Simion Stoilow Institute of Mathematics of the Romanian Academy (IMAR)

&

Octav Mayer Institute of Mathematics of the Romanian Academy, Iaşi (IMOM)

&

Faculty of Mathematics and Computer Science, Ovidius University of Constanţa

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Analysis, PDEs & Applied Mathematics
– List of abstracts –

Rates of asymptotic regularity for the Tikhonov-Mann iteration

Horatiu Cheval

University of Bucharest

Abstract: In this talk, we will introduce the Tikhonov-Mann iteration, which extends to the nonlinear setting of W-hyperbolic spaces a strongly convergent variant of the Krasnoselskii-Mann iteration recently proposed by Boţ, Csetnek and Meier in Hilbert spaces. We study quantitatively the asymptotic behavior of the Tikhonov-Mann iteration, obtaining effective rates of asymptotic regularity for it. Under a natural choice of the algorithm's parameters, the rates we obtain turn out to be quadratic. This is a joint work with Laurenţiu Leuştean.

Self-similarity and ramification in coagulation equations with fusion

Iulia Cristian

University of Bonn

Abstract: We study coagulation equations allowing fusion of particles which coagulate at a rate only depending on their volume. We discover that the long time analysis of

the system is strictly related to the chosen fusion rate. We prove existence of self-similar profiles in the case when fusion is faster than the coagulation rate and notice different behaviours otherwise. One of the particularities of this model is a tendency to form a ramified-like system in the case when fusion is slow. Lastly, we are able to recover the standard coagulation equation in the case of fast fusion. This is joint work with Juan J.L. Velázquez (University of Bonn).

Hardy uncertainty principle for the linear Schrödinger equation on regular quantum trees

Andreea Grecu

Institute of Mathematical Statistics and Applied Mathematics of the Romanian Academy (ISMMA)

Abstract: We study the Hardy uncertainty principle for the linear Schrödinger equation on some quantum graphs, more precisely in the case of regular quantum trees, where the Laplacian taken into consideration is the one subject to Kirchhoff coupling condition. Based on joint work with Aingeru Fernandez Bertolin (University of the Basque Country) and Liviu Ignat (IMAR).

The Graham-Kohr extension operator and starlike mappings in $\mathbb{C}^n$

Eduard Stefan Grigoriciuc

Babes-Bolyai University of Cluj-Napoca

Abstract: We present some remarks related to the univalence and the starlikeness of convex combinations of Graham-Kohr extension operators (defined by I. Graham and G. Kohr in Complex Variables Theory Appl. 47 (2002), 59-72) on the Euclidean unit ball in several complex variables.

On certain Runge pairs and polynomially convex sets in $\mathbb{C}^n$

Mihai Iancu

Babes-Bolyai University of Cluj-Napoca

Abstract: We present some results that connect certain Runge pairs and polynomially convex sets with the following properties studied in geometric function theory in several complex variables: ϕ-like, starlike, spirallike and convex. Joint work with Gabriela Kohr and Hidetaka Hamada.

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h-transform for Bochner subordinate L^p-semigroups

Oana Lupascu-Stamate

Institute of Mathematical Statistics and Applied Mathematics of the Romanian Academy (ISMMA)

Abstract: We show that the subordination induced by a convolution semigroup (subordination in the sense of Bochner) of a C_0-semigroup of sub-Markovian operators on an L^p space is actually associated to the subordination of a right (Markov) process. As a consequence, we solve the martingale problem associate with the L^p-infinitesimal generator of the subordinate semigroup. It turns out that an enlargement of the base space is necessary. A main step in the proof is the preservation under such a subordination of the property of a Markov process to be a Borel right process. We also investigate the h-transform of a subordinate C_0-semigroup of sub-Markovian operators on an L^p space.

The results were obtained jointly with Lucian Beznea and Ana-Maria Boeangiu.

Non-local transport problem on Hyperbolic space

Dragos Manea

IMAR

Abstract: We consider a model for particle transport on the Hyperbolic space, governed by a non-local interaction potential that is defined on the tangent bundle and is invariant to the geodesic flow. Further on, we study the relaxation limit of this model to a local transport problem, as the potential gets concentrated near the origin of each tangent space. We impose some regularity and integrability conditions for convergence of the non-local problem to the local one and, finally, we construct a class of suitable interaction potentials that satisfy those conditions.

Weak solvability via bipotentials for a class of nonlinear mechanical models

Osiceanu Madalina

University of Craiova

Abstract: We consider a nonlinear boundary value problem arising from continuum mechanics, the nonlinearity of the model arising from the constitutive law which is described by means of the subdifferential of a convex map. A bipotential related to the constitutive map and its Fenchel conjugate is considered. Based on this bipotential, we propose a two-field variational formulation whose solution is a pair consisting of the displacement field and the Cauchy stress tensor. Subsequently, we obtain existence and uniqueness results and we study some properties of the solution focusing on the data dependence.

On the controllability of some systems modeling cell dynamics related to leukemia

Lorand Gabriel Parajdi

West Virginia University & Babes-Bolyai University of Cluj-Napoca

Abstract: In this talk, I will present two control problems for a model of cell dynamics related to leukemia. The first control problem is in connection with classical chemotherapy, which indicates that the evolution of the disease under treatment should follow a prescribed trajectory assuming that the drug works by increasing the cell death rates of both malignant and normal cells. In the second control problem, as for targeted therapies, the drug is assumed to work by decreasing the multiplication rate of leukemic cells only, and the control objective is that the disease state reaches a desired endpoint. The solvability of the two problems as well as their stability is proved by using a general method of analysis. Some numerical simulations are included to illustrate the theoretical results and prove their applicability. The results can possibly be used to design therapeutic scenarios such that an expected clinical evolution can be achieved.

Newton-like components in the Chebyshev-Halley family of degree n polynomials

Dan Paraschiv

Universitat de Barcelona

Abstract: We study the Cebyshev-Halley methods applied to the family of polynomials $f_{n,c} : z \mapsto z^n + c$. We prove the existence of parameters such that the immediate basins of attraction corresponding to the roots of unity are infinitely connected. We also prove that, for $n \geq 2$, the corresponding dynamical plane contains a connected component of the Julia set, which is a quasiconformal deformation of the Julia set of the map obtained by applying Newton's method to $f_{n,-1} : z \mapsto z^n - 1$.

Spatiul convex al aproximarilor sofice

Liviu Paunescu

IMAR

Abstract: Un grup numarabil este sofic daca poate fi aproximat local, intr-un anume sens, cu permutari finite. Un grup sofic, ne-amenabil, are un spatiu foarte bogat de astfel de aproximari. In aceasta prezentare introducem structura convexa pe care spatiul aproximarilor sofice il are si discutam cateva rezultate despre aceasta structura.

GIST and Ghrelin: To Be or Not to Be?

Iulia Plesca

Universitatea "Alexandru Ioan Cuza" din Iasi

Abstract: Ghrelin is the orexigenic hormone secreted mainly by the stomach. Its involvement in neoplastic development has been studied in gastrointestinal adenocarcinomas. Our work aims to evaluate the influence of the ghrelin axis in gastrointestinal stromal tumors (GISTs). Joint work with Irene Alexandra Spiridon, Delia Gabriela Apostol Ciobanu, Simona Eliza Giuşcă, Dan Ferariu, Irina Draga Căruntu.

Critical points in holomorphic dynamics

Remus Radu

IMAR

Abstract: In general, critical points play an essential role in determining the geometry and dynamics of a Julia set associated with a one-dimensional complex dynamical system. Polynomial diffeomorphisms of $\mathbb{C}^2$ do not have critical points, but there is a notion of critical locus (i.e. the set of tangencies between the foliations of the sets of points which escape to infinity in forward, respectively backward time). In this talk we discuss the global topology of the critical locus for complex Hénon maps, a family of polynomial diffeomorphisms of $\mathbb{C}^2$ with chaotic dynamics. This is joint work with Tanya Firsova (Kansas State University) and Raluca Tanase (IMAR).

Linear PDE and Nonlinear Algebra

Bogdan Raita

Scuola Normale Superiore di Pisa & Universitatea "Alexandru Ioan Cuza" din Iasi

Abstract: We study linear PDE with constant coefficients. The constant rank condition on a system of linear PDEs with constant coefficients is often used in the theory of compensated compactness.While this is a purely linear algebraic condition, the nonlinear algebra concept of primary decomposition is another important tool for studying such system of PDEs. We investigate the connection between these two concepts.

Best constants in bipolar L^p-Hardy-type Inequalities

Teodor Rugina

University of Bucharest

Abstract: In this talk, we prove generalized L^p versions of the multipolar Hardy inequalities stated by Cazacu & Zuazua (Pr. Nonlin. Diff. Eq., 2013) and Cazacu (Comm. Contemp. Math., 2016), in the case of a bipolar potential and $p > 2$. Our results are sharp and minimizers do exist in the energy space. New features appear when $p > 2$ compared to the linear case $p = 2$ at the level of criticality of the associated nonlinear operators which are singular perturbations of the p-Laplacian $-\Delta p$. Joint work in progress with C. Cazacu.

An approximation method for exact controls of vibrating systems using vanishing viscosity

Mihai-Adrian Tudor

University of Craiova

Abstract: The aim of this talk is to study an effcient numerical method for computing exact controls for a class of infinite dimensional systems modelling elastic vibrations. Our theoretical result improves the rate of convergence of the approximations to an exact control, compared with the one previously obtained in N. Cindea, S. Micu, M. Tucsnak, *An approximation method for exact controls of vibrating systems*, SIAM J. Control Optim. 49 (3) (2011), 1283-1305. The strategy consists of adding a vanishing viscosity term in an algorithm which combine Russell's principle and the Galerkin method. Moreover, to illustrate the effciency of this approach, we apply it to several systems governed by PDEs and describe the associated numerical simulations.