Alexandru Ioan Cuza
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Romanian Academy
Iași Branch

International Conference on Applied and Pure Mathematics

Department of Mathematics and Informatics, Gheorghe Asachi Technical University, Iaşi, Romania

Faculty of Mathematics, “Alexandru Ioan Cuza” University, Iaşi

and

Institute of Mathematics, Romanian Academy, Iaşi

ICAPM 2025

8-th Edition November 6-9, 2025

BOOK OF ABSTRACTS

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1 About the International Conference on Applied and Pure Mathematics

The purpose of the International Conference on Applied and Pure Mathematics (ICAPM) is to bring together researchers, academics and professionals from around the world to present new results, to exchange ideas, and to strengthen collaborations in all fields of mathematics. The conference seeks to provide a stimulating environment for discussion on both theoretical developments and practical applications, highlighting the role of mathematics in advancing science, technology and innovation.

2 Plenary speakers PS

- **Viorel BARBU** – Romanian Academy, Romania.
- **Ioan BUCATARU** - Alexandru Ioan Cuza University of Iași, Romania.
- **Akhtar KHAN** – Rochester Institute of Technology, USA.
- **Gabriela MARINOSCHI** – Gheorghe Mihoc-Caius Iacob Institute of Mathematical Statistics and Applied Mathematics of the Romanian Academy (ISMMA), Romania.
- **Stefano MONTALDO** – University of Cagliari, Italy.
- **Sergiu MOROIANU** – „Simion Stoilow" Institute of Mathematics of the Romanian Academy and University of Bucharest, Romania.
- **Liviu ORNEA** – Romanian Academy and University of Bucharest, Romania.
- **Marc SORET** – University of Tours, France.
- **Christiane TAMMER** – Martin-Luther-University Halle-Wittenberg, Germany.

3 Contributed speakers Pure Mathematics CSP

- **Rareş AMBROSIE** - Vasile Alecsandri University of Bacău, Romania.
- **Ștefan ANDRONIC** – Alexandru Ioan Cuza University of Iaşi, Romania.
- **Cristian CIULICĂ** - University of Bucharest, Romania.
- **Georgiana FASOLĂ** - Alexandru Ioan Cuza University of Iaşi, Romania.
- **Silviu LAZOREC** - Alexandru Ioan Cuza University of Iaşi, Romania.
- **Vlad MARCHIDANU** - University of Bucharest, Romania.
- **Simona NISTOR** - Alexandru Ioan Cuza University of Iaşi, Romania.
- **Anamaria PASTIU** - Babeș-Bolyai University, Cluj-Napoca, Romania.
- **Iulia PLEŞCA** - Alexandru Ioan Cuza University of Iaşi, Romania.
- **Mihaela RUSU** - Alexandru Ioan Cuza University of Iaşi, Romania.
- **Antonio SANNA** - University of Cagliari, Italy.
- **Miron STANCIU** - University of Bucharest, Romania.

4 Contributed Speakers Applied Mathematics CSA

- **Mihai ARON** - Babeş-Bolyai University, Cluj-Napoca, Romania.
- **Sixuan BAI** - University of Electronic Science and Technology of China, China.
- **Mihai BUCATARU** - University of Bucharest, Romania.
- **Răzvan CEUCĂ** - Gheorghe Asachi Technical University, Iași, Romania.
- **Andreea Elena FLOREA** - Alexandru Ioan Cuza University of Iași, Romania.
- **Paul GEORGESCU** - Gheorghe Asachi Technical University, Iași, Romania.
- **Cristina GHEORGHE** - Babeș-Bolyai University, Cluj-Napoca, Romania.
- **Christian GÜNTHER** - Leibniz Universität Hannover, Germany.
- **Bahareh KHAZAYEL** - Martin Luther University Halle-Wittenberg, Germany.
- **Nataliia KOLUN** - Babeș-Bolyai University, Cluj-Napoca, Romania.
- **Alexandru LAZARI** - Moldova State University, Republic of Moldova.
- **Gabriela LIŢCANU** - Romanian Academy, Iasi Branch, Romania.
- **Eugenia LUCA** - Babeş-Bolyai University, Cluj-Napoca, Romania.
- **Bogdan MAXIM** - University of Craiova, Romania.
- **Radu-Adrian MIHAI** - National University of Science and Technology POLITEHNICA Bucharest (NUSTPB), Romania.
- **Ioan PAPUC** - Babeş-Bolyai University, Cluj-Napoca, Romania.
- **Cornel PINTEA** - Babeş-Bolyai University, Cluj-Napoca, Romania.
- **Bianca SATCO** - Ștefan cel Mare University of Suceava, Romania.

5 Schedule

Day 1–November 6th, 8:00 AM – 19:00 PM

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15:00–15:30	CSA	**Gabriela LIŢCANU** Romanian Academy, Iași Branch, Romania	A quantitative mathematical model of developmental pattern formation
15:30—16:00	CSA	**Alexandru LAZARI** Moldova State University, Republic of Moldova	Total Alert Time of the Hidden Markov Models with Final Sequences of Observable States
16:00–16:30	CSA	**Nataliia KOLUN** Babeș-Bolyai University, Cluj-Napoca, Romania	On constant vorticity time-dependent water flows over a variable bottom
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14:45–15:20	CSP	**Vlad MARCHIDANU** University of Bucharest, Romania	An Aubin-Yau theorem for transversally Kähler foliations
15:20—15:55	CSP	**Cristian CIULICĂ** University of Bucharest, Romania.	Curves on Endo–Pajitnov Manifolds
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18:30—19:00	CSA	**Ioan PAPUC** Babeș-Bolyai University, Cluj-Napoca, Romania	Free surface azimuthal flow with surface tension and discontinuous density stratification
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17:35–18:10	CSP	**Georgiana FASOLĂ** Alexandru Ioan Cuza University of Iași, Romania	Completely realisable groups - a step in inverse group theory

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10:20—11:10	PS	**Stefano MONTALDO** University of Cagliari, Italy	A Friendly Introduction to Biconservative Submanifolds
11:10–12:00	PS	**Marc SORET** University of Tours, France	On biharmonic hypersurfaces in Euclidean Spaces
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17:30–18:00	CSA	**Răzvan CEUCĂ** Gheorghe Asachi Technical University, Iași	Numerical exploration of scale separation regimes in the Landau-de Gennes model for nematic liquid crystals
18:00—18:30	CSA	**Bogdan MAXIM** University of Craiova, Romania	A doubly nonlinear elliptic problem with variable exponents, homogeneous Neumann conditions and generalized logistic source
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Chairperson	**Dorel FETCU**		
17:00—17:35	CSP	**Rareş AMBROSIE** Vasile Alecsandri University of Bacau, Romania	New constructions of biharmonic polynomial maps between spheres
17:35—18:10	CSP	**Antonio SANNA** University of Cagliari, Italy	Higher order energy functionals and polyharmonic curves

Day 3–November 8th, 9:30 AM – 21:00 PM

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10:20–10:50	**Coffee break**		
10:50—11:40	PS	**Sergiu MOROIANU** „Simion Stoilow" Institute of Mathematics of the Romanian Academy and University of Bucharest, Romania	Invariants of vector bundles with connection
11:30–12:30	PS	**Akhtar KHAN** Rochester Institute of Technology, USA	Stochastic Inverse Problem of Estimating Random Coefficients
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18:00 – 21:00	**Festive Dinner**		

Day 1

November 6th, 8:00 AM – 19:00 PM

Stochastic processes associated with the p-Laplacian

PS 9:30

Viorel BARBU

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We consider the parabolic equation associated to the p-Laplace operator, with fundamental solution given by Barenblatt function. We approach it as a nonlinear Fokker-Planck equation and we establish the connection between the probabilistic solution to the associated McKean-Vlasov equation and the p-Laplace flow. This result extends to the case of the p-Laplace operator the results of Einstein (1905) on the Brownian motion and linear heat flow.

On the Preeminence of Euclidean Geometry

PS 10:50

Liviu ORNEA

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According to Kant's philosophy of space, Euclidean geometry is synthetic a priori. The advent of non-Euclidean geometries dangled seriously this position. However, relaxing the notion of a priori to a milder one, that we call preeminence, Kant's view seems still sustainable. In this talk, I shall briefly recall (1) Kant's philosophy of space, and (2) a piece of the history of geometry, in particular Riemann's notion of manifold, Whitney's and Nash's embedding results. Then, based on Nash's theorems, I shall argue in favor of a preeminence of Euclidean geometry over all other possible, vindicating somehow Kant's position. This is a joint work with Mircea Dumitru.

The operatorial algebraic Ricatti equation in connection with the H-infinity optimal control problem

PS 11:40

Gabriela MARINOSCHI

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The H-infinity optimal control problem is a technique used in control theory to design robust stabilizing feedback controllers that force a system to achieve stability with a prescribed performance even if the system output may be corrupted by perturbations. Previous results in the literature show the connection between the feedback controller solving the H-infinity optimal control problem and the solution to an algebraic Ricatti equation involving the operators associated to the system to be controlled. Thus, the investigation of how this can be solved and especially of the existence and uniqueness of its solution are issues of particular importance. After discussing some basic idea about the H-infinity optimal control problem we present an operatorial method for proving the existence and uniqueness of the solution to the algebraic Ricatti equation associated to parabolic systems.

Epidemic modelling in unusual circumstances: assessing academic influence among peers

CSA 14:00

Paul GEORGESCU

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We examine the influence of social-cognitive factors such as self-efficacy, locus of control and negative peer pressure on the academic performance and dropout intentions of undergraduate students. To this purpose, an epidemiological modelling framework is employed, of concern being a 4-dimensional model which bears resemblance to a SEI model with two stages of infectivity. Sufficient conditions for the existence and stability of the equilibria are determined in terms of threshold parameters defined adhoc, similar in scope, definition and interpretation to the basic reproduction number of an epidemic model.
After performing further numerical simulations to support and explore the relevance of our theoretical findings, we observe that the model exhibits rich dynamical behavior, such as multiple positive equilibria, backward bifurcations (which means that resit and dropout can become mainstays even if the resit reproduction number is less than one), transcritical bifurcations and Hopf bifurcations leading to oscillatory solutions.

Sweeping processes and Stieltjes derivative

CSA 14:30

Bianca SATCO

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A remark of J.J. Moreau in his paper in 1977 on sweeping processes with closed convex-valued moving set having finite retraction suggests a very natural involvement of the Stieltjes derivative with respect to a right-continuous, nondecreasing function in the study of evolution equations governed by a sweeping process. Therefore, such a problem with periodic boundary value conditions and multivalued perturbation is considered.
An application of Kakutani-Ky Fan's fixed point theorem provides us, under Carathéodory assumptions on the right-hand side, with the existence of right-continuous solutions of bounded variation.

A quantitative mathematical model of developmental pattern formation

CSA 15:00

Gabriela LIŢCANU

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One of the biggest challenges in the study of developmental pattern formation is how to select the relevant information from biochemical studies in order to obtain a quantitative model that is in agreement with the experimental data. We focus on a system where the chemosensitivity term is described by a power function and we study the mechanisms behind various types of propagating patterns. The existence and the shape of solutions strongly depend on the parameter values, so various cases are discussed and also the numerical simulations of propagating pattern will be presented.

Total Alert Time of the Hidden Markov Models with Final Sequences of Observable States

CSA 15:30

Alexandru LAZARI

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A hidden Markov model is a stochastic process with hidden and observable states. At each moment, the hidden state evolves according to the transition probabilities of the underlying Markov process, and it generates the observable state according to specific emission probabilities. A hidden Markov model with final sequences of observable states is defined as a process whose observation terminates when an arbitrary sequence of states from the set of predefined final sequences of observable states is observed. The current observed state is said to be critical if the sequence of observed states is in the process of matching one of the final sequences of observable states. The total alert time of a hidden Markov model is defined as the cumulative time during which a critical state is observed. In this paper, it is shown that the total alert time of such a hidden Markov model follows a homogeneous linear recurrence distribution, whose order of recurrence does not exceed the order of the homogeneous linear recurrence that defines the distribution of the evolution time of the given hidden Markov model. This allows us to use previously developed algorithms for the probabilistic characterization of the total alert time.

On constant vorticity time-dependent water flows over a variable bottom

CSA 16:00

Nataliia KOLUN

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We prove that non-stratified water flow with non-zero constant vorticity over a variable bottom exhibits a two-dimensional character, meaning that the velocity field components, pressure, and free surface show no variations in the horizontal direction orthogonal to the wave propagation direction. Furthermore, we consider a time-dependent three-dimensional stratified water flow over a variable bottom with a free surface and an interface, which plays the role of an internal wave and separates two layers of constant and different densities. We show that at least one layer of a two-layer water flow with non-zero constant vorticity exhibits a two-dimensional character. Additionally, we establish that three-dimensional motion in a two-layer water flow does not occur if the vorticity vectors in the upper and lower layers are either parallel or orthogonal to each other. We also consider two-layer water flows with constant vorticity over a variable bottom, assuming that the governing geophysical water wave equations include the full Coriolis term. We prove that bounded solutions to the three-dimensional water wave equations exist if and only if the vorticity vectors in both layers vanish.

Special non-Kähler metrics on nil- and solvmanifolds

CSP 14:00

Miron STANCIU

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I will go over a few results about the existence of special non-Kähler metrics (e.g. locally conformally Kähler, locally conformally balanced, pluriclosed) and the interplay between them on nilmanifolds and, more generally, solvmanifolds. As a special example, I will talk about the properties of Endo-Pajitnov manifolds.

An Aubin-Yau theorem for transversally Kähler foliations

CSP 14:45

Vlad MARCHIDANU

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Transversally Kähler foliations are a generalisation of Kähler manifolds, appearing naturally in the complex non-Kähler setting. We present the outline of a self-contained proof of how the classical methods used in the proof of the Aubin-Yau theorem adapt to the transversally Kähler case under the homological orientability condition. We apply this result to obtain a new, simpler proof of the already known Vaisman Aubin-Yau theorem.

Curves on Endo–Pajitnov Manifolds

CSP 15:20

Cristian CIULICĂ

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Endo-Pajitnov manifolds are generalizations to higher dimensions of the Inoue surfaces S^M. We study the existence of complex submanifolds in Endo-Pajitnov manifolds. We identify a class of these manifolds that do contain compact complex submanifolds and establish an algebraic condition under which an Endo–Pajitnov manifold contains no compact complex curves.

On two problems about order sequences of finite groups

CSP 15:55

Silviu LAZOREC

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The order sequence of a finite group G is a non-decreasing finite sequence formed of the element orders of G. Several properties of order sequences were studied by P. J. Cameron and H. K. Dey in a recent paper that concludes with a list of open problems. In this paper we solve two of these problems by showing the following facts: 1) if there is a non-supersolvable/non-solvable group of order n, it is not always true that its order sequence is properly dominated by the order sequence of any supersolvable/solvable group of order n; 2) the supersolvability of a finite group cannot be described by its order sequence.

Stratified equatorial flows in cylindrical coordinates with surface tension

CSA 17:00

Cristina GHEORGHE

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We study equatorial flows with depth dependent-stratification and surface tension. The fluid is considered as incompressible and inviscid, moving in the azimuthal direction. The model considers the line of Equator "straightened" and replaced to the axis Oz. The aim of my presentation is to give a solution which pertains to large scale equatorial dynamics of a fluid with free surface expressed in cylindrical coordinates. The main goal is to relate variations of pressure over the free surface to variations of shape of the free surface, by applying Implicit Function Theorem (see [1]). We also give a regularity result for the free surface. My work is motivated by the special characteristics of flows in the equatorial region, where strong vertical stratification prevails. In literature, the problem was studied by using cylindrical coordinates in [3] (where density was considered varying both on depth and latitude and the surface tension was neglected) and [4] (where surface tension is considered in modelling equatorial azimuthal flows, but density is considered as constant). The results obtained in [5] serve as a basis for the topic of my talk.

References:
1. Berger, M.S.: Nonlinearity and Functional Analysis. Academic Press, New York (1977);
2. Coddington, E.A.: An Introduction to Ordinary Differential Equations. Dover, New York (1961);
3. Henry, D., Martin, C.I.: Stratified equatorial flows in cylindrical coordinates, Nonlinearity 33(8), 3889 (2020);
4. Hsu, H.-C., Martin, C.I.: Free-surface capillary-gravity azimuthal equatorial flows. Nonlinear Anal. 144, 1–9 (2016);
5. Gheorghe, C., Stan, A.: Stratified equatorial flows in cylindrical coordinates with surface tension. Monatsh Math 205, 497–509 (2024).

Invariance in time of alpha-convexity of order beta

CSA 17:30

Eugenia LUCA

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The Hele–Shaw problem models the motion of a viscous fluid contained between two closely spaced parallel plates. Its evolution is described by a free boundary whose dynamics can be represented through conformal mappings satisfying the Polubarinova–Galin equation. This equation provides a powerful analytic framework linking geometric function theory to free-boundary dynamics in planar domains. In this talk, we focus on the hereditary properties of alpha-convex functions of order beta under the assumptions of the Hele–Shaw model. These functions form a two-parameter family that unifies and extends the classical starlike and convex classes. We analyze how the alpha-convexity of order beta behaves under the conformal evolution dictated by the Hele–Shaw equation and identify sufficient conditions for which this property is preserved in time. The results establish a direct connection between analytic convexity and geometric stability, revealing how structural properties from univalent function theory control the invariance of evolving domains in Hele–Shaw-type flows.

Time evolution of elastically starlike domains in the Hele-Shaw flow problem

CSA 18:00

Mihai ARON

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The notion of elasticity and the associated concept of elastically starlike functions are newly introduced in geometric function theory. The terminology is motivated by the geometric interpretation of elasticity as a measure of the deformation of level lines under conformal mappings. We investigate the connection between elastically starlike and starlike functions, and we apply these ideas to the Hele-Shaw flow problem with zero surface tension. We show that if the initial fluid domain is starlike and the boundary elasticity is bounded above and below by positive constants depending on the geometry of the initial domain, then this geometric structure is preserved throughout the existence time of the solution.

Free surface azimuthal flow with surface tension and discontinuous density stratification

CSA 18:30

Ioan PAPUC

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An exact solution in spherical coordinates is achieved for the governing equations that model the propagation of oceanic water waves in the equatorial region. The velocity and pressure obtained describes a steady, purely azimuthal gravity flow, characterized by a discontinuous density stratification along a moving internal interface that splits the whole fluid region into two superimposed layers. The outer boundaries of the domain under study are represented by the upper dynamic surface on which the atmospheric pressure and surface tension act, and the ocean floor which is considered fixed. Finally, using the implicit function theorem, we prove the existence of a dependence between the shape of the flexible surfaces involved in the study and the pressures directly applied to them.

Harmonic mean of element orders

CSP 17:00

Iulia PLEȘCA

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In this talk we study the recently introduced harmonic mean of orders of elements in a finite group. We find when it is an integer in the context of p groups, dihedral groups. We offer a criterion for solvability. This is joint work with Marius Tarnauceanu.

Completely realisable groups - a step in inverse group theory

CSP 17:35

Georgiana FASOLĂ

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In group theory, there are many constructions f which start from a group H and produce another group f(H). For each of these constructions, there is an inverse problem: Given a group G; is there a group H such that G is isomorphic with f(H)? If affirmative, we say that G is f-realisable. Given a construction f on groups, we will classify the groups G all of whose subgroups are f-realisable. We will determine completely Aut-realisable groups, then we will present several results concerning completely f-realisable groups for f = Z; F;M;D;L, where Z(H), F(H), M(H), D(H) and L(H) denote the center, the Fitting subgroup, the Chermak-Delgado subgroup, the derived subgroup and the absolute center of the group H, respectively.

Day 2

November 7th, 9:00 AM – 18:30 PM

Killing vector fields and symmetries in Riemann and Finsler geometry

PS 9:00

Ioan BUCATARU

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bucataru@uaic.ro

Alexandru Ioan Cuza University of Iași, Romania

We use the Frolicher-Nijenhuis formalism to characterize Killing vector fields and corresponding symmetries in the general case of Finslerian geometries. In particular, for the Riemannian case, we recover some well-known results and obtain new characterizations.

A Friendly Introduction to Biconservative Submanifolds

PS 10:20

Stefano MONTALDO

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University of Cagliari, Italy

In this talk, I will give an accessible introduction to the theory of biconservative submanifolds, exploring the motivations for their study and highlighting some key facts and open problems in the field.

On biharmonic hypersurfaces in Euclidean Spaces

PS 11:10

Marc SORET

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University of Tours, France

We discuss geometric properties of biconservative and biharmonic hypersurfaces in Euclidean spaces.

Various types of closed convex sets

CSA 14:00

Cornel PINTEA

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We characterize various types of closed convex subsets of $\mathbb{R}^n$ and apply these characterizations to show that some classes of closed convex sets are closed with respect to the Minkowski sum and the intersection. The metric projection over polyhedral sets is also considered and described.

On Derivative-Free Methods for Solving Set-based Robust Counterparts to Uncertain Multiobjective Optimization Problems

CSA 14:30

Christian GÜNTHER

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This talk is devoted to derivative-free methods for solving set-based robust counterparts to uncertain multiobjective optimization problems. The motivation comes from uncertain multiobjective engineering problems for damage localization and quantification in flexible mechanical structures, which are in fact nonsmooth nonlinear multiobjective parameter estimation problems. We focus on robustness concepts (e.g., set-based min-max robust efficiency, set-based optimistic robust efficiency) given by solution concepts for the set-based robust counterpart problems based on preorder set relations (e.g., upper set less relation, lower set less relation). We illustrate an algorithmic pattern search procedure for approximating solutions to the set-based robust counterpart problems (with special emphasis on the case with a finite number of uncertainties), which is based on set-based (first- and higher-level) non-dominated sorting for finite families of sets and an infinite penalty approach, together with some implementation details of the procedure to improve numerical efficiency.

Optimality conditions for sharp and isolated solutions in nonsmooth optimization

CSA 15:00

Andreea Elena FLOREA

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In this talk, we present some sufficient optimality conditions for sharp and isolated solutions of constrained scalar and set-valued nonsmooth optimization problems, formulated in terms of several types of subgradients and coderivatives. By assuming Shapiro properties for the constrained set and employing different types of generalized differentiation objects, we are able to describe multiple degrees of sharpness. The main results extend and generalize related findings from the literature. t

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Bishop-Phelps Type Scalarization for Vector Optimization in Real Topological Linear Spaces

CSA 15:30

Bahareh KHAZAYEL

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It is well-known that scalarization techniques (e.g., in the sense of Gerstewitz; Kasimbeyli; Pascoletti and Serafini; Zaffaroni) are useful for generating (weakly, properly) efficient solutions of vector optimization problems. One recognized approach is the conic scalarization method in vector optimization in real normed spaces proposed by Kasimbeyli (SIAM J Optim, 20(3), 2010), which is based on augmented dual cones and Bishop-Phelps type (norm-linear) scalarizing functions. In this talk, we present a Bishop-Phelps type scalarization method for vector optimization problems in real topological linear spaces, which is based on Bishop-Phelps type cone representing functions (e.g., Gerstewitz functions or seminorm-linear functions). This method can be seen as an extension of Kasimbeyli's conic scalarization method in real normed spaces. Within this framework, we derive new Bishop-Phelps type scalarization results for the concepts of weak efficiency and different types of proper efficiency. This talk is based on a joint work with Christian Günther, Radu Strugariu and Christiane Tammer.

Generalized D-Gap Functions and Error Bound Results for Time-Dependent Variational-Hemivariational Inequalities

CSA 16:00

Sixuan BAI

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This paper first introduces a novel class of generalized difference gap (D-gap) functions derived from locally Lipschitz continuous functions, aiming to equivalently transform time-dependent variational-hemivariational inequalities into unconstrained optimization formulations. Based on this, we further establish that the generalized D-gap function exhibits local Lipschitz continuity and coercivity. Finally, under the conditions of coercivity and local ξ -monotonicity, we present local and global error bound results for the generalized D-gap function, which provides critical theoretical support for the design and analysis of optimization algorithms.

From harmonicity to biharmonicity and c-biharmonicity

CSP 14:00

Simona NISTOR

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This talk will trace the path from the classical theory of harmonic maps to its higher-order generalizations. We will focus on biharmonic and conformal biharmonic maps, emphasizing their geometric relevance and connections with the theory of hypersurfaces in space forms. Several rigidity and classification results will be highlighted.

Biconservative Weingarten surfaces with flat normal bundle in space forms

CSP 14:45

Ștefan ANDRONIC

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In the first part of the talk, we present some basic properties of biconservative submanifolds. In particular, we present known results about biconservative surfaces in 4-dimensional space forms, focusing on biconservative surfaces with parallel normalized mean curvature vector field (PNMC). In the second part of the talk, we relax the PNMC hypothesis and study the non-PNMC biconservative Weingarten surfaces with flat normal bundle in 4-dimensional space forms. We determine the system of compatibility conditions which ensures the existence of an infinite family of such surfaces. Next, we provide examples of non-PNMC biconservative Weingarten surfaces with flat normal bundle in 4-dimensional space forms. At the end of the talk, we formulate an open problem regarding the (non-)existence of biharmonic Weingarten surfaces with flat normal bundle in 4-dimensional space forms.

Biconservative Surfaces in the Four-Dimensional Hyperbolic Space - Intrinsic Characterizations

CSP 15:20

MIhaela RUSU

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In this paper, we extend the investigation of biconservative surfaces with parallel normalized mean curvature vector fields (PNMC) in the 4 dimensional space forms, focusing on the hyperbolic space H4, the last remaining case to explore. We establish that an abstract surface admits a PNMC biconservative immersion in H4 if and only if it satisfies a certain intrinsic condition; if such an immersion exists, it is unique. We further analyze these abstract surfaces, showing that they form a two-parameter family. Additionally, we provide three characterizations of the intrinsic condition to explore the geometric properties of these surfaces

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Loewner chain associated with the generalized Graham-Kohr extension operator

CSP 15:55

Anamaria PASTIU

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Let f be a locally univalent function defined on the unit disc. We first show that the generalized Graham-Kohr extension operator maps the class of spirallike functions of type beta into the class of functions that admit a parametric representation on the unit ball. In the second part, we prove that if f is a normalized univalent Bloch function on the unit disc, then the generalized Graham-Kohr extension operator is a Bloch mapping on the unit ball.

Time-based air traffic trajectory model and optimisation

CSA 17:00

Mihai BUCATARU and Radu-Adrian MIHAI

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The aim of this project is to optimise flight trajectories for multiple aircraft confined to a specific two-dimensional airspace. The trajectories are generated according to Visual Flight Rules (VFR), meaning that navigation is based on the visual determination of the aircraft's position relative to surrounding landmarks that are well-known both to the controller and pilots. In our model, these points are fixed within the airspace described by a polygonal line. During navigation, aeroplanes are guided towards several points in the airspace, and the air traffic controller is able to instruct the aircraft to head directly to any point at any time.

Numerical exploration of scale separation regimes in the Landau-de Gennes model for nematic liquid crystals

CSA 17:30

Răzvan Dumitru CEUCĂ

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We revisit the elastic energy formulation of the Landau-de Gennes model for nematic liquid crystals. We study quantitative reductions of the multi-constant elastic energy. We use the framework introduced by a co-author, namely the generalised optimal scaling procedure (GOS) introduced by Rusconi et al. in 2025. We identify explicit parameter regimes in which the three-constant model (L_1, L_2, L_3) can be reduced to (L_1, L_2, 0). Furthermore, we study how the two-constant model (L_1, L_2, 0) can be reduced to the commonly used one-constant configuration (L_1, 0, 0). The analytical scaling predictions are tested numerically using the openQmin simulation framework. We are able to confirm that below a critical threshold for L_3 or L_2, given by GOS, the deviation from the reduced model remains of the same order of magnitude as predicted by the scaling theory. These results provide a quantitative criterion for the validity of reduced elastic models. They also establish a direct connection between optimal scaling arguments and numerical observations within the Landau-de Gennes framework. This represents joint work with S. Rusconi and A. D. Zarnescu.

A doubly nonlinear elliptic problem with variable exponents, homogeneous Neumann conditions and generalized logistic source

CSA 18:00

Bogdan MAXIM

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The aim of this talk is to present existence and uniqueness results for a class of doubly nonlinear elliptic problems that are fundamental to solving the corresponding parabolic problem via Rothe's method (time discretization). The associated parabolic model has important applications in image processing, particularly in denoising tasks. Our analysis is conducted under very weak assumptions, as we eliminate the commonly imposed requirement that the source term be locally Lipschitz—a condition frequently found in the literature. Instead, we base our approach on the continuity properties of the Nemytskii operator acting between Lebesgue spaces with variable exponents. The results presented here provide a rigorous mathematical foundation for further analysis of related parabolic models and contribute to the development of more general frameworks for nonlinear problems with variable growth conditions.

New constructions of biharmonic polynomial maps between spheres

CSP 17:00

Rareș AMBROSIE

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In this paper, we study diagonal maps between spheres given by two homogeneous polynomial maps between spheres, defined on the same domain sphere. First we find their bitension field, then we give a method for generating proper biharmonic maps between spheres, relying on harmonic homogeneous polynomial maps of different degrees. Further, we establish a result for constructing proper biharmonic product maps using harmonic homogeneous polynomial maps between spheres.

Higher order energy functionals and polyharmonic curves

CSP 17:35

Antonio SANNA

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In recent years, higher-order versions of the energy functional have obtained increasing attention. The first attempt to generalize the energy functional was proposed by Eells and Sampson in 1965 when they introduced the ES-r-energy. Later, Wang in 1989 and Maeta in 2012 proposed a slightly different higher-order energy called simply r-energy. These two energies assume the same expression for r=1,2,3 but they differ when r>3. However, considering the case of curves in a Riemannian manifold, the two energies coincide. In the first part of this lecture, we present the development of these two functionals and in the second part, we present the techniques for studying the polyharmonicity of curves. In particular, we will discuss some of the known results for curves in a Riemannian manifold and the recent original results we have obtained in Semi-Riemannian manifolds.

Day 3

November 8th, 9:30 AM – 21:00 PM

Title

PS 9:30

Christiane TAMMER

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It is well-known that duality theory is a fundamental tool in various areas of mathematics. There are great advantages to including or using the dual problem and duality statements. Especially, solving the dual problem can be done using other methods of analysis or numerical mathematics.
We consider a primal vector optimization problem with an objective function acting between a linear topological space X and a linear topological space Y equipped with a pointed closed convex cone $D \subset Y$ with nonempty interior. We assume that the vector-valued objective function is D-quasiconvexity and the feasible set is supposed to be a closed convex cone. Using a suitable nonlinear scalarization and the special structure of the primal problem, we construct a useful dual problem.
In this talk, we derive weak and strong (direct and converse) duality assertions.

Invariants of vector bundles with connection

PS 10:50

Sergiu MOROIANU

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We define a Chern–Simons invariant of connections on stably trivial vector bundles over smooth manifolds, taking values in 3-forms modulo closed forms with integral cohomology class. We show an additivity property of this invariant for connections defined on a direct sum of bundles, under a certain block-diagonality condition on the curvature. We deduce an obstruction for conformally immersing a n-dimensional Riemannian manifold in a translation manifold of dimension $n+1$.

Stochastic Inverse Problem of Estimating Random Coefficients

PS 11:30

Akhtar KHAN

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This talk focuses on estimating the mean and variance of stochastic coefficients in mixed variational problems, with an application to the elasticity imaging inverse problem for tumor localization. We begin with an abstract mixed variational formulation in which both the coefficients and the right-hand side are strongly measurable functions. By establishing pathwise mixed variational problems, we demonstrate unique solvability for each realization and prove the measurability of the corresponding pathwise solutions. These results lead to an integral formulation that provides the foundation for treating the inverse problem as a stochastic optimization problem and for developing a discretization framework for both direct and inverse problems. Within the setting of Sobolev–Bochner spaces, we establish existence results for the integral solutions and derive basic estimates. We further analyze the coefficient-to-solution map, proving its Lipschitz continuity and characterizing its first- and second-order derivatives. Two optimization formulations will be presented: a classical least-squares approach and an energy-minimization approach, the latter shown to be convex. Finally, we introduce a stochastic approximation framework for solving the inverse problem. The coupling of this stochastic approximation scheme with a stochastic Galerkin-based discretization will be used to compute the solutions. Numerical examples will be presented to illustrate the performance of the proposed methods.