

Institute of Mathematics and Informatics  
Bulgarian Academy of Sciences

**Fourth International Conference**  
**MATHEMATICS DAYS IN SOFIA**

July 10-14, 2023, Sofia, Bulgaria



**Scientific Programme**

<https://mds.math.bas.bg/>

## Organizers



Institute of Mathematics and Informatics, Bulgarian Academy of Sciences  
Union of the Bulgarian Mathematicians  
Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski"

## Sponsors



SIMONS FOUNDATION





The Fourth International Conference *Mathematics Days in Sofia* is held in Sofia, Bulgaria, in the period July 10 – 14, 2023.

The Conference is organized by the *Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences* in collaboration with the *Union of the Bulgarian Mathematicians* and the *Faculty of Mathematics and Informatics of Sofia University "St. Kliment Ohridski"*.

The purpose of the events *Mathematics Days in Sofia* is to present the current state of the art in all areas of mathematics and mathematical aspects of computer science and their applications.

One of the main goals of the Conference is to bring together Bulgarian mathematicians and computer scientists working all over the world. In this way, we enrich the relations between the mathematicians working in Bulgaria and the Bulgarian mathematical diaspora.

About 200 scientists from 29 countries participate in the fourth issue of the Conference. They present more than 160 invited talks and communications.

## Programme Committee

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## Satellite Events Organizers

### International Workshop "Invariant Distances and Metrics in Complex Analysis"

Nikolai Nikolov (IMI BAS, Bulgaria)

Pascal J. Thomas (Université Paul Sabatier, France)

Krassimira Ivanova (IMI BAS, Bulgaria)

### International Workshop "Hausdorff Geometry of Polynomials"

Edward Saff (Vanderbilt University, USA)

Boris Shapiro (Stockholm University, Sweden)

Andrei Martinez-Finkelstein (Baylor University, USA)

Peter Boyvalenkov (IMI BAS, Bulgaria)

### Third Meeting of Young Bulgarian Mathematicians

Oleg Mushkarov (IMI BAS, Bulgaria)

Antoni Rangachev (IMI BAS, Bulgaria)

### Mini-symposium "Advances in Stochastics"

Maroussia Slavtchova-Bojkova (Sofia University, Bulgaria)

Eugenia Stoimenova (IMI BAS, Bulgaria)

### Mini-symposium "Analysis of Nonlinear Waves"

Sevdzhan Hakkaev (IMI BAS, Bulgaria and Trakya University, Turkiye)

Milena Stanislavova (University of Alabama at Birmingham, USA)

Atanas Stefanov (University of Alabama at Birmingham, USA)

### Mini-symposium "Data Analysis and Modelling in Contemporary Epidemiology"

Antoni Rangachev (IMI BAS, Bulgaria)

Georgi Boyadzhiev (IMI BAS, Bulgaria)

Ognyan Kounchev (IMI BAS, Bulgaria)

Radka Argirova (Acibadem City Clinic Tokuda Hospital, Bulgaria)

### Mini-symposium "Integrability and Mathematical Physics"

George Papamikos (University of Essex, UK)

Georgi Boyadzhiev (IMI BAS, Bulgaria)

Georgi Grahovski (University of Essex, UK)

Rossen Ivanov (Technological University Dublin, Ireland)

### Mini-symposium "Topology and Applications"

Vladimir Todorov (UACEG, Bulgaria)

Ekaterina Mihaylova (UACEG, Bulgaria)

## Common Structure of the Program Schedule

### July 10

09:30 – 10:00	Opening Session	Hyatt Regency Sofia
10:00 – 10:50	Talk by the winner of IMI Prize	
10:50 – 11:10	<i>coffee break</i>	
11:10 – 12:00	Plenary panel	
14:00 – 15:30	Section/mini-symposium panels	IMI-BAS
15:30 – 16:00	<i>coffee break</i>	
16:00 – 18:00	Section/mini-symposium panels	
18:30 – 20:00	Welcome party	IMI-BAS

### July 11

10:00 – 10:50	Plenary panel	Hyatt Regency Sofia
10:50 – 11:10	<i>coffee break</i>	
11:10 – 12:00	Plenary panel	
14:00 – 15:30	Section/mini-symposium panels	IMI-BAS
15:30 – 16:00	<i>coffee break</i>	
16:00 – 18:00	Section/mini-symposium panels	

### July 12

10:00 – 10:50	Plenary panel	Hyatt Regency Sofia
10:50 – 11:10	<i>coffee break</i>	
11:10 – 12:00	Plenary panel	
14:00 – 15:30	Section/mini-symposium panels	IMI-BAS
15:30 – 16:00	<i>coffee break</i>	
16:00 – 18:00	Section/mini-symposium panels	

### July 13

10:00 – 10:50	Plenary panel	Hyatt Regency Sofia
10:50 – 11:10	<i>coffee break</i>	
11:10 – 12:00	Plenary panel	

14:00 – 15:30	Section/mini-symposium panels	IMI-BAS
15:30 – 16:00	<i>coffee break</i>	
16:00 – 18:00	Section/mini-symposium panels	

20:00 – 23:00	Official dinner	Hyatt Regency Sofia
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### July 14

10:00 – 10:50	Plenary panel	Hyatt Regency Sofia
10:50 – 11:10	<i>coffee break</i>	
11:10 – 12:00	Plenary panel	

14:00 – 15:30	Section/mini-symposium panels	IMI-BAS
15:30 – 16:00	<i>coffee break</i>	
16:00 – 18:00	Section/mini-symposium panels	

18:00 – 20:00	Sofia sightseeing tour	Sofia Historical Center
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\*) Depending of the number of included talks and their types some of the section/mini-symposium panels are slightly shorter or longer.

## Registration Desk

July 9	14:00-17:00	IMI-BAS
July 10	08:00-09:00	Hyatt Regency Sofia
July 10	13:30-16:00	IMI-BAS
July 11	13:30-16:00	IMI-BAS
July 12	13:30-14:00	IMI-BAS
July 13	13:30-14:00	IMI-BAS

## Social Program

(included in all registration rates)

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### Welcome party

July 10, 18:30 – 20:00, IMI-BAS

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### Official dinner

July 13, 20:00 – 23:00, Hyatt Regency Sofia

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### Sightseeing tour

July 14, 18:00 – 20:00, Sofia historical center

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# Opening Session

## Hyatt Regency Sofia

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### July 10, Vasil Levski Ballroom, 09:30-10:00

- Opening by the President of the Republic of Bulgaria Rumen Radev
- IMI Mathematics Prize Awarding for 2023

# Plenary Talks

## Hyatt Regency Sofia

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### July 10, Vasil Levski Ballroom

Chair: Vesselin Drensky

- ❖ 10:00-10:50  
Vesselin Dimitrov: *Converse theorems and Diophantine analysis*
- ❖ 11:10-12:00  
Kevin Ford: *Detecting prime numbers in general sequences*

### July 11, Botev Hall

Chair: Petar Popivanov

- ❖ 10:00-10:50  
Bojko Bakalov: *Algebras in 2-dimensional conformal field theory*
- ❖ 11:10-12:00  
Plamen Iliev: *Fejér-Riesz factorizations and Bernstein-Szegő measures*

### July 12, Botev Hall

Chair: Oleg Mushkarov

- ❖ 10:00-10:50  
Gueo Grantcharov: *Isotropic Killing vector fields and complex surfaces*
- ❖ 11:10-12:00  
Slawomir Dinew: *Geodesics in the space of convex and plurisubharmonic functions*



## July 13, Botev Hall

Chair: Petar Kenderov

❖ 10:00-10:50

Pavel Boychev: *Letting the steam off STEAM education (Developing and utilizing intuition, imperfection and gamification in STEAM)*

❖ 11:10-12:00

Stoyan Mihov: *Finite-state machines and neural networks for language modelling*

## July 14, Botev Hall

Chair: Stanimir Troyanski

❖ 10:00-10:50

Bojan Popov: *Invariant domain preserving approximations for hyperbolic systems and related problems*

❖ 11:10-12:00

Peter Minev: *Efficient integrators for incompressible flow*

**Section**  
**“Mathematical Logic, Algebra, Number Theory,  
and Combinatorics”**

IMI, Hall 578

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**10th July (Monday)**

Chair: Bojko Bakalov

- ❖ 14:00-14:45  
Antun Milas: *Combinatorics of arc algebras in vertex algebra theory*
- ❖ 14:45-15:30  
Plamen Koshlukov: *Gradings on block-triangular matrix algebras*

Chair: Dessislava Kochloukova

- 16:00-16:30  
Tatiana Todorova: *A Diophantine problem with a prime and three squares of primes of a special form*
- 16:30-17:00  
Ivan Chipchakov, Boyan Paunov: *Quasifinite fields of prescribed characteristic and Diophantine dimension*
- 17:00-17:30  
Alaa Abouhalaka: *Almost prime radical and almost radical ideals*

**11th July (Tuesday)**

Chair: Natasha Rozhkovskaya

- ❖ 14:00-14:45  
Sihem Mesnager: *A mathematical guided tour from symmetric cryptography to linear codes: a selection of main problems on functions over finite fields, recent achievements and perspectives*
- 14:45-15:15  
Assia Rousseva: *Characterization of some strong  $(t \bmod q)$ -arcs*

Chair: Sihem Mesnager

- 16:00-16:30  
Emiliyan Rogachev: *Blocking sets in  $PG(r, q)$  and ternary codes of dimension 6*
- 16:30-17:00  
Ivanka Nikolova: *Modeling with recurrence relations. Tower of Hanoi*

### 12th July (Wednesday)

Chair: Stoyan Mihov

- ❖ 14:00-14:45  
Tinko Tinchev: *On the correspondence theory*
- 14:45-15:15  
Ibrahim Senturk: *A note on general state-morphism in Sheffer stroke basic algebras*

Chair: Tinko Tinchev

- 16:00-16:30  
Dimitar Dobrev: *Language for description of worlds*
- 16:30-17:00  
Marin Genov: *Functions holomorphic over finite-dimensional commutative associative unital algebras*

### 13th July (Thursday)

Chair: Azniv Kasparian

- ❖ 14:00-14:45  
Natasha Rozhkovskaya: *Linear transformations of vertex operators of hall-littlewood polynomials*
- 14:45-15:15  
Youngook Choi: *Linear series on a curve of compact type*

Chair: Ivan Chipchakov

- 16:00-16:30  
Hristo Iliev: *Curves on cones giving rise to non-reduced components of the Hilbert scheme of curves*
- 16:30-17:00  
Azniv Kasparian: *Modular forms on ball quotients, birational to bielliptic surfaces*
- 17:00-17:30  
Pancho Beshkov: *Smooth toroidal compactifications of ball quotients with bi-elliptic minimal model*

14th July (Friday)

Chair: Antun Milas

- ❖ 14:00-14:45  
Greta Panova: *Computational complexity in algebraic combinatorics*
- ❖ 14:45-15:30  
Dessislava Kochloukova: *Higher dimensional algebraic fiberings of group extensions*

Chair: Plamen Koshlukov

- 16:00-16:30  
Elitza Hristova: *On the  $GL(n)$ -module structure of Lie nilpotent associative relatively free algebras*
- 16:30-17:00  
Vesselin Drensky: *Free bicommutative superalgebras*
- 17:00-17:30  
Şehmus Findik: *Recent advances in symmetric polynomials*

# Section “Geometry and Topology”

IMI, Hall 403

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## 10th July (Monday)

Chair: Vestislav Apostolov

- ❖ 14:00-14:45  
Georges Dloussky: *On classification of non Kählerian compact complex surfaces*
- 14:45-15:30  
Stefan Ivanov: *Solution of the qc Yamabe equation on a 3-Sasakian manifold and the quaternionic Heisenberg group*

Chair: Stefan Ivanov

- 16:00-16:30  
Peter Dalakov: *Seiberg-Witten differentials on the Hitchin base*
- 16:30-17:00  
Viktoria Bencheva: *Timelike surfaces with parallel normalized mean curvature vector field*
- 17:00-17:30  
Peter Petrov: *On a generalization of Drinfeld - Grinberg - Kazhdan theorem*
- 17:30-18:00  
Danila Cherkashin: *A self-similar infinite binary tree is a solution for the Steiner problem*
- 18:00-18:30  
Vesko Vaslov: *On homogeneous ANR-spaces*

## 12th July (Wednesday)

Chair: Velichka Milousheva

- ❖ 14:00-14:45  
Ina Petkova: *A contact invariant from bordered Heegaard Floer homology*
- ❖ 14:45-15:30  
Rafael López: *New perspectives on the notion of catenary*

Chair: Gueo Grantcharov

- ❖ 16:00-16:45  
Arkady Leiderman: *Kolmogorov superposition theorem and its applications in topological algebra*
- 16:45-17:15  
Jose Medel Torrero: *Towards constructing new solutions for the Hull-Strominger system*
- 17:15-17:45  
Andrei Lasnier: *Multiplicities for smoothable curves*
- ❖ 17:45-18:30  
Julien Keller: *Constant scalar curvature Kähler cone metrics and beyond*

**Section**  
**“Analysis”**  
**IMI, Hall 503**

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**11th July (Tuesday)**

Chair: Virginia Kiryakova

- 14:00-14:30  
Diana Stoeva: *On Gabor frames and compactly supported dual frames*
- 14:30-15:00  
Lubomir Markov: *A Hjortnaes-type integral for the Basel series, and several other results involving the special functions which generalize it*
- 15:00-15:30  
Zerrin Onder: *The  $(N,p,q)$  summability and its applications to Tauberian theory*

Chair: Jordanka Paneva-Konovska

- 16:00-16:30  
Pando Georgiev: *Parametric variational principles in Banach spaces*
- 16:30-17:00  
Radu Miculescu: *Graph Lipscomb's space is a generalized Hutchinson-Barnsley fractal*

## Section “Differential Equations and Mathematical Physics”

IMI, Hall 055

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### 10th July (Monday)

Chair: Plamen Stefanov

- ❖ 14:00-14:45  
Kiril Datchev: *Low frequency scattering asymptotics in dimension two*
- ❖ 14:45-15:30  
Petar Topalov: *Spatially quasi-periodic solutions of the Euler equation*

Chair: Nikola Kamburov

- 16:00-16:30  
Milena Stanislavova: *Asymptotic behavior of semigroups generated by Hamiltonian linearizations*
- 16:30-17:00  
Atanas Stefanov: *Solitary waves for power degenerate NLS - existence and stability*
- 17:00-17:30  
Vesselin Vatchev: *On multi-fission interaction of traveling waves for the two-dimensional Euler equations*

### 11th July (Tuesday)

Chair: Petar Popivanov

- ❖ 14:00-14:45  
Maciej Zworski: *Internal waves in 2D aquaria and homeomorphisms of the circle*
- ❖ 14:45-15:30  
Fioralba Cakoni: *Transmission eigenvalues and non-scattering inhomogeneities*



Chair: John Schotland

- 16:00-16:30  
Agnieszka Bartłomiejczyk: *Travelling waves in modelling chemotherapy for gliomas*
- 16:30-17:00  
Nikola Kamburov: *On positive solutions of the Lane-Emden system in the plane*
- 17:00-17:30  
Piotr Bartłomiejczyk: *Modelling a neuron via one-dimensional dynamics*

12th July (Wednesday)

Chair: Vladimir Georgiev

- ❖ 14:00-14:45  
John Schotland: *Nonlocal PDEs and quantum optics*
- 14:45-15:15  
Georgi Boyadzhiev: *Comparison and maximum principles for systems of nonlinear PDE. Applications*

**Section**  
**“Numerical Analysis, Operations Research,  
Probability and Statistics”**

IMI, Hall 478

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**10th July (Monday)**

Chair: Kamen Ivanov

- ❖ 14:00-14:45  
Geno Nikolov: *Inequalities of Duffin-Schaeffer type*
- 14:45-15:15  
Pando Georgiev: *Tensor decompositions and applications to optimization problems and data analysis*

Chair: Eugenia Stoimenova

- 16:00-16:30  
Detelina Kamburova: *Saddle points in completely regular topological spaces*
- 16:30-17:00  
Mohammed Beggas: *A new approach to geometrical convergence of Schwarz method for parabolic quasi-variational inequalities*
- 17:00-17:30  
Alexander Klump: *The inverse first-passage time problem for general stochastic processes including Lévy processes and diffusions*

**13th July (Thursday)**

Chair: Mladen Savov

- ❖ 14:00-14:45  
Dieter Mitsche: *Tail bounds for detection times in mobile hyperbolic graphs*
- ❖ 14:45-15:30  
George Yanev: *Characterization properties of exponential distribution*

Chair: Dieter Mitsche

- 16:00-16:30  
Alessandro Barbiero: *A discrete analogue of the half-logistic distribution based on the mimicking of the probability density function*
- 16:30-17:00  
Martin Minchev: *Bivariate Bernstein-gamma functions and asymptotic behaviour of exponential functionals on deterministic horizon*
- 17:00-17:30  
Hristo Sariev: *Characterization of exchangeable measure-valued Pólya urn sequences*
- 17:30-18:00  
Lyben Lichev: *The clique chromatic number of random graphs*

# Section “Mathematical Foundations of Computer Science and Artificial Intelligence”

IMI, Hall 278

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## 12th July (Wednesday)

Chair: Galia Angelova

- ❖ 14:00-14:45  
Stefka Fidanova: *How ants can solve engineering problems*
- ❖ 14:45-15:30  
Petia Koprinkova-Hristova: *Brain-inspired AI models*

Chair: Stefka Fidanova

- 16:00-16:30  
Teodor Boyadzhiev: *Analysis of convolutional auto-encoder latent space*
- 16:30-17:00  
Galina Momcheva: *Design of new architectures for artificial neural networks inspired by modern brain research*

## 13th July (Thursday)

Chair: Petia Koprinkova-Hristova

- ❖ 14:00-14:45  
Petia Radeva: *How self-supervised learning can leverage food fine-grained recognition*
- 14:45-15:15  
Milena Dobрева, Krassimira Ivanova: *How to measure the contribution of games to skills? A case study of disinformation games*

Chair: Krassimira Ivanova

- 16:00-16:30  
Negoslav Sabev: *Accessibility analysis of the current state of public bodies' websites in Bulgaria*
- 16:30-17:00  
Radoslav Markov: *AI-assisted restoration and enhancement of the archival visual content*

## Section “Mathematics Education and History of Mathematics”

IMI, Hall 057

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### 10th July (Monday)

*School Students' Session*

Chair: Zlatogor Minchev

- 14:00-14:30  
Miroslav Marinov, Nikola Gyulev: *Proof of the modulo 4 bias for the semiprimes*
- 14:30-15:00  
Delyan Boychev, Kristian Georgiev: *Adversarial training approaches providing enhanced interpretability in computer vision models*
- 15:00-15:30  
Liubomir Nenov, Zvezdin Besarabov: *Method for performing computations on hidden data in a decentralized environment*

Chair: Zlatogor Minchev

- 16:00-16:30  
Daniela Nikolova: *Symmetric structures in nature: undergraduate research at Florida Atlantic University*
- 16:30-17:00  
Simona Gagarova: *Graph-codes of bipartite graphs*

### 13th July (Thursday)

Chair: Daniela Nikolova

- ❖ 14:00-14:45  
Toni Chehlarova, Georgi Gachev, Petar Kenderov: *The online competition "Mathematics with Computer"*
- ❖ 14:45-15:30  
Eugenia Kovatcheva: *Moving forward to new educational realities in the digital era*

Chair: Eugenia Kovatcheva

- 16:00-16:30  
Maria Brauchle: *The STEM school label platform and the Bulgarian participation*
- 16:30-17:00  
Dragomir Marchev: *LOFAR-BG – the Bulgarian station of the LOFAR project*
- 17:00-17:30  
Stanislav Harizanov: *The Bulgarian trace in international mathematical competitions: foundation, organization, and participation*

# Workshop

## “Invariant Distances and Metrics in Complex Analysis”

in honour of our teacher and friend Prof. Dr. Peter Pflug  
on the occasion of his 80th birthday

IMI, Hall 503

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### 12th July (Wednesday)

Chair: Gautam Bharali

- ❖ 14:00-14:45  
Filippo Bracci: *Visibility and geodesic loops in Kobayashi complete hyperbolic and Gromov hyperbolic domains*
- ❖ 14:45-15:30  
Matteo Fiacchi: *The Julia-Wolff-Carathéodory theorem in convex domains of finite type*

Chair: Filippo Bracci

- ❖ 16:00-16:45  
Gautam Bharali: *The squeezing function: exact computations and a new application*
- ❖ 16:45-17:30  
Armen Edigarian: *Isometries on the symmetrized bidisc*

### 13th July (Thursday)

Chair: Armen Edigarian

- ❖ 14:00-14:45  
Włodzimierz Zwonek: *2-proper holomorphic images of the Cartan domains*
- ❖ 14:45-15:30  
Lukasz Kosinski: *Extension property*



Chair: Włodzimierz Zwonek

❖ 16:00-16:45

Slawomir Dinew: *Complex nonlinear equations, weak solutions and admissible domains*

❖ 16:45-17:30

Zywoimir Dinew: *Aspects of B-regularity*

## 14th July (Friday)

Chair: Pascal J. Thomas

❖ 14:00-14:45

Herve Gaussier: *Invariant metrics – old and more recent results*

❖ 14:45-15:30

Ahmed Yekta Okten: *Estimates of the Kobayashi distance of strongly pseudoconvex domains*

Chair: Herve Gaussier

❖ 16:00-16:45

Andrew Zimmer: *Bounded geometry in several complex variables*

❖ 16:45-17:30

Open problems

# Workshop

## “Hausdorff Geometry of Polynomials”

dedicated to the memory of Acad. Blagovest Sendov

### Grand Hotel Sofia, Hall "Triaditsa 1"

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#### 10th July (Monday)

- ❖ 14:00-14:50  
Hristo Sendov: *Stronger Rolle's theorem for complex polynomials*
- ❖ 15:30-16:20  
Arno Kuijlaars: *Matrix orthogonal polynomials and random tilings*
- ❖ 16:30-17:20  
Dmitrii Karp: *Polynomials arising in hypergeometric research: motivation, properties and conjectures*

#### 11th July (Tuesday)

- ❖ 14:00-14:50  
Andrei Martinez-Finkelshtein: *On the flow of zeros of derivatives of polynomials*
- ❖ 15:30-16:20  
Vladimir Kostov: *Beyond Descartes' rule of signs*
- ❖ 16:30-17:20  
Nikos Stylianopoulos: *Strong comparison law for Faber and Bergman*

#### 12th July (Wednesday)

- ❖ 14:00-14:50  
Franck Wielonsky: *Optimal prediction measures and polynomials of extremal growth*
- ❖ 15:30-16:20  
Lyudmila Kryvonos: *TBA*
- ❖ 16:30-17:30  
Open problems

### 13th July (Thursday)

- ❖ 14:00-14:50  
Boris Shapiro: *Introducing isodynamic points for binary forms and their ratios*
- ❖ 15:30-16:20  
Edward Saff: *Threshold condensation to singular support for a Riesz equilibrium problem*
- ❖ 16:30-17:30  
Open problems

### 14th July (Friday)

- ❖ 14:00-14:50  
Ramon Orive: *Electrostatic partners or... How can we find an electrostatic interpretation for the zeros of multiple orthogonal polynomials?*
- ❖ 15:30-16:20  
Open problems
- ❖ 16:30-17:20  
Open problems

# Third Meeting of Young Bulgarian Mathematicians

IMI, Hall 403

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## 13th July (Thursday)

Chair: Antoni Rangachev

- ❖ 14:00-14:05  
Opening ceremony
- ❖ 14:05-14:50  
Martin Vechev: *Deep learning with guarantees*
- ❖ 14:50-15:35  
Ina Petkova: *Knot Floer homology and contact knot theory*
- ❖ 16:00-16:45  
Borislav Mladenov: *Seiberg-Witten duality for hyperkähler manifolds, deformation quantisation and formality of differential graded algebras associated to holomorphic Lagrangians*

## 14th July (Friday)

Chair: Mladen Savov

- ❖ 14:00-14:45  
Stoyan Dimitrov: *Why would you want to count? Problems and results illustrating a set of reasons*
- ❖ 14:45-15:30  
Nikola Konstantinov: *Statistical aspects of trustworthy machine learning*
- ❖ 16:00-16:45  
Stoyan Apostolov: *Transversality concepts in variational analysis*

## Mini-symposium “Advances in Stochastics”

dedicated to the contributions of Prof. Nikolay Yanev

IMI, Hall 478

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### 11th July (Tuesday)

Chair: Miguel González Velasco

- ❖ 14:00-14:45  
Maroussia Slavtchova-Bojkova: *The root of exponentially growing and branching knowledge*
- ❖ 14:45-15:30  
Nikolay Yanev: *Branching processes - Regulation, Regeneration, Statistical Inference, Applications*

Chair: George Yanev

- ❖ 16:00-16:45  
Miguel González Velasco: *Controlled branching processes subordinated by a renewal process*
- ❖ 16:45-17:30  
Ollivier Hyrien: *Clonal dynamics modeled by multitype age-dependent branching processes with non-homogeneous immigration*

### 12th July (Wednesday)

Chair: Ollivier Hyrien

- 14:00-14:30  
Ines Maria del Puerto: *Large Deviation Rates for Controlled Branching Processes*
- 14:30-15:00  
Assen Tchorbadjieff, Penka Mayster: *Wright function in the solution to the Kolmogorov equation of the Markov branching process with geometric reproduction of particles*

- 15:00-15:30  
George Yanev: *Branching processes with migration subordinated by a renewal process*

Chair: Ines Maria del Puerto

- 16:00-16:30  
Anna Staneva, Vessela Stoimenova: *Statistical estimation of multitype branching processes via machine learning methods*
- 16:30-17:00  
Kosto Mitov: *Markov branching processes with non-homogeneous Poisson immigration*
- 17:00-17:30  
Pavlina Jordanova, Mladen Savov, Assen Tchorbadjieff, Milan Stehlik: *Mixed Poisson process with Stacy mixing variable*

# Mini-symposium “Analysis of Nonlinear Waves”

IMI, Hall 256

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## 11th July (Tuesday)

Chair: Atanas Stefanov

- 14:00-14:30  
Vladimir Georgiev: *Stability/instability results for NLS with singularity in 2D*
- 14:30-15:00  
John Albert: *Stability of travelling waves for some nonlocal nonlinear Schrodinger equations*
- 15:00-15:30  
Milan Ivanov: *Truncated contact defects in reaction-diffusion systems*

Chair: Atanas Stefanov

- 16:00-16:30  
Iryna Petrenko: *Well-posedness and solitary waves in the nonlinear Schrodinger equation with higher order dispersion*
- 16:30-17:00  
George Venkov: *Extremals to new Gagliardo-Nirenberg inequality and solitary waves*
- 17:00-17:30  
Svetlana Roudenko: *On fractional gKdV-type equations in 1d and higher dimensions*

## 12th July (Wednesday)

Chair: Milena Stanislavova

- ❖ 14:00-15:00  
Dmitry Pelinovsky: *Stability analysis of peaked and smooth traveling waves*

- 15:00-15:30  
Xing Cheng: *Global existence of the weak solution of three dimensional focusing energy-critical nonlinear Schrödinger equation*

Chair: Milena Stanislavova

- 16:00-16:30  
Ademir Pastor: *Weighted estimates and local well-posedness for some nonlinear dispersive equations*
- 16:30-17:00  
Dionyssios Mantzavinos: *The Robin and Neumann problems for the nonlinear Schrödinger equation*
- 17:00-17:30  
Nilay Duruk: *The role of dispersive effect in qualitative analysis of nonlinear nonlocal equations*

### 13th July (Thursday)

Chair: Sevdzhan Hakkaev

- 14:00-14:30  
Yuri Latushkin: *Fredholm determinants, Evans functions and Maslov indices for partial differential equations*
- 14:30-15:00  
Fabio Natali: *Transversal spectral instability of periodic traveling waves for the generalized Zakharov-Kuznetsov equation*
- 15:00-15:30  
Abba Ramadan: *Stability of solitary waves in the NLS system of the third-harmonic generation*

Chair: Sevdzhan Hakkaev

- 16:00-16:30  
Stephane Lafortune: *Stability analysis of solutions to the b-family of peakon equations*
- 16:30-17:00  
Vahagn Manukian: *Multi-scale reduction of modified Holling-Tanner model with an Allee effect*



**Mini-symposium**  
**“Data Analysis and Modelling in Contemporary  
Epidemiology”**

IMI, Hall 256

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**14th July (Friday)**

Chair: Ognyan Kounchev

- 14:00-14:30  
Radka Argirova: *A nationwide comparison of COVID-19 outcomes of vaccinated against non-vaccinated patients with single comorbidities in Bulgaria (March 2020 – April 2022)*
- 14:30-14:50  
Hristiana Batselova: *Infectious diseases with increased risk for public health in Bulgaria*
- 14:50-15:10  
Trifon Valkov: *Handbook for diagnostics and treatment of COVID-19*
- 15:10-15:30  
George Dimitrov: *Contemporary digital solutions for clinical decision support in the context of the COVID-19 pandemic*

Chair: Ognyan Kounchev

- 16:00-16:20  
Latchezar Tomov: *Classical vs postclassical epidemiologic modeling - reflections on the COVID-19 pandemic*
- 16:20-16:40  
Milen Borisov, Svetoslav Markov: *On the relation between the SEI epidemiological model and the logistic model. Analysis using reaction network theory*
- 16:40-17:00  
Tsvetomir Tsachev: *Optimal control of Covid-19 spread*
- 17:00-17:20  
Georgi Boyadzhiev: *Spatial SEIR epidemic models with low rate of infected*

Chair: Ognyan Kounchev

- 17:40-18:00  
Georgi Simeonov: *Modeling of the initial phase of Omicron spread in Bulgaria*
- 18:00-18:20  
Dimitar Atanasov: *Statistical modelling of COVID-19 pandemic development applying branching processes*
- 18:20-18:40  
Antoni Rangachev: *The impact and progression of the COVID-19 pandemic in Bulgaria in its first two years*
- 18:40-19:00  
Ognyan Kounchev: *Modeling of the initial phase of Omicron spread in Bulgaria – the hidden cases*

# Mini-symposium “Integrability and Mathematical Physics”

IMI, Hall 055

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## 13th July (Thursday)

Chair: Rossen Ivanov

- ❖ 14:00-14:45  
George Papamikos: *Solutions of the set theoretical Yang-Baxter equation over Grassmann algebras*
- ❖ 14:45-15:30  
Pavlos Kassotakis: *Matrix factorizations and Pentagon maps*

Chair: George Papamikos

- ❖ 16:00-16:45  
Vladimir Gerdjikov: *On action-angle variables of 2-dimensional Toda field theories*
- ❖ 16:45-17:30  
Georgi Grahovski: *On real Hamiltonian forms of affine Toda field theories*
- ❖ 17:30-18:00  
Meglana Lazarova, Michail Todorov: *On the solution of the non-ruin probability equation arisen in the extended bivariate Polya-Aeppli risk model*

## 14th July (Friday)

Chair: Georgi Grahovski

- ❖ 14:00-14:45  
Tihomir Valchev: *Special solutions to a multicomponent nonlinear evolution equation*
- ❖ 14:45-15:30  
Rossen Ivanov: *Symmetric spaces and soliton hierarchies*

Chair: Vladimir Gerdjikov

- ❖ 16:00-16:45  
Michail Todorov: *Paradigm and long-time evolution of localized solutions of wave systems: consistency vs integrability*
- ❖ 16:45-17:30  
Stoyan Mishev: *Neural network approximation in the Lipkin-Meshkov-Glick model*
- ❖ 17:30-18:00  
Nikola Stoilov: *Numerical studies of the Zakharov-Kuznetsov equations*

## Mini-symposium “Topology and Applications”

dedicated to the memory of Prof. Stoyan Nedev and Acad. Mitrofan Choban

IMI, Hall 057

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### 11th July (Tuesday)

Chair: Takamitsu Yamauchi

- ❖ 14:00-14:45  
Arkady Leiderman: *Dense metrizable subspaces in powers of Corson compacta*
- ❖ 14:45-15:30  
Vesko Valov: *Separation of homogeneous continua*

Chair: Vesko Valov

- ❖ 16:00-16:45  
Olivier Otafudu: *On entropy in quasi-metric space*
- ❖ 16:45-17:30  
Petar Kenderov, Julian Revalski: *Topological spaces containing dense completely metrizable subsets*

### 12th July (Wednesday)

Chair: Valdemar Tsanov

- ❖ 14:00-14:45  
Ekaterina Mihaylova, Zlatina Tsoleva: *Families of Subspaces of Topological spaces of Countable type*
- ❖ 14:45-15:30  
Takamitsu Yamauchi: *Group coarse structures on locally compact abelian groups*

Chair: Ekaterina Mihaylova

- ❖ 16:00-16:45  
Valdemar Tsanov: *On partial convex hulls of coadjoint orbits of compact groups*



The Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences (IMI-BAS) IMI-BAS was created shortly after the end of WW II by the effort and high professionalism of a generation of Bulgarian mathematicians whom we now thankfully style the pivots of Bulgarian mathematics.

The date 27 October 1947 is rightly considered the birth date of IMI, when the Executive Council of the Academy confirmed the plan of the scientific activity in 1947/1948.

Since its creation in 1947 IMI has been a leading Bulgarian centre for research and training of highly qualified specialists and exercising an efficient, long-range, consistent policy related to the fundamental trends in the development of mathematics, computer science and information technologies.

#### Mission of IMI:

- Development of fundamental and applied research in mathematics and informatics in compliance with the national and European priorities, integration of IMI into the European Research Area;
- Scientific research in the fields of mathematical structures, mathematical modeling and mathematical informatics, enriching the theoretical foundations of mathematics and informatics and leading to innovative applications in other sciences, in information and communication technologies, industry and society;
- Application of mathematics and informatics in the national educational programmes and educational processes at all levels in the country;
- Establishing the Institute of Mathematics and Informatics as a leading research centre in Bulgaria in the field of mathematics and informatics.



