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UNIVERSITÉ HASSAN II DE CASABLANCA

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Analysis, Modeling and Simulation Laboratory
Faculty of Sciences Ben M'sik
Hassan II University of Casablanca, Morocco

# I C R A M C S 2 0 2 0

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# THE 2ND INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE

| MARCH 2020 | | | | | | |
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# Conference Proceedings Report

ICRAMCS 2020 Proceedings ISSN: 2605-7700

# FOREWORD & ACKNOWLEDGEMENTS

The second **I**nternational **C**onference on **R**esearch in **A**pplied **M**athematics and **C**omputer **S**cience (**ICRAMCS** 2020) 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 first International Conference on Research in Applied Mathematics and Computer Science (ICRAMCS 2020), which took place in Casablanca-Morocco, March 28, 2020. 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 & Science Computer 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, 2020. 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, 2020 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,

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*On behalf of Organizing Committee of ICRAMCS 2020*
*Prof. Youssef EL FOUTAYENI*
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*Faculty of Sciences Ben M'Sik*
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# ICRAMCS 2020

**INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE**
**March 28, 2020 | Casablanca, Morocco**


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# ABSTRACTS

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March 28, 2020 | Casablanca, Morocco

# THE MATHEMATICAL STUDY FOR MORTALITY COEFFICIENTS OF SMALL PELAGIC SPECIES

## Communication Info

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**Keywords:**
(1) bioeconomic model
(2) parapenaeus longirostris population
(3) Nash equilibrium problem.

## Abstract

In the past few years, the parapenaeus longirostris population stock has seen a sharp reduction. In this work, we propose a bioeconomic model that represents the biomass evolution of this marine population in two moroccan maritime patches: protected area and unprotected area. In the model construction, we take in consideration the predation interaction between the parapenaeus longirostris population and the small pelagic species of moroccan coastal zones. We suppose the existence of coastal trawlers that exploit both the predator and prey populations. Our objective is to study the influence of the predator mortality rate variation on the evolution of prey biomass and the profit of coastal trawlers. It should be underlined that, coastal trawlers are constrained by the conservation of marine biodiversity. One of the key consequences of this is that the increase in the mortality rate of small pelagics leads to an evolution in the parapenaeus longirostris stock, and consequently to an increase in the profit of coastal trawlers after exploitation of this species.

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ICRAMCS 2020
INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
March 28, 2020 | Casablanca, Morocco

# Mathematical modeling of fishing bioeconomic model including wind speed effects

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**Keywords:**
(1) Bioeconomic model
(2) Fish populations
(3) Annual profit
(4) Fishing effort
(5) Wind speed
(6) Nash equilibrium

## Abstract

In this work, we search to show the influence of the wind speed on the annual profit of purse seiners. We consider a bioeconomic model of marine populations exploited by purse seiners in the southern athletic zone of Morocco. This zone is characterized by major wind speed changes. We calculate the fishing effort and the amount of catch that allows seiners to have a maximum annual profit taking into account changes of wind speed in the reporting year and the sustainability of the marine populations stocks. We compare our results with those obtained by the" Institut National de Recherche Halieutique (INRH)" (National Institute of Fisheries Research).



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**INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE**
**March 28, 2020 | Casablanca, Morocco**


# An optimal control approach for a discrete time model of information dissemination

## Communication Info


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**Keywords:**
(1) Information
(2) Spread
(3) Share
(4) Epidemic
(5) Discrete-time
(6) control


## Abstract


In this communication, we consider a new discrete-time model that describes the spread of information by shares in some kind of online environment such as Facebook, WhatsApp, Tweeter and other platforms groups. The impact of sharing information on the information amount is investigated, where in the considered model, the information amount is incorporated as a supplement compartment. We consider the possible interactions between individuals and information in the internet, such as posts, images and videos, etc. Theory of control is used to show the effectiveness of our optimal control strategy in reducing the information amount and Sharers in order to control the dissemination of false information that can lead to annoying situations and unstable state of society. Numerical simulation is performed to investigate several scenarios before and after the use of our strategy of control, furthermore, sensitivity analysis of the information amount on parameters is discussed.




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ICRAMCS 2020
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March 28, 2020 | Casablanca, Morocco

# Mathematical modelling of planktonic organisms

## Communication Info

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**Keywords:**
(1) Planktonic organisms
(2) Mathematical modelling
(3) Stability analysis
(4) Nash equilibrium
(5) Linear complementarity problem

## Abstract

Marine planktonic ecosystems are highly dynamic environments that are subject to a wide range of external forces [1]. This paper presents the conditions for local and global stability of a bioeconomic problem concerning the harvesting of phytoplankton and zooplankton in Moroccan areas. The problem of determining the fishing effort that maximizes the net economic revenue of each fishing boat results in a Generalized Nash Equilibrium Problem [2,3]. Growth of both organisms is governed by parameters as well as externally applied nutrients and the biomass of the other species available as supplemental nutrition.

More precisely, we are interested in the equilibrium of the mathematical game given by the situation where all the fishing boats try to optimize their strategies according to the strategies of all the others [4]. The importance of marine reserve is analyzed through the obtained results of the mathematical analysis of the proposed system.



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# ICRAMCS 2020

**INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE**
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# Existence and energy decay of solutions for a nonlinear wave equation with a constant weak delay and a logarithmic nonlinearity


**Communication Info**

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**Keywords:**
(1) nonlinear wave equation
(2) logarithmic nonlinearity
(3) Faedo-Galerkin method



**Abstract**

In this work, we consider a nonlinear viscoelastic wave equation with a weak internal constant delay term and a logarithmic nonlinearity:

$$u_{tt}(x,t) - \Delta u(x,t) - \Delta u_{tt}(x,t) + \mu^1(t)u_t(x,t) + \mu^2(t)u_t(x,t-\tau) = uln|u|^k$$

in a bounded domain. Under appropriate conditions on $\mu_1$ and $\mu_2$, we prove global existence of solutions by the Faedo-Galerkin method and establish a decay rate estimate for the energy using the multiplier method.





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Existence and uniform decay of nonlinear viscoelastic equation with strong damping, Mathematical Methods in Applied Sciences, 2001.

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# The topology of cosmic radiations

## Communication Info

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**Keywords:**
(1) Algebriac Topology
(2) Topological Data Analysis
(3) Recognition Shape

## Abstract

Based on some experiences conducted by the NASA, we will discover that the topological data analysis can extract some information, where the classical methods were unable to do. In this paper, we focus on some leader experiences (e.g. [1-3]), after what authors are convinced that irradiation caused significant reductions in dendrite complexity, spine density and altered spine morphology along medial prefrontal cortical neurons known to mediate neurotransmission interrogated by our behavioral tasks. Behavioral deficits for individual animals correlated significantly with reduced spine density and increased synaptic puncta, providing quantitative measures of risk for developing cognitive impairment.

Thanks to the persistence homology, as an algebraic topology tool used in the topological data analysis approach, we propose to issue a barcode of the results of these experiences. The only data we will use is high-resolution imaging of brain tissue taken by the authors for rodents' brain before and after having bombarded them with some cosmic radiation. We will implement an algorithm that store regions adjacency under topology signature to evaluate the density of dendrites and spines. Moreover, we will design a software which issue from any humain IRM's brain an alert about the neuronal density. This can be useful, for example, to alarm the parents whose kids are addict of video games, they only need brain scan to put in the software. An alert will be issued according to the dendrite complexity and spine density readed by the software, based only on brain scan. Indeed, persistent homology persistence allowed us to interpret geometrical constitution shape, and then can be used to make shape recognition.



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# Limit theorem and LIL of some additive functionals of some self-similar Gaussian processes

## Communication Info

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**Keywords:**

(1) Limit theorem
(2) Fractional Brownian motion
(3) Bi-fractional Brownian motion
(4) Sub-fractional Brownian motion
(5) Additive functional
(6) Law of Iterated Logarithm (LIL)
(7) Local time
(8) Strong approximation

## Abstract

Our purpose in this paper is to study the limit theorem of some additive functionals with respect to fractional Brownian motion by using strong approximation. With an additional hypothesis, we obtain a strong approximation which will be stronger than that obtained by Kasahara and Kosugi in [6]. As an application, this will allow us to get the Law of the Iterated Logarithm (LIL for brevity) of the process

$$\left(\int_0^t f(B_s^H)\,ds, \qquad t \geq 0\right),$$

Where $f$ is a Borel function on $\mathbb{R}$ such that $\bar{f} \neq 0$ and $\int_{\mathbb{R}} x^k f(x)dx < \infty$ for some $k > 0$.

We end this paper by noting that these results remain valid for other self-similar Gaussian processes namely: the bi-fractional Brownian motion and sub-fractional Brownian motion, by giving the version of the limit theorem and that of Law of Iterated Logarithm for this particular self-similar processes.



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# A Trust-Based Communities For Collaborative Filtering Recommendation

## Communication Info

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**Keywords:**
(1) Recommendation systems
(2) Trust
(3) Collaboratif Filtering (CF)
(4) Hierarchical Ascending Classification (CAH)

## Abstract

Every company, considers documentation as the engine of its productivity. Recommendation systems allow the diffusion of knowledge between experts and operators in an efficient and a fast manner [1]. The goal of a trust-based recommendation system is to generate personalized recommendations by aggregating the opinions of users in the trust group [2].
In this paper, we present new modelling approach to build trust communities for recommending relevant documents to industrial operators based on collaborative filtering (CF) algorithm and Hierarchical Ascending Classification (HAC) method.
The idea is that documents recommendation depends not only on operators' needs and preferences but also on the trust relationships between these latter.
Based on this idea, we suggest reliable documents recommendation tool in the industrial environment where operators can express their preferences towards a set of documents. An analysis of trust among operators within a group is performed to identify trusted operators. The groups of operators are formed by the HAC method. This approach is based mainly on the trust model that calculates the importance of a user within his group according to three metrics: his implicit self-confidence, his interests, and his activity score. This model allows a significant reduction of recommendation time by taking into account the group of trusted operators to predict new reliable recommendation.



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# A knowledge based decision support system for geological follow-up of petroleum drilling

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**Keywords:**
(1) Business rules
(2) Decision support system
(3) SONATRACH enterprise
(4) Lithological interpretation
(5) Geological information

## Abstract

At SONATRACH Company, the domain Experts follow the same procedures to ensure the interpretation of the potential interest of hydrocarbon reservoirs using archaic methods to date. They rely on their business rules, which they check on fairly large databases of up to about 4500 records for the GAZ database and up to 30000 records for the Logging database.
Our motivation behind this study is to design and implement a decision support system for the geological monitoring of oil drilling; This latter will allow the characterization of hydrocarbon reservoirs by using gas ratios (Wh, Bh, Ch) as well as logging or logging parameters (Gama Ray, Sonic, Resistivity, ...).
The developed system willl also facilitate the lithological interpretation of for-mations that are traversed during drilling with Logging data such as (GR, Sonic, Resistivity, Electrical Factor, rock density, ...).
Thus, the expert will have at his disposal all the information he needs to decide on the continuation or not of operations whose purpose is to optimize costs.



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# Théorie des sentiers rugueux et cohomologie de Hochschild

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**Abstract**

Depuis la naissance de la théorie des chemins rugueux à la fin des années 90 [5], le domaine a connu une progression remarquable et extrêmement fulgurante. En outre, ces dernières années, plusieurs articles ont montré comment appliquer la théorie des chemins rugueux au machine learning et à l'analyse des séries chronologiques.

Au préalable, nous définissons la signature d'un chemin continu et nous introduisons ses propriétés, puis nous définissons l'algèbre tensorielle en question. Le n-ième puissance tensorielle de $\mathbb{R}^d$ est définie par

$$(\mathbb{R}^d)^{\otimes n} := \underbrace{\mathbb{R}^d \otimes \mathbb{R}^d \otimes \ldots \otimes \mathbb{R}^d}_{n},$$

où $\otimes$ est le produit tensoriel. On définit l'algèbre tensorielle par

$$T((\mathbb{R}^d)) := \{(a_0, a_1, a_2, \ldots) : a_n \in (\mathbb{R}^d)^{\otimes n} \ \forall n \geq 0\}, \tag{1}$$

avec $(\mathbb{R}^d)^{\otimes 0} = \mathbb{R}$, par convention. C'est une algébre de Lie stratifié(encore appelé groupe de Carnot)

La signature d'un chemin est un objet clé dans la théorie des chemins rugueux. Pour un chemin continu $X : [0, T] \to \mathbb{R}^d$ tel que les intégrales ci-dessous aient un sens, la signature de $X$ est définie par la suite

$$S(X) := (1, X^1, X^2, \ldots) \in T((\mathbb{R}^d))$$

où

$$X^n := \int \ldots \int_{0<u_1<u_2<\ldots<u_n<T} dX_{u_1} \otimes \ldots \otimes dX_{u_n} \in (\mathbb{R}^d)^{\otimes n} \quad \forall n \geq 1.$$

Un flux de données(data steaming) se traduit par $(t, S_t)_{t\in D}$, où $D \subset [0, T]$ correspond à l'instant où nous possédons une information sur le chemin, et $S_t$ désigne sa valeur au temps $t$. En finances, $D$ désigne l'instant où nous détenons une information sur le prix d'un titre, et $S_t$ désigne le prix du titre au temps $t$.

L'homologie simpliciale de cet algébre est l'homologie de Hochschild, qui pour le cas de degré 1, son module de différentiels de Kähler coïncide avec sa première homologie de Hochschild. $\Omega(R/k) \simeq H_1(R, R)$ . Le théorème Hochschild-Kostant-Rosenberg est une généralisation aux degrés supérieurs. Une étude de la différentielle de kähler ainsi construite et son effet sur les intégrales itérées est examinée.

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# ICRAMCS 2020

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# The reduced Hartree-Fock model with self-generated magnetic Fields

## Communication Info


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**Keywords:**
(1) Minimization problem
(2) well-posedness
(3) reduced Hartree-Fock model
(4) Stability


## Abstract


The Schrödinger model with self-generated magnetic fields has been studied in a series of papers [1,2,3]. Here, we present some results about the well-posedness of the reduced Hartree-Fock model with self-generated magnetic fields for molecules and crystals. In particular, we exhibit a critical value $a_c > 0$ such that, if the fine structure constant a is smaller than $a_c$, then the corresponding system is stable, whereas if a is greater than $a_c$, it is unstable. We give an explicit characterization of $a_c$ as a minimization problem over the set of zero-modes, and we prove that the critical values for the molecular case and the periodic case coincide. Finally, we give some results about the existence of minimisers.




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# Retarded stochastic functional integro-differential equations driven by Rosenblatt process

**Communication Info**

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**Keywords:**
(1) Stochastic partial integro-differential equations
(2) resolvent operators
(3) Rosenblatt process

**Abstract**

Hermite processes are self-similar processes with stationary increments, the Hermite process of order 1 is fractional Brownian motion and the Hermite process of order 2 is the Rosenblatt process. In this talk we consider a class of neutral stochastic integro-differential equations with variable delays driven by Rosenblatt process with index H which is a special case of a self-similar process with long-range dependence. More precisely, we establish some conditions ensuring existence and uniqueness of mild solution by using the theory of resolvent operators. Finally, an illustrative example is provided to demonstrate the effectiveness of the theoretical result. Since they are non-Gaussian and self-similar with stationary increments, the Rosenblatt processes can be an input in models where self-similarity is observed in empirical data which appears to be non-Gaussian. There exists a consistent literature that focuses on different theoretical aspects of the Rosenblatt processes, see [1-5].

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# ICRAMCS 2020

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## Measure of noncompactness and fractional integro-differential equations with state-dependent non-local conditions in Fréchet spaces


**Communication Info**

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**Keywords:**
(1) Measure of noncompactness
(2) Integro-differential equation
(3) Non-local conditions



**Abstract**

This paper deals with the existence of mild solutions for non-linear fractional integro-differential equations with state-dependent nonlocal condition. In [4], Hernandez and O'Regan introduced a new type of non local conditions, which we call state dependent non local conditions. Recently, in [3], Hernandez studied the existence of mild and strict solutions for a class of abstract differential equations with state dependent delay. We use the technique of generalization of the classical Darbo fixed point theorem for Fréchet spaces associated with the concept of measures of noncompactness. It is well known that this method provides an excellent tool for establishing the existence of solutions of nonlinear differential equations. More details are found in Akhmerov et al. [1], Al´vares [2]. An application of the main result have been included.




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# Cross validation vs generalized cross validation in PLS regression: a comparison by simulation

**Communication Info**

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**Keywords:**
(1) Pls regression
(2) Model selection
(3) Cross validation

**Abstract**

Partial least squares regression (PLS regression) is often used to overcome the problem of multicollinearity in chemometrics. This method shrinks the ordinary least squares estimator (OLS estimator) in order to exchange bias with lower variance. PLS requires a proper model selection tool to choose the optimal model; cross validation is the most common tool in the PLS literature. In this work we will compare leave one out cross validation with two methods of generalized cross validation (GCV), often used in regularization methods in the numerical analysis literature. The difference between the two (GCV) methods is the use of different estimations for the trace of the influence matrix. Our comparison is conducted using simulated datasets.



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# A fast algorithm for solving the linear complementarity problem in a finite number of steps.

## Communication Info

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**Keywords:**
(1) Linear Complementarity
(2) Matrix M

## Abstract

In this work, we present an algorithm that has a finite number of steps for solving a linear complementarity problem LCP (M, q). If the solution of the linear complementarity problem LCP (M, q) exists, then we prove, under certain assumptions predefined on the matrix M, that the proposed algorithm converges to this solution.
To solve the LCP (M, q), we use the fact that this last one is equivalent to solve the equation of the absolute value. In order to clarify the speed of our algorithm as a function of time and number of iterations, we apply this algorithm to some numerical examples, also we compare it with other methods.



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# CONTROLLABILITY OF SEMILINEAR STOCHASTIC IMPULSIVE FUNCTIONAL DIFFERENTIAL EQUATIONS DRIVEN BY FBM WITH INFINITE DELAY

## Communication Info

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**Keywords:**
Controllability; impulsive stochastic differential equations; Karasnoselskii's fixed point theorem; infinite delay; fractional Brownian motion.

## Abstract

This work concerns the study of the controllability for impulsive stochastic functional differential equations with infinite delay driven by fractional Brownian motion in a real separable Hilbert space. The controllability results are obtained using stochastic analysis and a fixed-point strategy. Finally, an illustrative example is provided to demonstrate the effectiveness of the theoretical result.

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# Bongard Problems: Image Clustering By Means Of Persistent Homology and Group Equivariant Non Expansive Operators

## Communication Info

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**Keywords:**

(1) Topological Data Analysis
(2) Persistent Homology
(3) Machine learning
(4) Group Equivariance

## Abstract

Bongard problems are a set of 100 visual puzzles posed by M. M. Bongard, where each puzzle consists of twelve images separated into two groups of six images. The task is to find the unique rule separating the two classes in each given problem. The problems were first posed as a challenge for the AI community to test machines ability to imitate complex, context-depending thinking processes using only minimal information. Although some work was done to solve these problems, none of the previous approaches could automatically solve all of them. Our work is a contribution to attack these problems with a different approach, combining the tools of persistent homology alongside with machine learning methods. Here, we present an algorithm and show that it is able to solve problems involving differences in connectivity and size as examples, we also show that it can solve problems involving a much larger set of differences provided the right G-equivariant operators.



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# Global Asymptotic Stability of a Generalized SEIRI Epidemic Model

## Communication Info

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**Keywords:**
(1) Lyapunov Function
(2) Local Stability
(3) Global Stability

## Abstract

In this paper we propose the global dynamics of an SEIRI epidemic model with a general nonlinear incidence function. The model is based on the susceptible-exposed-infective-recovered (SEIR) compartmental structure with relapse (SEIRI). Sufficient conditions for the local and global stability of equilibria (the disease-free equilibrium and the endemic equilibrium) are obtained by means of Routh-Hurwitz criterion and Lyapunov-LaSalle theorem.



## References

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# ICRAMCS 2020

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# Sequential formulae for ε-subdifferential of multi-composed functions via perturbation approach with application to facility location problems

## Communication Info


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**Keywords:**
(1) Sequential ε-subdifferential calculus
(2) Multi-composed convex functions
(3) Perturbation theory
(4) Multi-composed optimization problems
(5) ε-optimality conditions


## Abstract


Recently, the sequential ε-subdifferential calculus rules have received a great deal of interest from the scientific community (see [1] and [2] and references therein). Indeed, these calculus rules enable us to characterize an ε-optimal solution of a scalar or vector convex programming problems in terms of limits of ε-subgradients at nearby points to the nominal point and without assuming any qualification condition (i.e. regularity condition).

In this work, by using an approach based on perturbation theory and without imposing any qualification condition, we establish several sequential formulae for the ε-subdifferential of a multi-composed convex function defined in a reflexive Banach space. As an application of these formulae, necessary and sufficient sequential ε-optimality conditions are obtained for location problems with monotonic gauge.




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# Stabilization of Schrödinger equation with constants coefficients and dynamic limit condition

## Communication Info

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**Keywords:**
(1) Schrödinger equation
(2) Stabilization
(3) I memory
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## Abstract

In this work we consider the boundary stabilization of the Schrödinger equation with variable constants and a dynamical Neumann boundary control. Our proof relies on the Geometric multiplier skills and the energy perturbed approach. The dynamics on the boundary comes from the acceleration terms which cannot be ignored in some physical applications.
phenomena. In recent years, different equations with time delay effects have become an active area of
research. In particular, as is well-known that an arbitrarily small delay may be the source of instability
and some dissipative mechanism need to be introduced to against the instabilities, the control and
stabilization of the wave equations with time delay have been extensively studied by several authors.



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# ICRAMCS 2020

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# Calculus rules of generalized proper ε-subdifferential for vector valued mappings and applications

## Communication Info


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**Keywords:**
(1) ε-proper subdifferential
(2) vector optimization problem
(3) vector valued mappings
(4) ε-proper minimizer


## Abstract


This work deals with a new concept of subdifferential defined in the Pareto sense and adapted to nonconvex vector mappings, called generalized proper approximate subdifferential. Some existence theorems and properties are established. We give the calculus rules of the generalized proper approximate subdifferential for the sum and the difference of two vector valued mappings. We study optimality conditions of constrained vector optimization problems.




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# Variation on the conjecture of Hilali I

## Communication Info


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**Keywords:**
(1) Rational Homotopy Theory
(2) Elliptic spaces
(3) Rational cohomology
(4) Hilali conjecture


## Abstract


The well-known Hilali conjecture stated in [1] is one claiming that:
if $X$ is a simply connected elliptic space, then

$$\dim \pi_*(X) \otimes \mathbb{Q} \leq \dim H_*(X ; \mathbb{Q}).$$

In this talk we propose a *relative version* of the Hilali conjecture, that:
if $f : X \to Y$ is a continuous map of simply connected elliptic spaces, then

$$\dim \operatorname{Ker} \pi_*(f) \mathbb{Q} \leq \dim \operatorname{Ker} H_*(f ; \mathbb{Q}) + 1$$

and we prove this for certain reasonable cases.




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# A New Algorithm for the Computation of the Covariance Matrix Implied by a Structural Recursive Model using the Finite Iterative Method

## Communication Info

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**Keywords:**
(1) Structural Equation Modeling
(2) Finite Iterative Method
(3) Covariance Matrix

## Abstract

Structural Equation Modeling (SEM) is a set of statistical techniques that assesses a hypothesized causal model by showing whether or not, it fits the available data (Bagozzi and Yi, 2012). One of the major steps in SEM is the computation of the covariance matrix implied by the specified model (Jöreskog et al, 2016). This matrix is crucial in estimating the parameters, testing the validity of the model and, make useful interpretations. Two major methods are used for this purpose: the Jöreskog's formula (Jöreskog, 1970) and the finite iterative method (Elhadri and Hanafi, 2015; Elhadri et al, 2019). In this communication, we present a new algorithm based on the finite iterative method for the computation of this matrix. The proposed algorithm aims to make the computation more simplistic and the assumptions less restrictive. To illustrate the proposed method, an illustrative example is presented. Furthermore, theoretical and numerical comparisons between the exposed methods with the proposed algorithm are discussed and illustrated through a Python program.



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# Regional Observability For Semilinear Fractional Systems

## Communication Info

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**Keywords:**
(1) Regional Observability
(2) Time-Fractional Systems
(3) Fractional Calculus
(4) Semilinear Fractional Systems

## Abstract

Control theory is one of the essential domains of studies in mathematics, it serves as a link between applied mathematics and technology, it includes various notions, which are very useful in many fields of engineering, such as Controllability, Stability and Observability. For us, we are interested in a global version of only the last concept, namely "Regional Observability", and we are investigating it for a special type of systems called fractional order systems. Many works have been done in this subject for both linear and semilinear classical "integer order" systems. The reason behind our interest in fractional or non-integer order systems is that, it had been proven in the last few years that these kind of systems can be better in modeling real world phenomena compared to classical systems. In this work we study the regional observability problem more precisely the regional reconstruction of the initial state for a given time fractional semilinear systems using an extension of the famous Hilbert Uniqueness Method (HUM).



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# ICRAMCS 2020

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# An existence result for a strongly nonlinear parabolic equations with variable nonlinearity

## Communication Info


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**Keywords:**
(1) Strongly nonlinear parabolic equations
(2) Variable exponents,
(3) Weak solution


## Abstract


We prove the existence of a solution for the strongly nonlinear parabolic initial boundary value problem associated to the equation

$$\begin{cases} \frac{\partial u}{\partial t} - div\, a(x,t,\nabla u) + g(x,t,u,\nabla u) = f \ \ in\ \Omega \times ]0,\mathrm{T}[ \\ u(x,t) = 0 \qquad\qquad in\ \ \partial\Omega \times ]0,\mathrm{T}[ \\ u(x,0) = u_0(x) \qquad\quad in\ \Omega \end{cases}$$

where $-div\, a(x,t,\nabla u)$ is a Leray-Lions type operator which growths like $|\nabla u|^{p(x)-1}$ not depending on $u$ and where the perturbation $g$ has a critical growth with respect to $\nabla u$ and a sign condition. The right-hand side $f$ is assumed to belong to $X^*$ where $X := \left\{ u \in L^{p^-}\left(0,T; W_0^{1,p(.)}(\Omega)\right) : \nabla u \in L^{p(.)}(\mathrm{Q}) \right\}$, and $u_0$ lies in $L^2(\Omega)$.




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# Etude comparative des bases de données NoSQL : MongoDB, Cassandra, HBase, Redis, CouchBase, OrientDB

**Communication Info**

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**Keywords:**
(1) Big Data
(2) NoSQL
(3) YCSB

**Abstract**

L'explosion de la volumétrie des données, qui reflète le changement d'échelle des volumes, du nombre et de types de données, a émergé de nouvelles technologies : Cloud Computing et Big Data [1]. Le Big Data est un ensemble de technologies basées sur les bases de données NoSQL [2-3], permettant le passage à grande échelle. Les grandes entreprises du domaine informatique voient dans les nouveaux systèmes NoSQL, de nouvelles solutions permettant de répondre à leurs besoins d'extensibilité. Plusieurs solutions open-source et payantes de modèles NoSQL sont disponibles sur le marché. Notre contribution consiste à développer une étude comparative sur les performances de six solutions NoSQL très répandues dans le marché (MongoDB, CouchBase, Cassandra, HBase, Redis, OrientDB) [4-5], à l'aide de Yahoo! Cloud Serving Benchmark (YCSB) [6]. La finalité est d'apporter l'assistance et l'aide nécessaire aux acteurs intéressés pour d'éventuelles prises de décision sur le choix de la meilleure solution appropriée pour leurs entreprises.



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# Approximate null--controllability for systems governed by fully nonlinear differential inclusion

**Communication Info**

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**Keywords:**
(1) Controlability
(2) Viability
(3) Differential inclusion

**Abstract**

Let $X$ be a real Banach space. We consider the control system $y'(t) \in A\, y(t) + F(t, y(t))$, where $A$ is an m--dissipative set--valued operator, and $F$ is a given set--valued map.
We show that the problem of approximate null controllability of the above system, i.e., whether it is possible to approximately steer an initial state into the origin in a finite time can be treated as a problem of near viability of the epigraph of the norm of the Banach space $X$ with respect to an appropriate dynamical system.
We recall that a set is said to be near viable with respect to a system if, starting from the set, one is able to find solutions of the system remaining arbitrary close to the set in some arbitrarily small
neighborhood of the set. We provide also, on the base of a new tangency condition, sufficient conditions for a cylindrical domain to be near viable with respect to
The the consideration problem.
Finally, we investigate some nonlinear cobtrol problems.



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# ICRAMCS 2020

**INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE**
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# Entropy solutions for nonlinear degenerate elliptic


**Communication Info**

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**Keywords:**
(1) Degenerate elliptic problem.
(2) Entropy solution.
(3) Weighted Sobolev space.



**Abstract**

Let $\Omega \subset R^N, (N \geq 2)$ be a open bounded domain and p be a real number such that 1<p<∞. Our aim of this communication is to prove the existence and uniqueness results of entropy solutions for the nonlinear degenerate elliptic problem

$$\begin{cases} -\operatorname{div}(\omega(\nabla u - \Theta(u))^{p-2}(\nabla u - \Theta(u))) + \alpha(u) = f \text{ in } \Omega, \\ u = 0 \text{ on } \partial\Omega \end{cases}$$

where ω is a measurable positive and a.e finite function defined in $R^N$, α and Θ are real functions satisfying the following hypotheses

$(H_1) : \omega \in L^1_{loc}(\Omega)$ and $\omega^{-1/(p-1)} \in L^1_{loc}(\Omega)$ ,

$(H_2) : \omega^{-s} \in L^1_{loc}(\Omega)$ where $s \in \left(\frac{N}{p}, \infty\right) \cap \left(\frac{1}{p-1}, \infty\right)$].

$(H_3)$ : α is a non decreasing continuous real function defined on R, subjective such that α(0)= 0.

$(H_4)$ : Θ is a continuous function from R to $R^N$ such that Θ(0)=0 and for all real numbers x, y, we have $|\Theta(x)-\Theta(y)| \leq \lambda_2|x-y|$, where $\lambda_2$ is a real positive constant satisfying some conditions.

The datum f is in $L^1(\Omega)$ .




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# ICRAMCS 2020

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# Solving an Evolutionary Business Process Optimization Issue with a Multiple-Population Genetic Algorithm

## Communication Info


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**Keywords:**
(1) Business process
(2) Multi-criteria optimization
(3) Evolutionary computing
(4) Genetic algorithm
(5) Multi population


## Abstract


This article deals with an optimization up to two objectives of business process designs using evolutionary computing as defined by [1]. The authors present an approach for an evolutionary combinatorial multi objective optimization of business process designs with a specified genetic algorithm. The latter differs from the canonical genetic algorithm [2] by its use of not one but several populations [3] simultaneously during its iterations. So, the proposed approach uses (i) an effective mathematical proposition for solution representation, (ii) an original evolutionary algorithm and (iii) two contradictory criteria to optimize. In order to show the efficiency of the whole, five different test scenarios proposed by [4] and [5] have been used. The obtained results show that the optimization approach is capable of producing a satisfactory number of optimized designs alternatives and adding more populations has shown an increase of non-dominated solutions in reduced iterations amount.




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# Mathematical modeling of fishing bioeconomic model including wind

## Communication Info

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**Keywords:**
(1) Bio-economic model
(2) Fish populations
(3) programming

## Abstract

In this talk, we search to show the influence of the wind speed on the annual fishing effort, catches and profit of seiners; and show that these parameters are the most important parameters involved in seiner's fishing activity [1-2]. To achieve this objective, we consider a bio-economic system of marine populations exploited [3-4], in the southern Atlantic zone of Morocco, by seiner fleets. In this talk, we show that our model is stable. After, we move to calculate the fishing effort and the amount of catch that allows seiners to have a maximum annual profit under the two constraints: The changes of wind speed and the sustainability of the marine populations stocks [5]. Also we compare the obtained results with those given by National Institute of Fisheries Research.



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# Sequential proper efficiency optimality conditions for multiobjective fractional programming problems

## Communication Info

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**Keywords:**
(1) Multiobjective fractional programming
(2) Henig proper efficient solution
(3) Henig proper subdifferential

## Abstract

A multiobjective fractional optimization problem, which consists of more than two fractional objective functions with convex numerator functions and concave denominator functions, subject to conic and geometric constraint set, is considered in this work. By using a parametric approach, we transform the problem as a non-fractional multiobjective convex optimization problem . By means of this equivalence, we establish in the absence of any constraints qualification, sequential necessary and sufficient optimality conditions for multiobjective fractional optimization problems characterizing completely a Henig proper efficient solution.



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# Recurrence of Set of Operators and applications

## Communication Info

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**Keywords:**
(1) Hypercyclicity
(2) Recurrent operators
(3) C-regularized group

## Abstract

An operator T acting on a Banach space X is said to be recurrent if for each U; a nonempty open subset of X, there exists n∈N such that $T^n(U)\cap U\neq\emptyset$. In the present work, we generalize this notion from a single operator to a set Γ of operators. As application, we study the recurrence of C-regularized group of operators.



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# Estimation de l'espérance conditionnelle de queue pour un processus Lévy stable

**Communication Info**

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**Abstract**

Les distributions Lévy stables sont capables de capturer l'asymétrie et les queues lourdes, qui sont fréquemment observées dans les données financières. Dans ce travail, nous ajustons un processus AR (1) avec des innovations stables aux logarithmes des volumes d'actions de Wal-Mart de la Bourse de New York et estimons la mesure de risque TCE (Tail Conditional Expectation).

**Keywords:**
(1) Processus autorégressif
(2) Distributions Lévy stables
(3) Mesure du risque



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# Does more flexibility impact interdependence to EUR/USD? Empirical evidence from Morocco

**Communication Info**

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**Keywords:**
(1) Exchange Rate
(2) Interdependence
(3) Flexible Exchange Rate

**Abstract**

(Forbes & Rigobon, 2000) and (Forbes & Rigobon, 2002) suggested the existence of a wide interdependence between financial markets in both calm and crisis periods. However, practically all the econometric studies such as (Habib, 2002), (McAleer & Nam, 2005) and (Kenourgios, 2014) only investigated this interdependence in period of crisis as part of contagion phenomenon. The purpose of this article is to investigate the evolution of interdependence of exchange rates after the introduction of flexibility reforms rather than during or after a crisis. To do so, we exploit daily exchange rates from Morocco over more than 23 years that we split into a non-flexibility and a flexibility period. We then employDCC GARCH Model introduced by (Engle, 2002)to investigate the evolution of the interdependence. The main result is that introducing greater flexibility tend to reduce the interdependence and increase the impacts of past shocks. We also find that the composition of the peg basket and international crisis impacts highly the interdependence. Finally, we present some important policy implications as well as some propositions for follow up studies.



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# Impact of the flexible exchange rate regime on the misalignment of Moroccan dirham

## Communication Info

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**Keywords:**
(1) Exchange Rates
(2) Misalignment
(3) Flexiblity

## Abstract

The exchange rate misalignment is a key metricofthe macroeconomic failure to steer correctly the external competitiveness issue of a given economy as shown in the works of [1] and [2]. Many studies such as [5], [3] and [4] specifically examined out the Moroccan case, however since the start of 2018 the country switched to a new exchange rate regime which increased flexibility.

Our goal is to assess the impact of the newly introduced flexible exchange rate in Morocco on the national currency misalignment. Our methodology consists on using vector error correction model to exhibit a relationship between dirham's misalignment and various macroeconomic aggregates based on a 28 years' time series of financial DATA. Our main finding is that the new exchange rate regime can help reduce the misalignment as larger fluctuation bands may help the local currency depreciate toward its real value. Another finding is that increases in GDP, Net balance of Payments and inflation help reduce misalignment of the dirham in the long run with different pace. We also present some key policy implications for both investors and monetary authorities based on our findings.



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# Remarks On the Strong and Uniform Kreiss Resolvent Condition

**Communication Info**

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**Keywords:**
(1) Strong resolvent condition
(2) Uniform resolvent condition
(3) Banach space.

**Abstract**

In the present paper, we extend the strong (uniform) Kreiss resolvent condition to a direct sum, and we show that if an operator on a Banach space satisfies the strong (uniform) Kreiss resolvent condition then so does the fractional powers of this operator.



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# Equations Différentielles Fractionnaires de Sturm-Liouville

## Communication Info

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**Mots clés:**
(1) Equation différentielle fractionnaire.
(2) Problème de Sturm-Liouville .
(3) Piont fixe.

## Résumé

L'objectif principal de ce travail est consacré aux applications de point fixe sur de problème aux limites d'ordre fractionnaire de Sturm-Liouville (voir [2-3]). Tout d'abord, on établit des hypothèses sous lesquelles on peut présenter des résultants qui consistent à étudier l'existence et l'unicité de solutions pour un problème non linéaire aux dérivées d'ordres fractionnaires (voir [1]). D'autres résultants assurant l'existence d'une solution au moins du problème fractionnaire traité sont construits. On a présenté aussi quelques exemples qui sont construit pour illustrer les résultants (voir [4]).



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# Construction of a strongly co-hopfian Abelian Which the torsion part isn't strongly co-hopfian

**Communication Info**

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**Keywords:**
(1) Abelian group
(2) Endomorphism
(3) Strongly co-hopfian

**Abstract**

An abelian group A is called strongly co-hopfian if for every endomorphism α of A the chain

Im(α1) _⊇ Im(α2) _⊇ Im(α3) _⊇ Im(α1) _⊇…….

is stationary.

In this work, we characterize some properties of the strongly co-hopfian abelian group. Then we show that the p-component of strongly co-hopfian abelian group is also strongly co-hopfian but for the torsion part we construct strongly co-hopfian abelian group whose the torsion part is not strongly co-hopfian. method.

 Proceedings ISSN: 2605-7700

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# Insulin Control of the Glucose-Insulin System: Type 1 Diabetes

**Communication Info**

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**Keywords:**
(1) Physiological mode
(2) Type 1 diabetes mellitus
(3) Glucose-insulin system
(4) Optimal Control and Pontryagin's Maximum Principle.

**Abstract**

Type 1 diabetes is a serious disease that affects many children and adolescents. The disease causes the pancreas to stop producing insulin, a hormone that regulates blood sugar level Insulin is a hormone that lowers the blood glucose concentration by catalyzing storage of glucose. In this work, the construction of a mathematical model describing the whole blood glucose-insulin system was tried. The model was derived both based upon the two minimal models of Bergman's minimal model, which is primarily used to interpret an IVGTT. Our objective is to propose a therapeutic scheme adapted to the needs of the diabetic patient and this through a mathematical model describing type 1.



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# Monte Carlo and Data scientist simulation methods for American options.

**Communication Info**

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**Keywords:**
(1) Monté Carlo simulation for pricing Américain option
(2) Ibanez and Zapatero algorithm.
(3) Lonstaff & shwatrz algorithm.
(4) Random Forest regression.

**Abstract**

The Option Pricing Problem began with the works of Black and Scholes appeared in 1973. However, with the rise of robust models, resolving optimization problems became less time consuming due to the currently used computational methods for the Multi Dimensional Backward Stochastic Differential Equation which is resolving problems involving final condition. So in this project we aim explore two Monte Carlo algorithms for pricing multi dimensional American options. First method based on computation of the optimal exercise boundary [1] while the second is about compare between continuation and exercise values based on conditional expectation approximation by least-square [2], We also show the efficiency of the two approaches, and comparing these methods with Data scientist approaches especially random forest regression [4].



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# A bioeconomic model applied to a small pelagic species along the Moroccan coast

## Communication Info

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**Keywords:**
(1) Bio-economic model
(2) Small pelagic species dynamics
(3) Fishing effort
(4) Nash equilibrium

## Abstract

This paper proposes a case study of five small pelagic species: sardine pilchrdus, sardinella, engraulis encrasicolus, scomber scombrus and trachurus exploited by seiners in the maritime zones of Morocco. A comparison is made between the fishing effort calculated using the generalized Nash equilibrium problem and the actual fishing effort given by the National Institute of Fisheries Research. In this work, fishing effort represents the number of fishing trips that must be made by seiners and that allows them to maximize their gain taking into account the preservation of marine species. As a result, we find that master data of the National Institute of Fisheries Research support the outcomes shown in the end of this paper.



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# Étude d'un problème d'optimisation de forme

## Communication Info


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**Keywords:**
(1) Problèmes inverses
(2) Optimisation de forme
(3) Problèmes à frontière libre


## Abstract


Ce travail a porté sur l'étude d'un problème à frontière libre de type Bernoulli intérieur qui est apparu dans la modélisation de plusieurs phénomènes. Nous citons par exemple le problème de détection de la forme d'une inclusion située à l'intérieur d'un matériau ou d'un système.
Pour l'étude théorique et numérique, ce problème est reformulé en un problème d'optimisation de forme géométrique. Deux types de fonctionnelles coûts sont considérés. La première de type classique de moindres carrés et la deuxième de type Kohn-Vogelius.
Nous avons commencé par l'étude de l'existence et l'unicité de forme optimale. Puis, nous avons calculé la dérivée de forme de la solution du problème d'état. Ainsi, nous avons calculé les gradients des deux fonctionnelles coûts en introduisant un problème adjoint pour la méthode de moindres carrés.
Concernant l'approximation du problème d'optimisation de forme, nous avons utilisé la méthode des éléments finis pour la discrétisation du problème direct et la méthode du gradient pour la minimisation.
Finalement des résultats numériques sont représentés en utilisant la méthode d'optimisation géométrique, et nous avons comparé es résultats obtenus par les deux fonctionnelles de formes.




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# LEVEL-CROSSED: A SOLUTION FOR ENERGY SAVING IN WIRELESS SENSOR NETWORKS

## Communication Info

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**Keywords:**
(1) Wireless Sensor Networks
(2) Energy efficiency
(3) cross-layering

## Abstract

Energy efficiency in one of the most considered challenges in wireless sensor networks[1], [2].Cross layer technique is a commonly used solution for improving network performance[3], such as lifetime optimization[4]. Based on low energy adaptive clustering hierarchy protocol[5],[6], this paper puts forward a cross layer algorithm named LEVEL-CROSSED for energy saving in a clustred wireless sensors network. For cluster-head selection LEVEL-CROSSED algorithm takes into account both the SNR of different links and the outstanding energy of sensor nodes. Simulation results in terms of the average energy consumption, the network lifetime and the Packet Delivery Ratio show evidently the outperformance of LEVEL-CROSSED algorithm against the basic LEACH.



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# Numerical Simulation of a Thermo-electro-viscoelastic Contact Problem involving Tresca Friction Law

## Communication Info

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**Keywords:**
(1) Thermo-piezoelectric Material
(2) Frictional Contact
(3) Finite Element Method
(4) Augmented Lagrangian Method
(5) Numerical Simulations

## Abstract

This work considers a mathematical model that describes quasistatic evolution of a piezoelectric body that may come in frictional contact with a conductive foundation. The behavior of the material is modeled with a linear thermo-electro-viscoelastic constitutive law. The contact is described by Signorini's conditions and Tresca's friction law including the electrical and thermal conductivity conditions. This paper continues [2], providing the numerical modelling of the problem supported by numerical simulations. We introduce a numerical discretization based on a uniform time step and the finite element method in space. Then, we treat the frictional contact conditions by using an augmented Lagrangian approach and a version of Newton's method (see [1, 3] for details). Finally, an academic two-dimensional example is presented to demonstrate the performance of the algorithm.



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# Ulam-Hyers Stability of Singular FBVPs in Terms of the Caputo Derivative

## Communication Info


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**Keywords:**
(1) Caputo derivative
(2) fixed point
(3) singular fractional integro-differential equation
(4) existence and uniqueness
(5) Ulam-Hyers stability


## Abstract


This communication deals with singular fractional boundary value problems with Caputo derivatives.
We establish new existence and uniqueness result using the Banach contraction principle.
We also prove an existence result using the Schauder fixed point theorem. Moreover, we generate the Ulam-Hyers stability and the generalized Ulam-Hyers stability of solutions for the considered problem. Some examples are presented to illustrate the applications of our main results.




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# Nonlocal approches for image denoising

**Communication**

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**Keywords:**
(1) Nonlocal gradients
(2) Image restoration

**Abstract**

We present a state-of-the-art of recent nonlocal models applied in image denoising. In [1], Gilboa and Osher defined a nonlocal gradient, divergence and Laplacian operatos, and proposed different applications in image processing. Different definitions have been proposed by Jin, Jost, and Wang [2]. Based on nonlocal operators, many applications have been proposed. A nonlocal $H^1$ has been proposed in [5] which improves on the model of Gilboa-Osher. In [2], the authors proposed a new variant of the total variation model, based on Rudin-Osher's nonlocal operators. Experiments show that the new model is capable of producing good denoising results. In [3], the authors defined an approximation of the nonlocal Meyer's model. In [4], a variable exponent nonlocal p(x)-Laplacian model has been proposed to reduce the execution time and to represent textures and small details.

The aim of this presentation is to give an overview of some important nonlocal methods, using two different definitions of nonlocal gradient, and to compare their theoretical properties and experimental results.



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# USING WAVELET TRANSFORM AND NEURAL NETWORK FOR FORECASTING TIME SERIES

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**Keywords:**
(1) Wavelets
(2) Neural Networks
(3) Time series

## Abstract

Wavelets are a class of functions such that multiple resolution nature of wavelets that provides a natural frame work for the analysis of time series. A wavelet network is an important tool for analyzing time series especially when it is nonlinear and non-stationary. It takes advantage of high resolution of wavelets and learning and feed forward nature of Neural Networks. The power of this network to approximate functions from given input-output data is proved and it has utilized the localization property of a wavelet to focus on local properties.
Here we are analyzing the time series of of daily price of steel over a 790-day period for establishing the superiority of this method over other existing methods. The simulation results using MATLAB and R software show that the model is capable of producing a reasonable accuracy.



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# On the topology in zero-dimensional subrings of a product of rings

## Communication Info

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**Keywords:**
(1) Ultrafilter
(2) Zariski topology
(3) Zero-dimensional ring

## Abstract

Let R be a ring and $\{R_i\}_{i\in I}$ a family of zero-dimensional rings. In this work, we define the the Zariski topology on $Z(R,\prod R_i)$ and study their basic properties. Moreover, we define a topology on $Z(R,\prod R_i)$ by using ultrafilters it's called the ultrafilter topology and we demonstrate that this topology is finer than the Zariski topology.



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# Denoising Electroencephalogram Signal Using Complete Ensemble Empirical Mode Decomposition

## Communication Info

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**Keywords:**
(1) EEG
(2) CEEMDAN
(3) EEMD

## Abstract

An electroencephalogram is a test that permits to detect abnormal electrical activity in the brain. Before the evaluation of the brain disorders by experts that used an electroencephalogram test; it has necessary to filtering this EEG signal that affected by noise signal. This noise interfere with the EEG signal; which does not allow the provide a good interpretation by the doctor because of this mixing. Consequently, to obtain accurate registration identification it is required to select denoising techniques that minimize the noise. Among the denoising methods chosen are the Empirical Mode Decomposition (EMD), the Ensemble Empirical Mode Decomposition (EEMD) and the Complete Ensemble Empirical Mode Decomposition with adaptive noise (CEEMDAN) [1,2]. These techniques are applied on normal and abnormal EEG signals that corrupted with noise. The results show the efficiency of the CEEMDAN method in minimizing the noise in comparison with the EMD and EEEMD techniques.



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# ICRAMCS 2020

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# A Mathematical Modeling for the Dynamics of a Population of Diabetics and its complications with Effect of living envirenment using Optimal Control Strategy


**Communication Info**

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**Keywords:**
*(1) Diabetes*
*(2) Mathematical model simulation*
*(3) Optimal control.*



**Abstract**

In this paper,We want to develop our model of kouidere et al [3] talking about Optimal Control Strategy for a Discrete Time to the Dynamics of a Population of Diabetics with Highlighting the Impact of Living Environment, By dividing the complications of diabetes into two types can be treated and the other reached a critical stage. So, we propose an optimal control approach modeling the evolution from pre-diabetes to diabetes without complications,diabetics without complications to both types of complications with the highlighting of negative impact of living environment.
We show the existence and characterization of an optimal control and then use a numerical implicit finite-difference method to monitor the size of population in each compartment.




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# Algorithm for conflict detection and resolution in ground mouvement

**Communication Info**

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**Keywords:**
(1) Air Traffic Management
(2) First Come First Served
(3) Conflict Distribution

**Abstract**

Cette étude présente le développement d'un simulateur de surface d'aéroport. Le simulateur utilise les données de sortie d'un planificateur premier arrivé, premier servi (FCFS) [3,4] pour simuler le mouvement de ces aéronefs sur la surface. Les situations présentant un risque de collision plus élevé dans le trafic de surface aéroportuaire sont analysées et classées selon plusieurs cas [2]. Un algorithme de détection et de résolution de conflit est mis en œuvre pour maintenir la distance d'espacement recommandée. Le simulateur a été mis à l'essai avec un scénario de l'aéroport international Mohammed V qui met en mouvement 20 aéronefs [1]. Sans détection ni résolution de conflit, diverses situations de conflit sont identifiées. Lorsque l'algorithme de détection et de résolution de conflit gère le trafic, trois stratégies de priorisation sont mises en œuvre et le nombre d'aéronefs retardés et les retards en général sont compares [5]. Il est plus intéressant, à partir des résultats de l'établissement des priorités en fonction du temps ou de la distance restante, de choisir l'algorithme de détection plutôt que de minimiser le retard pour chaque situation donnée.



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# Optimality Conditions and DC Method of Centers for Minimax DC Fractional Programs

## Communication Info

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**Keywords:**
(1) Fractional programming
(2) Difference of convex functions
(3) Optimality conditions
(4) Method of centers

## Abstract

We are concerned with minimax fractional programs whose objective functions are the maximum of finite ratios of difference of convex (DC) functions, with DC constraints. We first give necessary optimality conditions for minimax fractional DC constrained DC problems, by means of convex analysis tools, and then propose a method to solve such programs. The method is based on solving a sequence of parametric convex problems. We show that every cluster point of the sequence of optimal solutions of these subproblems satisfies necessary optimality conditions of KKT criticality type.



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# ICRAMCS 2020

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# Mathematical Modeling and Optimal Control Strategy for a Discrete Time Drug Consumption

## Communication Info


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**Keywords:**
(1) Drug users model.
(2) Discrete mathematical modeling .
(3) Optimal control.


## Abstract


The aim of this paper is to study and investigate the optimal control strategy of a discrete mathematical model of drug consumption. The population that we are going to study is divided into six compartments: potential drug users, light drug users, heavy drug users, heavy drug users-dealers and providers, temporary quitters of drug consumption and permanent quitters of drug consumption.

Our objective is to find the best strategy to reduce the number of light drug users, heavy drug users and temporary quitters of drug consumption. We use four control strategies that are: awareness programs through media and education, preventing contact through security campaigns, treatment and psychological support along with follow-up. Pontryagin's maximum principle in discrete time is used to characterize the optimal controls. The numerical simulation is carried out using MATLAB. Consequently, the obtained results confirm the effectiveness of the optimization strategy.




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# Some Results on the Growth of Solutions to Higher Order Linear Differential Equations

## Communication Info

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**Keywords:**
(1) iterated order
(2) Meromorphic function
(3) Linear differential equations.

## Abstract

The purpose of this work is to study the growth of solutions of higher order linear differential equations $f^{(k)} + A_{k-1}f^{(k-1)} + \cdots + A_1 f' + A_0 f = 0$, $f^{(k)} + A_{k-1}f^{(k-1)} + \cdots + A_1 f' + A_0 f = F$, where $A_0(\not\equiv 0), A_1, \ldots, A_{k-1}$, $F$ are entire functions of finite iterated p-order. Under some conditions, we improve and extend some results and we obtain general estimates of the iterated convergence exponent and the iterated $p$-order of solutions for the above equations. Our results are an extension of [1] and[4].



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# Upper semi-continuous non-convex differential inclusions


**Communication Info**

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**Keywords:**
(1) Differential inclusion
(2) Regularity
(3) Clarke sub-differential



**Abstract**

We prove the existence of local solutions for upper semi-continuous non-convex differential inclusions, where the intersection between the right-hand side and the Clarke sub-differential of a regular function V is nonempty. This result is an extension of Bressan, Cellina and Colombo's work [3]. Furthermore, we have used the regularity of the function V to construct the approximate sequences. This construction is new and can be used to solve the viability problem for differential inclusions under weak assumptions.




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# An Alternative Least-Square Procedure to Estimate a Recursive Path Model using the Finite Iterative Method

## Communication Info

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**Keywords:**
(1) Path Analysis
(2) Finite Iterative Method
(3) alternative Least-Square
(4) Correlation Matrix

## Abstract

Path Analysis (PA) is a Multivariate statistical method used to analyze the relationship between a set of variables observed on the same set of individuals (Grace et al., 2012; El Hadri & Hanafi, 2015). The core of the method is the estimation stage. Indeed, the unknown parameters relating endogenous and exogenous variables are computed by minimizing a certain discrepancy function such as the weighted least square WLS. These later measures the distance between the observed and the implied correlation matrices (i.e. How much the model fits the data). In this communication, we present a new procedure to compute the parameters basing on the finite iterative method (El Hadri & Hanafi, 2015, 2016; El Hadri et al., 2019) and an alternative least-square strategy. A theorem ensuring the optimality of the procedure will be given as well as an empirical simulation showing the advantages of the proposed procedure using the Newton Raphson algorithm.



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# On the Existence of Extremal Weak Periodic Solutions For a Class of Nonlinear Fractional Parabolic Differential Equations

## Communication Info

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**Keywords:**
(1) Parabolic equation
(2) Conformable fractional derivative
(3) Periodic solution
(4) Upper and lower method
(5) Monotone iterative technique.

## Abstract

In this paper we consider a **fractional parabolic equation** in a bounded domain under periodic Dirichlet boundary conditions. Our main goal is to prove the existence of extremal solutions by using a more generalized monotone iterative method coupled with the merhod of upper and lower solution. Moreover, the convergence of this method is discussed.



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# Exact determinantions of maximal output admissible set for a class of nonlinear discrete systems

**Communication Info**

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**Keywords:**
(1) Discrete-time
(2) output admissible set
(3) semilinear system

**Abstract**

In the present paper, we consider the semilinear system defined by

$$\begin{aligned} x(i+1) &= Ax(i) + f(x(i)), \quad i \geq 0 \\ x(0) &= x_0 \in \mathbb{R}^n \end{aligned}$$

and the corresponding output signal $y(i) = Cx(i)$, $i \geq 0$, where $A$ is a $n \times n$ matrix, $C$ is a $p \times n$ matrix and $f$ is a nonlinear function. An initial state $x(0)$ is output admissible with respect to $A$, $f$, $C$ and a constraint set $\Omega \subset \mathbb{R}^p$, if the output signal $(y(i))_i$ associated to our system satisfies the condition $y(i) \in \Omega$, for every integer $i \geq 0$. The set of all possible such initial conditions is the maximal output admissible set $\Gamma(\Omega)$. In this paper we will define a new set that characterizes the maximal output set in various systems (controlled and uncontrolled systems). Therefore, we propose an algorithmic approach that permits to verify if such set is finitely determined or not. The case of discrete delayed systems is taken into consideration as well. To illustrate our work, we give various numerical simulations.



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# Discrete time optimal control applied to control problems

**Communication Info**


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**Abstract**


We apply discrete time optimal control theory to the mathematical modeling of pest control. Two scenarios: biological control and the combination of pesticide and biological control are considered. The goal is maximizing the "valuable" population, minimizing the pest population and the cost to apply the control strategies. Using the extension of Pontryagin's maximum principle to discrete system, the adjoint systems and the characterization of the optimal pest controls are derived. Numerical simulations of various cases are provided to show the effectiveness of our methods.




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# L'ADN pour Sécuriser un Environnement IoT

## Communication Info


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**Keywords:**
(1) Cryptographie
(2) ADN
(3) Security


## Abstract


De nos jours, nous entendons de plus en plus parler de l'Internet des objets (IoT). En raison du rythme croissant d'Internet , du grand nombre d'objets connectés et du grand flux d'informations entre les objets, les menaces augmentent également de jour en jour pour les utilisateurs. Par conséquent, pour garantir que les informations parviennent à l'expéditeur et au destinataire prévus, toutes les faiblesses des systèmes de sécurité doivent être surmontées. [1] [2] [3].
Basant sur les travaux qui ont montré que l'utilisation de l'adn est plus résistant aux attaques cryptographiques dans plusieurs situations [4] [5], nous présentons dans cette communication un nouveau algorithme inspiré de l'ADN pour sécuriser les messages transmis dans un environnement IoT. Nous proposons un processus sécurisé de génération de clés symétriques basé sur des séquences d'ADN qui sont généralement des chromosomes humains, puis nous appliquons des opérations biologiques telles que la transcription, le Xor biologique et la traduction.




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# Observateur pour une classe de systèmes épidémiologiques implicites

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**Keywords:**
(1) Observateur
(2) Modélisation épidémiologique
(3) Système implicite

## Abstract

La modélisation mathématique est devenue un outil indispensable pour analyser et comprendre la dynamique d'une épidémie. Dans la littérature, plusieurs travaux proposent des modèles à compartiments où la population est divisée en plusieurs groupes de personnes ayant le même statut vis-à-vis de l'infection (personnes susceptibles, exposées, infectieuses ou retirées). Ces modèles sont souvent formulés par des équations différentielles ordinaires EDO, mais cette représentation ne permet pas toujours de bien décrire le phénomène étudié. De plus, pour la plupart des épidémies la seule mesure disponible est le nombre d'infectés alors que les données concernant les autres compartiments sont souvent imprécises ou non disponibles.
En se basant sur une classe de systèmes implicites, qui sont mieux adaptés pour modéliser des phénomènes complexes et présentent l'avantage de prendre en considération des contraintes aussi bien statiques que dynamiques; nous proposons, dans ce travail, un observateur qui permet d'estimer en même temps tous les sous-groupes d'un modèle à compartiments, et qui peut être utilisé pour la prévision des épidémies ou la conception de système d'alerte précoce.



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# A generalization of fixed point theorems in generalized metric spaces

## Communication Info

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**Keywords:**
(1 Asymmetric

(2) Fixed point

(3) generalized asymmetric space

## Abstract

Asymmetric space is a generalization of a metric space, but without the requirement that the (asymmetric) metric d (x, y) = d (y, x). The study of asymmetric metrics apparently goes back to Wilson [5]. Following his terminology, asymmetric metric are often called quasi metrics. In asymmetric spaces some notions, such as convergence, compactness and completeness are different from this in metric case. Collins and Zimmer [2]. Have discussed these notions in the asymmetric context.
In this work, we define the notion of generalized asymmetric [3]. Spaces and we describe some fixed point theorems in complete generalized asymmetric spaces. In this way, we give some examples to illustrate our result.



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# Application de l'analyse en composantes principales à l'étude de l'impact de la pollution atmosphérique sur la santé des nourrissons de la ville de Casablanca

## Communication Info


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**Keywords:**
(1) Analyse en composantes principales.
(2) Pollution atmosphérique
(3) Santé des nourrissons


## Abstract


Dans les plus grandes villes industrialisées à travers le monde, la pollution de l'air constitue depuis quelques années un des problèmes majeurs de santé publique [1]. Dans ce contexte, l'objectif de ce travail est de mettre en évidence l'impact de la pollution atmosphérique sur la santé des nourrissons à la ville de Casablanca en appliquant l'analyse en composantes principales. Les résultats de cette étude statique montrent une forte corrélation entre l'exposition à court termes aux émissions atmosphérique d'origine anthropique et le taux d'asthme chez nourrissons [2]. Les résultats de cette étude ont permis de confirmer l'impact négatif de la pollution atmosphérique sur la santé de la population concernée avec une vulnérabilité particulière dans les franges de population les plus sensibles dont les nourrissants asthmatiques.




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# La modélisation économétrique de l'effet de l'éthique sur la performance financière des entreprises Marocaines

## Communication Info

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**Keywords:**
(1) Investissement Socialement Responsable(ISR)
(2) Performance Financière.
(3) Impact

## Abstract

L'objectif de ce travail est de présenter les modèles les plus connus de traitement économétrique utilisé pour établir le rapport entre Investissement Socialement Responsable(ISR) et Performance financière(PF) d'entreprise.
Pour mesurer et comparer la PF des ISR et Investissements conventionnels, les investisseurs et la majorité des études empiriques ont principalement recours a des mesures de performance financière basées sur le risque global du portefeuille, à savoir les ratios de Sharpe et de Sortino.
**La mesure de Sharpe** tient compte du risque total du portefeuille. Selon cette méthode, le portefeuille qui a connu la meilleure performance est celui qui a procuré à l'investisseur l'excèdent de rendement le plus élevé par unité de risque total.
**La mesure de Sortino** est utilisée pour comparer la performance des fonds. C'est un moyen de mesurer le rendement par unité de risque. Ce ratio compare le rendement du portefeuille au rendement minimum acceptable (minimum acceptable return = MAR).
Au sein de notre thèse de recherche nos perspectives est d'en tirer profit par la combinaison de ces deux modèles économétriques dans la mesure de définir un nouveau modèle adapté au contexte économique marocain permettent de mesurer le rapport entre l'ISR/PF. Pour cela, l'intérêt serait de chercher à comprendre le marché de l'ISR au Maroc : existe-il des fonds ? Y-a-t-il un contexte spécifique ? En quoi les fonds ISR marocains sont-ils performants



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# A Note On the Numerical Results of Regional Controllability for Caputo type Sub-diffusion Processes .

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**Keywords:**
(1) Fractional Calculus
(2) Regional Controllability
(3) Time-Fractional Sub-diffusion systems.
(4) Analytical Semigroup.

## Abstract

The controllability is a major branch of control theory, which consists of determining the targets to which one can drive the state of some dynamical system by means of a control parameter presenting in the equation.

This concept has been studies by several authors [6],[5] and [2].

Later, regional controllability was introduced and developed in [4],[3] and the references therein, which consists of steering a system to a prescribed state defined only in a given subregion of the evolution domain.

In recent years, a considerable interest has been shown in the so called fractional calculus ( integration and differentiation of any order) [1]. Fractional calculus has found many applications in physics, chemistry and control.

The purpose of this work is to discuss the regional controllability of a class of fractional semi-linear sub-diffusion systems in the analytical case which lead to numerical simulations.



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# Existence and Uniqueness of Periodic Solutions for some Class of Partial Differential Equation

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**Keywords:**
(1) Hille–Yosida condition
(2) semi-Fredholm operators
(3) Poincaré map
(4) Chow and Hale's theorem

**Abstract**

In this work, we study the existence of periodic solutions for a class of linear partial functional differential equations with infinite delay. We assume that the linear part is not necessarily densely defined and satisfies the known Hille-Yosida condition. The perturbation theory of semi-Fredholm operators is using to show that the Poincaré map satisfies all conditions of the Chow and Hale fixed point theorem, which allows us to prove the existence of periodic solutions. In addition we present a sufficient condition to guarantee the uniqueness of such solution and an example is also given to illustrate our results.



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# Amenability of sofic groups using return probability

## Communication Info

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**Keywords:**
(1) amenability
(2) Geometry on groups.
(3) Return probability.

## Abstract

In mathematics, an amenable group is a locally compact topological group G carrying a kind of averaging operation on bounded functions that is invariant under translation by group elements. The original definition, in terms of a finitely additive invariant measure (or mean) on subsets of G, was introduced by John von Neumann in 1929 (see [1]) in response to the Banach–Tarski paradox. The amenability property has a large number of equivalent formulations.
In 1959, Harry Kesten (see [2]) proved that there is a relation between the amenability and the estimates of symmetric random walk on finitely generated groups. The concept of amenability, has been central in many areas of mathematics and in several fields (see for example [3,4,5,6]} or more recently [7,8].
In this work we study this relation according to return probability to the origin. Our aim is to study the amenability of sofic groups using Return Probability.



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# A multi-regions discrete TB epidemic model with an optimal control strategy

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**Keywords:**
(1) Discrete-time model
(2) Optimal control
(3) Pontryagin's maximum principle

## Abstract

In this work, we devise a multi-regions $SL_1IL_2R$ discrete-time model which describes the spatial spread of a Mycobacterium Tuberculosis epidemic emerging in regions that are connected by any kind of anthropological movement. The main goal from this kind of modelling, is to exhibit the importance of mobility of individuals, in the spread of infection regardless the mean of transport utilized, and also to show the role of travel restrictions in TB pandemic prevention, by introducing controls variables which reduce the incidence for which an infection could occur once susceptible populations have contacts with infected individuals coming from the neighboring regions of one region targeted by our optimization approach called here: the travel restrictions vicinity optimal control strategy. The theoretical method we follow for the characterization of the travel restrictions optimal controls, is based on a discrete version of Pontryagin's maximum principle while the numerical approach applied to the multi-points boundary value problems we obtain here, is based on discrete progressive-regressive iterative schemes.



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# Modèle d'Evaluation d'Options Américaines

# Application aux Options Pétrolières

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**Keywords:**
(1) Option Américaine
(2) Problème de Complémentarité Linéaire
(3)Modèle de Black & Scholes

## Abstract

Le pétrole n'est pas une matière comme les autres et son prix ne saurait être fixé par le marché. En effet sur le marché libre, les fluctuations de prix sont naturelles et dépendent d'un grand nombre d'événements aléatoires d'ordre économique, politique ou même géologique. Ces fluctuations constituent une menace permanente pour les producteurs de pétrole car elles placent ces opérateurs devant un risque important de perte financière. Pour gérer ce risque, nous proposons l'utilisation de l'option américaine qui est une option qui peut être exercée à tout moment jusqu'à sa date d'échéance et nous allons montrer dans cette présentation, comment cet outil permet de gérer efficacement ledit risque. Nous estimons à la fin, le prix d'option de vente américaine en utilisant le modèle de Black & Scholes.



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# Sampling designs for approximating the inverse function with shape-preserving quadratic splines


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**Keywords:**
(1) Inversion of functions
(2) Inverse of the normal cumulative distribution
(3) Inverse of the arc-length function



**Abstract**

Given a strictly monotone cumulative function $f : [a,b] \to [c,d]$, with $a, b, c, d \in R$, $a < b$ and $c < d$, such that $f([a,b]) = [c,d]$. The use of spline approximation [1] to approximate the inverse of f is natural in many applications, and it leads to schemes that are faster and simpler to implement than the inversion schemes based on iterative methods. We show that, with shape-preserving quadratic Hermite interpolation in B-spline representation, we can preserve the monotonicity of the inverse of f while maintaining third-order of the interpolation error. To demonstrate the effectiveness of this approach, we provide some examples of applications such as the inversion of cumulative distribution functions (arc-length [2], [3] and normal cumulative distributions) and the computation of the Lambert W-function[4].




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# ICRAMCS 2020

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# Supercyclicity and recurrence of elementary operators on Banach ideal of operators

## Communication Info


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**Keywords:**
(1) Supercyclicity
(2) Recurrence
(3) Elementary operators
(4) Banach ideal of operators


## Abstract


Let X be a Banach space with dim X>1 such that its topological dual X* is separable and B(X) the algebra of all bounded linear operators on X. In the present work, we introduce the concept of mixing recurrent and we investigate the study of recurrent and mixing recurrent for elementary operators on an admissible Banach ideal $(J, ||.||_J)$ of B(X). Also, we study the passage of property of being supercyclic from an operator $T \in B(X)$ to the left and the right multiplication $L_T$ and $R_T$ induced by T on $(J, ||.||_J)$. In particular, we prove that :

- T satisfies the supercyclicity criterion on X if and only if $L_T$ is supercyclic on $(J, ||.||_J)$.
- T* satisfies the supercyclicity criterion on X* if and only if $R_T$ is supercyclic on $(J, ||.||_J)$.
- $T \oplus T$ is recurrent on $X \oplus X$ if and only if $L_T$ is recurrent on $(J, ||.||_J)$.
- T is mixing recurrent on X if and only if $L_T$ is mixing recurrent on $(J, ||.||_J)$.




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# ICRAMCS 2020

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# A Discrete Mathematical Modelling of the Influence of Alcohol Treatment Centers on the Drinking Dynamics using Optimal Control

## Communication Info


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**Keywords:**
(1) Mathematical model
(2) Alcohol drinking
(3) Addiction treatment centers
(4) Optimal control.


## Abstract


In this paper, we propose a discrete mathematical model that describes the interaction between the classes of drinkers, namely, potential drinkers ($\Pi$), moderate drinkers (M); heavy drinkers(H), poor heavy drinkers ($T_\pi$), rich heavy drinkers($T_\rho$), and quitters of drinking ($\Theta$). We also focus on the importance of 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 addiction treatment centers. We use three controls which represent awareness programs through media and education for the potential drinkers, 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 in discrete time to characterize these optimal controls. The resulting optimality system is solved numerically by Matlab. Consequently, the obtained results con.rm the performance of the optimization strategy.




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# Existence Of Solution Of Dirichlet Problems In Markinkiewicz Space

## Communication Info

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**Keywords:**
(1) Dirichlet Problem
(2) Entropy Solution
(3) Markinkiewicz Space

## Abstract

This work proves the existence solution of Dirichlet problem managed by singular convection terms :

$$A(u) = f(x) \text{ in } \Omega.$$

And

$$u = 0 \text{ on } \partial\Omega.$$

Where $A(u) = -\operatorname{div}(M(x)\nabla u) + \operatorname{div}(uE(x))$ is a Carathèodory function defined on $W_0^{1,p}(\Omega)$ into its dual, $\Omega$ is a bounded open subset of $\mathbb{R}^N$, $N > 2$, $E \in (L^N(\Omega))^N$ ( vector fields ), $f \in L^m(\Omega)$ with $1 \leq m < \frac{N}{2}$ and M(x) is a bounded and measurable matrix such that

$$\alpha |\xi|^2 \leq M(x)\xi.\xi$$

$$|M(x)| \leq \beta \text{ a.e } x \in \Omega, \forall \xi \in \mathbb{R}^N.$$



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# Application du modèle épidémiologique SIR

## Communication Info

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**Keywords:**
(1) Optimal control
(2) Parabolic SIR model
(3) Numerical method
(4) Infectious disease epidemiology

## Résumé

**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. L'épidémiologie classique utilise des variables pour décrire l´état d'individus dans une population qui a été exposée à une pathologie infectieuse. Les paramètres incorporés représentent des facteurs de base, comme le taux de transmission de l'agent infectieux, le taux de mortalité, et autres données. La modélisation mathématique des maladies infectieuses au niveau cellulaire ou moléculaire est fondée sur un principe similaire. Chez un patient, il y a des cellules susceptibles non infectées, des cellules infectées, il y aura une réponse immunitaire dont les composantes peuvent être incorporées. 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.**



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# A delayed oncolytic virotherapy model with Hattaf-Yousfi functional response.

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**Keywords:**
(1) Cancer
(2) Virotherapy
(3) Hattaf-Yousfi functional response
(4) Stabilty
(5) Hopf bifurcation

## Abstract

Nowadays, cancer is among the leading causes of death worldwide. To combat this dangerous disease, we can treat it with oncolytic virotherapy which uses viruses programmed to infect and kill cancer cells without causing damage to normal tissue. In this work, we propose a mathematical model with time delay that describes the dynamics of cancer treatment with oncolytic viruses. In the proposed model, the infection transmission process is modeled by Hattaf-Yousfi functional response which covers various types of incidence rate existing in the literature. We first show that our model is biologically and mathematically well-posed. Also, we prove the existence of three equilibrium points which represent the desired outcome of therapy, the partial success of treatment and the failure of treatment. Moreover, we establish the stability of the three equilibria and the local existence of Hopf bifurcation.



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# MOOC Video Classification using Nature Language Processing and Machine Learning Model

## Communication Info

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**Keywords:**
(1) Mooc
(2) Classification of multimedia
(3) Natural language processing
(4) Data mining
(5) Supervised machine learning
(6) SVM

## Abstract

MOOC opens up the doors for universal access to education remotely and serves as a constructive approach to acquire formal education in an informal way by negating the traditional practices. In recent years, the number of MOOC video resources has increased exponentially. Therefore, the need of the moment is a fully automated system that would proficient enough to store, analyze and manage such immensity of videos while sustaining the quality in response. An automatic classification/prediction of videos is a challenging and complex aspect, although, supervised machine learning can achieve this task in an effective way. Many applications use text classification to categorize documents like e.g. spam filtering, email routing, sentiment analysis, etc. In this study, we present a competent and adaptive technique for autonomous classification of MOOC videos transcription using natural language processing and machine learning model. Our approach is capable to predict the category of a targeted video; the data mining algorithms such as SVM, Random Forest, and Naive Bayesian will be engaged to organize the MOOC videos. Experiments reveal that our approach outperformed other approaches in the field of transcription classification and supervised learning.



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# Towards an Smart Home architecture based on the Internet of Things

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**Keywords:**
(1) Smart Home
(2) IoT
(3) Smart cities
(4) IP

## Abstract

The concept of the Internet of Things is to connect intelligent physical objects in a network; especially in a heterogeneous environment; in important application areas such as smart cities, smart homes and smart traffic [1]. The rapid growth of IoT devices and services has led to the deployment of many vulnerable and unsecured nodes. Therefore, we mention the main security trends in IoT such as confidentiality, access control and secure communication [2-3]. This study focuses on the use of the Internet of Things for smart homes and its benefits. The main objective is to model and simulate a connected smart home that uses a set of intelligent objects through an IP addressing network to allow them to transmit valuable information to homeowners.



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# EXTRACTING TEXT FROM IMAGES ACCORDING TO A DEFINED REGULAR EXPRESSION

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**Keywords:**
(1) Optical character recognition
(2) Convolutional neural network
(3) Regular expressions
(4) Text recognition

**Abstract**

The recognition of text from images has been the subject of several researches and studies since the early 1920s. The Optical Character Recognition (OCR) initially proposed by Gustav Tauschek is the most used technique today thanks to the high accuracy remarked in the texts extracted [1]–[4]. Recently, the OCR process has been improved, more than ever, by the integration of convolutional neural networks [5] and we are witnessing today an unexpected efficiency and a margin of error tending to zero in the processed images.

Despite the effort made to extract the entire text from an image. Most text detectors use only a small part of the extracted text, for instance they are interested in plate numbers[2], e-mails, phone numbers, product codes, etc. In this paper, we propose to use the OCR technique to extract only the desired part of the text and which corresponds to a pattern or a regular expression initially defined.



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# Investigation sur les problèmes d'optimisation {OPF\ED} dans les µ-Réseaux intelligents :

## Nouvelle Approche par "Consensus distribué"

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**Keywords:**
(1) *S*mart *G*rid
(2) *D*emand *S*ide *M*anagement
(3) *E*conomic *D*ispatch
(4) *O*ptimal *P*ower *F*low

### Abstract

La Maitrise de l'offre et de la demande au sein d'un réseau électrique devient de plus en plus complexe avec l'avènement des TICs, la transition énergétique et la métamorphose vers le paradigme Smart Grid [1]. Pour les raisons citées, les chercheurs et les gestionnaires du réseau donnent un intérêt primordial aux problèmes de diffusion des flux énergétiques [2], en tenant compte du cout optimal, ainsi qu'aux différents aspects dynamiques qui impactent le réseau. Dans ce travail, nous allons présenter un intérêt plus particulier aux problèmes : OPF et ED appliqués à l'échelle : « Micro-Grid », en se basant sur le principe de partage par consensus [3]. En revanche, plusieurs chercheurs ont abordé ce type de problèmes dans la littérature de l'optimisation d'énergie et du « Demande-Side Managment DSM» [4-6], mais peu de tentatives ont été élaborées à l'échelle des Micro-Grids couplés, pour en résoudre le problème de manière distribuée [7]. L'introduction du consensus permet la simplification des calculs distribués et augmente la fiabilité du contrôle en cas de pertes de communications ou lors de l'apparition d'un défaut inattendu dans un nœud du réseau. Pour valider cette approche multi-objective {OPF \ EDP}, nous testons les performances de partage à base du consensus entre 14 jeux de barres contigus de deux systèmes Micro-Grids, chacun d'eux est composés de plusieurs ressources énergétiques distribués DERs.



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# Dynamicfrictional Contact Problem for Viscoelastic Thermo-piezoelectric Materials

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**Keywords:**
(1) Thermo-piezoelectric
(2) Dynamic process
(3) Frictionalcontact
(4) Evolutionaryinclusion
(5) Hemi variational inequality

## Abstract

In this work we deal with a mathematical model which describes the frictional contact between a piezoelectric body and a thermally-electrically conductive foundation. The process is dynamic and the frictional contact is described by sub-differential boundary conditions which include, as a particularly case various contact, friction laws and electrical-thermal conditions. The material is assumedto have a nonlinear behavior and it is modeled with a visco-elastic constituve law with a long-term memory, which includes the electrical and thermal effects. We derive the variational formulation of the problem which is in the form of a system involving integral equation coupled witha two evolutionary inequalities. We prove the existence and the regularity properties of a unique weak solution to the model. The proof is based on argument of abstract second order evolutionary inclusions with monotone operators and the theory of hemi variational inequalities by using a fixed point argument.



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# Modeling and analysis of the stability of a bioeconomic model in fisheries

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**Keywords:**
(1) Fishery model.
(2) Stability, Equilibrium points.
(3) Biomathematics.

## Abstract

This work consists first of all in an understanding of the basic tools necessary for the mathematical modeling of the dynamics of a marine population and then in a combined work of two types of studies:

• A descriptive study of the main sardine stock of the Moroccan Atlantic which extends between Cape Cantin and Cape Blanc and which is based on the assumption of distribution of the population in two distinct stocks, that of the central zone ( between Cap Cantin and Cape Boujdor) operated by Moroccan coastal purse seiners, and that of the southern zone (Cap Boujdor and Cap Blanc) which is targeted, in addition to the coastal purse seiners, by a foreign high-seas fleet forced by the managers to act exclusively in this zone.

• An analytical study of a mathematical model that describes the overall dynamics and exploitation of the sardine stock of the Moroccan Atlantic, taking into account its physical characteristics and the fishing effort of the fleets targeting it. This study consists of studying the stability of the different equilibria and looking for the bio-economic relations between them.



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# Tail probability for local times of Subordinated-Gaussian processes

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**Keywords:**
(1) Local times
(2) Local nondeterminism
(3) Subordinated processes

## Abstract

Using the property of Moderated local nondeterminism, we investigate the problem of tail probability for the local times of processes with are subordinated to Gaussian processes.
Under mild regularity conditions on the subordination function, we prove that the order of infinitesimal depends only on the conditional variance of the Gaussian process. The laws of iterated logarithmes of local times are deduced for the special cases of fractional Brownian motion and Riemann Liouville fBm.



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# THÉORÈME DU POINT FIXE ALÉATOIRE POUR APPLICATIONS $(\psi_1,\psi_2,\phi)-$ FAIBLEMENT CONTRACTIVE DANS UN ESPACE DE BANACH SÉPARABLE

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**Keywords :**
(1) Point fixe aléatoire
(2) Espace de Banach séparable,
(3) Opérateur aléatoire
(4) $(\psi_1, \psi_2, \phi)-$faiblement contractifs.

## Abstract

La théorie du point fixe aléatoire est une généralisation stochastique de la théorie du point fixe déterministe. En 1955, Špaček_[7] et Hanš_[4, 5] ont prouvé la première généralisation stochastique, celle du principe de la contraction de Banach_[2] dans un espace de Banach séparable, cela a ouvert la voie à plusieurs chercheurs sur d'autres généralisations qui ont joué un rôle important dans l'évolution et le développement de la théorie du point fixe aléatoire.
Ce travail est une investigation à la théorie du point fixe des opérateurs aléatoires $(\psi_1, \psi_2, \phi)-$faiblement contractifs définis sur un espace de Banach séparable. Nous avons prouvé la généralisation stochastique du théorème du point fixe classique de Eslamian and Abkar_[1], et nous avons déduit, comme corollaires, la version aléatoire des théorèmes du point fixe classique de Rhoades _[6], de Dutta and Choudhury_[3] ainsi que, celui de Banach_[2].



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# Optimal control of an Ebola Virus Disease model with post-death transmission

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**Keywords:**
(1) Ebola
(2)Optimal control
(3) General incidence rate
(4) Post-death transmission

## Abstract

This work deals with an optimal control problem for an Ebola Virus Disease (EVD) model with post-death transmission. The model under consideration describes the interaction between susceptible, infectious, recovered and died human individuals.
The proposed control represent the efficiency of vaccination to increase the number of susceptible and decrease the number of infectious individuals. The Pontryagin's minimum principle is used to characterize this optimal control. The optimality system is derived and solved numerically using the forward and backward difference approximation. Finally, numerical simulations are performed in order to show the role of the proposed program in controlling the Ebola infection.



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# Blockchain and collective self-consumption

## Communication Info


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**Keywords:**
(1) Blockchain
(2) Energy
(3) energy consumption tracking


## Abstract


Blockchain is a system for storing and transmitting records of transactions promoting decentralization, transparency, and data integrity. The name comes from its structure, in which individual records, called blocks, are linked together in single list, called a chain. Actually, Blockchain looks like a big database, oftentimes public, containing the history of all the exchanges made between its users since its creation. In this paper, we investigate the possibility of using this technology to track energy consumption. We began on presenting of the fundamental principles that underpin blockchain technologies, such as system architectures, data structures and algorithms, next we provide a systematic review of blockchain activities and initiatives in the energy sector this review offers as a guidance to better assess where and how to apply blockchain technology to achieve energy consumption tracking. Finally, we summarize the characteristics and field-proven benefits of our implementation which shows the feasibility of Blockchain based energy consumption tracking.




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# Prime near-rings and rings involving additive maps

**Communication Info**

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**Keywords:**
(1) Commutativity
(2) generalized semiderivations
(3) prime near rings

**Abstract**

Let N be a zero-symmetric prime near-ring. An additive mapping $F : N \to N$ is said to be a generalized semiderivation associated with a semiderivation d and a map g if it satisfies

$F(xy)=F(x)y+g(x)d(y)=d(x)g(y)+xF(y)$

and $F(g(x)) = g(F(x))$ for all $x, y \in N$.

The purpose of this paper is to extend some results concerning generalized derivations of prime near rings to generalized semiderivations. Moreover, example is provided to show the necessity for N to be prime and g to be an automorphism in the hypothesis of the theorems. When, g = idN, one can easily obtain the main results of [1] and [5].



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# Dynamics of a delayed CHIKV infection model with cell-to-cell transmission

## Communication Info

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**Keywords:**
(1) Chikungunya virus
(2) Mathematical modeling
(3) Stability
(4) Hopf bifurcation

## Abstract

The aim of this work is to present a generalized Chikungunya virus (CHIKV) infection model with general incidence rate and two time delays. The stability of the infection-free equilibrium and the chronic infection equilibrium is analyzed by using the linearization method and by constructing appropriate Lyapunov functionals. Also, the existence of Hopf bifurcation is rigorously investigated. Finally, numerical simulations are presented to illustrate the analytical results.



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# Bayesian Neural Networks Applied to Face Recognition

## Communication Info

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**Keywords:**
(1) Bayesian neural networks
(2) Co-occurrence Matrix
(3) Face recognition

## Abstract

Face recognition is one of the most effective and relevant applications of image processing and biometric systems, and developing a computational model for it is difficult. In this work we propose a new approach to the face recognition problem based on combining co-occurrence matrix and Bayesian neural networks. Co-occurrence matrix are applied to extract the relevant information in a face image, which are important for identification. Using this we can represent face pictures with several coefficients instead of having to use the whole picture. Bayesian Neural networks are used to recognize the face through learning correct classification of the coefficients calculated by the Co-occurrence Matrix.



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# Improved image edge detection using an approach based on quadtree decomposition

## Communication Info

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**Keywords:**
(1) Edge detection
(2) Quadtree decomposition
(3) Image processing
(4) Sobel
(5) Robert
(6) Prewitt

## Abstract

The edge detection [1] is an important procedure in the image processing [2] [3]. It is a main tool used for pattern recognition [4], image segmentation [5] and scene analysis [6]. The main function of edge detection is to locate and identify sharp dis-continuities in images. These discontinuities are due to abrupt changes in pixel intensities which characterizes boundaries of objects in a scene. These boundaries are used to recognize objects present in a scene [7], to differentiate areas of the image [8], to segment images, to extract information often reduced relevant to characterize the image, or to reconstruct objects in three dimensions [9].

In this paper, we present an approach aimed at improving edge detection [1] [2] in images, particularly by Sobel, Prewitt, Robert and Canny edge detectors. The proposed improvement is based on the quadtree decomposition of the image into zones with common characteristics. The proposed approach allowed to display more edges compared to those displayed when the detectors are applied to the entire image.



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# Urbanisation Des Systèmes d'Information Des administrations publiques au Maroc (2010-2020) : étude et analyse de leur performance

## Communication Info

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Mots clés:
[1] . E-gouvernement,
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[3] . système d'information,
[4] . urbanisation,
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## Résumé

L'urbanisation des Systèmes d'Information (SI) est une démarche efficace pour la maîtrise de la complexité de l'organisation, cette démarche s'amplifie d'avantage pour le cadre de l'administration publique marocaine. Elle renforce la cohérence du SI et permet de l'aligner sur sa stratégie globale, cette dernière liée également au contexte du Maroc numérique. Elle permet également d'aboutir à l'agilité du SI. Cette démarche présente des avantages considérables comme la réduction des coûts informatiques, un meilleur positionnement son environnement et une intégration des innovations technologiques afin de garantir l'évolutivité du SI. Par conséquent, l'inscription de l'administration publique dans un projet de refonte d'un SI devient primordiale. Comprendre le succès des SI est un défi complexe ou une réflexion sur l'évaluation des SI doit être appropriée pour capturer l'ampleur des besoins des utilisateurs et des retombées organisationnelles du SI Urbanisé (SIU). L'objet de ce travail est d'évaluer le succès du SI de l'administration publique marocaine avant et après une démarche d'urbanisation que nous avons accompagné et modélisé. Cette recherche fournit l'une des premières validations empirique quantitative du le performance des SIU et identifie les dimensions qui agissent sur la perception de l'utilisation et les bénéfices nets du SIU. Le travail constitue une tentative qui ne manque pas d'ambition à la compréhension et l'étude de la dynamique de changement d'un SI existant à un SIU.



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## Maximising the utility function for switching-prey model

### Communication Info


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**Keywords:**
(1) Game theory
(2) Switching-prey
(3) Nash equilibrium,
(4) Utility function
(5) LCP
(6) Balance equations


### Abstract


The importance of prey switching in the dynamics of marine ecosystems has been underlined at all levels of the trophic chain: zooplankton species, fish, whales, birds and mammals. Most of the models of foraging behavior emphasize the effects of spatial distribution of populations, much more than the trophic structure of food webs. We propose an economic approach coupling mass balance relationships with the principles of optimal foraging theory and the related ideal free distribution theory. In this model, populations optimize the 'utility' of their diet (the energy gain), being constrained by balance equations between biomasses and trophic flows. This results in a Generalized Nash Equilibrium Problem. More precisely, we are interested in equilibrium of mathematical game given by the situation where all species try to optimize their strategies according to the strategies of all other species.




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# A numerical scheme for an HBV infection model with multi-delays and capsids

## Communication Info

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**Keywords:**
(1) HBV infection
(2) Difference equation
(3)Diffusion
(4) Global stability

## Abstract

In this work, we propose a numerical scheme for delayed partial differential equations that describe the dynamics of hepatitis B virus (HBV) infection with multi-delays and capsids. We first show that the proposed numerical scheme preserves the positivity and boundedness of solutions in order to ensure the well-posedness of the problem. By constructing suitable discrete Lyapunov functionals, we prove that the numerical scheme also preserves the global stability of equilibria of the corresponding continuous model with no restriction on the space and time step sizes. Furthermore, the discrete models and the results existing in many previous studies are improved and generalized.



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# Synthesis of a Fuzzy logic controller to reduce urban congestion

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**Keywords:**
(1) Fuzzy Logic
(2) Artificial Intelligence
(3) Traffic Optimization

## Abstract

The congestion problem is the most treated phenomenon in recent years[1][2][3][4].In this paper, we presented an efficient and intelligent road traffic modeling system, based on graph theory and fuzzy logic theory. In a road network, the intersections were presented by nodes, and the roads by edges. Each edge in the network is characterized by a weight generated by a fuzzy decision system, weight has been generated after a multicriteria analysis. The elaborate system highlights five criteria considered as entry for the fuzzy system, these criteria can be divided into two basic criteria which are the number of cars present in a road and the distance between two intersections which limits this road, and three additional criteria which are the detection of accidents, the presence of public works and the maximum speed permitted by the Highway Code. The results analyzed in this article have shown their effectiveness when it comes to the changes of the five input criteria. Future work aims to improve the adaptability of the system to respond to the expectation of several categories of people such as normal citizens, ambulance, municipal police ... ect.



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INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
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# Optimal control of a fractional-order HBV infection model with capsids and CTL immune

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**Keywords:**
(1) HBV infection
(2) Fractional derivative
(3) Optimal control

## Abstract

The objective of this work is to study the optimal control problem for the fractional hepatitis B virus (HBV) infection model with HBV DNA-containing capsids and cytotoxic T lymphocyte (CTL) immune response. The fractional derivative is defined in the Caputo sense. Moreover, the optimality system is derived and solved numerically in order to validate the theoretical results.



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# Convolutional Neural Network (CNN) to Detect DeepFake by Analysing the Variations in the Blood Flow of a Face in a Video

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**Keywords:**
(1) DeepFake
(2) Deep learning
(3) deepfake facebook dataset
(4) Artificial Intelligence

## Abstract

A deepfake is a type of montage which exploits an artificial intelligence technology to obtain fake videos where the face of a person is modified and replaced by that of another person and modify the words of a person with a suitable facial expression [1].
To be able to identify videos with facial or vocal manipulations we have built a deep learning model (convolutional neural network (CNN)) with a multitude of videos of two classes (video fake and truthful video) by interpreting the images of each video one by one. 'learning. Next, our model will analyze each of the videos and draw their own result. The goal is that at the end, once the learning phase is over, if we give our model a video it will be able to deduce whether it is fake or not (with a certain probability). The working principle of our proposal is to analyze the variations in the blood flow on a face. With each heartbeat, our face becomes a little redder. It is imperceptible to the eye, so if a face has been superimposed on another video to create a deepfake, the false face will have no heartbeat and our model will report the video as faked.
For the experiments we used the dataset created by facebook made up of 100,000 videos with actors and for realistic scenarios. these videos were manipulated and annotated by AI. The results are satisfactory compare to other techniques that exist in the literature. To conclude, we are sure that in the future deepfakes will be a rapidly evolving challenge, just like spam, phishing and other threats.



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# Nonlinear control of the HAGC by backstepping with integral action

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**Keywords:**
(1) Automatic Gauge Control
(2) Reversible Cold Rolling Mill
(3) Backstepping

## Abstract

The Hydraulic automatic gauge control (HAGC) [1] system is used in cold rolling mill control system, a fine adjustment types it to eliminate or reduce in the process of rolling steel strip produced by vertical thickness deviation, so as to ensure the accuracy requirement of the product thickness.
The HAGCS of the cold rolling mill becomes difficult to control to improve performance [2]. This is due to the complexity of HAGCS and its nonlinear mathematical model. It is clear that the structure of the controller generated by backstepping [3] is composed of a proportional action, to which is added a derivative action on the errors. The absence of integrator leads to the appearance of a constant static error not null. The problem solution is the design of a new backstepping control law. This technique has an integral action. For this purpose, this communication describes a new control strategy by nonlinear control of the AGC by backstepping with integral action [4]. This controller has been implemented using MATLAB/SIMULINK software. The simulation results show clearly the effectiveness of the proposed control for improving the quality of the output web.



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# COMMON FIXED POINT FOR KANNAN TYPE CONTRACTIONS VIA INTERPOLATION

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**Keywords:**
(1) common fixed point
(2) interpolation
(3) Kannan contractions.

## Abstract

We have made a generalization of Karapinar's [1] work on fixed point Theorem of Kannan [2], in which he proposes a new type of Kannan contraction mappings. We have worked out an example on our result.



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# the intelligent search engine backtracking algorithm

## Communication Info

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**Keywords:**
(1) regular expression
(2) backtracking
(3) Catastrophic backtracking.

## Abstract

The regular expression is the set of text strings that describe a search pattern [1][2], and also can provide special techniques for parsing and validating data. There are several works that have been done on reading text string [3][4][5] using several algorithms like backtracking search, local search, and dynamic programming ...
As a result backtracking is an effective algorithm for reading a regular expression text string, and there are exceptional cases that it encounters an infinite loop or a waste of time, this is the case of catastrophic backtracking. And to avoid this type of problem we have proposed an intelligent reading method based on reverse reading of a text string.

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# STABILITY ANALYSIS OF A DELAYED SIR EPIDEMIC MODEL WITH DIFFUSION AND SATURATED INCIDENCE RATE

**Communication Info**

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**Keywords:**
(1) Partial Differential Equations
(2) Lyapunov function
(3) Global stability

**Abstract**

We investigate the effect of spatial diffusion and delay on the dynamical behavior of the SIR epidemic model. The introduction of the delay in this model makes it more realistic and modelizes the latency period. In addition, the consideration of an SIR model with diffusion aims to better understand the impact of the spatial heterogeneity of the environment and the movement of individuals on the persistence and extinction of disease. Next, by constructing an appropriate Lyapunov function and using upper-lower solution method, we determine the threshold parameters which ensure the the global asymptotic stability of equilibria.



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# Quasi-periodicity of operators

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**Keywords:**
(1) Quasi-periodicity
(2) Recurrence
(3) Dynamic of operators

## Abstract

A bounded linear operator T acting on a topological vector space X is called recurrent if for every nonempty open subset $U \subset X$ there is an integer n such that $T^n U \cap U \neq \emptyset$. In this work, we introduce the notion of quasi-periodicity in the context of topological vector space. This leads us to define a new class of operators in connection with recurrent operators. We also give a characterization of quasi-periodicity of operators and we establish some of their properties.



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# Detection and monitoring of vehicles for road safety

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**Keywords:**
(1) Kalman Filter
(2) Vehicle detection
(3) Vehicle tracking
(4) road safety
(6) monitoring

## Abstract

Road and highway traffic remains a subject of study for the public authorities because it is at the heart of many concerns such as mobility and security. We propose in this work a system for detecting, tracking and estimating vehicle trajectories and continuous line crossing for possible accident prevention. We used kalman filter known by its performance in motion detection. The main phases adopted consist at first in calculating of the background image that will be used to detect the moving object by subtracting from the current frame. The detected blobs will eventually have a processing set such as merging adjacent regions and elimination of negligible regions. The characteristics of the blobs detected will then be processed by the kalman filter, to estimate the trajectory of vehicle in the following frames. The tests carried out on several roads and highway scene have given very satisfactory results on detecting and tracking vehicle and detecting of continuous line crossing that can be exploited for accident prevention.



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## Generalized k-variations and Hurst parameter estimation for the fractional wave equation via Malliavin calculus

### Communication Info


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**Keywords:**
Hurst parameter estimation
Fractional Brownian motion
Stochastic wave equation


### Abstract


We analyzed the generalized k-variations for the solution to the wave equation driven by an additive Gaussian noise which behaves as a fractional Brownian with Hurst parameter $H > \frac{1}{2}$ in time and is white in space. The k-variations are defined along of any order $p \geq 1$ and of any length. We show that the sequence of generalized k-variation satisfies a Central Limit Theorem when $p > H + \frac{1}{4}$ and we estimate the rate of convergence for it via the Stein-Malliavin calculus. The results are applied to the estimation of the Hurst index. We construct several consistent estimators for H and these estimators are analyzed theoretically and numerically.




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# Some fixed point theorems in a set endowed with a binary relational system

## Communication Info

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**Keywords:**
(1) Generalized metric space
(2) Non expansive mapping
(3) Fixed point

## Abstract

In this work, we define a metric structure d in a set E endowed with a binary relational system and we prove that if the generalized metric space (E, d) has a compact and normal structure then every non expansive mapping has a fixed point. Our proof differs from that given by the authors in [7], since it adapt a constructive lemma due to Gillespie and Williams [3]. We obtain Tarski's fixed point theorem as a corollary. We also establish DeMarr's type fixed point theorem for an arbitrary family of symmetric Banach operator pairs and we give an illustration of the latter result via an example.



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# Contrôle optimal de certains modèles épidémiologies en dimensions deux

## Communication Info


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**Keywords:**
(1) Modélisation mathématique
(2) Modèles épidémiologies
(3) Modèle SIR


## Résumé


la modélisation mathématique est devenue un outil important pour analyser les causes, la dynamique et la propagation des épidémies. En effet, les modèles mathématiques permettent de mieux comprendre les mécanismes sous-jacents à la propagation des maladies infectieuses émergentes, et permettent aux autorités de prendre des décisions concernant les stratégies de contrôle efficaces. L'une des procédures les plus élémentaires dans la modélisation de maladies consiste à utiliser un modèle, dans lequel la population est divisée en différents groupes en fonction du stade d'infection, avec des hypothèses sur la nature et le taux de temps de transfert d'un compartiment à un autre. Plusieurs maladies qui confèrent une immunité contre la réinfection ont été modélisées utilisant les modèles SIR, SEIR....etc.




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# A New Version of Komlós' Theorem in L1(μ,X)

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**Keywords:**
(1) Komlós' theorem
(2) Truncated function
(3) Weak convergence

## Abstract

Let (Ω, T, μ) be a finite measure space, X a Banach space and L1(μ, X) the Banach space of all equivalence classes of Bochner integrable functions. A well-Known result of Komlós' [6] says the following: Every bounded sequence (fn)n of L1(μ, ℝ) has a subsequence (fm)m such that its means of Césaro convergence almost everywhere to a real integrable function, moreover this convergence takes place for any subsequence of (fm)m. Several extensions of Komlós' theorem to infinite dimensions has been given for exemple [1],[4],[5]. We aim to give a weak version of Komlós' theorem for bounded sequences in L1(μ, X) related to the convergence of truncated functions.



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# The Algebra of Fox's *H* Distributions and its Application in Wireless Communications

## Communication Info

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**Keywords:**
(1) Fox's *H*-function
(2) Maximal Ratio Combining
(3) Mellin transform
(4) Multivariable *H*-function
(5) Weibull fading

## Abstract

The Fox's *H* function distribution has been defined and studied based on a Mellin-Barnes type contour integral [1-3]. In the present work, we provide its definition with convergence region, and some properties that are very useful in manipulating *H* distributions. It has been extensively applied in statistical theory and some fields of theoretical physics. We investigate application to wireless communication by dealing with the performance analysis of Maximal-Ratio combining technique diversity at the receiver over Weibull multipath fading channels. Theoretical analysis is verified by computer algebra simulations.



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# Proposal for a new tool to evaluate a serious game

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**Keywords:**
(1) Serious Games
(2) Evaluation tool
(3) Analytic Hierarchy Process

## Abstract

The current enthusiasm of generations of students for video games and the marked interest of training institutions for the use of playful strategies, which facilitate learning, has encouraged the development and use of formative games called Serious Games [1][2]. The main aim behind these games is not to substitute the traditional training mode, but to complement it by making the learner benefit from the interactivity and ergonomics of the graphical interfaces offered by a SG.

So far, much research work has focused on the benefits that SGs can bring to a training environment. [3][4], However, little has been done in terms of evaluating an SG, not as a training tool but, as the outcome of a development project of a tool meant for use in a learning context.

The purpose of this paper is to propose an evaluation tool of a SG designed in terms of four necessary dimensions that a SG should have in order to fulfill the task for which it was designed. These four dimensions are represented in terms of measurement criteria and prioritized according to the AHP method « Analytic Hierarchy Process » [5].

This model was tested on an SG validated by an educational committee and used by biology students in Hassan II University, Ben M'Sik Faculty of Sciences. The results obtained show the quality and relevance of the evaluation of the proposed tool.



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# Some associated curves of normal indicatrix of a regular curve

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**Keywords:**
(1) Associated curves
(2) Direction curves
(3) Evolute curve
(4) Bertrand curve
(5) Mannheim curve
(6) C- slant helix

.

## Abstract

In this paper, we consider integral curves of a vector field generated by Frenet vectors of normal indicatrix of a given curve in Euclidean 3-space. We define some new associated curves such as evolute direction curves, Bertrand direction curves and Mannheim directon curves of the normal indicatrix of a regular curve, respectively. We also found the relationships between curvatures of these curves. By using these associated curves, we give a new approach to construct slant helices and C- slant helices. Finally, we present some examples.



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# fixed point theorems in probabilistic metric spaces

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**Keywords:**
(1) problabilistic metric spaces
(2) Caristi-type fixed

## Abstract

In this work, we study the existence of common fixed point for two applications verifying a system of Caristi-type contractions defined on a complete Menger space ( a triplet (E, F, τ ) with E is a nonempty set, F is a family of distribution functions and τ is a t-norm). The results presented in this paper generalizes the corresponding results of [4].



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# modèles organisationnels des entreprises

## Information

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**Keywords:**
(1) Gouvernance d'entreprise
(2) intelligence artificiel
(3) systèmes autonome

## Abstrait

L'intelligence artificiel est un énorme progrès pour les entreprises, assurer une solide gouvernance et des résultats bien mesurés sont parmi les objectifs de chaque entité. Mettre à disposition un programme intelligent qui pourra améliorer le système organisationnel de l'entreprise, ainsi la pousser à se positionner dans un marché concurrentiel est l'objectif prioritaire.

Au-delà des préjugés et discours mentionnant le remplacement des humains par des machines intelligentes, notre recherche se base sur l'idée de créer un nouveau cadre de travail, où une machine intelligente prendra en charge toutes les taches rébarbatives, répétitives ou pénibles d'une manière à offrir aux humains l'opportunité de se développer, favorisant ainsi son quotient intellectuel (QI).

Pour cela et tout au long de notre article on sera amené à étudier les différents piliers du sujet :

- Intelligence artificiel
- Intelligence économique
- Gouvernance d'entreprise
- Systèmes d'information autonome

Afin de présenter des modèles organisationnels au profit des entreprises pour améliorer leurs processus interne ainsi optimiser la coordination entre ses différentes parties prenantes.



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# Optimal control of a delayed rumor propagation model

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**Keywords:**
(1) Optimal Control
(2) rumor propagation

## Abstract

The optimal control theory is an important tool to better manage the spread of rumors. Most of the literature on rumor propagation models deals with quadratic cost functions relative to the control variable. In this work, we have considered a time-delay rumor propagation model with saturated control functions and an objective function of $L^1$ - type linear with respect to the control variables.
The existence of the optimal control pair is also proved. Pontryagin's maximum principle with delay is used to characterize these optimal controls.
The optimality system is derived and then solved numerically.



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# Global nonexistence of solutions to system of Klein-Gordon equations with degenerate damping and strong source terms in viscoelasticity

## Communication Info

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**Keywords:**
(1) Global nonexistence
(2Nonlinear viscoelastic wave equations
(3Concavity method

## Abstract

In this paper, we consider a system of nonlinear visco-elastic wave equations with degenerate damping and source terms. We prove, with positive initial energy, the global nonexistence of solution by concavity method.



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# A fast fractal image encoding based on a new genetic algorithm

## Communication Info

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**Keywords:**
(1) Fractal image encoding
(2) Partitioned Iterated Function System
(3) Quadtree partitioning
(4) Genetic algorithm

## Abstract

Fractal image encoding (FIC) [1] is time consuming due to the search of the matching between range and domain blocks. In order to reduce the encoding time, many improved approaches where developed among which some genetic algorithm (GA) [2-5] schemes. In the present study, we propose a new GA scheme to reduce the computational complexity of FIC. In this scheme, we modify the GA to use only domain blocks that have the potential to be the best candidate in the search of matching. Thus, the number of comparisons will decrease resulting in reduction in computation time.

In the experimental tests, we compared our scheme to the full search and previous GA schemes performed on some test images. The proposed GA scheme speed up the time encoding with preserving the image quality and with a slight decrease of the compression ratio. The quadtree partitioning used in our GA scheme gives better image quality than the square partition used in previous schemes.



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# Application de la méthode de l'entropie maximale pour obtenir des primes de crédibilité


**Communication Info**

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**Keywords:**
(1) Fonction de perte équilibrée pondérée
(2) Méthode de l'entropie maximale
(3) prime de crédibilité



**Abstract**

Dans cette communication, nous nous concentrons sur l'estimation de la prime de crédibilité dans le cas où nous ne connaissons rien de la distribution de probabilité des sinistres $X_i$ (i=1,2,..., n) à l'exception des données d'observation. Pour traiter ce cas, nous appliquons la méthode de l'entropie maximale (proposée par Jaynes [1]) sous la fonction de perte équilibrée pondérée (introduite par Zellner[2]et généralisée par Gómez-Déniz[3]) pour obtenir une nouvelle prime de crédibilité. Pour illustrer notre travail, une simulation numérique (langage R) est réalisée pour comparer notre prime de crédibilité avec celle de Gómez-Déniz[4]en utilisant l'erreur quadratique moyenne comme critère d'évaluation.




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# A survey of RDF querying approaches in a Big Data world

## Communication Info

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**Keywords:**
(1) SPARQL
(2) Hadoop
(3) Semantic

## Abstract

RDF (Resource Description Framework) is a graph model for representing information on the Web, while SPARQL (Protocol and RDF Query Language) is a query language for manipulating RDF data, but the latter generates a problem on the difficulty of executing complex queries when there is a big volume of RDF data, to solve this problem, different approaches [1-5] are intervening, to improve the queries of RDF data, in an optimized way with a minimal response time. In this survey, we provide an extensive literature on the capacity of existing approaches in a Big Data world.



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# A common fixed point theorem for a commuting family of G-strictly type monotone mappings in function modular space.

## Communication Info


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


## Abstract


**The aim of this work is to generalize the results obtained in [1] in the restricted case of posets, to the wider context of a topological set endowed with a graph.**

**We then explore some interesting applications of the obtained results in modular spaces, and modular function space, when the modular $\rho$ has the $\Delta_2$-type property.**




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March 28, 2020 | Casablanca, Morocco

# A comparative study of E-orientation platforms according to extended TAM

**Communication Info**

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**Keywords:**
(1) E-orientation
(2) Extended Technology Acceptance Model
(3) User's profile

**Abstract**

The orientation field has changed its approach thanks to the use of new technologies hence the emergence of the E-orientation systems which consists in orienting and assisting students online in their choice of future training. .The purpose of this study is to generate an acceptance model prediction's of the e-orientation platform that can be used during the conceptual design of the future E-orientation platforms. As theoretical model we have used an extended version of the Technology Acceptance Model (TAM)[1]-[2]-[4]. Our database has been founded via the collected data of the survey instrument that was developed using validated items from the theoretical constructs of the extended TAM model for E-orientation platforms. The platforms offer an adequate environment for students to self orienting themselves, seek information and validate their skills. Therefore, E-orientation platforms do not aims for short-term support but on the contrary long-term academic. For a good orientation of the students we need to know the user's profile, in other words all the necessary information about the student (Individual factors [2], Social factors[2], Perceived usefulness[3], Perceived ease of use[3], Perceived risk [4], Perceived information quality [4]). A comparison between the five most used platforms according to the user profile was made using our extended TAM model.



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# Estimation of the impact of systemic risk on stock market equity return using stochastic approximation

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**Keywords:**
(1) Stochastic approximation
(2) Risk managment
(3) Value at Risk

## Abstract

The stochastic approximation methods are a family of iterative methods used in solving problems where the observations are disturbeds by noise normally distributed, for more details see the introduction of Abdelkrim BENNAR third cycle thesis [1]. In this communication we will be using the stochastic approximation in stock market risk management. A field where risk models are wildly criticizeds due to the normality of equity return hypothesis which is rarely fulfilled [2]. The stochastic approximation bypasses the normality of return to put hypothesis only on the observed noise, in order to estimate the sensibility of a stock market equity to systemic risk. To achieve that we used statistic modeling to find the link between some equity returns and the S&P Stock market index returns as an indicator of systemic risk and added normally distributed noise to get a function which cannot be computed directly, and simulate real economic condition, then we used stochastic approximation to get the value of S&P return that have a fixed probability to cause important loss to the stock market equity studied, by using the estimation of a quantile using response, non response data, developed by Herbert Robbins and Sutton Monro [3].



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# Amélioration du modèle de prédiction de crime par regroupement des types de crime

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**Keywords:**
(1) Prediction des crimes
(2) Clustering
(3) Machine learning

**Résumé.**

Dans nos travaux antérieurs nous avons travaillé sur les algorithmes de machine learning pour établir un modèle de prédiction de crime qui se base sur des données historiques des crimes.[1] Le modèle donne comme sortie un vecteur de n valeurs représentant le risque par type de crime dans un point spatio-temporel où le nombre n est le nombre de types de crime.[2]
Afin d'améliorer notre modèle et de bénéficier de cette corrélation entre les types de crime[3], nous avons pensé à réduire la dimension de ce vecteur de sortie en utilisant des méthodes de regroupement ou de réduction de dimension[4].
Dans ce travail, nous proposons l'ajout d'une sous-couche de la couche transformation permettant de regrouper les types de crime selon les données historique des crimes. La sortie de cette couche sera les données transformées avec les l nouveaux types de crime résultats de l'exécution de l'algorithme de regroupement avec le nombre l inférieur à n.



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# Machine Learning Applications in E-Commerce

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**Keywords:**
(1) Deep Learning
(2) E-commerce
(3) Customer Behaviour
(4) Machine Learning

## Abstract

In the last two decades, the on-line trade knew a considerable development. In order to create a more personalized customer experience, to understand customer search intent, to provide more adaptive advertisements, to prevent from fraud in online transactions, to retargeting and recommend products and follow the costumer's behaviour, many works based on machine learning are developed [1,2,3,4,5]. In this work, we will present some interesting researches and results of various applications of machine learning in the field of e-commerce proposed recently in the literature and discuss the advantages, difficulties and differences between the used machine learning algorithms. Inspired from previous works in the field mentioned above we will give and share ideas about new application of one or two of machine learning algorithm in e-commerce.



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# Recommendation using job profile analysis

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**Keywords:**
(1) Recommendation system
(2) E-recruitment
(3) Job search
(4) Topic modeling
(5) Natural Language Processing

**Abstract**

Job seekers are suffering with the big amount of information to retrieve in order to find the suitable job. Recommendation systems are an efficient solution to address this issue. A recommender system is a sort of software with the capabilities to make item recommendations based on user preferences and profile attributes[1]. Different methods and algorithms are used to recommend relevant job offers to candidates such as the similarity functions based on the fuzzy logic's operators [2] and the classification algorithms from Naïve Bayes to Neural Networks [3]. Furthermore, Topic modeling technique could be applied to represent job offers by a limited number of topics [4].

To recommend relevant jobs, we have used Natural Language Processing technique [5] consisting on parsing job offers and resumes in order to extract meaningful features such as job titles, technical skills and qualifications. Then, we build resulted data in the form of tables to facilitate the matching of features from both job postings and candidate resumes.



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# Arabic Sentiment Analysis using Grey Wolf Optimizer based on Feature Selection

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**Keywords:**
(1) Arabic Sentiment Analysis
(2) Feature selection
(3) Grey Wolf Optimizer

## Abstract

The development of social media allows to increase the textual information which provides different opinions. So, Sentiment Analysis (SA) of Arabic text documents have become a real challenge in the field of Natural language processing (NLP) [1]. This paper consists to identify automatically the opinion into positive/negative. This task required two phases: the first is preprocessing phase which applied several steps including normalization, tokenization, removing the stop words and stemming [2], while the second is Feature selection (FS) using grey wolf optimizer (GWO) [3]. The transformation of textual data to numerical data is realized by computing the TF-IDF matrix which increase the dimensionality of the space research. Thus, the process of FS is obligatory in the field of NLP in order to select the relevant words using a wrapper GWO based FS. The experimental results are assessed on two public datasets: AJGT and OSAC. The wrapper GWO employed K-nearest neighbors as classifier shown a good performance for opinions classification with 80%.



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# Toward a Recommendation system for human resources

## Communication Info

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**Keywords:**
(1) Recommendation System
(2) Collective competence
(3) AHP method
(4) PCA method

## Abstract

To assure the delivery 's performance and customer's satisfaction, particularly in IT Digital services company, we must assign the best collaborator's profile in the adequate project. The objective of our study is to develop a Recommendation system for Human Resources with based-content[1]and collaborative filtering[2], that allow recommending potential collaborators for a new job offer, using multicriteria analysis (AHP)(Analytic Hierarchy Process)[3] , and the matching between job offer of new project and collaborators profiles[4] . We propose in the first step a model of criteria to measure competences for Information Technology team according to the comparative study between different works [5][6], we validate our model by a survey carried out in the IT service company based in Morocco. The data collected is analyzed using dimensionality reduction (PCA) method [7] (Principal Component Analysis). The results indicate that six factors can measure the collaborator's competences in the team (collective competence): Technical competence, Integrity, Proactivity, Communication, Cooperation, and Benevolence/Interpersonal Relationship. These criteria will be used in the AHP function to allow a recommendation of potential collaborators for the adequate project.



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## Fixed Point Theorems of Block Operator Matrix Under Weak Topology

### Communication Info


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**Keywords:**
(1) Banach Algebra
(2) Fixed Point Theory
(3) Operator matrix


### Abstract


Fixed point theory is one of the famous theories in mathematics and has a large number of application in various fields of pure and applied mathematics. In this work, we study some fixed point theorems of a 2×2 block operator matrix defined on nonempty bounded closed convex subset of Banach algebras, where the entries are nonlinear operators. These results are formulated in terms of weak topology and measures of weak noncompctness.




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# Caristi type fixed point theorems in generalized metric spaces

**Communication Info**

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**Keywords:**
(1) Fixed point
(2) JS metric space
(3) b-metric space

**Abstract**

Fixed point theory is one of the most studied research axes in mathematics. It has provided a powerful tool to prove existence of solutions for numerous problems in different branches of science. The publication of the Banach contraction principle [1], has motivated and inspired researchers from different fields in science which have developed the fixed point results and prove their interest in applications to solve various scientific problems such as transport theory, biomathematics, economics,etc. The generalization of the Banach principle followed different directions ; but one of the most important direction is the generalization of the contraction (see for example [2, 3]).
In 2019, E.Karapinar et al. [4], a new fixed point theorem in the setting of b-metric space has been given, by mixing Banach and Caristi-type contraction, Using a similar idea we proved a fixed point theorem by combining Ciric and Caristi-type contraction in b-metric space.



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# Zero output controllability of discrete-time positive switched systems

## Communication Info

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**Keywords:**
(1) Switched positive systems
(2) Zero output controllability
(3) Reachability

## Abstract

In the last 10 years, many studies concern switched positive systems because of its importance in several fields such as bioengineering, economic modelling, behavioural science, and stochastic processes. Initially, the focus was on the study and analysis of stability and stabilizability properties [1-3], As a result of research, a lot of mathematical problems have been examined, including structural properties such as reachability, controllability and observability. The authors of [2-7] provided controllability and reachability criteria for discrete and continuous time positive linear switched systems.

In this communication, we present a zero output controllability property for discrete-time positive switched systems. Also, we focus on the necessary and sufficient conditions for zero output controllability.



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# Application de la technique forêt d'isolement pour la détection de fraude par carte de crédit

## Communication Info

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**Keywords:**
(1) Apprentissage automatique
(2) forêt d'isolement IF
(3) détection fraude

## Abstract

Grâce à la technologie du commerce électronique, il y a une augmentation significative de l'utilisation de la carte de crédit. Néanmoins, le risque de transactions par carte de crédit est un problème majeur car il joue un rôle crucial dans les activités criminelles. Les fraudes en ligne augmentent de jour en jour; les fraudeurs améliorent toujours leurs techniques pour imiter un comportement normal et commettent des fraudes. L'utilisation d'un processus de détection normal ne peut détecter la fraude que si elle se produit. Par conséquent, la nécessité de mettre en œuvre une nouvelle technique capable de détecter les nouvelles transactions frauduleuses avec une grande précision. Dans ce travail, notre solution est basée sur la technologie IF pour traiter la fraude par carte de crédit en temps réel.



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# Modélisation d'un système photovoltaïque avec amélioration de l'algorithme MPPT type conductance incrémentale pour des changements rapides d'irradiation

**Communication Info**

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**Keywords:**
(1) MPPT
(2) Photovoltaic
(3) Boost converter

**Abstract**

L'objectif de ce travail est de déterminer certains des paramètres de performance caractérisant le comportement de panneaux photovoltaïques (PV) particuliers qui ne sont pas normalement fournis dans les spécifications des fabricants. Celles-ci fournissent la base pour développer un modèle simple pour le comportement électrique du panneau PV [1]. Ensuite, en utilisant ce modèle, les effets de l'irradiation solaire, de la température, des résistances série et parallèle et de l'ombrage partiel sur la sortie du panneau PV sont présentés. Pour ce faire, un convertisseur DC-DC de type Boost est modélisé et conçu sur Matlab/Simulink [2]. Ce convertisseur est placé entre le panneau et la charge afin de contrôler au moyen d'un contrôleur MPPT [3,4]. L'algorithme MPPT utilisé est basé sur la conductance incrémentale (INC), et il est démontré ici que cette technique ne répond pas avec précision lorsque l'irradiation solaire augmente.

Pour remédier à ce problème, une technique de conductance incrémentale modifiée est présentée dans cet article. Il est démontré que le système réagit avec précision et réduit les oscillations lorsque l'irradiation solaire change. Enfin, les simulations de l'algorithme conventionnel et modifié sont comparées, et les résultats montrent que l'algorithme modifié fournit une réponse précise à une augmentation soudaine de l'irradiation solaire.



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# Proposition d'un métamodèle de la méthodologie PRINCE 2

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**Keywords:**
(1) Gestion de projet
(2) PRINCE 2
(3) Méthode prédictive
(4) Business Case
(5) Thèmes
(6) Principes
(7) Méta-modélisation

## Abstract

Compte tenu des progrès technologiques rapides, la nécessité de la gestion de projet continue de se développer en termes de méthodologie et de nouveaux concepts [4]. Dans cette communication nous allons passer en revus les différents concepts de la méthodologie en les agrégeant afin de construire un métamodèle de la méthodologie PRINCE 2 en se basant sur les principes de la MDA.
Le but de cette recherche est de valider et de comparer le métamodèle généré avec celui des méthodes Agile, chose qui nous permettra par la suite d'avoir un métamodèle global en matière de management de projet, puis d'appliquer cette méthodologie sur tous les composants de la gouvernance informatique pour restaurer un métamodèle global pour tous les domaines de gouvernance informatique.



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# La remédiation par groupe dans le cadre de la pédagogie différenciée : Cas des mathématiques

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**Keywords:**
(1) Pédagogie différenciée
(2) Apprentissage mathématique
programming

**Resumé**

Notre contribution représente une nouvelle méthode d'apprentissage des mathématiques par groupe en utilisant la pédagogie différenciée dont le but est de réduire l'hétérogénéité entre les apprenants dans la classe en prenant en considération leurs acquis, leurs compétences, et leurs relations sociales. En effet, il existe différentes modalités pour mettre en œuvre une pédagogie différenciée [1]. Ces modalités doivent être réfléchies par l'enseignant afin que sa remédiation soit efficace sur l'apprentissage des élèves. Notre approche concerne précisément la différenciation par situation [2-3], elle permet l'auto évaluation des étudiants et cela pour situer leurs acquis et leurs compétences. En cas de difficulté au moment de l'évaluation de l'apprenant, l'approche fait recours à l'apprentissage par groupe afin que les apprenants interagissent entre eux sans faire recours à l'enseignant.



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# Convergence Comparison of Approximating Fixed Point Schemes

**Communication Info**

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**Keywords:**
(1) Approximating
(2) Convergence
(3) Fixed point

**Abstract**

In this paper, we study some iterative schemes to approximate fixed points of contractive mappings. We establish some weak and strong convergence results for such mappings in Banach spaces.
Further, we compare numerically the rate of convergence of those schemes. To support our claim, we give an illustrative numerical example and approximate fixed points of such mappings using Python program. Our results are new and generalize several relevant results in the literature.



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## Characterization of $(n-2)$-spectrally monomorphic $(0,1)$-tournaments

### Communication Info


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**Keywords:**
(1) Tournaments
(2) Monomorphy
(3) Skew conference matrix


### Abstract


Let $T = (V, A)$ be a tournament on $n$ vertices. The adjacency matrix of the tournament $T$ is the $n \times n$ matrix $A = (a_{ij})$ in which $a_{ij} = 1$ if $(v_i, v_j) \in$ A and 0 otherwise. A (0,1)-tournament is a tournament related to its adjacency matrix $A$ such that $A + A^t = J - I$, where $I$ and $J$ will (respectively) denote the $n \times n$ identity matrix and all-ones matrix. We say that a (0,1)-tournament is $(n-2)$- monomorphic if all its principal submatrices of order n-2 are isomorphic. Moreover, we say that it is (n-2)-spectrally monomorphic if all its principal submatrices of order n-2 have the same characteristic polynomials. In the present paper, we give a characterization of (n-2)-spectrally monomorphic (0,1)-tournaments.




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# Liver Segmentation: A Capsule Based Network

## Communication Info


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**Keywords:**
(1) Segmentation
(2) Medical Imaging
(3) Capsule Networks


## Abstract


Liver segmentation is essential in many clinical applications, such as pathological diagnosis of liver disease, visualization, etc. However, segmentation of the liver is still a very difficult task[1] due to the complex context, fuzzy and blurred boundaries between abdominal and the low contrast. Deep models [2], [3]have been very successful in many tasks such as detection, classification and segmentation on non-medical images due to the insufficient availability of labeled data. In the medical field, labeled data is still limited due to privacy concerns and the need for experts. In this paper, we present a new automatic and efficient model based on capsules network[4], [5]. Our proposed network is an end-to-end learning process that can eliminate redundant computations and reduce the risk of overfitting. The model has been validated on 3D liver segmentation CHAOS[6] challenges and have obtained competitive segmentation results compared to state-of-the-art on such a limited amount of labeled data.




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# The Dark Web: Stat of Art

## Communication Info

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**Keywords:**
(1) Dark web
(2) Tor browser
(3) Anonymity System,
(4) Deep web,
(3) Web Networks.

## Abstract

In the recent years, the digital currency (Bitcoins) and some illegal services has led to the emergence of a new software and mechanism to hide the privacy in the internet. this latter, is the service that interconnect the computer resources using different protocols (TCP/IP, FTP, etc.). The web is one of those services that offer the possibility to the internet users to navigate between a number of websites. Those websites can be found either from a search engine or directly from a link. In the case of a search engine, the website must be indexed by the search engine indexation robots unless it will not appear in research results. In the internet the search engines appeared websites compose just 10% of the whole websites that exists. However, the other 90% are existing in the dark web. In the dark web, the users use the anonymity systems such as Tor to hide their privacy and the possibility of non-detection. In this paper, we seek to define the dark Web, it's characteristics and tools. Also, we will present some statistics about the use of Tor browser either for Morocco or the whole world.



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# ICRAMCS 2020

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# On the Maximal Output Admissible Set for a Class of Bilinear Discrete System

## Communication Info


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**Keywords:**
(1) Discrete-time
(2) output admissible set,
(3) asymptotic stability,


## Abstract


Given a bilinear discrete system with initial state $x_0$ and output function $y_i$, we investigate a finite dimensional bilinear system that produces, with a constraint set $\Omega$, the initials states $x_0$ which satisfied the condition $y_i \in \Omega$ for all $i \geq 0$, the set of all such initial states called K- $\Omega$ output admissible set, that we characterize by a finite number of inequalities. We propose also an algorithmic approach to verify the finitely determined of this set. Various numerical examples are given.




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# Image Classification For Multimodal Biometrics Recognition System (Face And Finger Print) using Deep Learning

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**Keywords:**
(1) Biometric Multimodal
(2) VGG16
(3) ResNet50
(4) Deep Learning
(5) Face
(3) FingerPrint

## Abstract

*Biometrics* is a field that is undergoing rapid change on everything with technological development and acquisition devices. *Biometrics* significantly improves the security of information. The mono-modal systems have brought their points of satisfaction, but on the other hand they presented a disadvantage, which is the intrusion and the rate of identification. Researchers and manufacturers in the field have opted for a multimodal biometric recognition system. They make it possible to improve the score such as the accuracy and the rate of people recognition (fusion of descriptors between several biometric methods). In our article we propose to develop a multimodal biometric system based on the face and fingerprints. Facial recognition uses several mathematical methods to extract the relevant information from the face which allows the descriptor [1] [2] to be extracted, among these methods we find: global methods (*ACP* [3], *LDA* [4]), local methods (*SVM* [5], HMM [6]), hybrid methods [7] [8]. Fingerprints recognition is delicate because it goes through several processes to be able to extract the descriptor (*binarization, skeletonization,* detection of minutiae, elimination of false minutiae) [9] [10]. In our approach we recommend using Deep learning technology with *convolutional* neural networks. We will retrieve the descriptors of the face and the fingerprints, then we use two CNN architects namely *VGG* 16 [11] and *Resnet* 50 [12]. The experiments were carried out on the *SDULMA-HCM* database [13].



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# BOUNDARY CONTROL FOR A CLASS OF DELAYED REACTION-DIFFUSION SYSTEMS WITH SPATIALLY-VARIYING COEFFICIENTS

**Communication Info**

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**Keywords:**
(1) Boundary control
(2) Backstepping
(3) Reaction-diffusion system with time delay.

**Abstract**

**The problem of boundary stabilization is considered for a class of reactiondiffusion system with time delay. Semigroups have become important tools in infinitedimensional control theory over the past several decades. We show that the well known backstepping method proposed in the one dimensional case and for the undelayed system, still works well for a class of systems with time delay. The determination of the feedback controller require the solutions of some kernels equations, which are a system of coupled linear second-order hyperbolic equations which were recently founded to be well posed. Applying this result in our problem, allows us to prove an exponential stability for the closed loop system.**



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# Adaptive Help System Based on Learners' Digital Traces and Learning Styles in the ILE

## Communication Info

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**Keywords:**
(1) ILE
(2) Data mining
(3) Learning styles
(4) Digital traces
(5) User profile

## Abstract

In the recent years Learning Management System (LMS) such as Claroline, Ganesha, Chamilo, Moodle ..., are commonly and well used in e-education (e-learning). Most of the Interactive Learning Environment (ILE) focus on supporting teachers in the creation and organization of online courses. However, in general, they do not consider individual differences of each learner. In addition, they do not provide enough indicators which will help to track the learners.

In this paper, we investigate the benefits of integrating learning styles in the Web-based educational systems. Also, we are interested in the use of interaction traces in order to address the lack of feedback between the learner and the teacher.

Generally, we aim to offer a tool that allows the tutor and the instructional designer to interpret learner courses, in order to provide help as needed for each individual using data mining techniques.



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# Optimization of the two Fishermen's Profits Exploiting Three Competing Species

**Communication Info**

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**Keywords:**
(1) MARKOV Chain
(2) Equilibrium
(3) Profit
(4) Bioeconomy

**Abstract**

The study of the bioeconomic equilibrium is an important issue in the term of the optimization of the biological exploitation resources [2], we suggest in this work a model for two fishermen who catch three species taking into consideration the fact that the prices of fish populations vary according to the quantity harvested[3]; these species compete with each other for space or food; the natural growth of each species is modeled using a logistic law MARKOV CHAIN. [1] The main purpose of this work is to define the fishing effort that maximizes the profit of each fisherman, but all of them have to respect two constraints: the first one is the sustainable management of the resources and the second one is the preservation of the biodiversity.

The existence of the steady states and their stability are studied using MARKOV eigenvalue analysis.

The equilibrium point that maximizes the profit of each fisherman is studied by MARKOV CHAIN.



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# On the spectral reconstruction problem for digraphs

## Communication Info


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**Keywords:**
(1) Digraph
(2) reconstruction problem
(3) idiosyncratic polynomial


## Abstract


**The idiosyncratic polynomial of a graph G with adjacency matrix A is the characteristic polynomial of the matrix A + y(J − A − I), where I is the identity matrix and J is the all-ones matrix. It follows from a theorem of Hagos (2000) combined with an earlier result of Johnson and Newman (1980) that the idiosyncratic polynomial of a graph is reconstructible from the multiset of the idiosyncratic polynomial of its vertex-deleted subgraphs. For a digraph G with adjacency matrix A, we define its idiosyncratic polynomial as the characteristic polynomial of the matrix A + y(J − A − I) + z$A^t$ t . By forbidding two fixed digraphs on three vertices as induced subdigraphs, we prove that the idiosyncratic polynomial of a digraph is reconstructible from the multiset of the idiosyncratic polynomial of its induced subdigraphs on three vertices. As an immediate consequence, the idiosyncratic polynomial of a tournament is reconstructible from the collection of its 3-cycles.**




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# Gestion budgétaire : stratégie d'aide à la décision et recommandation pour les universités

**Communication Info**

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**Keywords:**
(1) Aide à la prise de décision
(2) Gouvernance
(3) Meta model
(4) Risque
(5) Système d'information
(6) Système de recommandation

**Abstract**

La loi 01-00, portant organisation de l'enseignement supérieur, dans ses articles 4 et 5, définit les universités comme des établissements publics dotés de la personnalité morale et de l'autonomie administrative et financière. Elles sont placées sous l'égide tutelle de l'état, laquelle a pour objet de faire respecter par les organes compétents des universités, les dispositions de la présente loi. Dans cette recherche on va essayer de montrer l'apport des changements sur la gestion budgétaire (préparation et répartition du budget) qui connait malheureusement plusieurs contraintes donnant lieux à des retards d'exécution multi-axes (risques relatif aux domaines de la formation continue et la recherche, risques relatif au domaine de la gouvernance, risque relatif aux ressources matérielles, risque relatif aux ressources humaines, risque informatique et risque relatif aux ressources financières). Et ceci en déterminant les risques pouvant survenir lors de la réalisation des axes des universités et en proposants des recommandations.



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# An Algorithm for the Realization of 3-uniform Hypergraphs by tournaments

## Communication Info

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**Keywords:**
(1) hypergraph
(2) 3-uniform
(3) module
(4) Tournament
(5) realization

## Abstract

Let H be a 3-uniform hypergraph. A tournament T defined on V(T)= V (H) is a realization of H if the edges of H are exactly the 3-element subsets of V(T) that induce 3-cycles. We characterize the 3-uniform hypergraphs that admit realizations by using a suitable modular decomposition.



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# Etat d'art des techniques d'analyse de comportement client pour la détection de fraude par carte de crédit

**Communication Info**

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**Keywords:**
(1) Détection des fraudes
(2) Comportement client,
(3) Fraude de carte de crédit

**Résumé**

Le volume des transactions par carte de crédit a considérablement augmenté ces dernières années. Ainsi, le nombre de cas de fraude a également augmenté, entraînant des pertes de milliers de dollars dans le monde. Par conséquent, il est obligatoire d'utiliser des techniques qui peuvent aider à détecter la fraude par carte de crédit [1]. Notre objectif est de développer un système multi-niveau pour la détection des fraudes par carte de crédit, dont l'un de ces niveaux est l'analyse du comportement client. Dans ce travail, nous présentons un état d'art des techniques d'analyse de comportement client pour la détection des fraudes par carte de crédit (CCFD). Cette analyse des travaux antérieure nous servira pour trouver la technique la plus prometteuse, basé sur l'activité et le profil du porteur de la carte, et l'intégrer à notre architecture de CCFD [2].



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# Bio-Inspired Algorithms: A brief state of art

## Communication Info

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**Keywords:**
(1) Optimization
(2) Metaheuristics
(3) Bio-Inspired Metaheuristics

## Abstract

Metaheuristics have been used to resolve hard continuous and discrete problems instead of exact methods. Their principal advantages are that they provide good solutions in a reasonable amount of time and are problem independent. In the few last decades metaheuristics inspired from biology have been emerged. They are easy to implement and provide amazing results. We can cite Firefly Algorithm (FA) [1], Cuckoo Search (CS) [2], Bat Algorithm (BA) [3], Biogeography-Based Optimization (BBO) [4] and Shuffled Frog Leaping Algorithm (SFLA) [5]. These bio-inspired metaheuristics were compared to known metaheuristics of state of art like Genetic Algorithm (GA) [6], Ant Colony Optimization (ACO) [7], and Particle Swarm Optimization (PSO) [8]. In this communication we will give a general classification of metaheuristics, a brief review of the five abovementioned bio-inspired metaheuristics, their principals, algorithms, applications and a synthetic comparison table.



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# Realizability, primality and criticality of Hypergraphs

**Communication Info**

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**Keywords:**
(1) hypergraph
(2) 3-uniform
(3) module
(4) Tournament
(5) realization

**Abstract**

Given a 3-uniform hypergraph H, a subset M of V (H) is a module of H if for each e ∈ E(H) such that e ∩ M ≠ ∅ and e \ M ≠ ∅, there exists m ∈ M such that e ∩ M = {m} and for every n ∈ M, we have (e\{m})∪{n} ∈ E(H). For example, ∅, V (H) and {v}, where v ∈ V (H), are modules of H, called trivial. A 3-uniform hypergraph is prime if all its modules are trivial. Let H be a 3-uniform hypergraph. A tournament T defined on V(T)= V (H) is a realization of H if the edges of H are exactly the 3-element subsets of V(T) that induce 3-cycles. Given a prime 3-uniform hypergraph, we study its prime, 3-uniform and induced sub-hypergraphs. Our main result is: given a prime 3-uniform hypergraph H, with v(H) ≥ 4, there exist v, w ∈ V (H) such that H − {v, w} is prime.



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# On the numerical solution of fractional stochastic differential equations

## Communication Info

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**Keywords:**
(1) fSDEs Itô–Doob type
(2) strong and weak approximation
(3) numerical methods

## Abstract

Recently, fractional differential equation models have been largely employed in many fields, which is the case in mecanics, finance, image processing and bioengineering. Since the fractional order derivative has the memory effect property, modeling by stochastic fractional differential equations has more advantages to understand problems and phenomena with memory. In this work, we give an overview of numerical methods for the solution of fractional stochastic differential equations. Then we present discrete time strong and weak approximation methods that are suitable for different applications.



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# L'impact de la variation du prix de deux espèces marines sur l'effort de pêche, les captures et le profit

## Communication Info

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**Keywords:**
(1) Modélisation bioéconomique.
(2) Effort de pêche.
(3) Capture et profit de pêcheur.

## Abstract

Dans cette communication nous proposons d'étudier un modèle bioéconomique, sous divers scénarios de gestion, de deux espèces marines qui sont en compétition entre elles pour l'espace ou la nourriture.

Ce modèle bioéconomique comprend 3 parties : Partie biologique reliant les captures aux stocks de biomasse, une partie exploitation qui relie les captures aux efforts de pêche, et une partie économique reliant les efforts de pêche aux profits. Ensuite nous introduisons le profit à l'équilibre biologique comme étant la différence entre le chiffre d'affaires et les coûts totaux.

Ces deux espèces marines sont exploitées par un pêcheur qui cherche à maximiser son profit. L'objectif principal de ce travail est d'étudier l'impact de la variation du prix de ces deux espèces marines sur l'effort de pêche, les captures et le profit de ce pêcheur.



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# First Principles Investigation of The Elastic, Optoelectronic and Magnetic Properties of New Half-Heusler Compounds Using The mBJ Exchange Potential

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**Keywords:**
(1) Half-Heusler compounds,
(2) DFT Theory
(3)GGA+mbj approximation
(4) FPLAPW Method, Wien2K code.

## Abstract

The structural, half-metallic and elastic properties of the hypothetical half-Heusler compounds XBaGa (X=Li, Na, K, and Rb) were investigated using first-principles calculations within the generalized gradient approximation (GGA) and GGA+mbj based on density function theory (DFT) [1,2,3]. The absence of the transition-metal atoms makes these compounds important model systems for the study the origin and properties of half-metallic ferromagnetism of sp electron systems [4]. It is shown that for all the compounds the ferromagnetic state is favorable than the non-magnetic state. It is also found that KBaGa and RbBaG compounds exhibit half metallic ferromagnetic [4]. The individual elastic constants, shear modulus, Young's moduli, ratio B/G and the Poisson's ratio were also calculated. The calculated value of the B/G ratio is about 1.834 to 1.967 indicating that the investigated compound can be classified as a ductile material [5].



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# p-cyclic contraction best proximity point

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**Keywords: P-cyclic contraction, best proximity point (S) convex metric space**

**Abstract**

Consider a self mapping on the union of p-subsets of metric spaces. In this article we introduce the notion of (S) convex structure, and we acquire a best proximity point for p-cyclic contraction in (S) metric space.

In 2003 Kirk. Srinivasan and veeramani proved convergence and existence result for fixed point that if a self mapping defined on the union of p- nonempty subsets of metric spaces.

In 2005 Antony Eldred and veeramani introduced the existence of the best proximity point for the map in setting of uniformly convex Banach spaces.

In 2017 T Sabar M. Aamri A. Bassou studied convergence and existence results of best proximity points for tricyclic contraction.

In this work we introduce new results of best proximity points for a self mapping defined on the union of p-nonempty subsets of (S) convex metric spaces.



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# A generalization of the Hilali conjecture

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**Keywords:**
(1) Rational Homotopy Theory
(2) Hilali conjecture
(3) Sullivan minimal model
(4) Cohomology

## Abstract

We focus on the relative Hilali conjecture proposed by T. Yamaguchi and Yokura, that for a continous map between two simply connected elliptic spaces $f:X\to Y$, $\dim \operatorname{Ker} \Pi_{*}(f)_{\mathbb{Q}} \leq \dim \operatorname{Ker} H_{*}(f;Q)+1$. Our aim in this paper is to prove this conjecture for fibrations whose fibre has at most two-oddly generators. Also we show it in the case $H\to G\to G/H$, where G is a compact connected Lie group and H is a closed sub-Lie group of G.



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# Contribution à la meilleure décision instantanée de la gestion des stocks

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**Keywords:**
(1) Décision instantanée
(2) Gestion de stocks
(3) Modélisation
(4) Optimisation
(5) Programme linéaire en nombres binaires

**Résumé**

Toute entreprise, quelle que soit son activité, doit veiller à assurer une bonne gestion des stocks. Pour être performante et éviter le sur-stockage ou le sous-stockage, la société doit être efficace dans la rotation des stocks et éventuellement la gestion des approvisionnements. C'est dans cet esprit où se situe ce travail, qui consiste à mettre en place une bonne organisation de la gestion de stock de l'entreprise afin d'augmenter son chiffre d'affaires et apriori créer de la richesse. Selon ce constat, on propose, dans ce travail, une démarche digitale permettant de mettre en place une gestion de stock optimale et adaptée à l'entreprise. Premièrement, on recueille les informations nécessaires sur chaque produit de l'enseigne. Ensuite et grâce à une feuille de calcul, on suit les entrées et les sorties en stock de ce produit pour déterminer le stock final en fin de période, en quantité et en valeur. Après et à l'aide d'une programmation linéaire, on modélise le problème par un programme linéaire en nombres binaires (PLNB). Enfin on résout numériquement le PLNB pour proposer une meilleure décision instantanée possible des stocks. Des exemples pratiques pour illustrer le travail sont donnés.



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# Équations différentielles à retard et applications

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**Keywords:**
(1) delay differential equation
(2) stem like cells
(3) stability

**Abstract**

Dans cet article, nous étudions un modèle mathématique de Leucémie inspiré des travaux de [2] et [3]. L'existence et l'unicité d'équilibre ont été établies selon le paramètre q tel que $-1 < q \leq 0$ . Pour $q = 0$, nous avons prouvé l'existence de l'état stationnaire trivial $X_0$, pour un paramètre de retard $\tau \geq 0$ et la présence d'un état stable $X_1$ qui existe pour $\tau$ tel que $0 \leq \tau \leq \boldsymbol{\tau}$. De plus, nous avons déterminé que l'état trivial est stable pour $\tau > \boldsymbol{\tau}$ et instable pour $0 \leq \tau \leq \boldsymbol{\tau}$ dans l'autre cas $X_1$ est stable pour tout $0 \leq \tau \leq \boldsymbol{\tau}$. Pour $q \neq 0$ nous établissons l'existence de trois états d'équilibre $X_0$, $X_2$ et $X_3$ pour tout $0 \leq \tau \leq \boldsymbol{\tau'}$ . Nous avons prouvé la stabilité de $X_3$ et l'instabilité de $X_2$ pour tout $0 < \tau \leq \boldsymbol{\tau'}$.



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