

Sessions Plénières

Quelques aspects de la théorie de Hodge p-adique

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Abstract

La théorie de Hodge p-adique a été initiée par Tate dans les années 60. Elle a joué un rôle central dans plusieurs avancées importantes de ces dernières années en géométrie arithmétique. Je présenterai une introduction à cette théorie à travers deux aspects importants, l'un abélien, la suite spectrale de Hodge-Tate, et l'autre non abélien, la correspondance de Simpson p-adique. L'exposé démarrera très doucement par une présentation rapide des principaux outils (faisceaux, cohomologie, suite spectrale...). Nous ferons ensuite une petite excursion du côté de la théorie de Hodge complexe qui sert de modèle à la théorie p-adique, objectif ultime de l'exposé.

Singularités et ultramétriques

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Abstract

J'expliquerai comment la connaissance des nombres d'intersection entre courbes se coupant en un point singulier d'une surface analytique permet de construire des espaces ultramétriques, comment les arbres associés renseignent sur la structure cachée dans le point singulier, et enfin comment tout cela est gouverné par une version du théorème de Pythagore. Il s'agit partiellement de travaux faits en collaboration avec Garcia Barroso, Gonzalez Perez et Ruggiero.

Spectral Analysis of the Sinc Kernel Operator and of Some Related Random Matrices

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Abstract

The purpose of this talk is twofold: On one hand, we study a set of recent results concerning the behaviour and the estimates of the spectrum of the Sinc kernel operator, within its three main regions. On the other hand, we use the previous results and study the spectrum of a random discretization of the finite Fourier transform operator. Note that for a positive real number $c > 0$, the Sinc kernel operator is given by $Q_c(f)(x) = \int_{-1}^1 \frac{\sin c(x-y)}{\pi(x-y)} f(y) dy$. Here, we recognize the reproducing kernel of the Paley-Wiener space of c -bandlimited functions. From another perspective, this kernel is the well-known Dyson Sine kernel which is related to the Wigner-Mehta-Dyson universality conjecture about the local statistics of the eigenvalues of random Wigner matrices. In our study of the spectrum of Q_c , we first provide the optimal super-exponential decay rate of the eigenvalues $\lambda_n(c)$ of Q_c . Then, we provide non-asymptotic estimates for those eigenvalues $\lambda_n(c)$ lying in the plunge region, as well as before this region. As a first application of the previous results, we use some probability concentration inequalities and study the spectrum of a random discretization of the finite Fourier transform operator. This is given by an $n \times n$ random matrix A , with entries $a_{j,k} = \frac{\sqrt{m}}{n} \exp(2i\pi m Z_j Y_k)$, where $1 \leq m \leq n$ is an integer and the Y_j, Z_k are independent random variables, following the uniform law on $I = (-1/2, +1/2)$. As a second application, we provide an estimate of the hole probability in the spectrum of a bulk scaled random matrix from the Unitary Gaussian Ensemble.

Exponential families: some characteristic properties and statistical applications

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Abstract

In this presentation, we recall the notion of natural exponential families and we give different characterizations of these families under "steepness" property. These models were first introduced and described by Barndorff-Nielsen and Gérard Letac. The natural exponential families include many standard distributions such as Gaussian, Poisson, Gamma and Inverse-Gaussian. Firstly, we give some properties of the generalized variance (i.e. determinant of covariance matrix) which we use to characterize some natural exponential families through the corresponding Monge-Ampere equations. Secondly, we determine the convolution real power set of Gamma and Bernoulli distributions. Thirdly, we consider the problem of learning parameters of the exponential family mixtures using an extended Expectation Maximization algorithm. Finally, we introduce the Tweedie regression models, develop a new method for their parameter estimation and apply them to signal path loss and image segmentation. Keywords: Exponential families, Generalized Variance function, Tweedie models, convolution power, EM algorithm.

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Cohomologie équivariante et complexe associé

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Abstract

Soient V un 2-groupe abélien élémentaire et X un $V - CW$ complexe fini. On définit la cohomologie équivariante d'un $V - CW$ -complexe et On donne quelques unes de ses propriétés. A cette cohomologie équivariante, on associe un complexe topologique dans la catégorie $H * V - U$ des $H * V$ -modules qui sont aussi des modules sur l'algèbre de Steenrod. Ce complexe est basé sur les propriétés topologiques de l'action du groupe V sur X .

Les variétés de Fano ayant un fibré tangent nef possèdent des métriques faiblement presque de Kähler-Einstein

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Abstract

Le but de cet exposé sera de montrer que toute variété de Fano ayant un fibré tangent nef possède une métrique presque de Kähler-Einstein, dans un sens faible. La preuve repose sur un théorème de régularisation des courants positifs fermés de type (1,1). Nous discuterons également de questions reliées de stabilité et d'inégalités pour les classes de Chern.

Groupe de Witt de variétés algébriques réelles

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Abstract

Dans cet exposé on démontre que ce groupe de Witt $W(V)$, qui est un invariant purement algébrique de la variété V , peut se comparer avantageusement à un invariant topologique nouveau $WR(V)$, lié à la K-théorie réelle d'Atiyah. Plus précisément, on définit une flèche $W(V) \rightarrow WR(V)$. Le noyau et le conoyau sont des groupes de torsion 2-primaire dont l'ordre est une fonction bien déterminée de la dimension de V .

Ceci est un travail en collaboration avec M. Schlichting et C. Weibel.

Bounded polynomials and holomorphic mappings between convex subrings of ${}^*\mathbb{C}$

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Abstract

Nonstandard analysis was introduced by A. Robinson in the early sixties. Since then, the methods of nonstandard analysis have been successfully applied and have led to new results in such diverse fields of mathematics as functional analysis, measure and probability theory.

We recently proved that Nonstandard analysis provides a remarkable connection between algebraic and analytic geometry via the standard part functor. Roughly speaking, we replace entire functions by nonstandard polynomials of some hyperfinite degree. The polynomials obtained in this way are called bounded since they map bounded points into itself.

Using convex subrings of ${}^*\mathbb{C}$, we define several kinds of bounded polynomials and we provide their associated analytic functions obtained by taking the quasi-standard part. Given \mathbb{F} and \mathbb{G} two convex subrings of ${}^*\mathbb{C}$ such that $\mathbb{F} \subset \mathbb{G}$, an internal polynomial P in n -indeterminates is (\mathbb{F}, \mathbb{G}) bounded if P maps \mathbb{F}^n to \mathbb{G} . The most important cases are $\mathbb{F} = \mathbb{G}$ and $\mathbb{F} = {}^b\mathbb{C}$, where ${}^b\mathbb{C}$ stands for the ring of bounded numbers in ${}^*\mathbb{C}$. The quasi-standard part of an (\mathbb{F}, \mathbb{F}) -bounded polynomial gives an entire function over $\widehat{\mathbb{F}}^n$ expressed as a generalized power series indexed by a monoid containing \mathbb{N} . In the second case, the quasi-standard part of an $({}^b\mathbb{C}, \mathbb{F})$ -bounded polynomial gives an entire function in the nonstandard counterpart of the space of holomorphic generalized functions introduced by Colombeau.

The involvement of nonstandard methods in Colombeau's theory has at least the following advantages:

- (i) The scalars of the nonstandard version of Colombeau's theory are algebraically closed while its standard counterpart in Colombeau's theory is a ring with zero divisors.
- (ii) Colombeau's theory is relatively heavy of quantifiers, the involvement of nonstandard analysis leads to a simplification of the theory by reducing the number of quantifiers.

Genericity of the strong obserbability for sampled systems

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Abstract

In this presentation, we study the genericity of the observability of sampled data systems. Consider a controlled continuous time system written as

$$\begin{cases} \dot{x} &= f(x, u) \\ y &= h(x). \end{cases} \quad (1)$$

Given a time T , to system (1), we relate the following continuous-discrete-time system

$$\begin{cases} \dot{x}(t) &= f(x(t), u_k), t \in [kT, (k+1)T) \\ y_k &= h(x(kT)) \end{cases} \quad (2)$$

where the control u is maintained constant on the intervals $[kT, (k+1)T)$ and the measurements of the state are made only at each of the times $0, T, 2T, \dots$. System (2) is called the sampled data system related to (1).

We prove that, generically, a sampled data systems is observable provided that the number of outputs is greater than the number of inputs plus 1.

Comment un mathématicien peut-il mieux comprendre la physique ?

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Abstract

Je parlerai d'occasions qui m'ont fait comprendre où il y a des choses à améliorer dans les équations utilisées par les "physiciens", et il y aura un peu d'algèbre, d'analyse, de géométrie, et de topologie.

Algèbre de Steenrod et filtration par la codimension du support

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Abstract

Soient R un anneau commutatif unitaire et M un R -module. On suppose R noethérien de dimension de Krull n ; l'exemple type d'un tel anneau est l'anneau de polynômes $k[X_1, X_2, \dots, X_n]$, k un corps. Le support de M , noté $\text{Supp}(R)$, est le sous-ensemble de $\text{Spec}(R)$, constitué des idéaux premiers \mathcal{P} de R tel que le localisé $M_{\mathcal{P}}$ est non nul. On rappelle que la hauteur d'un idéal premier \mathcal{P} , notée $\text{ht}(\mathcal{P})$, est le plus grand entier h tel qu'il existe une chaîne d'idéaux premiers distincts

$$\mathcal{P}_0 \subset \mathcal{P}_1 \subset \dots \subset \mathcal{P}_h$$

avec $\mathcal{P} = \mathcal{P}_0$. La dimension de $\text{Supp}(R)$, notée $\dim \text{Supp}(R)$, est le minimum de $\text{ht}(\mathcal{P})$ pour $\mathcal{P} \in \text{Supp}(R)$; sa codimension, notée $\text{codim} \text{Supp}(R)$, est $n - \dim \text{Supp}(R)$. Soit $k \geq 0$ un entier ; on montre que le R -module M possède un plus grand sous-module, noté $F^k M$, avec $\text{codim} F^k M \geq k$. La filtration

$$M = F^0 M \supset F^1 M \supset \dots \supset F^n M \supset F^{n+1} M = 0$$

est la filtration par la codimension du support.

Soit maintenant $V \approx (\mathbb{Z}/2)^n$ un 2-groupe abélien élémentaire ; on pose $H^*V = H^*(V; \mathbb{F}_2)$ (on a donc $H^*V \approx \mathbb{F}_2[X_1, X_2, \dots, X_n]$). On note A l'algèbre de Steenrod modulo 2 ; on expliquera pourquoi la théorie de la filtration par la codimension du support se simplifie drastiquement pour les H^*V - A -modules instables qui sont de type fini comme H^*V -modules.

What is absolutely continuous spectrum

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Abstract

We characterize the absolutely continuous spectrum of the one-dimensional Schrödinger operators $h = -\Delta + v$ acting on $\ell^2(\mathbb{Z}_+)$ in terms of the limiting behaviour of the Landauer-Büttiker and Thouless conductances of the associated finite samples. The finite sample is defined by restricting h to a finite interval $[1, L] \cap \mathbb{Z}_+$ and the conductance refers to the charge current across the sample in the open quantum system obtained by attaching independent electronic reservoirs to the sample ends. Our main result is that the conductances associated to an energy interval I are non-vanishing in the limit $L \rightarrow \infty$ iff $\text{sp}_{\text{ac}}(h) \cap I \neq \emptyset$.

Unbounded Quadratic BSDEs with singular generators

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Abstract

We first give the existence of solutions to quadratic backward stochastic differential equations (QBSDEs) which generator has the form $\frac{1}{y}|z|^2$ as well as the form $\alpha_t + \beta_t y + \frac{1}{y}|z|^2$. This is done with a terminal value in \mathbb{L}^3 and is strictly positive or strictly negative. Next, we consider QBSDEs which generator H is continuous in (y, z) and satisfies $0 \leq H(t, \omega, y, z) \leq \alpha_t + \beta_t |y| + \frac{1}{|y|}|z|^2$ where α_t, β_t are some positive processes. Using the domination method, we show that this kind of QBSDEs has solutions when the terminal value merely belongs to \mathbb{L}^3 and is strictly positive or strictly negative. This work improves many previous results where these kind of QBSDEs are considered with bounded terminal value.

If time permits, we also discuss the existence of Lipschitz BSDEs when the terminal value is merely measurable.

Blow-up solutions for two non-variational semilinear parabolic systems

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Abstract

We consider two non-variational semilinear parabolic systems, with different diffusion constants between the two components. The reaction terms are of power type in the first system. They are of exponential type in the second. Using a formal approach, we derive blow-up profiles for those systems. Then, linearizing around those profiles, we give the rigorous proof, which relies on the two-step classical method:

- (i) the reduction of the problem to a finite-dimensional one, then,
- (ii) the proof of the latter thanks to Brouwer's lemma.

In comparison with the standard semilinear heat equation, several technical problems arise here, and new ideas are needed to overcome them.

This is a joint work with T. Ghoul and V.T. Nguyen from NYU Abu Dhabi.

Algèbres de Leibniz symétriques et les bigèbres de Leibniz/ Symmetric Leibniz algebras and Leibniz bialgebras

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Abstract

Une algèbre non associative est dite Leibniz symétrique si les multiplications gauches et les multiplications droites sont des dérivations de cette algèbre. Nous montrerons que la classe des algèbres de Leibniz symétrique contient strictement la classe des algèbres de Lie et nous donnerons des résultats sur la structure de ces algèbres. En particulier, nous donnerons deux caractérisations intéressantes et très utiles des algèbres de Leibniz symétriques. Nous parlerons brièvement d'une nouvelle approche pour étudier les représentations de ces algèbres. On finira cet exposé en décrivant notre nouvelle approche pour l'étude des bigèbres de Leibniz.

A non-associative algebra is said symmetric Leibniz algebra if the left multiplications and the right multiplications are derivations of this algebra. We shall show that the class of symmetric Leibniz algebras contains strictly the class of the Lie algebras and we shall give results on the structure of these algebras. In particular, we shall give two interesting and very useful characterizations of symmetric Leibniz algebras symmetric. We shall mention briefly a new approach to study the representations of these algebra. We shall finish this talk by describing our new approach to study Leibniz bialgebras.

Mathematical analysis of syntrophic association of microbial species in Anaerobic Digestion models

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Abstract

The anaerobic digestion (AD) is a natural process in which organic material is converted into biogas in an environment without oxygen by the action of a microbial ecosystem. It is used for the treatment of waste or wastewater and has the advantage of producing methane or hydrogen under appropriate conditions. To better understand and control this process, many models have been proposed in the literature , cf. for example [1, 2, 3, 4, 5]. In particular, a key biological step has been described as the syntrophic relationship between acid consumers (which produce hydrogen) and hydrogen consumer (which produce methane). Such interactions are actually recurrent in natural ecosystems, that is why a considerable research effort has been dedicated to models including syntrophic associations. The biological systems are described by using sets of differential equations.

In many studies , the considered models are very specific. The mathematical analyses are realized for specific growth rates that are explicitly given. We extend these studies to more general systems, by considering a new input concentration substrate in the effluent, and a more general class of growth rate functions. We perform the analysis of two models including syntrophy, inhibition and maintenance terms.

Using qualitative hypotheses, a detailed mathematical analysis is achieved. The stability and bifurcation analysis of the model is performed. We prove, in particular, under appropriate general assumptions of monotonicity, the existence and the stability of one positive equilibrium point, which correspond to the coexistence of the two bacteria, [6]. We demonstrate that the qualitative behavior of the system can be significantly modified by introducing a new inhibition in the model. For a general class of non-monotonic growth

rates including the Haldane kinetics, we prove that, depending on the initial conditions, the system can exhibit a bistability with existence of two positive steady states. To describe the qualitative behavior of the considered systems, we determine bifurcation and operating diagrams of the model according to the the operating parameters.

References

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The Nonlinear Heat Equation involving Highly Singular Initial Values and new blowup and life span results

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Abstract

In this talk, we prove local existence of solutions to the nonlinear heat equation $u_t = \Delta u + a|u|^\alpha u$, $t \in (0, T)$, $x = (x_1, \dots, x_N) \in \mathbb{R}^N$, $a = \pm 1$, $\alpha > 0$; with initial value $u(0) \in L^1_{\text{loc}}(\mathbb{R}^N \setminus \{0\})$, anti-symmetric with respect to x_1, x_2, \dots, x_m and $|u(0)| \leq C(-1)^m \partial_1 \partial_2 \dots \partial_m (|x|^{-\gamma})$ for $x_1 > 0, \dots, x_m > 0$, where $C > 0$ is a constant, $m \in \{1, 2, \dots, N\}$, $0 < \gamma < N$ and $0 < \alpha < 2/(\gamma + m)$. This gives a local existence result with highly singular initial values.

As an application, for $a = 1$, we establish new blowup criteria for $0 < \alpha \leq 2/(\gamma + m)$, including the case $m = 0$. Moreover, if $(N - 4)\alpha < 2$, we prove the existence of initial values $u_0 = \lambda f$, for which the resulting solution blows up in finite time $T_{\max}(\lambda f)$, if $\lambda > 0$ is sufficiently small. We also construct blowing up solutions with initial data $\lambda_n f$ such that $\lambda_n^{[(\frac{1}{\alpha} - \frac{\gamma+m}{2})^{-1}]} T_{\max}(\lambda_n f)$ has different finite limits along different sequences $\lambda_n \rightarrow 0$. Our result extends the known "small lambda" blow up results for new values of α and a new class of initial data.

This is a joint work with Fred B. Weissler.

Conférence grand public

A nouvelle dimension, nouveaux phénomènes

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Abstract

Lorsqu'on passe d'une dimension à la suivante, par exemple du plan à l'espace de dimension trois, ou de celui-ci à l'espace de dimension quatre, de nouveaux phénomènes géométriques apparaissent. Nous en explorerons quelques uns qui se manifestent dans le monde incroyablement riche des polyèdres convexes.

Sessions Parallèles

Sur la transversalité des sous variétés de codimension supérieure

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Abstract

Dans ce travail on étudie la transversalité de deux sous variétés de codimension arbitraire. En particulier nous donnons une relation entre la transversalité et l'ellipticité des transformations de Newton généralisées.

Harmonic analysis and integral transforms associated with a class of a system of partial differential operators

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Abstract

we consider a generalized system of partial differential operators, we define the related Fourier transform and establish some harmonic analysis results. We also investigate a wide class of integral transforms of Riemann–Liouville type. In particular we give a good estimate of these integrals kernels, inversion formula and a Plancherel theorem for the dual.

Cohomology and deformation of Hom algebras morphisms

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Abstract

In the present work, one study deformation of Hom algebras morphisms. For that, we describe the cohomology which controls this deformation and obstructions theory. This cohomology turns out to be a generalization of the algebra valued cohomology theory to an adjoint module. Moreover, we provide some example.

Möbius disjointness conjecture for local dendrite maps

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Abstract

In this talk, we prove that the Möbius disjointness conjecture holds for graph maps and for all monotone local dendrite maps. We further show that this also hold for continuous map on certain class of dendrites. This extends Karagulyan result on the Möbius disjointness of any interval maps with zero entropy and (orientation preserving) circle homeomorphisms.

Harmonic analysis and heat equation associated with the Heckman-Opdam-Jacobi operator

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Abstract

We study the harmonic analysis associated with the Heckman- Opdam-Jacobi operator (generalized Fourier transform, generalized intertwining operator and its dual, generalized translation operators, Paley-Wiener theorem, inversion formula...). As a direct application, we give a solution for the generalized heat equation associated to this operator on \mathbb{R}^{d+1} .

Global existence of solutions for reaction-diffusion systems with a full matrix of diffusion coefficients

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Abstract

The subject proposed for this work are concerned with the existence of classical solution of the reaction-diffusion systems with a full diffusion matrix. The study concerns the generation of semi group and compacts in real Banach spaces, the existence of local solutions and its positivity, the global solutions. Keywords : Global solution, semigroups, local solution, reaction-diffusion systems.

La géométrie algébrique

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Abstract

Je présenterai un survol des ouvrages de Dieudonné (1974) et Houzel (2004) sur la géométrie algébrique. L'intérêt portera sur : - la théorie de l'intersection - les intégrales abéliennes - les méthodes différentielles. J'en tirerai des conclusions concernant l'instauration d'une continuité dans l'enseignement de la géométrie à l'université.

Compactness for nonlinear transport equations

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Abstract

We prove quantitative regularity estimates for the solutions to non-linear continuity equations. Our proof is based on a novel commutator estimates, quantifying and extending to the non-linear case the classical commutator approach of the theory of renormalized solutions.

Drift parameter estimation in various stochastic differential equations

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Abstract

We consider a stochastic differential equation with a general diffusion coefficient and we investigate the problem of estimation of the unknown drift parameter, with the coefficients supplying standard existence uniqueness demands and we establish the strong consistency of the maximum likelihood estimator for this unknown parameter.

Testing the lag length of vector autoregressive models: A power comparison between portmanteau and Lagrange multiplier tests

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Abstract

In this paper we provide an asymptotic theoretical power comparison in the Bahadur sense, between the portmanteau and Breusch-Godfrey Lagrange Multiplier (LM) tests for the goodness-of-fit checking of vector autoregressive (VAR) models. The merits and the drawbacks of the studied tests are illustrated using Monte Carlo experiments.

On singular elliptic Kirchhoff type problems with critical nonlinearities

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Abstract

Dans ce travail, on établit l'existence de deux solutions pour un problème du type Kirchhoff avec exposant critique de Sobolev dans un domaine borné de \mathbb{R}^3 . L'approche est variationnelle, le cadre fonctionnel est l'espace de Sobolev. on se base essentiellement sur le principe variationnel d'Ekeland.

Composition operators on the Hardy space H^2

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Abstract

We aim in this work to give some good properties of a special class of composition operators that are generated by a linear fractional transformation of the unit disk. Our study will be on Hardy spaces. However, we will focus on the particular Hardy space of order two (H^2) for the unique reason that it differs from the other spaces for being a Hilbert space. Some questions related to boundeness of these operators on those spaces are answered.

Existence of positive solutions for nonlinear operator equations

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Abstract

In this presentation, we study the existence of positive solutions for nonlinear operator equations in Banach spaces ordered by a cone. These studies are carried out by using a generalized monotone iteration method. The importance of the obtained results is highlighted by discussing the existence of positive solutions for a system of nonlinear integral equations of Volterra type, and for a system of nonlinear matrix equations.

The asymptotic of transmission eigenvalues for a domain with a thin layer

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Abstract

We consider the transmission eigenvalue problem for a medium surrounded by a thin layer of inhomogeneous material with different refractive index. We derive explicit asymptotic expansion for the transmission eigenvalues with respect to the thickness of the thin layer. We prove error estimate for the asymptotic expansion up to order 1 for simple eigenvalues. This expansion can be used to obtain explicit expressions for constant index of refraction.

The Finite Hankel Transform Operator: Some estimates of the eigenfunctions and eigenvalues decay rate

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Abstract

For fixed real numbers $c > 0$, $\alpha > -\frac{1}{2}$, the finite Hankel transform operator, denoted by \mathcal{H}_c^α is given by the integral operator defined on $L^2(0, 1)$ with kernel $K_\alpha(x, y) = \sqrt{cxy}J_\alpha(cxy)$. To the operator \mathcal{H}_c^α , we associate a positive, self-adjoint compact integral operator $\mathcal{Q}_c^\alpha = c\mathcal{H}_c^\alpha \mathcal{H}_c^\alpha$. Note that the integral operators \mathcal{H}_c^α and \mathcal{Q}_c^α commute with a Sturm-Liouville differential operator \mathcal{D}_c^α . In talk, we first give some useful estimates and bounds of the eigenfunctions of \mathcal{H}_c^α or \mathcal{Q}_c^α . If $(\mu_{n,\alpha}(c))_n$ and $\lambda_{n,\alpha}(c) = c|\mu_{n,\alpha}(c)|^2$ denote the infinite and countable sequence of the eigenvalues of the operators $\mathcal{H}_c^{(\alpha)}$ and \mathcal{Q}_c^α , arranged in the decreasing order of their magnitude, then we show an unexpected result that for a given integer $n \geq 0$, $\lambda_{n,\alpha}(c)$ is decreasing with respect to the parameter α . As a consequence, we show that for $\alpha \geq \frac{1}{2}$, the $\lambda_{n,\alpha}(c)$ and the $\mu_{n,\alpha}(c)$ have a super-exponential decay rate. Finally, we use a Min-Max based technique and provide an easy way to recover the super-exponential decay rate of the eigenvalues $\lambda_{n,\alpha}(c)$.

References:

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 - [2] D. Slepian, Prolate spheroidal wave functions, Fourier analysis and uncertainty–IV: Extensions to many dimensions; generalized prolate spheroidal functions, *Bell System Tech. J.* **43** (1964), 3009–3057.
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Existence et unicité de solutions périodiques de systèmes gradients en dimension finie

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Abstract

Dans cet exposé, on se propose de montrer l'existence et l'unicité de solutions périodiques d'un système gradient en dimension finie pour lequel le terme non linéaire est le gradient d'une fonctionnelle d'énergie par rapport à un produit scalaire qui dépend du temps. Notre approche consiste à appliquer un théorème d'inversion globale combiné avec la méthode de continuité.

Well posedness of diffusive 3D periodic burgers equations in Gevrey-Sobolev space

Abdelkerim Châabani

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Abstract

To prove that solutions of diffusive, vector valued Burgers equations in three dimensional domain with periodic boundary conditions are well posed in Gevrey-Sobolev space.

q-Convolution Integral Operator and Applications

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Abstract

In this work we attempt to study in quantum calculus the inversion of an integral operator and its approximation in a large class of Reproducing kernel Hilbert spaces. this work is based on the works of S. Saitoh.

Delay-dependent stabilization of a class of time delay nonlinear systems: LMIs approach

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Abstract

This paper deals with the state and output feedback stabilization problems for a family of nonlinear time-delay systems satisfying some relaxed triangular-type condition. A new delay-dependent stabilization condition using a controller is formulated in terms of linear matrix inequalities (LMIs). Based on the Lyapunov-Krasovskii functionals, global asymptotically stability of the closed-loop systems is achieved. Finally, simulation results were shown to illustrate the feasibility of the proposed strategy.

Uniqueness of Quantum Markov Chain Associated with XY-Ising Model on Cayley Tree of Order Two

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Abstract

In the present paper we consider backward and forward Quantum Markov Chains (QMC) associated with XY -Ising model on the Cayley tree of order two. We construct finite volumes states with boundary conditions, and define QMC as a weak limit of those states which depends on the boundary conditions. We prove that the limit state is a unique QMC associated with such a model, this means the QMC does not depend on the boundary conditions. Moreover, we observe the relation between backward and forward QMC.

On \hbar -relative cohomology on $S^{1|2}$ and deformations

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Abstract

On se propose de calculer les premiers espaces de cohomologies \hbar -relative de la super-algèbre de Lie des champs de vecteur de contact à coefficient dans l'espace des opérateurs pseudodifférentiels. Nous avons donné des formules explicites des 1-cocycles qui engendrent ces espaces ce qui nous a permis de décrire les déformations infinitésimales \hbar -trivial.

Saida Farhani

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Abstract

Le but du travail est de donner un résultat sur les superfeuillements de codimension 1|0 qui est essentiellement basé sur la (super)formule de Green. Dans cet exposé on va montrer l'analogie de la formule de Green sur une supervariété compacte.

Convergence and best proximity points for generalized contraction pairs

Abdelbasset Felhi

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Abstract

This talk is devoted to study the existence of best proximity points for a class of generalized contraction pairs by using the concept of proximally complete pair. Our results generalize and improve the result of S. Sadiq Basha (Best proximity points: global optimal approximate solutions, J. Glob. Optim (2011) 49:15–21) where some conditions have been weakened. As application, we give an important result for nonexpansive mappings in normed vector spaces.

Wavelet packets associated with the second q -derivative operator

Nouri Ferjani

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Abstract

Using the q -harmonic analysis associated with second order q -derivative operator, we study three types of q -wavelet packets and the corresponding q -wavelet transforms, and we give for these wavelet transforms the Plancherel and inversion formulas as well as their q -scale discrete scaling functions.

$L^p - L^q$ estimates for the solution of the Dunkl wave equation

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Abstract

Dans cet exposé, notre objectif principal est de déterminer les estimations $L^p - L^q$ de la solution de l'équation linéaire homogène dans la théorie de Dunkl. Les résultats sont déduits en se basant sur les estimations de Strichartz introduites dans son article, (R. Strichartz, Convolutions with kernels having singularities on a sphere, Trans. Amer. Math. Soc. 148 (1970), 461-471.)

The characterization of A - m -isometric weighted shift operators

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Abstract

We will study the characterization of A - m -isometric unilateral and bilateral weighted shift operators. We shall prove that any such operator is a A -Hadamard product of A -2-isometries and A -3-isometries. We also study weighted shift operators whose powers are A - m -isometric.

Higher order topological derivatives for a parabolic type problem

Emna Ghezaiel

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Abstract

This article concerns an extension of the high order topological sensitivity analysis for three dimensional parabolic problem with the presence of geometry perturbation. In the first part of the paper, we study the influence of the presence of a geometry perturbation on the temperature distribution. In the second part, we study the asymptotic behavior of the objective function. In the second part, we study the asymptotic behavior of the objective function.

Synchronization And Extreme Value Theory

Hamza Ghoudi

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Abstract

The aim of this work is to show that the probability of the appearance of synchronization in chaotic coupled map lattices is related to the distribution of the maximum of a certain observable evaluated along almost all orbits. We show that such distribution belongs to the family of extreme value laws, whose parameters, namely the extremal index, allow us to get a detailed description of the probability of synchronization.

La condition des chaines ascendantes pour les quasi semistar idéaux radicaux

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Abstract

Pour A un anneau intègre et $*$ une semistar opération sur A . On donne des caractérisation complètes des idéaux quasi $*$ -radicaux. Puis on va utiliser la semistar opération $*_1$ définie par G. Picozza sur l'anneau des polynômes $A[X]$ et on va montrer que A est satisfait la condition des chaines ascendantes pour les idéaux quasi $*$ -radicaux de A si et seulement si $A[X]$ est satisfait la condition des chaines ascendantes pour les idéaux quasi- $*_1$ -radicaux de $A[X]$.

On χ -Squared Testing in Kumaraswamy Weibull Model and its Applications

Hafida Goual

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Abstract

We propose here a study of a recent generalisation of the well known Weibull distribution. This model is a one of the sub-models of the Kumaraswamy-G model proposed by P. Kumaraswamy (1980), its called the Kumaraswamy-G distribution. We present the statistical inferences of Kumaraswamy-Weibull distribution, such as; the estimated parameters, elements of the Fisher's information matrix and all of the elements of the test statistic proposed by Bagdonavicius and Nikulin (2011).

Théorèmes de fluctuations pour le cas des réseaux d'oscillateurs harmoniques

Mayssa Hammami

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Abstract

Mon exposé sera sur les théorèmes de fluctuations détaillés pour les réseaux d'oscillateurs harmoniques hors équilibre thermique. Dans lequel on établit quelques estimations sur les grandes déviations pour les flux de courants dans les réservoirs thermiques à travers le théorème de Gärtner-Ellis.

Existence results of the m -polyharmonic Kirchhoff problems

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Abstract

We extend and complement previously existence results in the literature to the following m -polyharmonic Kirchhoff problems

$$\begin{cases} M(\|u\|_{r,m}^m) \Delta_m^r u = f(x, u) & \text{in } \Omega, \\ u = \left(\frac{\partial}{\partial \nu}\right)^k u = 0, & \text{on } \partial\Omega, \quad k = 1, 2, \dots, r-1, \end{cases} \quad (3)$$

where $\Omega \subset \mathbb{R}^N$ is a bounded smooth domain, $r \in \mathbb{N}^*$, $m > 1$, $N \geq rm + 1$ and M is a Kirchhoff function. The new aspect here consists in employing a **Schauder basis** of $W_0^{r,m}(\Omega)$ to prove the existence of infinitely many solutions of (3) when $f(x, \cdot)$ is an odd function **without any control on f near 0**. Moreover, our assumptions on f at infinity are weaker than the analogue of Ambrosetti-Rabinowitz condition and the standard subcritical polynomial growth condition, we also relax the **strong $m\gamma$ -superlinear condition** and the structural assumption imposed on M by Pucci. In analogy with the first eigenvalue of the m -polyharmonic operator, we introduce a positive quantity λ_M to find a mountain pass solution under a large growth assumptions at infinity and zero.

Principes d'incertitude pour la transformation en ondelettes associée à l'opérateur Riemann-Liouville

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Abstract

Nous définissons la transformation en ondelette associée l'opérateur de Riemann Liouville, et nous démontrons le résultat principal de ce travail qui est l'inégalité de Heisenberg - Pauli - Weyl pour la transformation en ondelette associée l'opérateur de Riemann Liouville. Enfin nous étudions la concentration de la transformation en ondelette continue sur des ensemble de mesure finie.

Bochner-Minlos Theorem in the Framework of Real Clifford Algebra

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Abstract

In this talk, we introduce and study the Clifford-Fourier transform for measure. Furthermore, we establish the Bochner-Minlos theorem in real Clifford algebra.

Un théorème de foncteur adjoint

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Abstract

On considère une catégorie monoidale symétrique fermée M et une petite catégorie I . On montre d'abord que la catégorie des foncteurs à valeurs dans M notée (I, M) possède une structure de M -module fermé. Cette structure nous permet dans la suite d'écrire le Lemme de Yoneda dans le cas des foncteurs à valeurs monoidales.

La méthode de Laplace et le développement asymptotique des intégrales

Nesrine Kamouche

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Abstract

Dans ce travail, nous considérons le développement asymptotique d'intégrales doubles de type de Laplace au cas de points minimaux non stationnaires, situés sur la frontière du domaine d'intégration. Nous allons surtout exposer les derniers résultats sur ce sujet récemment publiés.

Asymptotic behavior of ground state solutions of a nonlinear Dirichlet problem

Bilel Khamessi

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Abstract

Dans ce travail, on s'intéresse à l'existence et au comportement asymptotique de solutions continues et strictement positives d'un problème elliptique sur \mathbb{R}^n . Notre étude est basée essentiellement sur des outils de la théorie du potentiel, de la méthode de sous et sur-solutions et des propriétés de la classe de fonctions de Karamata.

Existence and uniqueness of periodic solutions for a class of third-order iterative functional differential equations

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Abstract

In this work we consider a class of third-order iterative functional differential equations. By Krasnoselskii's Fixed Point theorem, we prove the existence of periodic solutions and under certain sufficient conditions, the Banach's contraction principle ensures the uniqueness of the periodic solution.

Modèle de Leucémie

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Abstract

Dans ce travail, nous considérons un modèle mathématique sur la leucémie, qui est un système d'équations différentielles décrivant l'évolution des cellules sanguines suivant leurs stades. Nous faisons une étude mathématique du système qui permet de déterminer les stabilités locale et globale de chaque point d'équilibre, ainsi que l'analyse des bifurcations. Des simulations numériques sont présentées pour illustrer les résultats théoriques.

Existence and multiplicity results for a critical nonlocal problem with Hardy potential

Atika Matallah

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Abstract

Dans ce travail on établit l'existence et la multiplicité des solutions pour un problème nonlocal avec terme de Hardy et exposant critique de Hardy-Sobolev. On utilise le Théorème de Pass-Mountain.

Second order elliptic operators with unbounded coefficients and critical exponents: generation and heat kernel estimates

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Abstract

We consider the operator

$$Lu = (1 + |x|^\alpha)\Delta u + c|x|^\beta x \cdot \nabla u - b|x|^{\alpha-2}u$$

with $\alpha > 2$, $\beta \leq \alpha - 2$. We give sufficient conditions on α, b ensuring that the associated linear Cauchy problem is well posed in $L^p(\mathbb{R}^N)$. We prove that the solution is governed by analytic contractive semigroup which is ultracontractive. Moreover, we establish Gaussian heat kernel bounds.

Uniqueness of Hamilton Jacobi Bellman solutions, applications to the stochastic controls

Ahmed Mtiraoui

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Abstract

We study the Hamilton Jacobi Bellman (HJB in short) equations with Lipschitz condition in the time data and Hölder condition in the position data. We prove the uniqueness of the solutions by a probabilistic methods. The utility of this result, we use the uniqueness HJB solutions to prove the existence of an optimal control for a coupled Forward-Backward stochastic differential equations (FBSDEs in short) in the case of almost

Inequalities and Integral Transforms in Quantum Calculus

Bochra Nefzi

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Abstract

Calderon's Reproducing Formula and Uncertainty Principle for the Continuous Wavelet Transform associated with the q-Bessel Operator, Journal of Pseudo-Differential Operators and Applications, DOI 10.1007/s11868-017-0209-9, (2017). A Variation On Uncertainty Principles For The Generalized q-Bessel Fourier Transform, Journal of Mathematical Analysis and Applications, vol. 440(2) (2016), pp. 823-832.

Uncertainty principle related to Bessel-Struve transform

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Abstract

We deal with uncertainty principle, it states in quantum mechanics that we cannot simultaneously and precisely localized the values of position and momentum of a particle. Its equivalent in signal theory deals with time frequency localization. It tell us about the loss of precision of frequency of a signal observed for a finite period of time. There are many mathematical formulations of this physical idea. We consider the Bessel-Struve Fourier transform \mathcal{F}_{BS}^α and we show an analogous of Beurling-Hörmander's theorem for each $\alpha > -\frac{1}{2}$. More precisely, we determine the form of nonzero functions satisfying weaken condition of Beurling-Hörmander's theorem which differ from α half integer or nonhalf integer. As applications, we obtain further versions of uncertainty principle like Gelfand-Shilov type theorem, Cowling-Price type theorem and Hardy type theorem.

Gradient optimal control problem with minimum energy governed by a bi-linear wave equation

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Abstract

The aim of this presentation is to solve the gradient optimal control problem with minimum energy governed by a wave bi-linear equation. The idea is to bring the gradient state of the considered system with control act as a multiplier of the state, close to a desired profile by minimizing a non-linear quadratic cost and using optimization techniques. As an application, a method will be proposed showing how to reach a desired flux at a final time, only on internal sub-region of the system domain.

Some results on the Hardy space H_k^1 associated with the Dunkl operators

Mongi Rachdi

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Abstract

In the present paper, we investigate in Dunkl analysis, the action of some fundamental operators on the atomic Hardy space H_k^1 .

Liouville type theorems for elliptic equations in half-space with nonlinear boundary value conditions with finite Morse index

Belgacem Rahal

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Abstract

In this work we study the nonexistence of solutions which are stable or stable outside a compact set, possibly unbounded and sign-changing, of nonlinear elliptic equations with nonlinear boundary value conditions. The main methods used are the integral estimates and the monotonicity formula.

On the Anderson-Badawi Conjectures and 2-AB rings

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Abstract

Let R be a commutatif ring with identity. In my talk, I will study the Anderson-Badawi Conjectures, the concept of 2-absorbing ideals in the power series rings and finally, I will give some classes of 2-AB rings where $P^2 = P$ for every prime ideal P of R .

L^p -Convergence of some classical orthogonal series expansions and an extension to the weighted prolate wave functions

Ahmed Souabni

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Abstract

In this talk, we first recall from the literature some established results concerning the L^p -convergence of the expansion of a function in a classical orthonormal basis, such as the trigonometric exponential or the Jacobi orthogonal polynomials bases. Then, we give a general result that allows to extend the mean convergence in a given basis to the mean convergence in a second basis. As an application, we show how to extend the classical L^p -convergence result for the Gegenbauer's orthogonal polynomials to the case of the weighted prolate spheroidal wave functions. These functions are defined as the common eigenfunctions of the weighted finite Fourier transform operator and a commuting Sturm-Liouville differential operator.

References:

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[2] A. Karoui and A. Souabni, Generalized Prolate Spheroidal Wave Functions: Spectral Analysis and Approximation of Almost Band-limited Functions, *J. Fourier Anal. Appl.*, **22** (2016), 383–412.

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Singular limit solutions for a 2-dimensional semilinear elliptic system of Liouville type

Nihed Trabelsi

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Abstract

We consider the existence of singular limit solutions for a nonlinear elliptic system of Liouville type with Dirichlet boundary conditions. We use the nonlinear domain decomposition method.

Existence, uniqueness and convergence results for weak solution to a 3D regularized Boussinesq system in the Sobolev spaces

Mounia Zaabi

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Abstract

In this paper, we study analytically the regularization of the Boussinesq system which is realized in Sobolev spaces. We prove also the well-posedness and uniqueness of the weak solution with minimum regularity. Finally, we establish the convergence results.

Sessions Posters

Les graphes 1-couverts

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Abstract

That is, Theorem : let $G = (V, E)$ be an indecomposable graph G with $v(G) = 11$. For every $x \in V$, there are $y \neq z \in V - \{x\}$ such that $G - \{y, z\}$ is indecomposable. We prove that this theorem is still true when $v(G) = 9$. In the case of graphs we characterise all indecomposable and 1-couvert graphs.

Normalized-pointwise-generalized-inverse of linear maps between C^* -algebras

Ahlem Ben Ali Essaleh

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Abstract

Solutions of integral equation over any interval (a, b) by using Galerkin method

Menad Bendehiba

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Abstract

The aim of this work is to apply the Galerkin method with Hermite polynomials and Jacobi polynomials to solve the integral equation of the second kind with degenerate kernel. We compare the exact solution with an approximate solution obtained by the Galerkin method on numerical examples. The results show that the Galerkin method with Hermite polynomials and Jacobi polynomials is efficient and can be to applied to other problems.

Decomposability index of tournaments

Cherifa Bensalha

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Abstract

For every integer $n \geq 5$, we prove that $d(n) \geq \lfloor (n+1)/4 \rfloor$.

Periodic Solutions For a Class of First-Order Functional Differential Equations With Delay Depending on State

Ahlème Bouakkaz

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Abstract

This work is concerned with the existence and uniqueness of periodic solutions for a class of state-depending delay functional differential equations. Under some suitable conditions and by mean of Schauder's and Banach fixed point theorems, we establish our results.

On Some Identities and Symmetric Functions for k-balancing numbers

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Abstract

In this paper, we calculate the generating functions by using the concepts of symmetric functions. Although the methods cited in previous works are in principle constructive, we are concerned here only with the question of manipulating combinatorial objects, known as symmetric operators. The proposed generalized symmetric functions can be used to find explicit formulas of the k-balancing numbers, k-Lucas balancing and product of sequences and Chebychev polynomials of first and second kind.

Exponential stabilization of the full Von-Karman beam by thermal effect and delay term

Lamine Bouzettouta

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Abstract

In this work we prove that the solutions of the von Kàrmàn model equations decay exponentially to zero when this system is coupled to a heat equation modeling an expectedly dissipative exact.

Model of fractional system of nonlinear partial differential equations and its analytical solution

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Abstract

In this work, we apply the fractional natural decomposition method to derive approximate analytical solutions to model of system of nonlinear equations of unsteady flow of a polytropic gas with time-fractional derivatives. The proposed method (FNDM) has been applied successfully to solve this system. So, the results re-confirm that this method is very efficient and accurate to solve others nonlinear systems problems such as dynamics system of PDE.

Analyse statistique et applications pour le modèle de Bertholon

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Abstract

Dans ce travail, nous proposons une analyse statistique d'un modèle à risques concurrents proposé par Bertholon on 2001, et qui consiste à un mélange de deux lois, l'une est la distribution exponentielle et l'autre la distribution Weibull à deux paramètres. Pour illustrer l'importance du modèle nous proposons quelques applications en analyse de survie et en fiabilité.

Limit theorems for stochastic approximations algorithm with application to general urn models

Soumaya Idriss

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Abstract

Généralisation des théorèmes limites unidimensionnels à des théorèmes en dimension n en s'appuyant sur l'approche des algorithmes stochastiques. Par exemple théorèmes de la limite centrale ainsi que la loi forte des grandes nombres.

Backward stochastic differential equations by multi-fractional Brownian motion

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Abstract

In this paper, we prove the existence and uniqueness for a class of non-linear backward stochastic differential equations (BSDE) driven by multi-fractional brownian motion with Hurst function greater than $1/2$ via a partial differential equation and a multi-fractional Itô formula. On the other hand, we present another method to show the existence and uniqueness of the BSDE by probabilistic and potential theoretic methods.

Forecasting Techniques in Financial Series Using GARCH Models

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Abstract

Over the last several years there has been a renewed interest in issues relating to trade, and consequently exchange volatility has become one of the most important economic and financial variables to study. Financial series volatility is predictable. This observation has important implications for asset pricing and portfolio management, Investors seeking to avoid risk. The GARCH and stochastic volatility models are two competing, well known and often used models to explain the volatility of financial series.

In this work we present some new evidence on stock market volatility. We discuss the relationship between GARCH and volatility swaps and we calculate statistics parameters for to find the best forecast of volatility of some financial series.

Les Bases de Grobner et ses applications

Kadda Noufa

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Abstract

Le but est définir les Bases de Grobner et ses applications, notamment pour la résolution de systèmes polynomiaux. En particulier, les bases de Grobner sont indispensables pour la résolution de problèmes classiques comme le test d'appartenance d'un polynôme à un idéal.

Relaxed Stochastic control problems

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Abstract

In this work, we consider the relaxed stochastic control problem for which admissible controls are measure valued processes. We consider a filtered probability space and a stochastic differential controlled equation, the aim in this work is to optimize the criterion J over the class U of admissible controls.

Cubic decomposition of a family of semiclassical orthogonal polynomials of class two

Amel Saka

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Abstract

We deal with a family of semiclassical orthogonal polynomial sequences of class two having the cubic decomposition $W_{3n}(x) = P_n(x^3)$, $n = 0$. Only four monic orthogonal polynomial sequences (MOPS) appear in which their recurrence coefficients are explicitly given.

Multifractal dimensions for projections of measures

Bilel Selmi

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Abstract

We calculate the multifractal Hausdorff and packing dimensions of Borel probability measures and study their behaviors under orthogonal projections.

On Quantum Markov Fields and Chains

Abdessatar Souissi

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Abstract

The main aim of this presentation concerns a bridge between quantum Markov chains and fields as far as an analogy with the classical case.

Étude d'un modèle exponentiel bivarié

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Abstract

Considérons un système dont la durée de vie est régie par un modèle exponentiel bivarié (X, Y) . On établit une estimation des paramètres, du temps moyen de bon fonctionnement et de la fonction de la fiabilité de ce modèle.

Mixed model of two generalized Rayleigh distributions

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Abstract

The mixture distribution produced from the method of combination of two generalized Rayleigh distributions has a number of parameters which include shape parameters, scale parameters in addition to the mixing parameter. This method illustrates on how to produce a mixture distribution based on two generalized Rayleigh distributions by including a mixing parameter, say α , which represents the proportion of mixing associated to the two component models. In this paper, we focus on the estimation of parameters of the proposed mixture generalized Rayleigh distribution using maximum likelihood method based on the EM algorithm. Also, we propose the construction of chi-square modified goodness-of-fit test for this model in complete data. This test is based on NRR (Nikulin-Rao-Robson) statistic, which is a modification of the Pearson chi-squared statistic. The applicability of this test is shown in real data analysis.

reaction diffusion systems arising in biology

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Abstract