JOURNÉES DU GDR AFHP, 9 TO 11 OCTOBER 2017, BORDEAUX

Presentation

The annual meeting of the GDR Analyse Fonctionnelle, Harmonique et Probabilité will take place in the Salle de confrence in the building A33 of the Institute of Mathematics of Bordeaux.

The main speakers of the conference are:

- Fabienne Castell (Aix–Marseille Université, France)
- Ralph Chill (TU Dresden, Germany)
- Jacob Christiansen (Lund University, Sweden)
- Emmanuel Fricain (Université de Lille 1, France)
- Karlheinz Gröchenig (Universität Wien, Austria)
- Nicolas Juillet (IRMA, Université de Strasbourg, France)
- Matthias Keller (Institut fur Mathematik Postdam Universität, Germany)
- Juliette Leblond (INRIA, Sophia Antipolis, France)
- Laurent Miclo (Université Paul Sabatier, Toulouse, France)
- Sergey Naboko (St Petersbourg State University, Russia)
- Victor Nistor (Université de Lorraine, Nancy, France)
- Marius Tucsnak (University of Bordeaux, France)
- Brett Wick (Washington University, St. Louis, USA)

IDEX PRIZE

During this year's edition of the GDR-conference, a prize will be awarded for the best article (submitted, accepted or published) by a **young researcher** participating to the conference. We gratefully acknowledge the Initiative of Excellence (IdEx) of Bordeaux which allocates **1 500 EUR for this prize**.

The committee of the prize consists of the **main speakers** of the conference. The list of the 12 young researchers is:

- Mahdi Achache (Université de Bordeaux, France)
- Fermandez-Bertolin Aingeru (Université de Bordeaux, France)
- Jean-Charles Croix (Mines Saint-Etienne, France)
- Romuald Ernst (Université du Littoral, France)
- Clifford Gilmore (University of Helsinki, Finlande)
- Hubert Klaja (Ecole Centrale de Lille, France)
- Florian Le Manach (Université de Bordeaux, France)
- Marc-Adrien Mandich (Université de Bordeaux, France)
- Arnaud Marsiglietti (California Institute of Technology, USA)
- Felipe Negreira (Université de Bordeaux, France)
- Colin Petitjean (Université de Bourgogne-Franche Comté, Besançon, France)
- Rachid Zarouf (Aix–Marseille Université, France)

Conference dinner

For the **conference dinner** a participation of 10 euros is required. It will take place at the

Café du port
1 quai Deschamps, Bordeaux
`http://www.lecafeduport.com/`

on tuesday at 20:30.

The menu is comprised of:

Kir et toasts tapenade maison

Marbré de joue de boeuf aux légumes pot au feu, vinaigrette au jus de viande

Jarret de veau basse température, galette de pommes de terre aux herbes fraîches

Crème brûlée à la vanille Bourbon et un café

There is a vegetarian alternative to this dinner. If you are interested, tell us anytime before dinner on Tuesday.

The Tuesday lunch break

As Tuesday's lunch break is only 1h30, we suggest that you eat at the University restaurant *le Haut Carré* nearby. They would like you to pay in cash, but ask for 'exact change'. The price is 6.71 euros.

Wifi connection

To access to the internet, please follow the following instructions:

(1) Choose the 'REAUMUR' wireless network
(2) Start your internet browser and try to access a web site in http not in https
(3) Permit pop-up and cookies (the pop-up maintains the connexion open)
(4) Choose 'Confrences/Invits'
(5) Identify yourself with
    Login: IMB-n-1
    Password: ypv9*rr

Program

Monday 9 october 2017:

12:30 – 13:20: **Reception of the participants**

13:20 – 13:30: **Opening**

13:30 – 14:10: Marius Tucsnak (University of Bordeaux, France)
On the reachable space of the heat equation: a complex analysis approach

14:15 – 14:55: Juliette Leblond (INRIA, Sophia Antipolis, France)
Inverse source problems in magnetostatics

15:00 – 15:40: Laurent Miclo (Université Paul Sabatier, Toulouse, France)
On Markov intertwinings

15:40 – 16:00: **Coffee break**

16:00 – 16:25: Young researcher: Romuald Ernst (Université du Littoral, France)
Frequent hypercyclicity and weighted densities

16:25 – 16:50: Young researcher: Fermandez-Bertolin Aingeru, (Université de Bordeaux, France)
On unique continuation for solutions of the Schrödinger equation on trees

16:50 – 17:00: **Break**

17:00 –17:25: Young researcher: Mahdi Achache (Université de Bordeaux, France)
Lions's maximal regularity problem

17:25 –17:50: Young researcher: Jean-Charles Croix (Mines Saint-Etienne, France)
Karhunen-Love decomposition of Gaussian measures on Banach spaces

17:50 – 18:15: Young researcher: Rachid Zarouf (Aix–Marseille Université, France)
A constructive approach to Schaffer's conjecture

18:15 – 18:40: Quentin Menet (Université d'Artois, France)
Invariant subspaces in Fréchet spaces

18:40 – 19:05: Parallel sessions

Benjamin Célariès (Université Claude Bernard Lyon 1, France) *Universal semigroups*	S.d.C
Ihab Alam (Lebanese University, Liban) *Essential norms of Volterra and Cesaro operators on Muntz spaces*	Salle 1

Tuesday 10 october 2017:

08:30 – 09:10: Karlheinz Gröchenig (Universität Wien, Austria)
Sampling in shift-invariant spaces, Gabor frames, and totally positive functions

09:15 – 09:55: Fabienne Castell (Aix–Marseille Université, France)
Multiresolution analysis on graphs using Random Forests and Markov process intertwinning

09:55 – 10:20: **Coffee break**

10:20 – 10:45: Young researcher: Felipe Negreira (Université de Bordeaux, France)
A simpling theorem for functions in Besov spaces on spaces of homogeneous type

10:45 – 11:10: Young researcher: Arnaud Marsiglietti (California Institute of Technology, USA)
Sur une borne inférieure de l'entropie de Shannon pour les vecteurs aléatoires log-concaves

11:10 – 11:20: **Break**

11:20 – 11:45: Young researcher: Florian Le Manach (Université de Bordeaux, France)
Cyclicity and bicyclicity in weighted $\ell^p(\mathbb{Z})$ spaces.

11:45 – 12:10: Young researcher: Hubert Klaja (Ecole Centrale de Lille, France)
K-spectral sets for the numerical radius

12:10 – 12:35: Young researcher: Clifford Gilmore (University of Helsinki, Finlande)
Growth rates of frequently hypercyclic harmonic functions

12:35 – 14:00: **Déjeuner**

14:00 – 14:40: Emmanuel Fricain (Université de Lille 1, France)
Some new thoughts on systems of exponentials

14:45 – 15:25: Nicolas Juillet (IRMA, Université de Strasbourg, France)
Markovinification of the quantile process

15:30 – 16:10: Matthias Keller (Institut fur Mathematik Postdam Universität, Germany)
Optimal Hardy inequalities on graphs

16:10 – 16:30: **Coffee break**

16:30 – 16:55: Young researcher: Marc-Adrien Mandich (Université de Bordeaux, France)
Sub-exponential decay of eigenfunctions for some discrete Schrödinger operators

16:55 – 17:20: Young researcher: Colin Petijean (Université de Bourgogne - Franche Comté, Besançon, France)
Around some properties of dual Lipschitz-free spaces

17:25 – 17:50: Parallel sessions

- Yulia Kuznetsova (Université de Bourgogne - Franche Comté, Besançon, France) S.d.C
  Isomorphisms of weighted convolution algebras
- Walid Oukil (University of Medea, Algeria) Salle 1
  Synchronization in abstract mean-field models

17:50 – 18:15: Parallel sessions

- Stéphane Charpentier (Aix–Marseille Université France) S.d.C
  Hypercyclic sets
- Menkad Safa (University of Batna 2, Algeria) Salle 1
  On the injective norm of $A^* \otimes A^+ + A^+ \otimes A^*$

18:20 – 19:10: Prize decision: The committee comprises the main speakers meet

20:30: **Conference dinner and prize attribution** (a participation of 10 euros per person is required)

Wednesday 11 october 2017:

08:30 – 09:10: Jacob Christiansen (Lund University, Sweden)
Chebyshev polynomials

09:15 – 09:55: Ralph Chill (TU Dresden, Germany)
Decay rates for C^0-semigroups

10:00– 10:25: Parallel sessions

- Monia Mestiri (Université du Mons, Belgique) S.d.C
  Common upper-frequent hypercyclicity
- Hoang Duc Trung (Université de Bordeaux, France) Salle 2
  Exact observability of a 1D wave equation on a non–cylindrical domain

10:25 – 11:45: **Coffee break**

10:45 – 11:25: Victor Nistor (Université de Lorraine, Nancy, France)
Analysis on non-compact manifolds

11:30 – 12:10: Brett Wick (Washington University, St. Louis, USA)
Commutators and BMO

12:10 – 12:50: Sergey Naboko (St Petersbourg State University, Russia)
Periodic Block Jacobi Matrices: embedded eigenvalues and discrete spectrum

12:50: Closing of the conference

Abstracts

Mahdi Achache, Université de Bordeaux

Lions's maximal regularity problem.

Abstract. We report on recent progress on maximal Lp-regularity for evolution equations with time-dependent operators. These operators are associated with timedependent sesquilinear forms $a(t)$ on a Hilbert space. J. L. Lions (1960) proved the first results on maximal L^2-regularity provided the forms a(t) are C^1 (with respect to t). He then asked the problem whether this C^1 assumption is necessary. This problem was solved only recently. We discuss recent results on this problem and give some applications.

Ihab Alam, Lebanese University

Essential norms of Volterra and Cesaro operators on Muntz spaces.

Abstract. We study the properties of the Volterra and Ces?ro operators viewed on the L^1-Muntz space M^1_Λ with range in the space of continuous functions. These operators are neither compact nor weakly compact. We estimate how far from being (weakly) compact they are by computing their (generalized) essential norm. It turns out that this latter does not depend on Λ and is equal to $1/2$.

Fabienne Castell, University Aix-Marseille

Multiresolution analysis on graphs using Random Forests and Markov process intertwinning.

Abstract. We propose a new method to perform multiscale analysis of functions defined on the vertices of a finite connected weighted graph. Our approach relies on a random spanning forest to downsample the set of vertices, and on approximate solutions of Markov intertwining relation to provide a subgraph structure and a filterbank which is a basis of the set of functions. Our construction involves two parameters q and q'. The first one controls the mean number of kept vertices in the downsampling, while the second one is a tuning parameter between space localization and frequency localization. We provide an explicit reconstruction formula, bounds on the analysis and synthesis operator norms, and on the error in the intertwining relation. These bounds lead to recommend a way to choose the parameters q and q'. We illustrate the method by simulations.

Benjamin Cèlariès, Univeristé Claude Bernard Lyon 1

Universal semigroups.

Abstract. A bounded operator U on a Hilbert space $\mathcal{H}$ is universal if, for every bounded operator T, there exists a closed subspace $\mathcal{M}$ of $\mathcal{H}$ invariant by U, $\lambda \in \mathbb{C}$ and an isomorphism $S : \mathcal{H} \to \mathcal{M}$ such that $U_{|\mathcal{M}} = \lambda STS^{-1}$.

There exists strongly continuous semigroups $(T_t)_{t\geq 0}$ such that T_t is universal for every $t > 0$: consider for instance T_t defined on $L^2(\mathbb{R}^+)$ by $T_t(f)(x) = f(x + t)$. However, in this example, neither the space $\mathcal{M}$ nor the constant λ are *a priori* independent of t.

In this talk, we investigate the notion of universality for semigroups in a way that does not depend on the parameter t.

Stéphane Charpentier, University Aix-Marseille

Hypercyclic sets.

Abstract. A bounded linear operator T on a Banach or Fréchet space X is said to be hypercyclic if there exists a vector x in X whose orbit $\mathrm{Orb}(x, T) := \{T^n x,\, n \geq 0\}$ under T is dense in X. Two classical results show that the definition of a hypercyclic operator can be somehow weakened: 1) If the union $\bigcup_{i=1}^{l} \mathrm{Orb}(x_i, T)$ of finitely many orbits is dense in X, then one of these orbits also [Costakis/Peris, 2000/2001, independently]; 2) If the set

$$\mathrm{Orb}(\mathbb{T}x, T) := \{\lambda T^n x,\, n \geq 0,\, |\lambda| = 1\}$$

is dense in X, then $\mathrm{Orb}(x, T)$ also [Léon-Müller, 2004]. In this talk we will be interested in extensions of these results and we will discuss the following general question: which sets have the property that the density of their orbit under some operator T automatically implies the hypercyclicity of T? This is a joint work with R. Ernst, which is the continuation of a previous work with R. Ernst and Q. Menet.

Ralph Chill, TU Dresden Univerity

Decay rates for C_0-semigroups.

Abstract. In the last decade a considerable effort has been spent in order to determine decay rates for orbits of C_0-semigroups, with numerous applications especially to wave equations and other hyperbolic problems. The theoretical background for this problem lies in Tauberian theory which has its origins in the proof of the prime number theorem. I present some recent Tauberian theorems with applications to C_0-semigroups and wave equations.

Jacob Christiansen, Lund University

Chebyshev polynomials.

Abstract. A classical problem that goes back to Chebyshev is to approximate x^n by polynomials of lower degree on some compact interval. As is well known, the monic degree n polynomial that deviates the least from zero on $[-1,1]$ is given by $T_n(x) = 2^{1-n}\cos(n\theta)$ with $x = \cos\theta$. This polynomial oscillates for x between -1 and 1 and grows faster than any other monic polynomial of the same degree outside $[-1,1]$. But how can we describe the monic polynomials of least deviation from zero on $\mathsf{E} \subset \mathbb{R}$ when E is the union of, say k, intervals or a Cantor-type set? In the talk, I shall discuss the theory for these polynomials that also bear the name of Chebyshev. I'll focus on their asymptotic behavior (away from E) and the asymptotics of the approximation error. One may ask how this depends on the size and geometry of E. As we shall see, potential theory enters the field and part of the analysis relies on studying the zeros in the gaps of E.
The talk is based on joint work with B. Simon (Caltech), P. Yuditskii (JKU Linz), and M. Zinchenko (UNM).

Jean-Charles Croix, Institut Fayol, Mines Saint-Etienne

Karhunen-Love decomposition of Gaussian measures on Banach spaces.

Abstract. The study of Gaussian measures on Banach spaces is of active interest both in pure and applied mathematics. In particular, the spectral theorem for self-adjoint compact operators on Hilbert spaces provides a canonical decomposition of Gaussian measures on Hilbert spaces, the so-called Karhunen-Love expansion. In this work, we extend this result to Gaussian measures on Banach spaces in a very similar and constructive manner. In some sense, this can also be seen as a generalization of the spectral theorem for Gaussian covariance operators on Banach spaces. In the special case of the Wiener measure, this decomposition matches with Paul Lévy's construction of the Brownian motion.

Romuald Ernst, Université du Littoral, France

Frequent hypercyclicity and weighted densities.

Abstract. In this talk, I will recall a classical criterion ensuring frequent hypercyclicity and I will explain some recent results obtained in collaboration with Augustin Mouze concerning this criterion. In particular, I will describe some "scales" of weighted densities and explain the links that one may create between the Frequent Hypercyclicity Criterion and these different "scales".

Aingeru Fernandez-Bertolin, Univerity of Bordeaux

On unique continuation for solutions of the Schrödinger equation on trees.

Abstract. In this talk, we will see that if a solution of the time-dependent Schrödinger equation on a homogeneous tree decays fast enough at two distinct times then the solution is trivial. This can be understood as a dynamic version of the Hardy Uncertainty Principle on homogeneous trees, a classical result of the last century in Harmonic Analysis proved via complex analysis. We will then use complex analysis and spectral decomposition of the Schrödinger operator with compactly supported potential to extend the classical results to homogeneous trees. If time allows, we will also consider real variable methods, inspired by Escauriaza, Kenig, Ponce and Vega. This is a joint work with Philippe Jaming (Bordeaux).

Emmanuel Fricain, Université de Lille 1

Some new thoughts on systems of exponentials.

Abstract. Classical results say that every function in $L^2[-\pi,\pi]$ can be developed as a Fourier series. Indeed, the exponential system $(e^{int})_{n\in\mathbb{Z}}$ forms an orthonormal basis for $L^2[-\pi,\pi]$. Work by Paley, Wiener, Levinson, Beurling, and Mallivian examined questions of completeness and bases for the broader class of exponential functions $e^{i\lambda_n t}, \lambda_n \in \mathbb{R}$. These problems have obvious connections to the classical roots of analysis but they still continue to be studied by Poltoratski, Makarov, de Branges, and others and have many applications to differential equations and physics. In addition, the techniques developed to both address and solve these completeness and bases problems touch many areas of functional analysis, complex analysis, operator theory, and differential equations. In this talk I will examine some recent work on this topic with a special focus on how close the system $e^{i\lambda_n t}, n \in \mathbb{Z}$ is to an orthonormal basis for $L^2[-\pi,\pi]$. This is a joint work with Rishika Rupam.

Clifford Gilmore, University of Helsinki

Growth rates of frequently hypercyclic harmonic functions.

Abstract. The notion of frequent hypercyclicity stems from ergodic theory and it was introduced by Bayart and Grivaux (2004). Many natural continuous linear operators are frequently hypercyclic, for instance the differentiation operator on the space of entire holomorphic functions. We consider the partial differentiation operator acting on the space of harmonic functions on $\mathbb{R}^n$ and we identify minimal growth rates, in terms of the L^2- norm on spheres, of its frequently hypercyclic vectors. This answers a question posed by Blasco, Bonilla and Grosse-Erdmann (2010). This is joint work with Eero Saksman and Hans-Olav Tylli.

Karlheinz Groechenig, Fakultat fur Mathematik, Wien

Sampling in shift-invariant spaces, Gabor frames, and totally positive functions.

Abstract. Abstract: We study nonuniform sampling in shift-invariant spaces whose generator is a totally positive function. For a subclass of such generators the sampling theorems can be formulated in analogy to the theorems of Beurling and Landau for bandlimited functions. These results are optimal and validate the heuristic reasonings in the engineering literature. In contrast to the cardinal series, the reconstruction procedures for sampling in a shift-invariant space with a totally positive generator are local and thus accessible to numerical linear algebra. A subtle connection between sampling in shift-invariant spaces and the theory of Gabor frames leads to new and optimal results for Gabor frames. We show that the set of phase-space shifts of g (totally positive with a Gaussian part) with respect to a rectangular lattice forms a frame, if and only if the density of the lattice is strictly larger than 1. This solves an open problem going back to Daubechies in 1990 for the class of totally positive functions of Gaussian type.

Duc Trung Hoang, Université de Bordeaux

Exact observability of a $1D$ wave equation on a non–cylindrical domain.

Abstract. We discuss admissibility and exact observability estimates of boundary observation and interior point observation of a one-dimensional wave equation on a time dependent domain for sufficiently regular boundary functions. We also discuss moving observers inside the non-cylindrical domain and simultaneous observability results.

Nicolas Juillet (IRMA, Université de Strasbourg, France)

Markovinification of the quantile process.

Abstract. It has been established by Lisini that absolutely continuous curves (of order 2) $t \to \mu_t$ in the Wasserstein space over a metric space X can be represented by an action-minimizing probability measure on the space of absolutely continuous curves. We will show that in the basic case of the real line ($X = \mathbb{R}$), this measure can moreover be asked to be Markovian. This is a special case of a more general result, with consequences in stochastics, where no continuity assumptions are made on the family μ. (joint work with Charles Boubel)

Matthias Keller, Universitat Potsdam

Optimal Hardy inequalities on graphs.

Abstract. We construct optimal Hardy weights on graphs by using positive superharmonic functions. This is joint work with Felix Pogorzelski and Yehuda Pinchover.

Hubert Klaja, Ecole Centrale de Lille

K–spectral sets for the numerical radius.

Abstract. Recently, Davidson Paulsen and Woerdeman proved that an open set of the complex plane is completely K spectral for an operator T if and only if it is completely $\frac{1}{2}\left(\frac{1}{K}+K\right)$ spectral with respect to the numerical radius norm.
In this talk, we will show that is is also true for spectral sets. This is based on a joint work with Catalin Badea and Michel Crouzeix.

Yulia Kuznetsova

Isomorphisms of weighted convolution algebras.

Abstract. In this talk, I recall first results on isomorphisms of group algebras, isometric (notably Wendel's theorem for L^1) or of norm close to 1 (Kalton–Wood). These have their dual analogues for Fourier and Fourier-Stieltjes algebras, including our joint work with Jean Roydor (Bordeaux). Next I will speak on a work in progress with Safoura Zadeh on isomorphisms of weighted L^p-algebras. It appears that the isometric case can be described quite well, while in the non-isometric one only limited conclusions can be made. Among others, we make use of results on composition operators on certain spaces of analytic functions.

Juliette Leblond, Inria Sophia Antipolis

Inverse source problems in magnetostatics.

Abstract. We will discuss some inverse problems for Laplace-Poisson partial differential equations (PDE) with source term in divergence form, in dimension 3. We consider situations where incomplete (noisy) Cauchy data are given in some restricted region of the space (accessible to measurements) from which the unknown source term is to be recovered, at least partly. These issues arise in many physical problems related to non-destructive inspection, in particular for electromagnetic phenomenon modelled by Maxwell's equations, under quasi-static assumptions. They are ill-posed inverse problems, that need to be regularized in order to be constructively solved.
We will more specifically consider related problems from planetary sciences and paleomagnetism, concerning magnetization recovery from magnetic data. There, the magnetization distribution supported in thin rocks samples is to be estimated from measured values of the normal component of the (weak) magnetic field, measured by a very sensitive magnetometer (SQUID, Superconducting QUantum Interference Device). The magnetization is therefore assumed to have a rectangular (horizontal) support, while the normal magnetic field is measured on a parallel rectangle located above.
They are related together by means of convolution operators with truncated Poisson and Riesz kernels, the components of the magnetic field being harmonic in the half-space located above the magnetization support (the sample). We first tackle the issue of estimating the net moment of the magnetization (its mean value), an important preliminary step towards the full inversion problem. Observe that both are ill-posed, in that the moment recovery problem lacks stability, while the magnetization recovery issue itself suffers from non-uniqueness of its solution (silent sources, that fortunately possess vanishing moment). Note also that solving the moment recovery problem also provides an appropriate direction for the magnetization.
We will show how do harmonic analysis tools, together with approximation techniques, allow to set assumptions for well-posedness (stability) and to constructively solve for the above moment estimation issue. This is done by building a set of functions against which the scalar product of the available values of the normal magnetic field (taken on the data set) best quadratically approximates the components of the magnetic moment, under some norm constraint (linear estimator). Resolution algorithms and numerical illustrations will be provided. We will also discuss the links with Hardy spaces of gradients of harmonic functions in the upper half-space. This is joint work with Laurent Baratchart, Sylvain Chevillard, Doug Hardin, Eduardo Lima, Jean-Paul Marmorat.

Florian Le Manach, Université de Bordeaux

Cyclicity and bicyclicity in weighted $\ell^p(\mathbb{Z})$ spaces.

Abstract. We study the cyclicity and bicyclicity in weighted $\ell^p(\mathbb{Z})$ spaces. For $p \geq 1$ and $\beta \geq 0$, let $\ell^p_\beta(\mathbb{Z})$ be the space of sequences $u = (u_n)_{n\in\mathbb{Z}}$ such that $(u_n|n|^\beta) \in \ell^p(\mathbb{Z})$. We obtain both necessary conditions and sufficient conditions for u to be cyclic (resp. bicyclcic) in $\ell^p_\beta(\mathbb{Z})$, in other words, for $\{(u_{n+k})_{n\in\mathbb{Z}},\ k \in \mathbb{N}\}$ (resp. $\{(u_{n+k})_{n\in\mathbb{Z}},\ k \in \mathbb{Z}\}$) to span a dense subspace of $\ell^p_\beta(\mathbb{Z})$. The conditions are given in terms of the Hausdorff dimension and the capacity of the zero set of the Fourier transform of u.

Mandich Marc–Adrien, Univeristy of Bordeaux

Sub-exponential decay of eigenfunctions for some discrete Schrödinger operators.

Abstract. Following the method of Froese and Herbst, we show for a class of potentials V that an eigenfunction with eigenvalue E of the multi-dimensional discrete Schrödinger operator $H = -\Delta + V$ on $\mathbb{Z}^d$ decays sub-exponentially whenever the Mourre estimate holds at E. In the one-dimensional case we further show that this eigenfunction decays exponentially at a rate depending on the location of the nearest threshold of H. A consequence of the latter result is the absence of eigenvalues between 2 and the nearest thresholds above and below this value. The method of Combes–Thomas is also reviewed for the discrete Schrödinger operators.

Arnaud Marsiglietti, California Institute of Technology

Sur une borne inférieure de l'entropie de Shannon pour les vecteurs aléatoires log-concaves.

Abstract. L'entropie d'un vecteur aléatoire X admettant une densité de probabilité f_X par rapport à la mesure de Lebesgue sur $\mathbb{R}^n$, est définie par

$$h(X) = \mathbb{E}[-\log(f_X(X))].$$

L'entropie est une quantité fondamentale en théorie de l'information, et a de nombreuses significations pratiques. Par ailleurs, les vecteurs aléatoires log-concaves forment une classe riche, contenant par exemple les lois gaussiennes, et les lois uniformes sur un ensemble convexe.
Dans cet exposé, nous établirons une borne inférieure pour l'entropie d'un vecteur aléatoire log-concave, puis nous présenterons plusieurs applications. Ces résultats reposent sur des outils de géométrie convexe.

Quentin Menet Université d'Artois

Invariant subspaces in Fréchet spaces.

Abstract. A Fréchet space X has the invariant subspace property if every operator on X possesses a non-trivial invariant subspace. We will first show that there exists a non-normable Fréchet space X with the invariant subspace property and even with the hereditary invariant subspace property, i.e every closed infinite-dimensional subspace of X has the invariant subspace property. We will then discuss a sufficient condition for non-normable Fréchet spaces to not have the invariant subspace property.

Monia Mestiri University of Umons

Common upper-frequent hypercyclicity.

Abstract. An operator on a Banach space is called hypercyclic if it possesses a dense orbit; it is called upper-frequently hypercyclic if it possesses an orbit that is not only dense but that meets every non-empty open set 'very often'. A fundamental theorem in linear dynamics is the transitivity theorem of Birkhoff. It implies that the set of hypercyclic vectors of an operator is residual. Most results on common hypercyclicity are based on this result. Recently, Bonilla and Grosse-Erdmann have obtained an analogue of the theorem of Birkhoff for upper-frequent hypercyclicity. Based on this result we study common upper-frequent hypercyclicity. On the other hand, we obtain natural families of operators that do not possess common upper-frequently hypercyclic vectors.

Laurent Miclo, Université de Toulouse

On Markov intertwinings.

Abstract. After recalling the intertwining relation of the Brownian motion with the Bessel 3 process due to Pitman (1975) and the use of a corresponding technique to deal with the convergence to equilibrium for the top-to-random card shuffle by Aldous and Diaconis (1986), we will present extensions of this procedure to elliptic diffusions on manifolds via stochastic modifications of mean curvature flows.

Sergey Naboko, St Petresbourg University

Periodic Block Jacobi Matrices: embedded eigenvalues and discrete spectrum.

Abstract. The amount and structure of point spectrum, including the embedded into continuous one, of periodic scalar and block Jacobi matrices to be discussed. The talk is based on the common work with J.Janas.

Felipe Negreira Université de Bordeaux

A simpling theorem for functions in Besov spaces on spaces of homogeneous type.

Abstract. In this work we establish a sampling theorem for functions in Besov spaces on spaces of homogeneous type in the spirit of their recent counterpart for $\mathbb{R}^d$ established by Jaming-Malinnikova. The main tool is the wavelet decomposition presented by Deng-Han.

Victor Nistor, Université de Lorraine, France

Analysis on non-compact manifolds.

Abstract. I will present some recent results on analysis on non-compact manifolds. I first will discuss the case of manifolds with bounded geometry. Our main results here are the well-posedness of the Laplace equation in the usual scale of Sobolev spaces. Then I will take a quick look at the sub-class of "Lie manifolds", which are manifolds with "nice" ends and bounded geometry determined by a Lie algebra of vector fields. The advantage of a Lie manifold structure (on a manifold with bounded geometry) is that it provides a smaller algebra of differential operators that are easier to study. The main results here are the constructions of algebras of pseudodifferential operators and Fredholm conditions for the resulting operators. These results are joint work with B. Ammann, N. Grosse, C. Carvalho, and Y. Qiao.

Walid Oukil , Université Houari Boumediene, Alger.

Synchronization in abstract mean-field models.

Abstract. We study a class of a perturbed interconnected mean-field system, also known as a coupled systems. Under some assumptions we prove the existence of an invariant open set by the flow of the perturbed system; in other word, we prove that the distance between the components of an orbit is uniformly bounded, this property is also called synchronization. We use the perturbation method to obtain the result. However the result is not trivial for the not perturbed system. We use the fixed point theorem to prove the existence of a periodic orbit in the torus.

Lars Perlich, Technische Universität Dresden, Germany

Dirichlet-to-Robin operators via composition semigroups.

Abstract. We show for certain Robin boundary data that the semigroup generated by the Dirichlet-to-Robin operator is closely related to a weighted semigroup of composition operators on an appropriate Banach spaces of holomorphic functions.

Colin Petitjean , Université de Bourgogne Franche

Around some properties of dual Lipschitz-free spaces.

Abstract. After the seminal paper of Godefroy and Kalton, Lispchitz free spaces have become an object of interest for many authors. Indeed, the fundamental factorization property of Lipschitz-free spaces transforms in a particular way a nonlinear problem into a linear one. This creates links between some old open problems in the geometry of Banach spaces and some open problems about Lipschitz-free spaces. In this presentation we focus mostly on the study of Lipschitz-free spaces which are isometricaly isomorphic to dual Banach spaces. We show in particular that they enjoy l1 -like properties. We also extend some results to the vector valued case.

Menkad Safa, University of Batna 2, Algeria

On the injective norm of $A^* \otimes A^+ + A^+ \otimes A^*$.

Abstract. Let H be a Hilbert space and $B(H)$ the algebra of all bounded linear operators on H . The Moore-Penrose inverse of $A \in B(H)$, denoted by A^+, is the unique solution to the equations

$$AA^+A = A, \quad A^+AA^+ = A^+, \quad AA^+ = \left(AA^+\right)^*, \quad A^+A = \left(A^+A\right)^*.$$

In 2011, A. Seddik proved that, if $A \in B(H)$ is an invertible operator, then the injective norm $\|A^* \otimes A^{-1} + A^{-1} \otimes A^*\|_\lambda$ in the tensor product space $B(H) \otimes B(H)$, attain its minimal value 2, if and only if A is normal and satisfies the condition $\frac{\gamma}{\eta} + \frac{\eta}{\gamma} \leq 2$. for every γ, η in the spectrum of A. In this talk, we discuss about a version of this result for Moore-Penrose invertible operators. Also we shall characterize the class of closed range operators for which the equality $\|A^* \otimes A^+ + A^+ \otimes A^*\|_\lambda = 2$ holds.

Marius Tucsnak, Université de Bordeaux

On the reachable space of the heat equation: a complex analysis approach.

Abstract. We consider the heat equation some interval with Dirichlet boundary control and we aim describing the space of all possible states which can be attained in some positive time (called reachable space in control theoretic terms). The main results assert that this space is generally sandwiched between two Hilbert spaces of holomorphic functions defined on an appropriately chosen square in the complex plane. More precisely, we prove that the reachable space contains the Hardy-Smirnov space and it is contained in the Bergman space associated to the above mentioned square. The methodology, quite different of the one employed in previous literature, is a direct one. We first represent the input-to-state map as an integral operator whose kernel is a sum of Gaussians and then we study the range of this operator by combining the theory of Riesz bases for Hardy-Smirnov spaces in polygons and a result of Aikawa, Hayashi and Saitoh on the range of integral transforms associated with the heat kernel.

Soumia Touhami, Moulay Ismail University

Lions' formula for RKHSs of real harmonic functions on Lipschitz domains.

Abstract. Let Ω be a bounded Lipschitz domain of $\mathbb{R}^d$. The purpose of this paper is to establish Lions' formula for reproducing kernel Hilbert spaces $\mathcal{H}^s(\Omega)$ of real harmonic functions on the usual Sobolev space $H^s(\Omega)$ for $s \geq 0$.

To this end, we provide a functional characterization of $\mathcal{H}^s(\Omega)$ via some new families of positive self-adjoint operators, describe their trace data and discuss the values of s for which they are RKHSs. Also a construction of an orthonormal basis of $\mathcal{H}^s(\Omega)$ is established.

Rachid Zarouf Aix-Marseille Universit

A constructive approach to Schaffer's conjecture.

Abstract. We prove results that we found on our way to a deeper understanding of Schaffer's conjecture about inverse operators. Three topics are covered in this work:
1. The first and main one is devoted to the question what is the smallest $\mathcal{S} = \mathcal{S}(n)$ such that

$$|\det T|\|T^{-1}\| \leq \mathcal{S}\|T^{n-1}\|$$

holds for *any* induced matrix norm and *any* invertible complex $n \times n$ matrix.
J. J. Schaffer proved in 1970 that $\mathcal{S} \leq \sqrt{en}$ and conjectured that $\mathcal{S}$ was bounded for any choice of invertible matrices. Sch?ffer's conjecture was rebutted by Gluskin-Meyer-Pajor using a probabilistic approach: they determined an appropriate norm and proved the existence of a sequence of matrices $T = T(n)$ such that $\mathcal{S}$ grows unboundedly. This approach was refined by J. Bourgain effectively boiling down lower estimates on $\mathcal{S}$ to Turn-type power sum inequalities. Combined with a number theoretic analysis of such inequalities H. Queffelec (1993) proved the currently strongest estimate $\mathcal{S} \geq \sqrt{n}(1 - O(1/n))$. However, finding the optimal $\mathcal{S}$ and the construction of explicit sequences of matrices with growing $\mathcal{S}$ remain open tasks. Here we provide a constructive approach to Schaffer's conjecture. We derive new upper estimates on $\mathcal{S}$ and we construct an explicit class of matrices that reaches the asymptotic growth due to Schaffer's theorem. Our framework naturally extends to provide sharp estimates on the resolvent $\|(\zeta - T)^{-1}\|$ when $|\zeta| \leq \|T\|$ and ζ does not intersect the spectrum of T.
2. A key ingredient in our approach will be to investigate l_p-norms of Fourier coefficients of powers of a Blaschke factor, which is an interesting and well-studied topic in its own right, initiated by J-P. Kahane in 1956.
3. Finally, on our way, we prove new estimates for the asymptotic behavior of Jacobi polynomials with varying parameters and we highlight some flaws in the established literature on this topic. This is based on a joint work with Oleg Szehr.

Brett Wick, Washington University, St Louis, USA

Commutators and BMO.

Abstract. In this talk we will discuss the characterization of commutators with Riesz transforms and multiplication operators when acting from one weighted Lebesgue space to another weighted Lebesgue space; this characterization extends a result of Bloom for the Hilbert transform. Then we will discuss how one can generalize these results to characterize the commutators of multiplication and the Riesz transforms associated to different differential operators, in particular the Neumann Laplacian, when acting between weighted Lebesgue spaces. Connections to analytic function theory and Hankel operators will also be discussed.