaching of scientific learning.

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ICRAMCS 2022
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Applying Data Analytics for adaptive serious games benefit

Communication

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Keywords:
(1) Serious Games
(2) Gameplay
(3) Data Analytics
(4) Learning Analytics
(5) predictive modeling

Abstract

Intended to become a reference tool for all professionals in education (formal and non-formal) and support towards employment, Serious Games have become a revolutionary educational tools for the world of professional training, they are presented as another way of learning, simple and fun through a new pedagogical practice that reduces training but brings a solid acquisition of practical knowledge for the real world. However, the adoption of Serious Games as a form of training is not always sufficient in itself, studies that focus on the analysis of data generated based on the interactions of learners / players with the Serious Games environment are essential in order to understand how the students interact with the games and how the learning process actually occurs.

Even it is possible to generate and collect data from serious games on a massive scale. However, it is much more difficult to go back to the learning activity in order to transform this information into meaningful data, which can represent a first glimpse of what happened in the player's mind. It is precisely at this level that the whole issue of the analysis of these data lies in this paper.

Based on Data Analytics Technology and predictive modeling, we examine learner in-game interactions data to build predictive model that predict the outcome of future events and interactions and generate intelligent intervention in the game process or even open up new and exciting avenues for game design improvement. This predictive modeling process involves running different techniques and algorithms from statistics and data mining.

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Predictive analysis of delivery delay risk using a fuzzy-bayesian approach

Communication Info

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Keywords:
(1) Delivery logistics
(2) Risk management
(3) Predictive analysis
(4) Bayesian network
(5) Fuzzy logic

Abstract

Although one of the major roles of delivery logistics activities is to ensure a good quality of customer service, by delivering the right product to the right place, at the right time, with a lower cost [1] and in good condition, certain risks occur quite often such as delay, damage and return of transported goods. This makes risk control and prevention one of the requirements of supply chain quality. The article focuses on the analysis of the risk of delay, which is often considered to be fundamental for the quality of service and as a center of additional costs related to the violation of time windows [2]. Such a risk can harm the image of a supplier, which can even lead to the loss of customers in case of recurrence [3]. The aim of the article is the development of a fuzzy-bayesian approach that anticipates, by predictive analysis combining Bayesian networks [4] and Fuzzy logic [5], the possible delays affecting the smooth running of a delivery operation.

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Machine Learning for Detection of fatigue, inattention and driver alertness

Communication Info

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Keywords:
(1) Neural Networks
(2) ADAS
(3) Machine Learning

Abstract

Advanced Driver Assistance Systems, or ADAS, refers to a rising range of safety features aimed at improving driver, passenger, and pedestrian safety by lowering the severity and overall number of motor vehicle accidents, they employ automated technology, to identify surrounding barriers or driver errors and react appropriately. In this context, in this article we aim to detect fatigue, inattention and vigilance from the gripping force exerted on the steering wheel, correlated with an analysis of the state of the driver's eyes. After doing a comparative study of the different regression algorithms, our work consisted in introducing data acquired from the grip force on the steering wheel in order to implement an algorithm to detect the driver's fatigue. The confirmation of the driver's condition (tired or not), will eventually generate an alert signal depending on the result obtained.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Road Safety Analysis: Severity Prediction and Important Factors of Accidents

Communication Info

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Keywords:
(1) Road Traffic Accidents
(2) Road Safety
(3) Machine Learning

Abstract

Every year, over 1.3 million people die due to Road Traffic Accidents (RTAs), and more than 2000 people die just in the United Kingdom (UK) [1], not to mention injuries, the losses related to property and infrastructures. For governments and agencies of road security, the disaster of RTAs is an important issue that requires creative solutions to be tackled. Several factors impact the number of accidents, generally, these factors are summarized on three principal axes which are data related to the accident (location, day and time, weather, …), data related to the vehicles, and data about the causalities. In this work, an open dataset published by the department for transport of the UK [2] has been analyzed. this study aims to use statistical analysis techniques, and to compare machine learning algorithms such as Decision Tree [3], Random Forests [4], and artificial neural networks [5] to predict accidents severity, number of casualties, and finally to provide an ordered list of principal causes of accidents on road.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Variables based Clustering Algorithm For Big Data

Communication Info

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Keywords:
(1) Clustering
(2) Big Data
(3) Variable Latente

Abstract

La technique de clustering [1] [2] concerne également la tâche de regrouper les variables liées en différents groupes [3]. La méthode de regroupement de variables autour de variables latentes (CLV) est une technique alternative qui permet aux variables de s'organiser en groupes homogènes pivotés par une variable latente [4] [5]. Dans notre étude, nous comparons l'efficacité de différents algorithmes CLV. Cependant, la CLV classique ne peut pas être appliquée au big data car cette approche devient fastidieuse lorsque le nombre de caractéristiques augmente. En fait, la méthode CLV fonctionne bien lorsqu'elle est appliquée à de petits ensembles de données ; principalement, c'est difficile en big data [6]. En effet, il n'est plus évident de regrouper des variables similaires pour développer une structure significative. Par conséquent, les algorithmes CLV doivent être efficaces, évolutifs et très précis. Il est nécessaire de les améliorer pour les adapter à être pertinents en termes de big data.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

A Study of Brain Tumor Medical Image Segmentation Using U-net

Communication Info

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Keywords:
(1) Deep Learning
(2) Medical Image
(3) Image Segmentation
(4) U-Net Algorithm

Abstract

Deep learning-based medical image segmentation is a field of computer-aided diagnosis (CADx) that focuses on extracting useful information from medical images to help clinicians make a quick and error-free diagnosis [1]. In this paper we present a brain tumor segmentation approach based on one of the most widely considered Convolutional Neural Network architecture named U-Net introduced by Ranneberger and al. [2]. The main idea is to segment the brain MRI image into three sub-regions: whole tumor, tumor core and enhancing tumor. For this we used the default hyper parameters settings [3]. Afterwards we applied several other experiments with other parameters to find the best configuration. The training, validation and all tests were performed on Brats20 dataset [4] and the evaluation are done using dice coefficients [5]. Multiple training and tests were conducted and a final result comparison was made to evaluate each configuration.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 24-26, 2022 | Casablanca, Morocco

Valorization of feedback in building works

Communication Info

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Keywords:
(1) Feedback
(2) Risk management,
(3) Construction site

Abstract

Experience feedback data can have different types depending on the civil engineering sector for example experimental measurements, expert information, visual observation, these formats can provide several different practices for capitalizing on experience feedback, processing and finally valuation of the information capitalized for the diagnosis.
This work addresses the application of experience feedback to construction sites. As we shall argue, if the concept of experience feedback is applicable it would appear that the devices implemented in the construction sites are not taken into consideration.
This present study enables us to propose an approach to improve experience feedback by taking into account the existence of different practices in a construction site. We shall argue that the implementation of a safety case makes it possible to promote the creation of a communication link between community of practice centered around experience feedback (REX) which systematically promotes the improvement of the practice of this device.

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Design and implementation of a social media sentiment analysis system: A Social Listening

Communication Info

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Keywords:
(1) social Listening
(2) machine learning
(3) natural language toolkit
(4) web scraping
(5) selenium

Abstract

To stay competitive, a brand must embrace social listening and ensure its impact. Social Listening allows marketers to obtain insights and analyzes based on data collected from social media platforms, online chat rooms, consumer review sites, forums, blogs, etc. For effective social listening, it is essential to use one or more effective tools. It is in this context that we design and implement a Social Media Sentiment Analysis System (SMSAS). The SMSAS allow a user to select the social network to use (Tweeter or YouTube) and enter their search subject (film name, video, game, etc.) to subsequently display the sentiment analysis results using graphics. The system design is based on the API Twitter and Selenium for web scraping, Natural language toolkit (NLTK) for statistical language processing and machine learning algorithms for classification of comments from social networks.

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March 24-26, 2022 | Casablanca, Morocco

Event Tracking System based on Machine Learning prediction: Case Study of Covid-19 in Morocco

Communication Info

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Keywords:
(1) Information search
(2) Event detection and tracking
(3) Sir model
(4) Curve fitting
(5) Linear regression

Abstract

Event detection and tracking [1] is a somewhat new field in information research. Detection involves spotting new, previously unreported real-life events from an online news feed, while event tracking aims to automatically assign event tags to news as it arrives.

In this article, the COVID-19 dataset [2] was analyzed for the purpose of performing trend analysis and determining patterns that would allow future predictions to be made.

The SIR mathematical model [3] was analyzed in order to understand how the spread of the virus depends on factors such as the rate of disease transmission and the rate of cure. It was determined that the logistic curve fits the data more than the exponential curve. Applying linear regression has given excellent results and has proven to be a model to remember if the goal is to make future predictions for COVID-19.

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A study of the representativeness of an online consumer panel using a deep learning-based sentiment analysis technique.

Communication Info

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Keywords:
(1) Online Panel
(2) Representativeness
(3) Sentiment Analyses
(4) Deep learning

Abstract

The rise of online access panels has profoundly changed the market research landscape. Often presented by their owners as very powerful tools, they nevertheless raise important scientific questions, particularly with regard to the representativeness of the samples they produce and, consequently, the validity of the information they provide. In this paper, we present an innovative approach, based on deep learning and sentiment analysis techniques, to assess in real time the representativeness of an online panel sample. The idea is to measure the extent to which the opinions of an online panel converge with opinions on social networks. To validate the proposed method, we conducted a case study on the emerging discussion on covid-19 vaccination. The results not only proved the representativeness of online panel sample, but also demonstrated the feasibility and effectiveness of our approach.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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A deep learning framework for detecting and classifying surgical tools in laparoscopic surgery

Communication Info

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Keywords:
(1) Minimally invasive surgery
(2) Convolutional Neural Networks
(3) Computer vision
(4) Transfer learning

Abstract

Laparoscopic surgery is a surgical operation performed in the abdomen. It is a type of surgical procedure that allows a surgeon to examine the organs inside it without having to make large incisions in the skin, known also as minimally invasive surgery (MIS). Moreover, a laparoscope, which is a tube with a high-intensity light and a high-resolution camera at the end is inserted in the abdomen to help the surgeon operate easily using the surgical instruments. Additionally, surgery videos have become more and more precious information source. Those videos are a valuable tool to learn surgical procedures[1] and to evaluate surgeons using Surgical Quality Assessment (SQA).

Nevertheless, surgery videos can reach several hours easily. Therefore, navigation and searching through these videos are time and effort consuming. Thus, we overcome this problem by predicting and classifying surgical tools in laparoscopic surgery, and indexing their position using convolutional neural networks. The proposed method is evaluated on Cholec80 dataset (80 cholecystectomy videos). The results present an improvement of approximately 3.27% and a mean average precision of 97.02% compared to our previous work[2].

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ICRAMCS 2022

QUATRIÈME ÉDITION DU CONGRÈS INTERNATIONAL SUR LA RECHERCHE EN MATHÉMATIQUES APPLIQUÉES ET EN INFORMATIQUE

24-26 mars 2022 | Casablanca, Maroc

Problèmes relatifs à la gouvernance digitale des entrepôts

Communication Info

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Keywords:
(1) Gouvernance digitale des entrepôts
(2) Les réseaux bayésien

Abstract

Malgré les enjeux mis en évidence pour la gestion efficaces des chaines logistique, l'accroissement des innovations, l'application des nouvelles technologies, la collaboration entre les différentes parties de la chaine logistique et l'amélioration des compétences, l'entrepôt, qui joue un rôle primordial, centralise plusieurs problèmes. Ces derniers s'illustrent aux niveaux des ressources (personnel et matériel) comme indique **Nadia Ndhaief, 2018[1]**, de la gestion spatiale de l'organisation [**Gu et coll. 2007][2]** [**De Koster et coll. 2007**][**3]** et l'exploitation des différentes zones d'un entrepôt [**DAVID SUISSA**, **2019**] **[4]** et des manipulations de chargements, déchargements [**IBRAHIM Moussa**, **2015**] **[5]** et placements des marchandises entreposées. La marchandise lui-même peut avoir des perturbations durant leur cycle de vie, retard à l'arrivé [**Loïc Delaître, 2009**] **[6]**, perte avant l'arrivé ou l'existence et la qualité [**Nicolas LENOBLE, 2017**] **[7]**, casse, déformation…

Le présent article met en évidence les différents risques engendrés par les activités d'un entrepôt et propose une méthode, basée sur les réseaux bayésien, pour les anticiper de manière prédictive afin d'améliorer la gouvernance d'un entrepôt.

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FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Les Algorithmes Machine Learning pour la Détection de l'Attrition des Clients

Communication Info

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Keywords:
(1) Machine Learning
(2) Prédiction du Churn
(3) Attrition des clients
(4) Random Forest
(5) K-NN
(6) SVM

Abstract

La prédiction de l'attrition des clients est un défi majeur en marketing. L'attrition signifie le désabonnement des clients (ou Churn en anglais). Il représente l'un des cas d'usages les plus fréquents du machine learning en marketing.
En effet, La perte de la clientèle ou d'abonnés est toujours un problème grave pour l'industrie des télécommunications, car les clients n'hésitent pas à se désabonner ou de changer l'opérateur s'ils ne trouvent pas ce qu'ils recherchent. Ce qui pousse les entreprises de télécommunications de disposer d'un modèle de prédiction d'attrition robuste et précis, afin de prendre des mesures pour empêcher les clients de quitter l'entreprise.
Dans cette communication on va présenter le processus de préparation des données en utilisant les bibliothèques implémentées sur Python afin de les utiliser dans les étapes visualisation et machine learning pour développer une application qui permet d'anticiper le risque d'attrition d'un client dans le secteur des télécommunications. Afin d'identifier les clients les plus proches d'abandonner leur opérateur actuel. En se basant sur trois algorithmes machine learning à savoir SVM et Bagging comme méthode d'ensemble, Random Forest, et k-NN.

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Detecting climate change opinion in social media using deep learning

Communication Info

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Keywords:
(1) Climate change
(2) Sentiment Analysis
(3) Twitter

Abstract

Global warming or climate change is one of the most trend topics of the decade in the world, according to scientists the earth is getting warm more every year, hence people are more and more complaining about this phenomenon, while some of them believe that climate change is happening, and we should worry and act about it, others think that it is not real and not caused by human. To understand people thoughts about climate change we adopted Sentiment Analysis technique which is a field of natural language processing. However, Social media platforms such as Twitter could offer a good source of data, in order to analyze people opinions and behaviors. In this article we provided an effective model based on convolutional Neural Network (CNN) for detecting people's reviews on climate change in social media platforms. The experiential results confirmed that our model outperformed other machine learning algorithms.

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ICRAMCS 2022
FOURTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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Système de recommandation pour prédire les risques dans le processus d'appel d'offre

Communication Info

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Keywords:
(1) Appel d'offre
(2) Aide à la prise de décision
(3) Prédiction
(4) Meta model
(5) Risque
(6) Business Process Management
(7) Système de recommandation
(8) Arbre de décision

Abstract

Face à la spécificité et la diversité des missions assurées par les universités, elles sont menées de lancer et de gérer plusieurs projets qui se traduisent par les Appels d'Offres qui sont par définition des commandes publiques et qui nécessitent l'expression préalable des besoins, le respect des obligations de publication d'appel d'offres et le choix de la réponse la plus avantageuse. Les Appels d'offres doivent être préparer avec rigueur afin de ne pas se retrouver submergés par les propositions ou bien d'obtenir des réponses mal adaptées à la demande et donc faire perdre un temps précieux. Face à ce volume énorme des données et la pression que subissent nos universités pour perfectionner leurs missions on s'interroge sur les outils et les moyens que disposent ses derniers pour mieux mener leurs actions (système de gestion ou des outils de contrôle pour réussir la réalisation des dites projets dans les délais imparties, des outils qui ne serait-ce que pour résoudre le problème de la maîtrise des coûts, un business process management pour contrôler les risques) ? Notre recherche à pour objective de developer un système d'aide à la decision pour mener à bien les projets par le biais d'un système de recommandation qui soutient les participants au processus d'appel d'offre dans la prise de décisions fondées sur les risques, dans le but de réduire les risques de manière préventive.

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Using the K-means clustering method for customers segmentation based on their Lifetime value

Communication Info

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Keywords:
(1) Machine learning
(2) K-means
(3) Customer relationship management
(4) Customer segmentation
(5) Customer lifetime value

Abstract

Businesses increasingly derive more revenue from building and maintaining long-term relationships with their customers. Therefore, it is essential to build refined strategies based on customer relationship management [1], with the aim of increasing turnover and profits [2] while retaining customers [3]. With this in mind, customer segmentation, which is at the heart of marketing strategy [4], makes it possible to determine the answers to questions relating to the amount of investments to be made, the marketing campaigns to be organized and the development strategy to be implemented in place [5]. This article is based on the notion of "customer lifetime value" to operate a segmentation of customers by application, on a dataset, the k-means [6] method for unsupervised machine learning.

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Smart Tender Sourcing Using Machine Learning: a Construction Public Procurement Case Study

Communication Info

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Keywords:
(1) Public Procurement
(2) Machine Learning
(3) Classification
(4) SVN
(5) Random Forest
(6) KNN

Abstract

Public procurement plays a huge role in every country‘s socio-economic development due to the huge volume of public funds invested in it. Public adjudicators are increasingly considered as attractive customers especially for the Small-Medium Enterprises (SMEs). However, the procurement can require substantial resources for both buyers and customers in every stage of the process even at the preparation of the tender/bid. A strategic e-sourcing can help all stakeholders save time and money and enhance their chance to make the best financial decision. Most e-sourcing platforms, though are one-sided in the favor of the buyer and there is a dearth in e-sourcing solutions that helps providers, especially in the public procurement context, increase their chance to win a contract. This paper aims at presenting a smart e-sourcing model based on a comparison of the accuracy of classification algorithms such as SVN, Random Forest and KNN to determine the eligibility of the bidders to be awarded the tender. Many studies about the use of Machine Learning in public procurement have been conducted globally and theoretically, but most analysis concern mainly the adjudicator’s side, whether to audit the tender process [1][2], evaluate the bids [3][4] or predict the awarded price[5] . Few are the studies that focus on the bidder’s side [6][7]. Hence, this is a novel study which fills a gap in the literature.

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Text classification methods

Communication Info

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Keywords:
(1) Classification du texte
(2) Analyse des sentiments
(3) Extraction d'aspect

Abstract

Avec l'utilisation généralisée des réseaux sociaux, le volume de données textuelles générées par les utilisateurs augmente de façon exponentielle. Par conséquent, l'analyse des sentiments et l'exploration de l'opinion sont devenues importants dans les domaines de recherche.

La méthode de l'analyse des sentiments SS-LDA basée sur la modélisation des sujets pour l'extraction d'aspect, et la segmentation de la phrase introduite par Ozyurt et al. [1], est l'une des études les plus branchées parmi les sujets de classification de texte. Le modèle génératif probabiliste Sentence-LDA (SLDA) [2], suppose que tous les mots d'une seule phrase sont générés à partir d'un seul aspect, SLDA impose une contrainte selon laquelle tous les mots d'une phrase sont générés par un seul sujet. Alors qu'il est étendu à un modèle d'unification des aspects et des sentiments (ASUM) ASUM est une extension de SLDA qui incorpore à la fois l'aspect et le sentiment. [2], qui incorpore l'aspect et le sentiment ensemble pour modéliser les sentiments en différents aspects.

Dans le même sens, LDA [3] capture implicitement les modèles de cooccurrence de mots au niveau du document .Par conséquent, lorsque les documents sont courts, LDA souffert du problème de sparsité en raison de sa dépendance excessive sur les observations locales pour l'inférence de l'affectation de sujet de mot. Différemment de LDA, le mélange d'unigrammes [4] prend l'affectation de sujet pour chaque document à partir d'une distribution de sujet au niveau du corpus. Le BTM [4] surmonte le problème de la dispersion des données de LDA en prenant l'assignation de sujet de la distribution de sujet au niveau du corpus. Parallèlement, il surmonte également l'inconvénient du mélange d'unigrammes en décomposant les documents en bitermes.

Dans cette communication, un état de l'art sur les différentes techniques d'extraction d'aspect et de classification du texte sera élaboré. Plus particulièrement, nous proposons une analyse comparative des points forts et faibles de chaque méthode pour montrer comment le LDA traditionnel fonctionne sur l'extraction d'aspect sans aucune modification pour les textes courts. Toutes ces comparaisons ont prouvé que grâce à la segmentation de la phrase, SS-LDA est assez compétitif dans l'extraction des aspects produits des avis des utilisateurs.

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Blind Deconvoluton using Variable Exponent Nonlocal p(x)-Laplacian Model

Communication Info

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Keywords:
(1) Deblurring
(2) Blind deconvolution
(3) Blur kernel estimation
(4) Image restoration
(5) Nonlocal p-Laplacian model Variable exponent

Abstract

Blind deconvolution is the problem of recovering a degraded kernel from its noisy convolution. There are several applications in different fields such as medical imaging, image enhancement, edge detection, and image restoration. The blind deconvolution is an ill-posed problem, various regularizations have been proposed to hold this problem for the deblurring images. Chen et al. [1] proposed a blind deconvolution algorithm based on the total variational minimization (TV) method. Also, Chan and Wong [2] proposed a Total Variation regularization based approach to effectively restore piecewise constant kernel. Getreuer. al [3] proposed a total variation regularization term using the split Bregman method to recover the original image. Gabriele Facciolo. al [4] have proposed a method to deblur images using an a priori l0 on the degraded image. On the other hand, Kindermann, Osher and Jones [5] have proposed the nonlocal p-Laplacian problems for deblurring and denoising images. In [6], the authors proposed a nonlocal model using the variable exponent whose power p uses the local data of the image. In this work, we propose a new method for blind deconvolution algorithm based on the nonlocal p(x)-laplacian minimization method with variable exponent for deblurring and denoising images. Firstly, we prove the existence and uniqueness of the minimizer. Next, we present the algorithm used to solve the proposed model. Finally, we illustrate the effectiveness of our algorithm with various numerical tests which can compare favorably with some existing methods in the literature.

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Predictive Analytics in Email marketing based on Machine Learning Tools

Communication Info

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Keywords:
(1) Email Marketing
(2) Machine learning
(3) Predictive Analytics

Abstract

In the context of the transition to the digital economy with the evolution of prediction techniques, many sectors that are all concerned by the exploitation of data collected in real time from prospects and customers [1], have profoundly transformed.

Email marketing campaigns is among these sectors, it help to increase the sale of products and to target customers efficiently. It is possible to exploit large amount of information to guide marketing decisions using machine learning tools by extracting customer data, detecting patterns and predicting future customer behavior [2-3] for better personalization of email marketing [4] and hence enhancing the success rate of email campaigns [5].

In this paper, our contribution focuses mainly on the study of the main factors driving the response rate of email marketing campaigns. A glimpse on the applications of Machine Learning methods for solving marketing problems specifically related to email marketing perspectives and how to use predictive analytics to better target customers who are interested in some services.

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IoT and Artificial Intelligence:

An effective partnership.

Communication Info

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Keywords:
(1) Internet of Things
(2) Artificial Intelligence
(3) Artificial Intelligence of Things

Abstract

In the development of IoT firms, artificial intelligence plays a significant part in leading an individual business process [1]. With the adoption of artificial intelligence, the work process in an organization has become more fluid and simple [2]. Since the advent of the Internet of Things (IoT) in 2008, it has grown at a rapid pace [3]. IoT has become a significant element of daily life in many homes and organizations because of ongoing technological advancement. Artificial intelligence-enabled gadgets are capable of accomplishing needed operations and functions in a certain company. AI has played a significant role in guiding corporate processes toward success, both in terms of deployment and in terms of development of IoT applications [4]. Because the Internet of Things (IoT) is a network of connected devices that share data, it requires advanced and modern technology to support transactions without lagging devices [5].

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Conception et réalisation d'une plateforme de Télé-TP

Communication Info

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Keywords:
(1) Remote laboratory
(2) e-learning
(3) Control systems

Abstract

Le monde de l'enseignement supérieur a beaucoup changé ces dernières décennies dû à l'omniprésence de l'informatique [1]. Si l'on ajoute à cela les restrictions sanitaires et préventives suite à COVID'19. Les universités rendent les cours en mode distanciel, et dans l'enseignement technique les TP sont très importants et incontournable [2], et que les laboratoires à distance sont plus bénéfiques par rapport au laboratoire virtuels [3] car ce dernier n'est qu'un modèle informatique d'approximative à la réalité via des modélisations [4] afin de réaliser des simulations diverses. Dans ce contexte, l'EST d'Agadir a développé une plateforme à faible coût appelé LABERSIME installée en cloud (LMS et IDE) dotée d'un système embarqué à base de (ESP32-Micropython) pour piloter des équipements réels de laboratoire et faire des expériences qualitativement efficaces que celles en mode présentiel.

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La blockchain comme levier pour sécuriser et améliorer les systèmes IOT

Communication Info

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Keywords:
(1) Blockchain
(2) Sécurité
(3) IOT
(4) Smart Contrat
(5) Reseaux P2P
(6) Crypatge
(7) Bitcoin

Abstract

Jour après jour, de plus en plus d'applications et de cas d'utilisation de l'Internet des objets (IoT) sont déployés. Les capteurs sont largement utilisés dans les lignes de production, les réseaux électriques, les réseaux logistiques, les véhicules et dans les appareils que nous utilisons. Les applications IoT, soutenues par des technologies sous licence et sans licence, augmentent la productivité, l'efficacité et améliorent l'expérience client dans de nombreux secteurs tels que l'automobile, les villes intelligentes, la sécurité publique, les services publics, etc. Le large éventail d'exigences et d'opportunités commerciales de l'IdO conduira à la construction d'une variété de réseaux sur différentes technologies et par différentes parties. Décider des technologies les plus appropriées dans lesquelles une entreprise doit investir commence par la définition d'une stratégie de déploiement pour les systèmes l'IoT. Parmi les grandes stratégies et enjeux liés à cette popularité de l'Internet des Objets (IoT), se démarque l'enjeu et la stratégie de vérification de l'intégrité et de la sécurité des données véhiculées par les objets connectés. En raison de leur nature dynamique, confidentielle et personnelle, le cadre traditionnel de vérification de l'intégrité des données peut difficilement fonctionner d'autant plus que la plupart des cas d'utilisation des objets connectés reposent sur des infrastructures cloud. Pour répondre aux caractéristiques de l'IoT et éviter le recours excessif au TPA (Third-Party Auditor), nous proposons dans cet article une approche de la sécurité des données et des transactions IOT basée sur la blockchain.

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A New Recurrent Neural Network Adaptation To Fight Opponents of covid-19 vaccination in Twitter

Communication Info

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Keywords:
(1) Deep Learning
(2) Social Behavior
(3) Reccurent Neural Network
(4) BERT
(5) Machine Learning

Abstract

Today, at least 70% of people in the world get their news via social networks, where every day there are dozens of alarmist articles and testimonials questioning the usefulness and safety of covid-19 vaccines.

Very anxious, these speeches have no scientific basis, and they feed the fears of worried people and complete the convincing of the suspicious. Witness the number of anti-vaccination queries typed into the Google search bar, which over the past two years has increased by 130% **[4]**.

To fight opponents of vaccination and encouraged people to be vaccinated, the idea was to analyze the behavior of twitter users in order to detect negative tweets against vaccination. For this reason, we have developed three new configuration models of recurrent neural network (1- simple LSTM **[1]** 2-BDLSTM **[2]** 3-BERT **[3]**) in order to detect anti-vaccination tweets and eliminate them to minimize their psychological impact.

For the experiments, we have used a twitter benchmark dataset and supervised evaluation measures (recall, precision, f-measure, accuracy and loss) with a variety of hyper-parameters such as batch size, learning rate, and epoch number and optimizer algorithms.

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A hybrid reinforcement learning and cellular automata model

Communication Info

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Keywords:
(1) Reinforcement learning
(2) Cellular automata
(3) Traffic management

Abstract

Traffic light systems in cities are a very important topic to study due to many challenges such as traffic congestion, traffic accidents and gridlock. In this contribution, we propose a new model for traffic flow in city networks based on cellular automata and deep reinforcement learning, modifying the basic ideas of the most known Biham, Middleton and Levine (BML) model [1]. We show that the traditional BML model can be formulated as a Markov Decision Process. And using the deep Q-learning [2] our approach learns policies that can minimize the traffic jam at a group of intersections. An important difference between our work and existing approach is that we take the network density into account. A series of simulation experiments shows that the resulting policies significantly reduce traffic congestion under high traffic demand, and the policies are sufficiently reducing the necessary time to have a free flow state from a jammed state and keeping the traffic fluency in intersections.

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Tracking Connected devices Location using IP address

Communication Info

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Keywords:
(1) Connected devices
(2) IP
(3) Location

Abstract

Recently, in the fields of innovation and engineering, the internet of things (IoT) is a giant and promoter area. IoT devices are used in a variety of fields and provide advanced services that allow users to remotely monitor and control objects. The tracking of the location or trajectories of these things is one way to control devices, which introduces a new problem in the field of the Internet of Things. In this work, we present a new approach for connected device location tracking using IP addresses without the need for active cooperation by devices. The results of this proposal seem prominent because they will allow us to follow the location change of connected devices in real-time in a determined period. This approach can be used in various fields but it implies that the implications on information confidentiality must be taken into consideration.

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Resource Management for Mobile-Edge Computing Systems

Communication Info

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Keywords:
(1) Mobile-edge computing
(2) task scheduling
(3) computation offloading
(4) execution delay
(5) Markov decision process.

Abstract

Mobile-edge computing (MEC) is a promising technology to reduce the computing pressure of mobile devices by offloading the computational tasks to the MEC server. We present latency-optimal task scheduling policies based on Markov decision process (MDP) theory, which is used to control local processing and transmission unit states and task buffer queue length as a function of channel state. We also give a delay minimization problem by considering power as a constraint.

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Hyperconverged Infrastructure: New Challenge for Public Data Center

Communication Info

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Keywords:
(1) Public data
(2) Storage management
(3) Software Defined Storage
(4) Hyperconverged infrasturcture

Abstract

Nowadays, the amount of data created by the government organizations is growing at an exponential rate. IT Infrastructure are following a similar trajectory. To meet the challenges of big data volume, public agencies need to adopt new IT solution for storage management. Software defined systems (SDS) is a technology used in storage management that virtualize the storage. SDS solutions separates the storage hardware from the software. This adds scalability and efficiency to the complex storage systems [1], [2]. Hyperconverged infrastructures (HCI) are a set of SDS that provide in addition network and compute resources. Among the advantages of HCI is providing network, compute, storage in one solution [4]. HCI optimize storage and reduce cost for public data center [5]

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A DNA-based cryptosystem: Qr-code and Huffman coding for secure transmission in the IoT

Communication Info

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Keywords:
(1) DNA
(2) Security
(3) IoT
(4) Cryptography

Abstract

The Internet of Things (IoT) encompasses the entire ecosystem of connected objects, sensor manufacturers, software publishers,.. etc. With the wide use of this technology, the security of messages transmitted between users is becoming a major concern.[1]

We propose a symmetric key cryptosystem which derives its keys by the application of huffman coding on DNA sequences, which are generally human chromosomes. [2], [3]

After the scrambling phase, we apply biological operations such as transcription, translation and biological xor. [4]

Generally, in the IoT, objects use different codes in their transactions. Based on this particularity, we have integrated the Qr-code into our cryptosystem as the format for sending and receiving encrypted messages.[5]

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A soft decoding procedure for noisy communication channels

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Keywords:
(1) Decoding algorithms
(2) Symbol-by-symbol decoding
(3) Word-to-word decoding

Abstract

Decoding algorithms [1-3] are designed to recover information after its transmission over a noisy communication channel. Soft decision decoding algorithms are very powerful in concatenation schemes using two or more decoding levels. In this paper, we concatenated a symbol-by-symbol decoder [4] and a word-to-word decoder [5] with the aim of decoding linear block codes. We will use firstly the symbol-by-symbol decoding algorithm with less number of dual codewords then the word-to-word decoding algorithm, which exploits the output of the first decoder. We noticed that the proposed decoding scheme guarantees very satisfying performances with less dual codewords.

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Authentication based on the Blockchain and Fog computing for MANET

Communication Info

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Keywords:
(1) Authentication
(2) Mobile Ad hoc Network
(3) Blockchain
(4) Fog Computing
(5) Community Network

Abstract

Nowadays, the internet has become necessary in our daily life. Unfortunately, several areas remain unserved or underserved [1]. One of the reasons is the expensive cost of the internet in these areas. Community networks have been proposed to give Internet connections to low-income and remote locations not served by commercial service providers [2]. This work uses Mobile Ad hoc Networks (MANETs) as a solution. However, the absence of central authority to perform essential tasks like registering nodes and their authentication is one of the core issues in MANETs [3-5]. This paper proposes decentralized authentication based on blockchain and fog computing technology. The evaluation of the proposed mechanism demonstrates high performance because it satisfies the various security requirements and protects against attacks.

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Image Steganography using 2D Karhunen-Loève Transform and Chaos

Communication Info

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Keywords:
(1) Steganography
(2) 2D KLT
(3) Karhunen-Loève Transform
(4) Eigenvectors
(5) Pixel matrix
(6) Chaos
(7) Substitution

Abstract

As communication channels are increasing in number, reliability of faithful communication is reducing. Hacking and tempering of data are two major issues for which security should be provided by channel. This raises the importance of steganography. In this paper, a novel method to encode the message information inside a carrier image has been described. It uses 2D Karhunen- Loève Transform (2D KLT) for compression of data and chaos based Least Bit Substitution to embed data. Compression removes redundancy and thus also provides encoding to a level. It is taken further by means of Least Bit Substitution. The algorithm used for this purpose uses pixel matrix which serves as a best tool to work on. Three different sets of images were used with three different numbers of bits to be substituted by message information. The experimental results show that algorithm is time efficient and provides high data

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Enhanced User Authentication in Automated Teller Machines Using Multiple Security Layers

Communication Info

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Keywords:
(1) ATM
(2) Face recognition
(3) One Time Password
(4) Deep learning

Abstract

The rapid growth of financial services has driven banking institutions towards countless adequate ways of managing user accounts, in order to gain sustainable competitive advantage. An automated teller machine (ATM) is a practical way to meet the banking needs of the users. It is an electronic machine that enables customers to access their bank deposit or credit accounts to fulfill multiple financial needs. However, securing ATM transactions become more and more challenging[1], owing to the latter could be accessed by unauthorized users having a valid authentication code. Therefore, using only the Personal Identification Number (PIN) to verify the identity of customers is insufficient. Hence, stronger user authentication mechanisms are needed. In this research article, we introduce a three authentication layer model to prevent ATM frauds. Through this architecture a customer identification, authentication, and security transactions are increased, using the cardholder PIN, face authentication, and One Time Password (OTP)[2]. Furthermore, deep learning algorithms are used to identify a customer face in order to compare it with images stored in the database.

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(https://www.sciencedirect.com/science/article/pii/S2405844021005107)
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RMI Image Segmentation using Triplet Markov Chain

Communication Info

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Keywords:
(1) TMC
(2) Non-stationary process
(3)Stationary process
(4) Auxiliary process
(5) brain MRI Image segmentation
(6)ROI

Abstract

In this work, we present an application of brain RMI image segmentation. Using the Non-stationary Hidden Markov chain [1]: Triplet Markov Chain (TMC).
TMC model segments the image taking into account the non-stationary data, it assumes that the hidden process X is a non-stationary Markov chain, for that, it introduces an auxiliary process U to represent this non-stationary of X, the mission of U is to represent the different stationarities of X [2]. We consider the RMI images are non-stationary that characterized by different stationarities.
After, the operation of RMI segmentation. The thresholding technique has been used to extract to interest region (Tumor) ROI from segmented RMI images.

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THE APPLICATION OF ARTIFICIAL INTELLIGENCE FOR THE GUIDANCE THE ENGINEERING STUDENTS FOR THE SUCCESS OF THEIR END OF STUDY PROJECT.

Communication Info

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Keywords:
(1) fuzzy logic
(2) orientation
(3) artificial intelligence

Abstract

Our research aims to apply fuzzy logic to better guide engineering students for the success of their end-of-study project. The approach used aims to better overcome the problem of uncertainty and ambiguity. Initially, we will better present the three criteria chosen in the end of study project: analysis of the project, the design of the project, realization of the project and prospects for better improving the project. Secondly, we are going to explain the principle of fuzzy logic well, and in the case study we are going to thoroughly apply it by elaborating the fuzzification of the criteria, the fuzzy rules and then the deffuzification. Finally, to better guide engineering students so that they have success in their project, the criteria chosen must be excellent and better.

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Authoring tool to support the generation and adaptation of e-Assessment Activities

Communication Info

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Keywords:
(1) Authoring tool
(2) E-assessment design
(3) E-assessment activities
(4) Competencies assessment
(5) IMS QTI

Abstract

E-assessment plays an important role in supporting and improving learners' proficiency [1], also it provides a range of new opportunities for educational development [2]. Besides, the need of developing competencies has resulted in a reconsideration of learning and assessment design in e-learning environments [3], [4]. In this communication, we present an improved authoring tool to assist teachers in creating different assessment activities suited to any level of competency, also to satisfy teachers' pedagogical needs and competencies assessment requirements. The proposed authoring tool allows a teacher three services; the first one provides a conceptual model for describing assessment activities. The second service allows mechanisms to align assessment activities with competencies. The last service provides generating assessment activities in the XML Moodle and IMS QTI 2.1 format.

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Deep learning approaches to human activity recognition

Communication Info

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Keywords:
(1) Deep learning
(2) Computer vision
(3) CNN
(4) Human activity

Abstract

With the recent progress of deep learning using an artificial neural network, and with the increasing attention that has been paid to exploiting the processing power of GPUs for deep learning algorithms, also with the availability of large amount of online data, computers have become smarter than ever in several fields, computer vision being one of the most prominent and popular cases in terms of R&D trend. In particular, the recognition of human activity is being used in various application areas, ranging from human-machine interfaces to surveillance and security, to healthcare monitoring. Despite ongoing efforts in the fields, these tasks have remained unsolved in unconstrained environments and face many challenges such as occlusions, variations in clothing and background noise. This review paper gives a brief overview of research on deep learning algorithms including convolutional neural networks that have been proposed to solve traditional artificial intelligence problems. This is followed by a brief discussion of the main results and contributions of the different approaches studied for the classification of human activity based on deep learning. Finally, we conclude the research and strive to provide a future solution for human action/activity recognition based on a hybrid between CNNs and RNNs.

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Evaluation of an Open Distance Learning device based on SPOCs model for future teachers of Physical Education and Sport

Communication Info

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Keywords:
(1) Assessment
(2) ODL
(3) SPOC
(4) Trainee teachers
(5) Physical Education and sport

Abstract

Online learning is increasingly used as a powerful tool for the learning and teaching process [1]. Some of the online platforms used so far allow teachers to create educational courses, training and skills development programs (Petrie, 2020) [2]. In this regard, Mostafa et al. [3-4] analyzed the needs and learning styles of future physical education and sport's teachers for a design of a FOAD-SPOC.The aim of this communication is to assess the satisfaction of physical education and sports' trainee teachers of an open distance training on small private online course's model which aims to develop professional skills for 70 future teachers through a questionnaire administered at the end of training to our two groups : hybrid and distanced.We used descriptive and inferential t-test statistics for equality of means and z-test of Comparisons of column proportions to examine the effect of the following independent variables: participants' motivational factors, difficulties encountered, benefits and prospects of this ODL-SPOCs on groups' type formed at a threshold of $p < 0.05$.

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Optimization of the loan application management system at Sonatrach-Aval Oran.

Communication Info

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Keywords:
(1) Information system
(2) BPM
(3) Scrum 3.0
(4) Workflow engine
(5) Web service composition
(6) Ldap

Abstract

This paper deals with the automation of the loan application management system [1] at the company *Sonatrach Aval*, *Oran*, *Algeria*. The problem addressed implies that the existing system offers a manual functionality of traceability of the made requests. This functionality, by its nature, poses problems for the saving and the follow-up of the requests. The objective of this work is to automate the business process [2][3] "loan requests management". This automation involves the implementation of an application based on Web services composition [4] combined with a workflow engine, for the management of loans. The application is coupled with an Ldap directory service [5], for a better data management. In order to save time and to ensure compliance with the specifications established by the company, the system development life cycle followed the agile method SCRUM 3.0 [6].

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State of the art of Parson's puzzles

Communication Info

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Keywords:
(1) Parson's problem
(2) Parson's puzzle
(3) Computer Science Education
(4) Programming exercises.

Abstract

Programming is an important basic skill for computer science students. However, programming is a complex subject that requires continuous effort, special approach and multi-layer skills [1]. Students find this domain very difficult. It has high dropout and failure rates even do at the initial stage of computer introduction courses[2]. To overcome these difficulties Parsons Problems are a very interesting solution to decrease the cognitive load of students when carrying out a problem and avoid them frustration, and decrease self-efficacy [3].

Parsons problems are a kind of programming puzzles exercise where students should choose and rearrange a randomly mixed code blocks to form the problem solution [4].

In programming courses, researches demonstrates the effectiveness of Parsons Problems is same as traditional problems that consist of writing, tracing or fixing code. Furthermore, students find these problems helpful, more engaging and taking students significantly less time to complete [5,6].

This paper presents an overview of tools using Parsons Problems for both assessment and practice programming skills in order to provide continuous feedback to monitor and improve students' learning.

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Numerical linear analysis of a bow string bridge

Communication Info

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Keywords:
(1) Structural Linear analysis
(2) 3D modelling
(3) Bowstring bridge

Abstract

Structural Engineering witnessed in the past some major catastrophic structural failures [1] that made engineers and scientists work harder to sharpen their craft and come up with optimized solutions in order to design, analyze, test, build, and inspect buildings and bridges. The present study concerns a 3D modelling of a composite bowstring bridge having a total span of 51,18 m using Robot Structural Analysis 2018. The general structural elastic and linear analysis is performed according to Eurocodes. The design method used against progressive collapse in this study is Alternative load Path (ALP) [2] based on element removal and assessing the ability of the structure to redistribute the loads.

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ICRAMCS 2022
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The evolution of educational practices through the use of disruptive digital technology: Movement from Education 1.0 to Education 4.0

Communication Info

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Keywords:
(1) Educational practices
(2) Disruptive technology
(3) Education

Abstract

Innovation in schools does not escape the general trend of modernity in our society [1,2]. Indeed, with the integration of information and communication technologies in education (ICTE), the technological tool and the digital product have become major didactic elements in education and teaching [3,4]. Also, with the Covid-19 pandemic, we have witnessed a considerable increase in the use of innovative digital technologies in student learning at the same time that the world education system is inevitably turning to distance or blended learning [5]. This has pushed teachers to adopt new teaching and learning methods, especially those via online channels [4]. Thus, by tracking the learning progress of university students has proven difficult [6] on the one hand, and on the other, it has made us reflect on the question of "How are educational practices changing in the era of disruptive digital evolution?". As we all know, information technologies have never stopped evolving. And they will continue to have a significant and unprecedented influence on all fields, especially teaching and learning. In this article, I am going to present an overview of the evolution of educational practices through the use of disruptive digital technologies from Education 1.0 to Education 4.0.

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Analyse sismique d'une structure en béton armé

Communication Info

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Keywords:

(1) Earthquake

(2) RPS2000

(3) Vulnerability

Abstract

Seismic research is becoming more and more necessary with the increasing complexity of the problems to be treated, it is an area that has become very delicate, especially as earthquakes are increasingly intense and devastating. It is with this in mind that the need to improve methodologies for the calculation of structures subject to seismic action has arisen.

The first methodology for assessing the vulnerability of buildings is the of Vulnerability Index. It makes it possible to assign a vulnerability index to each building according to its different material, structural and architectural criteria.

The second proposed methodology is based on the Seismic Index Method, for seismic evaluation of existing reinforced concrete buildings.

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Realistic three dimensional finite element model for drawing process simulations

Communication Info

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Keywords:
(1) Drawing process
(2) Finite element modelling
(3) Jonson-Cook damage

Abstract

In this paper, a finite element model for dome drawing process is developed. The drawing tool is cylindrical with hemispherical head. The die is cylindrical and fixed to a support part with screw-nut system. The blank is tightened by applying sufficient clamping pressure using also a screw-nut system. Displacements and rotations of the support surface, in contact with machine table, are null. The existing contacts between elements (Tool, blank, blank holder, screw, washer, nut, die support) are modeled using the Master/slave method in combination with the coulomb friction model. The friction coefficients were fixed at 0.1. The explicit technique is used to integrate the motion equations through time. All components are considered deformable and meshed using 4-node tetrahedral elements. Material of the tool, blank, blank holder and die support is the aluminum alloy (Al 5083 H112) while screw, nut and washer are from AISI-1045 medium carbon steel. For the materials plastic behavior description, the Johnson-Cook material model is used [1] due to its ability to describe the manufacturing processes with high strain rates over a wide range [3]. The AISI-1045 Steel properties and Johnson-Cook parameters are excerpt from [4]. The Aluminum alloy properties and Johnson-Cook parameters are excerpt from [5]. For material separation, the Johnson-Cook failure model is used because it is suitable for high strain rate deformations [6].

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Towards an efficient use of recommender systems in smart agriculture

Communication Info

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Keywords:
IoT, Recommender system, Smart Agriculture
(1) Agriculture
(2) IOT
(3) recommendation system
(4) KNN
(5) Random Tree,
(6) Naive Bayes

Abstract

On IoT and machine learning support farmers in crop prediction based on the principle of metrological farming by collecting live metrological data from the cultivated field and using machine learning for planning. Science and technology may be used effectively and innovatively to increase agricultural quality and production, predict crop yields, and study crop diseases. Agriculture is the backbone of a rising economy, and there is a huge need to ensure agricultural sustainability. The most prevalent issue among farmers is that they do not select the appropriate crop based on their soil needs. The purpose of this study is to present a Data mining, IoT, and ML Data mining is the process of analyzing and extracting useful information from data. As a result, it makes a substantial contribution to the economic and agricultural well Agriculture advance techniques eliminate crop selection wrong choices and boost production.

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Molecular dynamics study of the growth of Cu thin film on stepped Si (100) substrates

Communication Info

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Keywords:
(1) Thin film
(2) Molecular dynamics
(3) Stepped surface

Abstract

The development of thin film deposition methods has enjoyed a great success for materials science, allowing scientists to solve and overcome great problems. To understand the factors involved which influence the growth of thin film on metal substrates with steps and to overcome the difficulty of understanding structure at the atomic scale, some researchers have been interested in the epitaxial growth of Cu (001) layers on Si (001) surface **[1],** the morphology and surface property **[2]**, the substrate temperature effect on the thin film growth **[3]**, the effect of incident energy on the surface morphology **[2].**

In this communication, we present the deposition of Cu on Si (100) substrate with steps; we will study the deposition on steps whose thickness varies from 3, 5 and 7 monoatomic layers. We are going to use LAMMPS as a molecular dynamics (MD) program to model all the particles using the modified embedded atom method potential to describe the interaction between the different atoms contained in our simulation box.

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Nonlocal $p(X)$–Laplacian for Multiplicative Noise

Communication Info

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Keywords:
(1) Nonlocal p(X)–Laplacian
(2) Variable exponent
(3) Multiplicative noise
(4) Poisson noise
(5) Gamma noise

Abstract

Image restoration is an important field of image processing, the restoration is done to remove degradations that an image has undergo. Local operators use local informations of the image and can effectively remove noise, unfortunately, fine details and textures, are destroyed. To overcome this, nonlocal methods have been used to denoise an image [1, 2]. Lately, Karami et al. (cf. [3]) proposed to use p–Laplacian and capitalize on variable exponent to reduce the CPU time, they proposed a nonlocal p(X)–Laplacian.
Inspired by the mentioned works and the fact that noise in image is not always additive, we propose an algorithm to denoise images contaminated by multiplicative noise using nonlocal p(X)–Laplacian.

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Machine Learning For ESG SCORING

Communication Info

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Keywords:
(1) ESG
(2) NLP
(3) Machine Learning
(4) Investment

Abstract

In the heat of the world's development, the effect of the environment and social interactions can be impactful in many ways. In other cases, some investors are interested in the benefits of the ESG Indicators, because between 2001-2009 green portfolios were positive [5], lead to better investment decisions [1]. This field has grown significantly when the use of machine learning algorithms started to get into Finance [2]. In this paper, we will be reviewing and discussing the use of NLP algorithms to automatically score the enterprises, according to ESG indicators, through social media networks, annual reports… [3]. The aim of this research is to optimize the investor's decisions and we will do it by optimizing our NLP models to fit this purpose, and to extract the data so our analysis and prediction can be more accurate and fast[4]. Which will help us regarding the huge amount of relevant and irrelevant data that we can find regarding the ESG indicators.

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Null controllability for 1D-heat equation with dynamic boundary conditions

Communication Info

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Keywords:
(1) 1D-heat equation,
(2) dynamic boundary conditions,
(3) Carleman estimate,
(4) null controllability,
(5) observability inequality.

Abstract

The null controllability of parabolic systems has been studied in [1], [2] for Dirichlet and nonlinear Neumann boundary conditions. Recently, Maniar, Meyries and Schnaubelt [3], have considered the case of the dynamic boundary conditions, where the presence of the diffusion term on the boundary, i-e "$\delta>0$", has played an essential role in establishing important results. The case of "$\delta=0$" remain unsolved. This situation can occur for instance in the one-dimensional case. Khoutaibi [4], has established the null controllability of 1D-heat equation using the moment method. In this communication, we present the study of the null controllability for the 1D-heat equation by developing a Carleman estimate for the adjoint system that will lead to the observability inequality, which is the key to the null controllability.

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Machine Learning et transmission de données

Communication Info

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Mots-clés:
(1) Codes correcteurs
(2) Classification
(3) Décodage
(4) Réseaux de neurones
(5) Regression logistique
(6) Machines à vecteurs de support
(7) K plus proches voisins
(8) Transmission de données
(9) Canaux de communication

Abstract

Dans les systèmes de transmission le décodeur de canal essaye de retrouver les données émises par correction des données reçues. Le décodage des codes linéaires en block est un problème NP-difficile. Nous nous intéressons ici à la présentation d'un état de l'art et une comparaison des travaux récents sur le décodage à base des modèles de Machine Learning et de Deep Learning.

En perspectives, nous comptons exploiter la puissance de ces méthodes intelligentes pour concevoir de nouveaux décodeurs intelligents efficaces et rapides.

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Most Recommended approaches of Sentiments Analysis: comparative study

Communication Info

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Keywords:
(1) NLP
(2) Sentiment analysis
(3) Opinion mining
(4) Machine Learning

Abstract

We aim to make a comparative study by analyzing and understanding the different methods that have been implemented in the field of sentiment analysis and opinion mining. This paper focuses on the different research designs, analysis, steps to follow, the different machine learning techniques applied including supervised and unsupervised learning, as well as the most recommended approaches in this field, and then compares them with the advantages and limitations of each.
Finally, some proposed directions to improve will be discussed.

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Towards an improvement in Arabic Sentiment Analysis applied on Tweets

Communication Info

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Keywords:
(1) Word-embedding
(2) N-grams
(3) Sentiment Analysis
(4) Machine learning

Abstract

Social media became recently a place for discussions in several topics, which sometimes carry emotions and opinions towards a specific idea. Given how many users are active on these platforms, especially in the MENA region, it is a very valuable yet hard to process source of data that can help determine the general point of view about a subject. Managing this volume of data is feasible through intelligent machine-learning based systems, especially in a language with a complex morphology such as Arabic. In this paper we present a set of experiments we conducted on a sentiment analysis benchmark datasets resulting in improvements in model performances applied on those datasets.

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