FSBM
Faculté des sciences ben m'sick
Université Hassan II de Casablanca

MATHÉMATIQUES & INFORMATIQUE

20ème Journée de Mathématiques et Applications (JMA23)

PROCEEDINGS

JEUDI
9 FÉVRIER 2023
À PARTIR DE 8H30

FACULTÉ DES SCIENCES
BEN M'SICK

https://jma23.sciencesconf.org/

20ème Journée de Mathématiques Et Applications (JMA23)

Le 9 Février 2023

Faculté des Sciences BenM'Sik
Casablanca

Programme de la Journée JMA23

8h30-9h00 :	Accueil et inscription des participants
9h00-9h30 :	Ouverture de la Journée • Pr Mohamed TALBI , Doyen de la Faculté des Sciences Ben M'Sik • Pr Noura YOUSFI, Vice doyen chargé de la recherche scientifique • Pr Abdelouahed NAMIR, Vice doyen chargé de la digitalisation • Pr Mohamed RADID, Vice doyen chargé des affaires pédagogiques, des affaires estudiantines et la Vie Universitaire. • Pr Mohamed AZZOUAZI, Chef de Département de Mathématiques et Informatiques. • Pr Naceur ACHTAICH, Directeur du Laboratoire Analyse Modélisation et Simulation • Annoncer le programme de la Journée (pour le comité d'organisation)
9h30 -10h00 :	Pause-café
10h00 -10h45 :	Conférence plénière 1 : "Survey and new development on dimension theory" Mr ZEROUALI, Faculté des Sciences de Rabat Modérateur : Pr. B. AHARMIM.
10h45-11h30 :	Conférence plénière 2 : « Mathematical and numerical analysis of the Stochastic Epidemiology Models. » Pr. Jaouad DANANE, École Nationale des Sciences Appliquées(ENSA) de Berrechid. Université Hassan I. Modérateur : Pr. A. EL ADRAOUI.
Sessions de communications	
Session 1 : Analyse Fonctionnelle Modérateurs : Pr. A. BASSOU, Pr. K. BOUZKOURA, Pr. A. EL ADRAOUI, Pr. A. ABOUSSOUROUR	
11h45-12h00 :	Fixed point theorems of Kannan Type in quasi-metric space Youssef EL BEKRI, Jamal MOULINE , Abdelhafid BASSOU
12h00-12h15 :	Boundary value problems on the classical domain of type I Daoud OUKACHA, Fouzia EL WASSOULI

12h15-12h30 :	La Théorie Des Anneaux Commutatifs Finis “Structure Des Anneaux Commutatifs ” Najat RAFI et Khadija BOUZKOURA.
12h30-12h45 :	New properties of controlled frames for Hilbert C*-modules Hatim LABRIGUI, Samir KABBAJ
12h45-13h00 :	Fixed point theorem type Kannan in the variable exponent sequence spaces with a graph Kenza BENKIRANE, Abderrahim ELADRAOUI, Samia BENNANI
13h00-13h15 :	A general fixed point theorem in random normed spaces and its applications Chaimaa BENZAROUALA
13h15-13h30 :	Fuzzy lattices theory and its applications on the fix point theorem Amine FAIZ
13h30- 13h45 :	Evolution Copulas: Elliptic Case Ahmed SANI
13h45-14h00 :	Evolution Copulas: Elliptic Case Mohamed EL MAAZOUZ
Session 2 : Géométrie, Algèbre et Analyse : fonctionnelle, convexe et non linéaire Modérateurs : Pr. K. ADNAOUI, Pr. M. RIHANI, Pr. B. AHARMIM, Pr. Y. EL FOUTAYENI	
11h45-12h00 :	In silico analysis of the functional and structural consequences of nsSNPs in human MC4R protein associated with childhood obesity Imane DOUIYEH, Jihane KHAMLICH, Anas KETTANI, Amal SAFI
12h00-12h15 :	In-silico analysis predicting the structural and functional effects of high-risk nsSNPs in the human GCK gene associated with Gestational Diabetes Jihane KHAMLICH , Imane DOUIYEH, Asmae SAIH, Anas KETTANI, Amal SAFI
12h15-12h30 :	Order semi-Fredholm operators Youssef EZZAKI
12h30-12h45 :	Fixed Point Theory In Generalized Metric Space And Quasi Metric Space Adil BAIZ
12h45-13h00 :	Surfaces de translation générées par les normales principales de courbes régulières d'un espace euclidien à trois dimensions Salma KHAN, Malika IZID, Soukaina OUARAB, AMINA OUAZZANI

	CHAHDI
13h00-13h15 :	A generalized aspect of strong implementation: Pairwise-strategyproofness and a new way of designing preference profiles for strategies Ahmed DOGHMI
13h15-13h30 :	On Bilevel Variational Inequalities Mohsine JENNANE
13h30-13h45 :	Existence of two positive solutions for a non-local problem with variable exponent Mohammed SHIMI
13h45-14h00 :	Metric properties of k-symplectic structures Ismail Benali et Souhaila El Amine
Session 3 : Contrôle des systèmes et mathématiques pour la finance Modérateurs : Pr. S. BIDAH, Pr. El. LOTFI, Pr. I. EL BERRAI, Pr. M. BACHRAOUI	
11h45-12h00 :	A new simple discrete-time epidemic model describing social media addicts with an optimal control strategy Soukaina HILAL
12h00-12h15 :	Cone-Bounded Feedback Laws for Linear second order Systems Ahmat MAHAMAT TABOYE, Abdellaziz BINID, Mohamed LAABISSI
12h15-12h30 :	Energy harvesting from quasi-periodic vibrations using time delay Zakaria GHOULI
12h30-12h45 :	On the optimal control compensation for linear time-varying disturbed systems Chadi AMISSI
12h45-13h00 :	Sampled-data controllers and observers design for uncertain semilinear systems with positivity constraints Abdellaziz BINID
13h00-13h15 :	Stabilization and F LQ-optimal control of conformable positive linear systems Toufik ENNOUARI
13h15-13h30 :	Estimation of the Conditional Probability Using a Stochastic Gradient Process Ali LABRIJI, Abdelkrim BENNAR, Mostafa RACHIK

13h30- 13h45 :	Pricing American options with irregular Payoff via reflected BSDEs Mohamed MARZOUGUE
Session 4 : Biomathématiques et mathématiques pour la finance Modérateurs : Pr. F. LAHMIDI, Pr. H. LAARABI, Pr. I. AGMOUR, Pr. O. ZAKARY, Pr. N. SOUKHER	
11h45-12h00 :	The simulation of MASI Index Option Pricing Based on Equation differential partial of Black-Scholes Youness SAOUDI, Hajar SABIKI, Hanaa HACHIMI
12h00-12h15 :	An epidemiological model for tuberculosis with Hattaf fractional operator and fixed point theory Hamza ELMAMOUNI, Khalid HATTAF, Noura YOUSFI
12h15-12h30 :	Biology in the teaching of mathematics in Moroccan high school Nabila BEQQALI
12h30-12h45 :	Dynamics of an immunological SARS-COV-2 model with antiviral treatment Mly Ismail EL KARIMI
12h45-13h00 :	Modélisation mathématique et stratégie de contrôle optimal de l'épidémie de variole du singe Abdelbar ELMANSOURI, Mohamed BELAM, Abderrahim LABZAI, Bouchaib KHAJJI
13h00-13h15 :	Modelling and Analysis of a Fractional prey-predator system in the presence of toxicity and harvesting Chaimaa ASSILA
13h15-13h30 :	Optimal control of a new corona virus model Youssef JABRANI, Rachid BOUAJAJI, Hassan LAARABI, Mostafa RACHIK, abdelhadi ABTA
Session 5 : Informatique Modérateurs : Pr. K. ACHTAICH, Pr. M. AIT DAOUD, Pr. O. ZAHOUR, Pr S. NOUH	
11h45-12h00 :	Approche évolutive d'analyse des sentiments Kamal WALJI
12h00-12h15 :	Chaine de Markov Couple: application en segmentation des images bruitées Meryem AMEUR

12h15-12h30 :	Connecting the Farm: A Comparative Study of IoT Connectivity in Smart Farming Mohamed DOUBIZ, Mouad BANANE, Abdelali ZAKRANI, Allae ERRAISSI
12h30-12h45 :	Etude comparative des approches de détection des valeurs aberrantes basées sur le Big Data et Machine Learning Samia ABARAGH
12h45-13h00 :	Importants algorithmes d'exploration pour les agents de problem-solving Mouataz Idrissi KHALDI, Allae ERRAISSI, Mustapha HAIN, Mouad BANANE
13h00-13h15 :	Log management generated and correlated by SIEM using ML algorithms Yasmine ABOUDRAR, , Mohammed OUZZIF
13h15-13h30 :	Precision Marketing: Machine Learning and Big Data Approach Nouhaila ELKOUFI, Abdessamad BELANGOUR, mounir SADIQ
13h30- 13h45 :	Surface Weather Parameters Forecasting Using Analog Ensemble Method Over the Main Airports of Morocco Badreddine ALAOUI, Driss BARI, Yamna GHABBAR
14h00-14h45 : Déjeuner	
15h00-15h45 :	Conférence 3: Quelques Aspects De Développement De La Pensée Statistique Pr Zahid M'HAMEDI, CRMEF de Rabat. Modérateurs : Pr ACHTAICH, Pr. J. MOULINE
15h45-16h15 :	Pause-café
16h15-17h00 :	Table ronde et clôture

Conférences

Survey and new developpement on dimension theory

El Hassan Zerouali
Faculty of Science
Mohammed V university of Rabat.

Abstract: We start this talk with an historical survey on dimension theory from the Greek time to the beginning of the last century.
We also discuss the philosophical motivations of such investigation. We end with a new paradigm of dimension theory and present several applications.

Mathematical and numerical analysis of the stochastic epidemiological models

Jaouad Danane

Laboratory of Systems Modelization and Analysis for Decision Support,
National School of Applied Sciences, Hassan First University of Settat,
Berrechid 26100, Morocco

E-Mail: jaouaddanane@gmail.com

Abstract

We propose and study a various mathematical epidemiological model by both the Brownian motion processes and the jump Lévy noise. The Lévy noise perturbations are usually ignored by the existing works on mathematical modeling in epidemiology, but their incorporation into the epidemic model is worth considering because of the presence of strong fluctuations in the dynamics, which often leads to the emergence of a number of discontinuities in the processes under investigation. We begin our study in this article by presenting our model and by clearly justifying its used form, namely the component related to the Lévy noise. The existence and uniqueness of a global positive solution is established. Also, under some assumptions, we show the extinction and the persistence of the infection. Finally, we introduce some numerical method in order to give some numerical simulations based upon our results.

Key Words epidemic model;Stochastic model; Brownian motion;Lévy jump; Lévy noise; Extinction and persistence.

Journée des Mathématiques et Applications (JMA23)
Le 09 février 2023
Faculté des Sciences Ben M'sik
Casablanca
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Titre de la conférence :

QUELQUES ASPECTS DE DÉVELOPPEMENT DE LA PENSÉE STATISTIQUE

Zahid EL M'HAMEDI
mhamdizahid@yahoo.fr

Résumé

Bien que l'enseignement de la statistique soit souvent justifié en se référant à la nécessité de préparer les étudiants aux demandes d'une société d'information, certains enseignants ne fournissent pas beaucoup d'efforts pour adresser directement telles demandes. Ils introduisent souvent, dans leurs instructions, des tâches obligeant les apprenants à effectuer seulement des calculs statistiques. Ceci peut ne pas être suffisant pour développer les habiletés du savoir-faire statistique des apprenants. Par ailleurs, une personne statisticienne s'élève certainement à plus qu'acquérir « la capacité de calcul », l'habileté de manipuler des nombres, de penser et raisonner en termes quantitatifs. Une des caractéristiques d'une personne statisticienne doit être alors l'habileté d'utiliser le jugement argumenté et informé, plutôt que des règles rigides et habillées de fer, pour effectuer des décisions. Une des caractéristiques d'enseignement de la statistique devrait être l'évitement attentif et sans justification de règles comme : « si $n>30$, l'échantillon moyen est normal (et si $n<30$ il ne l'est pas) ». Nous nous focalisons, dans ce travail, sur quelques aspects de développement de la pensée statistique, relativement aux concepts : « moyenne arithmétique » et « tests statistiques », en insistant sur le fait que leurs compréhensions dépassent l'application aveugle et mécanique de formules de calcul mathématiques.

Mots-clés : Moyenne arithmétique, Tests statistiques, Critiques, Compréhension conceptuelle.

Communications

Liste des communications

1. **In-silico analysis predicting the structural and functional effects of high-risk nsSNPs in the human GCK gene associated with Gestational Diabetes, Jihane Khamlich [et al.]**

2. **In silico analysis of the functional and structural consequences of nsSNPs in human MC4R protein associated with childhood obesity, Douiyeh Imane [et al.]**

3. **Existence of two positive solutions for a non-local problem with variable exponent, Shimi Mohammed**

4. **The simulation of MASI Index Option Pricing Based on Equation differential partial of Black-Scholes, Saoudi Youness [et al.]**

5. **Cone-Bounded Feedback Laws for Linear second order Systems, Mahamat Taboye Ahmat [et al.]**

6. **Energy harvesting from quasi-periodic vibrations using time delay, Ghouli Zakaria**

7. **Precision Marketing: Machine Learning and Big Data Approach, Elkoufi Nouhaila [et al.]**

8. **Modelling and Analysis of a Fractional prey-predator system in the presence of toxicity and harvesting, Assila Chaimaa**

9. **Surfaces de translation générées par les normales principales de courbes régulières d'un espace euclidien à trois dimensions, Khan Salma [et al.]**

10. On the optimal control compensation for linear time-varying disturbed systems, Amissi Chadi

11. Stabilization and F LQ-optimal control of conformable positive linear sys- tems, Ennouari Toufik

12. Optimal control of a new corona virus model, Jabrani Youssef [et al.]

13. Surface Weather Parameters Forecasting Using Analog Ensemble Method Over the Main Airports of Morocco, Alaoui Badreddine [et al.]

14. A new simple discrete-time epidemic model describing social media addicts with an optimal control strategy, Hilal Soukaina

15. On Bilevel Variational Inequalities, Jennane Mohsine

16. Sampled-data controllers and observers design for uncertain semilinear systems with positivity constraints, Binid Abdellaziz

17. Pricing American options with irregular Payoff via reflected BSDEs, Mar- zougue Mohamed

18. Boundary value problems on the classical domain of type I $ SU(n,m)/S(U(n) *U* (*m*))$, ≥ $*nm*$, *OukachaDaoud* [*etal.*]

19. Modélisation mathématique et stratégie de contrôle optimal de l'épidémie de variole du singe, Abdelbar Elmansouri [et al.]

20. Connecting the Farm: A Comparative Study of IoT Connectivity in Smart Farming, Doubiz Mohamed [et al.]

21. Fixed point theorem type Kannan in the variable exponent sequence spaces with a graph, Benkirane Kenza [et al.]

22. EVOLUTION COPULAS: ELLIPTIC CASE, El Maazouz Mohamed

23. EVOLUTION COPULAS: ELLIPTIC CASE, Sani Ahmed

24. Estimation of the Conditional Probability Using a Stochastic Gradient Pro- cess, Labriji Ali [et al.]

25. Chaine de Markov Couple: application en segmentation des images bruitées, AmeurMeryem

26. New properties of controlled frames for Hilbert C*-modules, Labrigui Ha- tim [et al.]

27. Fuzzy lattices theory and its applications on the fix point theorem, Faiz Amine

28. Etude comparative des approches de détection des valeurs aberrantes baséessur le Big Data et Machine Learning, Abaragh Samia

29. A generalized aspect of strong implementation: Pairwise-strategyproofness and a new way of designing preference profiles for strategies, Doghmi Ahmed

30. Importants algorithmes d'exploration pour les agents de problem-solving, Idrissi Khaldi Mouataz [et al.]

31. A general fixed point theorem in random normed spaces and its applica- tions, Benzarouala Chaimaa

32. Approche évolutive d'analyse des sentiments, Walji Kamal

33. An epidemiological model for tuberculosis with Hattaf fractional operator and fixed point theory, Elmamouni Hamza [et al.]

34. Dynamics of an immunological SARS-COV-2 model with antiviral treatment, El Karimi Mly Ismail

35. Log management generated and correlated by SIEM using ML algorithms, AboudrarYasmine [et al.]

36. Biology in the teaching of mathematics in Moroccan high school, Beqqali Nabila

37. Fixed point theorems of Kannan Type in quasi-metric space, El Bekri Youssef [et al.]

38. FIXED POINT THEORY IN GENERALIZED METRIC SPACE AND QUASI METRIC SPACE, Adil Baiz et Jamal Mouline.

39. Metric properties of k-symplectic structures, Ismail Benali et Souhaila El Amine.

40. LA THÉORIE DES ANNEAUX COMMUTATIFS FINIS "STRUCTURE DES ANNEAUX COMMUTATIFS ", Rafi Najat et Khadija BOUZKOURA.

In-silico analysis predicting the structural and functional effects of high-risk nsSNPs in the human GCK gene associated with Gestational Diabetes

Jihane Khamlich[1,2*], Imane Douiyeh[1,2], Asmae Saih[2], Anass Kettani[2£] and Amal Safi[1£]

[1] *Laboratory Biochemistry Environment and Agri-food, Department of Biology, Faculty of Science and Technics Mohammedia, Hassan II University Casablanca, Morocco.*

[2] *Laboratory of Biology and Health, URAC 34, Faculty of Sciences Ben M'Sik Hassan II University of Casablanca, Morocco.*

Résumé

Pour évaluer l'effet des variants faux-sens et le degré de pathogénicité de chaque nsSNP sur la fonction, la structure et la stabilité de la protéine glucokinase (GCK), divers outils bio-informatiques ont été utilisés, notamment PHD-SNP, PROVEAN, SNPs&GO, SIFT, PolyPhen 2.0, Mutpred, I-Mutant, MUpro, ConSurf et STRING. Vers la fin, TM-align a été utilisé pour analyser la topologie et la similarité structurelle entre le modèle natif et les mutants générés.

Au total, sept des huit nsSNPs se sont avérés être les variants les plus dommageables et exercer un effet délétère sur la structure de la protéine GCK, et probablement sur sa fonction. Cette analyse in silico fournit des informations sur les variants nucléotidiques fonctionnels qui ont un impact sur la structure et la fonction de la protéine GCK, et donc sur la susceptibilité au diabète gestationnel.

Mot clé : *GCK*, Diabete Gestationnel , nsSNPs, Prédiction, Outils Bio-informatique.

Abstract

To assess the effect of missense variants and the degree of pathogenicity of each nsSNP on the function, structure, and stability of the glucokinase protein (*GCK*), various bioinformatics tools were used, including PHD-SNP, PROVEAN, SNPs&GO, SIFT, PolyPhen 2.0, Mutpred, I-Mutant, MUpro, ConSurf, and STRING. Towards the end, TM-align was used to analyze the topology and structural similarity between the native model and the generated mutants.

In total, seven out of eight nsSNPs were found to be the most damaging variants and to exert a deleterious effect on the structure of the *GCK* protein, and probably on its function. This in silico analysis provides information on the functional nucleotide variants that impact *GCK* protein structure and function, and thus on susceptibility to Gestational Diabetes.

Keywords: *GCK*, Gestational Diabetes, Missense variants, Prediction, Bioinformatics tools.

In silico analysis of the functional and structural consequences of nsSNPs in human MC4R protein associated with childhood obesity

Imane Douiyeh1,2*, Jihane Khamlich1,2, Asmae Baggar1 , Anass Kettani2£, Amal Safi1, DOUIYEH Imane1*

[1]Laboratory Biochemistry Environment and Agri-food, Department of Biology, Faculty of Science and Technics Mohammedia, Hassan II University Casablanca, Morocco.

[2]Laboratory of Biology and Health, URAC 34, Faculty of Sciences Ben M'Sik Hassan II University of Casablanca, Morocco.

Presenting Author: imane.douiyeh-etu@etu.univh2c.ma;

*Corresponding Author: imane.douiyeh-etu@etu.univh2c.ma

Childhood Obesity is admitted as a major public health issue in both industrialized and developing countries, exposing obese patients to many complications. Previous studies revealed that the Melanocortin-4 receptor gene (*MC4R*) is the most common monogenic form of early-onset severe obesity. *MC4R* is designated as a regulator of energy homeostasis due to its effect on food intake and energy expenditure via neuronal melanocortinergic pathways. In this study, we presented an in-silico analysis of missense variants of *MC4R* using diverse computational platforms. Tools including SIFT, PolyPhen, SNAP2, PROVEAN, MutPred2, SNP&GO and PhD-SNP, Mu-Pro, I-Mutant, SAAFEC-SEQ I-Mutant, and ConSurf were used to predict 13 highly confident damaging and disease-causing nsSNPs that could potentially alter the *MC4R* gene. The proposed SNP can serve as prognostic and predictive biomarkers in childhood obesity.

Existence of two positive solutions for a non-local problem with variable exponent

MOHAMMED SHIMI

Sidi Mohamed Ben Abdellah University, École Normale Supérieure of Fez, Morocco.
mohammed.shimi2@usmba.ac.ma

Abstract Our aim is to study the existence of two non-negative solutions for a class of fractional $p(x, .)$-Laplacian problems with non-negative weight functions. The main tool is the Nehari manifold approach. Moreover, under some suitable assumptions, some continuous and compact embeddings results are established.

MSC (2020) : 35R11, 47D20, 35S15, 46E35.

Keywords : Fractional $p(x, .)$-Laplacian operator, Nonlocal problems, Nehari manifold, embeddings results.

THE SIMULATION OF MASI INDEX OPTION PRICING BASED ON DIFFERENTIAL PARTIAL EQUATION OF BLACK-SCHOLES

SAOUDI YOUNESS[1*], SABIKI HAJAR[2], and HACHIMI HANAA[3]

[1*]Systems Engineering Laboratory
USMS, Beni Mellal, Morocco
saoudiyouness@gmail.com

[2]Systems Engineering Laboratory
USMS, Beni Mellal, Morocco
sabikihajar@gmail.com

[3]Systems Engineering Laboratory
USMS, Beni Mellal, Morocco
hanaa.hachimi@usms.ac.ma

Corresponding Author: SAOUDI YOUNESS
saoudiyouness@gmail.com

Abstract.

The purpose of this paper is to present a simulation pricing study for the MASI Index based on the Black-Scholes option pricing model. Based on the pricing model, the price of a three-month MASI Index call option with a strike price of **10906,27** is approximately **80.46**, and the price of a put option is **0.36** on November 30, 2022. And the simulation results show that, given historical data, an option price can partially reflect the future price trend of the underlying asset, and the MASI Index has a high probability of rising.

These results can be beneficial for financial market traders to make good decisions regarding allocative portfolio and asset management strategies.

Keywords: *PDE, Black-Scholes Option Pricing Model, Simulation, Call , put, Index Option*

Cone-Bounded Feedback Laws for Linear second order Systems

Laboratory LIMA, Faculty of sciences, Chouaib Doukkali University B.P 20, El-Jadida, Maroc

Authors: Abdeallaziz BINID, Ahmat Mahamat Taboye, Mohamed Laabissi

Keywords: Stabilization, Abstract control systems, Infinite dimensional systems, Nonlinear semigroups, Wave equation.

1. Abstract

Consider the following wave equation

$$\begin{cases} \dfrac{\partial^2 x}{\partial t^2}(s,t) = -A_0 x(s,t) - \gamma \dfrac{\partial x}{\partial t}(s,t) + Bu(s,t), & t \geq 0, s \in [0,1], \\ \forall \geq \\ x(0,t) = x(1,t) = 0, & t \quad 0, \\ x(s,0) = x_0, \\ \dfrac{\partial x}{\partial t}(s,0) = x_1, \end{cases} \tag{1}$$

where u is the control and A_0 is a self adjoint and coercive operator on a Hilbert space H. During the last decades many works have studied the wave equation. Indeed, there are several articles in the literature that studies this equation (see [1, 4]). In a spacial case where the operator $A_0 = \Delta$ and $\gamma = 0$, the problem of stabilization by linear feedback control laws is considered by many authors. A simple examples can be find [1, 3], where the approach is based on standard C_0-semigroup theory on Hilbert spaces and linear quadratic techniques.

The objective of this article is to study the wave equation in the presence of nonlinear control laws in an infinite dimensional setting. As a first step, the well posedness problem of the closed loop in the presence of such nonlinearities is solved by using the Schauder's fixed-point Theorem and the C_0-semigroup theory. In the second step we use Theorem 2 of [2] to deduce the global asymptotic stability of the closed loop system. Another objective of this work is to apply these results to damped wave equation.

References

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[3] Anthony J Pritchard and Jerzy Zabczyk. Stability and stabilizability of infinite-dimensional systems. *Siam Review*, 23(1):25–52, 1981.

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Energy harvesting from quasi-periodic vibrations using time delay

Zakaria Ghouli

Polydisciplinary Faculty of Taroudant, University Ibn Zohr, Morocco

Abstract. We investigate quasi-periodic (QP) vibration-based energy harvesting (EH) in a nonlinear device consisting in an excited van der Pol oscillator coupled to a delayed piezoelectric coupling mechanism. We consider the case of primary resonance for which the frequency of the harmonic excitation is near the natural frequency of the oscillator. Analytical approximation of the QP response and the corresponding power output are obtained using the double-step multiple scales method. The effect of time delay on the EH performance is studied; It is shown that for appropriate combination of time delay parameters, QP vibration can be used to scavenge energy over a broadband of the excitation frequency away from the resonance with a significant performance. An optimum range of the system parameters where the QP vibration-based EH is maximum is determined. Numerical simulations are conducted to support the analytical predictions.

Introduction

Quasi-periodic (QP) vibration-based energy harvesting (EH) using time delay has been widely studied in the literature [1-4]. The time delay has used in a nonlinear harvester device subject to a harmonic/parametric excitation and coupled to an electric circuit [1,2]. The induced large-amplitude QP vibrations have been exploited to enhance EH performance. It was shown that for appropriate values of delay parameters, QP vibration-based EH can be exploited to extract energy over a broadband of excitation frequencies away from the resonance with good efficiency. In [1, 2] the time delay is introduced in the mechanical subsystem. The case where the time delay is introduced in the electrical circuit was studied in [3,4]. It is shown that for appropriate values of delay parameters, the energy harvesting performance is improved over a certain range of system parameters.

Taking advantage from using QP vibrations to extract energy from EH system in the case of the time delay is included within the electric circuit as a controller [3, 4], the purpose of the present work is to study the EH performance in the case of a van der Pol-type harvester device subject to a harmonic excitation and coupled to an electric circuit through a delayed piezoelectric coupling mechanism. Here we explore the effect of a time delayed introduced in the piezoelectric subsystem on the EH performance of the system.

Results

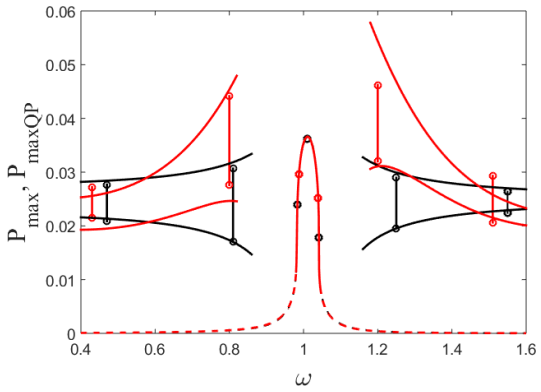

Fig. 1: Power amplitudes vs the frequency ω. Analytical prediction (solid lines for stable and dashed line for unstable) and numerical simulation (circles). Red lines for delayed electric circuit and black lines for undelayed circuit.

In Fig. 1 is shown the influence of time delay introduced in electrical component on the EH performance of the system. The curves given by the red lines correspond to this case of delayed harvester. For comparison, we plot also in *black* the case where the delay is absent. Here, it can be observed that introducing the delay in the electrical circuit causes a significant increase of the output power over a certain range of the frequency ω.

References

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Precision Marketing: Machine Learning and Big Data Approach

Nouhaila ELKOUFI*, Abdessamad BELANGOUR, Mounir SADIQ

*, [1], [2] Laboratory of Information Technology and Modeling(LTIM), Hassan II University,FS Ben M'sik, Bd Commandant Driss Al Harti, 20670 Casablanca, Maroc.
* elkoufi.nouhaila1@gmail.com

With the growth of the Internet industry and the informatization of services, online services and transactions have become the mainstream method used by clients and companies. How to attract potential customers and keep up with the Big Data era are the important challenges and issues for the banking sector. With the development of artificial intelligence and machine learning, it has become possible to identify potential customers and provide personalized recommendations based on transactional data to realize precision marketing in banking. The current study aims to provide a potential customer's prediction algorithm (PCPA) to predict potential clients using big data analysis and machine learning techniques. Our proposed methodology consists of five stages: data preprocessing, feature selection using Grid search algorithm, data splitting into two parts train and test set with the ratio of 80% and 20% respectively, modeling, evaluations of results using confusion matrix. According to the obtained results, the accuracy of the final model is the highest (98.9%). The dataset used in this research about banking customers has been collected from a Moroccan bank. It contains 6000 records, 14 predictor variables, and one outcome variable.

Modelling and Analysis of a Fractional prey-predator system in the presence of toxicity and Harvesting.

Chaimaa Assila[1] and Ha da Benazza[2]

[1] Mohammed V University in Rabat, Faculty of Sciences,
LabMIA-SI, Rabat, Morocco
chaimaa_assila@um5.ac.ma

[2] Mohammed V University in Rabat, Faculty of Sciences,
LabMIA-SI, Rabat, Morocco
h.benazza@um5r.ac.ma

Abstract

In this paper, we study the dynamic of a fractional-order prey-predator model with Holling type I and Holling type II functional responses in an aquatic environment of two competing species. We incorporate the e ect of harvesting and toxic substances by external agents into system. For the proposed model, we research the existence, uniqueness, non-negativity and boundedness of the equilibria. We discuss the local stability of these equilibria by using Matiginon's conditions, while the global stability is investigated by formulating an appropriate Lyapunov function. Finally, numerical simulations are provided to validate our theretical results and to investigate the in uences of each parameter on the dynamic behavior of the model.

Keywords : prey-predator model, Toxicity, Equilibria, Stability, fractional-order, fractional-order prey-predator model, functional response.

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Surfaces de translation générées par les normales principales de courbes régulières d'un espace euclidien à trois dimensions

Salma KHAN, Malika IZID, Soukaina OURAB, Amina OUAZZANI CHAHDI.

Résumé. En géométrie différentielle, une surface de translation est une surface qu'on obtient en translatant une courbe $\alpha = \alpha(u)$ le long d'une autre courbe $\beta = \beta(v)$. Les surfaces de translation peuvent être paramétrées localement par

$$\psi(u, v) = \alpha(u) + \beta(v),$$

où $\alpha : I \subset \mathbb{R} \to E^3$ et $\beta : J \subset \mathbb{R} \to E^3$, avec E^3 un espace euclidien à 3 dimensions.
Dans ce travail, nous nous intéressons aux surfaces de translation générées par les indicatrices normales principales de deux courbes régulières α et β de E^3, munies de leurs repères alternatifs $(N_\alpha, C_\alpha, W_\alpha)$ et $(N_\beta, C_\beta, W_\beta)$. En calculant la courbure de Gauss et la courbure moyenne de ces surfaces, on détermine une condition nécessaire et suffisante pour que ces dernières soient développables (resp. minimales) et on étudie le cas particulier où les courbes α et β sont planes, respectivement des hélices obliques.

Mots clés. Surface de translation, Normale principale, Courbure gaussienne, Courbure moyenne, Surface minimale, Surface développable, Repère alternatif.

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ON THE OPTIMAL CONTROL COMPENSATION FOR LINEAR TIME-VARYING DISTURBED SYSTEMS

C.Amissi [*], E.M. Magri[†], L. Afifi [‡], et M. Lhous [§]

Abstract. In this work, we consider a class of finite dimension time-varying control systems described by a linear state equation as follows :

$$\begin{aligned} z^{\cdot}(t) &= A(t)z(t) + B(t)u(t) + f(t)\ ;\ 0 < t < T \\ z(0) &= z_0 \end{aligned} \tag{1}$$

where $A \in C^{\infty}([0, T], M_n(\mathbb{R}))$, $B \in C^{\infty}([0, T], M_{n,p}(\mathbb{R}))$, $u \in L^2(0, T; \mathbb{R}^p)$ and $f \in L^2(0, T; \mathbb{R}^n)$.

The system (1) is augmented by the output equation:

$$y(t) = C(t)z(t)\ ;\quad 0 < t < T \tag{2}$$

with $C \in C^{\infty}([0, T], M_{q,n}(\mathbb{R}))$.

We study with respect to the observation, the possibility of finite time compensation of known or unknown disturbances. Under convenient hypothesis, we show how to find the optimal control ensuring the compensation of a disturbance, by bringing back the corresponding observation to the normal one. This concept is also examined as minimization problem with a decent cost function. A general approach was given to minimize the linear quadratic problem. Examples and numerical simulations are given.

Keywords.
Dynamical systems, remediability, observation, optimal control, disturbance.

[*]Département de mathématiques et informatique, FSAC, Université Hassan II, E-mail: amissichadi@gmail.com
[†]Département de mathématiques et informatique, FSAC, Université Hassan II, E-mail: magrielmostafa@yahoo.fr
[‡]Département de mathématiques et informatique, FSAC, Université Hassan II, E-mail: larbi.afifi@gmail.com
[§]Département de mathématiques et informatique, FSAC, Université Hassan II, E-mail: mlhous17@gmail.com

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Stabilization and *FLQ*-optimal control of conformable positive linear systems

Toufik Ennouari

Chouaib Doukkali University, 24000 El-Jadida, Morocco, toufik.ennouari@gmail.com

Abstract :

The positive stabilization problem for a class of fractional conformable linear systems in which the state takes non-negative values when the initial conditions are non-negative is addressed in this paper. Furthermore, the finite-horizon linear quadratic optimal control problem with non-negative state constraints FLQ^+ is studied for continuous-time positive linear fractional systems. Necessary and sufficient conditions are proved so that the *FLQ*-optimal control given by the standard fractional linear quadratic problem is also optimal for FLQ^+. Then, sufficient conditions are established for the positivity of the *FLQ*-optimal closed-loop system.

Keywords : Positive system, conformable derivative, stabilization, fractional linear quadratic (*FLQ*) problem..

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Contrôle optimal d'un nouveau modèle de la corona virus

Orateur, Youssef Jabrani*, Rachid Bouajaji ,Hassan Laarabi Mostafa Rachik , Abdelhadi Abta
Adresse

Laboratoire d'analyse, modélisation et simulation, faculté des sciences Benmsik.
mail
*Youssef Jabrani: jabrani.youssef@gmail.com

Abstract ou résumé: Cette étude propose un modèle de la pandémie de corona qui intègre les cas de virus déclarés et non déclarés pour être plus réaliste. Par ailleurs, on conseille d'employer les deux mesures préventives : la vaccination et le traitement et de les appliquer simultanément. Les contrôles optimaux ont été caractérisés par le principe du maximum de Pontryagin. Enfin, les résultats des simulations numériques démontrent l'utilité des mécanismes de contrôle proposés et de cette modélisation.

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Surface Weather Parameters Forecasting Using Analog Ensemble Method Over the Main Airports of Morocco

Badreddine ALAOUI [1,2*], Driss BARI [1], and Yamna GHABBAR [2]

1 *Direction Générale de la Météorologie, CNRM, Casablanca, Morocco*

2 *Hassania School of Public Works, LaGeS/MoNum, Casablanca, Morocco*

ABSTRACT

Surface weather parameters detain high socio-economic impact and strategic insights for all users, in all domains (aviation, marine traffic, agriculture, etc.). However, those parameters were mainly predicted using deterministic NWP models that include a wealth of uncertainties. The purpose of this study is to contribute in improving low-cost computationally ensemble forecasting of those parameters using Analog Ensemble Method (AnEn) and comparing it to the operational meso-scale deterministic model (AROME) all over the main airports of Morocco using 5 years period (2016-2020) of hourly data-sets. An analog for a given station and forecast lead-time is a past prediction, from the same model that has similar values for selected predictors of the current model forecast. Best analogs verifying observations forms AnEn ensemble members. To picture seasonal dependency, two configurations were set; a basic configuration where analogs may come from any past date and a restricted configuration where analogs should belong to a day window around the target forecast. Furthermore, a new predictors weighting strategy is developed using machine learning techniques (Linear Regression, Random Forest and XGBoost). This approach is expected to accomplish both the selection of relevant predictors as well as finding their optimal weights, and hence preserve physical meaning and correlations of the used weather variables. Results analysis shows that the developed AnEn system exhibits a good statistical consistency and it significantly improves the deterministic forecast performance temporally and spatially by up to 50% for Bias and 30% for RMSE at most airports. This improvement varies as a function of lead-times and seasons compared to the AROME model and to the basic AnEn configuration. Results show also that AnEn performance is geographically dependent where a slight worsening is found for some airports.

Keywords : analog ensemble, machine learning, surface weather parameters, ensemble forecasting, AROME, predictors weighting strategy

A New Simple Discrete-Time Epidemic Model Describing Social Media Addicts With An Optimal Control Strategy

Communication Info **Abstract**

Authors:
Soukaina Hilal[1] Hassan laarabi[1] Mostafa Rachik[1]

[1]*LAMS, Hassan II University ofCasablanca, Casablanca, Morocco*

Keywords:
(1) Médias sociaux
(2) Contrôle optimal
(3) Simulationnumérique

Dans cet article, nous avons développé un modèle mathématique déterministe de la dépendance aux médias sociaux (MS) avec une stratégie de contrôleoptimal [1, 2,3].

Ensuite, le modèle de contrôle optimal a été formulé en ajoutant deux contrôles (u1 ≡ stratégie de publicité et d'éducation et u2 ≡ stratégie de traitement). Le système d'optimalité a été établi à l'aide du principe du maximum de Pontryagin [4]. D'après les résultats de la simulation numérique, la stratégie de contrôle intégrée C (u1≠0 et u2≠0) est une politique optimale pour lutter contre le MS. Par conséquent, nous recommandons aux parties prenantes et aux décideurs d'utiliser la stratégie intégrée pour lutter contre l'effet de MS sur la population.

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On Bilevel Variational Inequalities *

MOHSINE JENNANE (e-mail: mohsinejennane@gmail.com)
Department of Mathematics, Dhar El Mehrez, Sidi Mohamed Ben Abdellah University, Fes, Morocco

Abstract

In this paper, we establish relationships between bilevel variational inequalities (BVI) and bilevel optimization problems (BOP) in terms of convexifactors. We establish the relationship between the vector efficient points of (BOP) and the solutions of (BVI) under convexity, pseudoconvexity and quasiconvexity assumptions.

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Mathematics Subject Classifications: 49J52, 90C46, 58E35.
Key words: Bilevel optimization; Bilevel variational inequalities; convexificator; convexity; monotonicity.

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Sampled-data controllers and observers design for uncertain semilinear systems with positivity constraints

Abdellaziz BINID

Chouaib Doukkali University, El-Jadida, Morocco, e-mail :abdellaziz.binid@gmail.com

Abstract :

In this Talk, i investigate the problem of positive stabilization for a class uncertain semilinear diffusion systems by sampled-data controllers. Next, we discuss the problem of designing a positive observer for this class of systems with discrete measurements. The existence of such controllers and observer are formulated in terms of Linear Matrix Inequalities. The approach is tested in numerical simulations to show its effectiveness.

Keywords : Stabilzation, observer design, sampled-data, semilinear systems, positivity, diffusion equation.

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PRICING AMERICAN OPTIONS WITH IRREGULAR PAYOFF VIA REFLECTED BSDES

Mohamed MARZOUGUE
Faculté des sciences de Tétouan, Université Abdelmalek Essaadi
m.marzougue@uae.ac.ma

Abstract. We formulate the value function of American options with irregular Payoff in term of the unique solution of an extended reflected backward stochastic differential equations (RBSDEs in short) where the barrier process is assumed to be regular (with regulated trajectories) .

Keywords. American options; irregular Payoff, Reflected BSDEs.

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Boundary value problems on the classical domain of type I $SU(n,m)/S(U(n)\times U(m))$, $n \geq m$.

Daoud Oukacha [1], **Fouzia El Wassouli** [2]

Abstract : Let

$$\mathcal{D} = \{Z \in \mathcal{M}_{n,m}(\mathbb{C}) : I_m - Z^*Z \text{ positive definite }\} \tag{1}$$

be the matrix ball of rank m.
we consider the Poisson transform $\mathcal{P}_{s,\nu}f(z)$ for a hyperfunction f on the Shilov boundary $\mathcal{S}$ of $\mathcal{D}$ defined by the generalized Poisson kernel

$$P_{s,\nu}(z,u) = \left(\frac{h(z,\bar{z})}{|h(z,\bar{u}|^2}\right)^{ns} h(z,\bar{u})^{-\nu},\ (z,u) \in \mathcal{D}\times\mathcal{S},\ s \in \mathbb{C}. \tag{2}$$

For all s satisfying certain non-integral condition we find a necessary and sufficient condition for the functions in the image of the Poisson transform in terms of Hua operators.

Keywords : bounded symmetric domains, Shilov boundary, hyperfunctions, Hua operators, generalized Poisson transform.

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1. FSAC, Université Hassan II, Casablanca, Maroc, E-mail : daoudoukacha@gmail.com
2. FSAC, Université Hassan II, Casablanca, Maroc, E-mail : elwassouli@gmail.com

Modélisation mathématique et stratégie de contrôle optimal de l'épidémie de variole du singe

A.ELMANSOURI[1*], B.KHAJJI, A. LABZAI, M. BELAM

[1]Laboratory LMACS, Sultan Moulay Slimane University, MATIC research team : Applied Mathematics and Information and Communication Technologies, Department of Mathematics and Computer Science, Khouribga Polydisciplinary Faculty, Morocco.

Résumé

In this work, we propose a separate time mathematical model that describes the dynamics of monkeypox among humans. The community studied is divided into five varieties: sensitive (S), exposed (E), infected (I), isolated (Q), and recovered (R). We also propose an ideal strategy to combat the spread of this epidemic. In this context, we propose three controls: awareness, quarantine, and vaccination promotion. To characterize these optimal controls, we apply the maximum pontryagin principle. The numerical optimization system is solved by Matlab. Therefore, the obtained results confirm the effectiveness of the proposed improved method.

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*abdelbar.elmansouri@gmail.com

Connecting the Farm: A Comparative Study of IoT Connectivity in Smart Farming

Mohamed Doubiz *
Laboratory of Artificial Intelligence & Complex Systems Engineering,
ENSAM, Hassan II University,
Casablanca, Morocco
m.doubiz.etu@gmail.com

Mouad Banane
Laboratory of Artificial Intelligence & Complex Systems Engineering,
ENSAM, Hassan II University,
Casablanca, Morocco
mouadbanane@gmail.com

Abdelali ZAKRANI
dept of Industrial Engineering
ENSAM, Hassan II University
Casablanca, Morocco
abdelali.zakrani@univh2c.ma

Allae Erraissi
Chouaib Doukkali University,
Polydisciplinary Faculty of Sidi Bennour,
El Jadida, Morocco
erraissi.allae@gmail.com

Abstract

Increasing global food demand requires an improvement in the efficiency and productivity of food production. The Internet of Things (IoT) can help to achieve this goal by allowing smart farms to collect and analyze real-time data on weather and growth conditions through IoT connectivity. This connectivity, based on specialized communication protocols and using various data transmission technologies such as Wi-Fi, Bluetooth, Zigbee, Z-Wave, and 4G LTE, allows objects to connect to the Internet and share data with each other without human intervention. However, there are many different IoT connectivity protocols available on the market, each with its own advantages and disadvantages to consider. In this article, we will compare the different IoT connectivity technologies for smart farms based on their range, data transmission speed, cost, power consumption, and security. Ultimately, our goal is to provide farmers with the tools they need to make an informed decision about the best IoT connectivity protocol for their smart farm.

FIXED POINT THEOREM TYPE KANNAN IN THE VARIABLE EXPONENT SEQUENCE SPACES WITH A GRAPH

Kenza BENKIRANE, Abderrahim ELADRAOUI, Samia BENNANI

Abstract.

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

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

where $\{p(n)\} \subset [1, \infty)$. They inspired the formal definition of a modular introduced by Nakano [2, 3]. This vector space is a special case of the variable exponent spaces $L_{p(.)}$. Toward the second half of the twentieth century, it was realized that these variable exponent spaces constituted the right framework for the mathematical formulation of a number of problems for which the classical Lebesgue spaces were inadequate. We open, this communication, by presenting some definitions and basic facts about the space $l_{p(.)}$. And, by combining the fixed point theory and the graph theory, we present Kannan fixed point theorem in the variable exponent sequence spaces $l_{p(.)}$ with a graph. Inspired by the ideas given in [4, 5, 6, 7, 8], we investigate the existence of the fixed point for mappings satisfying a G-monotone G-Kannan mapping in the variable exponent sequence spaces $l_{p(.)}$ endowed with graph.

Keywords: The variable exponent sequence spaces $l_{p(.)}$, modular spaces, vector spaces, graph, fixed point, G-Kannan.

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EVOLUTION COPULAS: ELLIPTIC CASE

MOHAMED ELMAAZOUZ AND AHMED SANI

ABSTRACT. We explore the evolution problem of time dependent copulas. As a start point, we make clear the proceeding of continuation to infinite horizon in order to ensure meaningfulness of the qualitative study. By this latter notion, we insinuate the behavior of the solution as the time goes to infinity. Precisely, we treat the problem

$$\begin{array}{c} \frac{\partial}{\partial t} C(t, u, v) = \Delta C(t, u, v) \\ C(0, u, v) = C_0(u, v). \end{array} \tag{0.1}$$

For stochastic processes that are governed initially by the copula C_0, we present outlines of an evolution equation constraining the process being governed by Gaussian copula at almost every time.
A deeper qualitative study of the limit copula describing the evolution at infinity confirms the known convergence to the product copula when the initial datum is so close to any standard distribution. In addition, we give some results susceptible to clarify the set $\mathcal{C}_0$ of all admissible start copulas C_0 appearing in the second line of problem (0.1).

UNIVERSITÉ IBN ZOHR, FACULTÉ DES SCIENCES, DÉPARTEMENT DE MATHÉMATIQUES, AGADIR, MAROC
Email address: maaz71@gmail.com

UNIVERSITÉ IBN ZOHR, FACULTÉ DES SCIENCES, DÉPARTEMENT DE MATHÉMATIQUES, AGADIR, MAROC
Email address: ahmedsani82@gmail.com

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Key words and phrases. Non autonomous equations, copulas, semigroups and stochastic independence.

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UNIVERSITÉ IBN ZOHR, FACULTÉ DES SCIENCES, DÉPARTEMENT DE MATHÉMATIQUES, AGADIR, MAROC
Email address: maaz71@gmail.com

UNIVERSITÉ IBN ZOHR, FACULTÉ DES SCIENCES, DÉPARTEMENT DE MATHÉMATIQUES, AGADIR, MAROC
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FIXED POINT THEORY IN GENERALIZED METRIC SPACE AND QUASI METRIC SPACE

ADIL BAIZ

Faculty of Sciences Ben M'Sik,Hassan II University, Casablanca, Morocco
baizadil@gmail.com

Joint work with: JAMAL MOULINE

Abstract. The Fixed point theory is one of the most important tools of mathematics modern. It occupies an important place in non linear analysis and in many mathematical disciplines.It allows us to establish theorems of existence and uniqueness of solutions for several nonlinear problems. In particular, when it comes to solving functional equations (equations differential, matrix equations,..).Three main approaches can be distinguished in fixed point theory: the metric approach, the topological approach and discreet.

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Metric properties of k-symplectic structures

Ismail Benali et Souhaila El Amine

Abstract. The main objective of the present paper is to introduce, on an n (k + 1)-dimensional manifold equipped with an almost k-complex metric, the analogue of the Hermitian structure in the almost complex case. We also study the compatibility between Riemannian metric and polarized k-symplectic structure. we give some properties of an almost k-complex structure. There exists a linear connection on an n (k + 1)-dimensional manifold, equipped with an almost k-complex structure, whose the covariant derivatives of almost k-complex structure are zero. The notion of a p-almost tangent structure and a p-almost cotangent structure as a natural generalization of almost tangent structure and almost cotangent structure. We establish the equivalence between an almost k-complex structure, a k-almost tangent structure and a k-almost cotangent structure. We introduce the notion of an almost k-complex metric on a foliated manifold. We highlight the compatibility between a such Riemannian metric and the polarized k-symplectic structure.

Keywords.
Symplectic structures. almost complex structures. G-structure. polarized k-symplectic structures. Riemannian metric

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Université Hassan II de Casablanca, E-mail: ismailbenali64@gmail.com

LA THÉORIE DES ANNEAUX COMMUTATIFS FINIS "STRUCTURE DES ANNEAUX COMMUTATIFS "

Par : Rafi Najat et Khadija BOUZKOURA.
Laboratoire d'analyse, Modélisation et Simulation.

Faculty of sciences Ben M'sik, Hassan II university of Casablanca.

Abstract. Un anneau commutatif fini unitaire, R, peut être exprimé comme somme directe des anneaux locaux. Cette décomposition est unique à permutation de facteurs près.

Dans cet exposé, nous donnerons une analyse d'anneau, commutatifs unitaire fini. Nous prouvons qu'un tel anneau peut être exprimé d'une façon unique en somme directe des anneaux locaux finis.

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