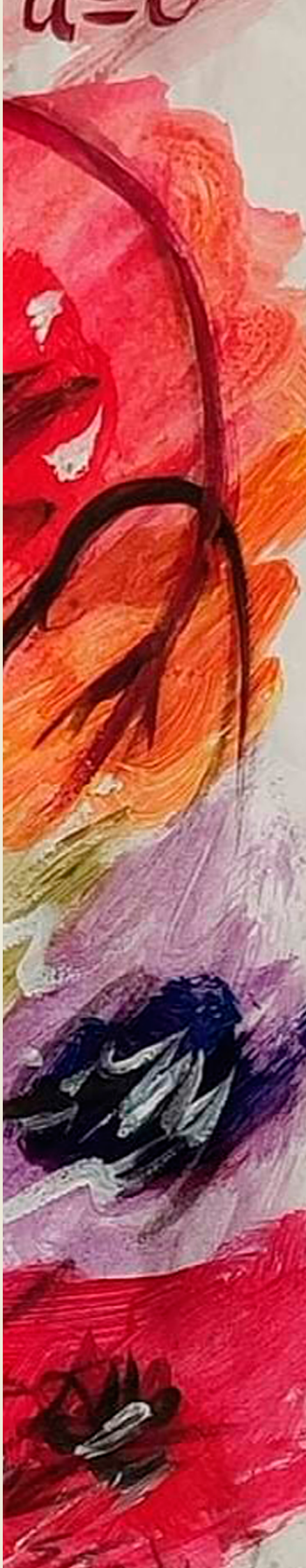
1ο Συνέδριο Ελληνίδων Γυναικών στα Μαθηματικά
11-12 Ιουλίου 2022 στο ΕΜΠ

ΠΡΟΓΡΑΜΜΑ



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ΚΛΗΡΟΔΟΤΗΜΑ Χ.ΠΑΠΑΚΥΡΙΑΚΟΠΟΥΛΟΥ

ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ
ΤΟΜΕΑΣ ΜΑΘΗΜΑΤΙΚΩΝ-ΣΕΜΦΕ

1ο ΣΥΝΕΔΡΙΟ ΕΛΛΗΝΙΔΩΝ ΓΥΝΑΙΚΩΝ ΣΤΑ ΜΑΘΗΜΑΤΙΚΑ

11 – 12 Ιουλίου 2022

Πρόγραμμα

Το συνέδριο θα πραγματοποιηθεί στην Αίθουσα Εκδηλώσεων του ΕΜΠ, που βρίσκεται στο ισόγειο του Κτηρίου Διοίκησης.

Δευτέρα 11 Ιουλίου

09:00 – 09:30	Προσέλευση συνέδρων
09:30 – 10:00	Καλωσόρισμα/Χαιρετισμοί
10:10 – 10:40	Marianthi Markatou (University of Buffalo) *Smoothing Kernels for Categorical and mixed-scale Data*
10:50 – 11:20	Cleopatra Christoforou (Πανεπιστήμιο Κύπρου) *An exposition on hyperbolic balance laws with application to self-organized systems*
11:20 – 11:50	*Coffee break*
11:50 – 12:20	Evita Nestoridi (Princeton University) *Cutoff for the non-backtracking random walk on Ramanujan graphs*
12:30 – 13:00	Marina Iliopoulou (University of Birmingham) *Some small progress on the Mizohata-Takeuchi conjecture*
13:00 – 14:30	*Group photo & Lunch break*
14:30 – 15:00	Paraskevi Gkeka (Molecular Data Sciences, Sanofi R&D) *Deciphering protein function with artificial intelligence (Virtual Talk)*
15:10 – 15:40	Georgia Karali (Πανεπιστήμιο Κρήτης) *Stochastic interface motion and properties of reaction-diffusion equations from phase transitions*
16:00 – 16:20	Παρουσίαση της Έκθεσης "Women of Mathematics throughout Europe: A gallery of portraits" από την Sylvie Paycha (University of Potsdam), Curator της Έκθεσης
16:20 – 16:50	Φόρος τιμής σε αφυπηρετήσασες Ελληνίδες Μαθηματικούς
16:50 – 17:00	Προβολή Μαθηματικού Θεατρικού και απονομή αναμνηστικών στην ομάδα σπουδαστ(ρι)ών
17:00 – 17:30	*Coffee break*
17:30 – 19:00	Στρογγυλή Τράπεζα *Προκλήσεις & Προοπτικές για τις Ελληνίδες Γυναίκες στα Μαθηματικά*
19:00 – 21:00	*Cocktail*

Τρίτη 12 Ιουλίου

09:30 – 10:00	Nelia Charalambous (Πανεπιστήμιο Κύπρου) *The form spectrum of open manifolds (Virtual Talk)*
10:10 – 10:40	Effie Papageorgiou (Πανεπιστήμιο Κρήτης) *The probabilistic method in analysis*
10:40 – 11:10	*Coffee break*
11:10 – 11:40	Maria Vlasiou (University of Twente & Eindhoven University of Technology) *Queues on interacting networks (Virtual Talk)*
11:50 – 12:20	Thalia Zariphopoulou (University of Texas at Austin & University of Oxford) *Human-machine interaction systems: an overview*
12:30 – 13:30	Poster Session
13:30 – 15:00	*Lunch break*
15:00 – 15:30	Eleni Panagiotou (University of Tennessee at Chattanooga) *Knotting and entanglement complexity of open curves in 3-space (Virtual Talk)*
15:40 – 16:10	Dimitra Kosta (University of Edinburgh) *On the strongly robustness property of toric ideals*
16:10 – 16:40	*Coffee break*
16:40 – 17:10	Christina Karafyllia (Stony Brook University) *Conformal mappings in spaces of holomorphic functions (Virtual Talk)*
17:20 – 17:50	Eirini Chavli (University of Stuttgart) *The irreducible representations of the braid group on 3 strands*
18:00 – 19:00	Συζήτηση για μελλοντικές δράσεις του GWM

ΚΑΛΩΣΟΡΙΣΜΑ θα απευθύνει η Σοφία Λαμπροπούλου (ΕΜΠ), ιδρυτικό μέλος του GWM και εκπρόσωπος της Ελλάδας στην Ένωση European Women in Mathematics

ΧΑΙΡΕΤΙΣΜΟΥΣ θα απευθύνουν :

- Ανδρέας Μπουντουβής, Πρύτανης του ΕΜΠ
- Marie-Françoise Roy (University of Rennes), Πρόεδρος της Committee for Women in Mathematics
- Δρόσος Γκιντίδης, Αντιπρύτανης Διοικητικών Υποθέσεων, Ακαδημαϊκών Υποθέσεων και Φοιτητικής Μέριμνας του ΕΜΠ
- Σταύρος Κουρκουλής, Κοσμήτορας Σχολής Εφαρμοσμένων Μαθηματικών και Φυσικών Επιστημών του ΕΜΠ
- Μαρία Δόκα, Γενική Γραμματέας του Συνδέσμου Υποτρόφων του Ιδρύματος Ωνάση
- Ρίβα Λάββα, Συντονίστρια της Επιτροπής Ισότητας των Φύλων του ΕΜΠ
- Sylvie Paycha (University of Potsdam), Εκπρόσωπος της Ένωσης European Women in Mathematics (Δευτέρα 11 Ιουλίου, 16:00)

Στη ΣΤΡΟΓΓΥΛΗ ΤΡΑΠΕΖΑ θα συμμετέχουν :

- Γιάννης Εμίρης (ΕΚΠΑ / Ερευνητικό Κέντρο 'Αθηνά')
- Θάλεια Ζαριφοπούλου (University of Texas at Austin & University of Oxford)
- Μιχάλης Κολουντζάκης (Πανεπιστήμιο Κρήτης)
- Ελίζα Κονοφάγου (Columbia University / ΕΣΕΤΕΚ)
- Σοφία Μπαριάμη (Cresset Software and Discovery)
- Δέσποινα Πόταρη (ΕΚΠΑ)
- Βασιλική Φαρμάκη (ΕΚΠΑ / ΕΛΕΓΥΠ)

Την ΣΤΡΟΓΓΥΛΗ ΤΡΑΠΕΖΑ θα συντονίζουν :

- Χαρά Χαραλάμπους (ΑΠΘ / Committee for Women in Mathematics)
- Ευαγγελία Γαζάκη (University of Virginia / GWM)

ΠΡΟΓΡΑΜΜΑ POSTER SESSION

- Aikaterini Aretaki & Iro Oikonomou (Π. Θεσσαλίας)
  Bounds for the spectral radius of nonnegative matrices and its applications on Fibonacci matrices
- Chrys Caroni (ΕΜΠ) & Francesca Pierri (Università degli Studi di Perugia)
  Using Survival Analysis to Predict Business Firms' Failure
- Myrto Galanopoulou (Heriot-Watt University)
  Weak-strong uniqueness result for quasiconvex adiabatic thermoelasticity
- Anastasios Kokkinakis (ΕΜΠ)
  A one-move Markov theorem for framed braids
- Dimitra Kouloumpou (Σχολή Ναυτικών Δοκίμων)
  Brownian Motion on a n-Dimensional Sphere with Applications in Epidemic Modeling
- Ioanna-Maria Lygatsika (Sorbonne Université)
  Approximation of intermolecular interaction energies using quantum mechanics
- Kallia Pavlopoulou & Xenia Pouliou (ΕΜΠ)
  Is i a really existing entity or just a mathematical tool? A Framework of Representation for Students Beliefs about Complex Numbers
- Kallia Pavlopoulou & Kalliopi Patsi (ΕΜΠ)
  The use of the Geogebra software in an interdisciplinary approach for solving systems of linear equations in secondary education
- Dimitra-Dionysia Stergiopoulou (ΕΚΠΑ & Πανεπιστήμιο Θεσσαλίας)
  A periodicity theorem in the cohomology of the general linear group
- G. Papasotiriou & I. Vonta (ΕΜΠ) and G. Mavrogiannis & A. Karagrigoriou (Π. Αιγαίου)
  Detecting Exponentiality - the Catastroph and Conspiracy principles
- Alexandra Stavrianidi (Stanford University)
  Anomalous spreading and travelling waves for a system of Fisher-KPP type equations
- Theodora Syntaka (University of Bath)
  Long Term Behavior: From particle dynamics through kinetic equations to fractional diffusion equations
- Zoi Terzopoulou (Université Paris-Dauphine)
  Axiomatic Social Choice Theory
- Rafailia-Persefoni Tsiavou (ΑΠΘ)
  Dirac operators: Two different approaches to the Seiberg-Witten equations

ΤΙΤΛΟΙ ΚΑΙ ΠΕΡΙΛΗΨΕΙΣ ΚΕΝΤΡΙΚΩΝ ΟΜΙΛΙΩΝ

Nelia CHARALAMBOUS : The form spectrum of open manifolds

The spectrum of the Laplacian over a manifold reflects many of its geometric and topological properties. In our recent work with Zhiqin Lu, we proved that the essential spectrum of the Laplacian on differential forms over asymptotically flat manifolds is a connected interval. We achieve this result by providing a new analytical criterion for the computation of the spectrum, and combining it with a geometric description of large sets of the manifold using Cheeger-Fukaya-Gromov and Cheeger-Colding theory.

Eirini CHAVLI : The irreducible representations of the braid group on 3 strands

In this talk we will introduce the braid groups and we will explain a classification of the small-dimensional irreducible representations of the usual braid group B_3, by recovering this classification as a consequence of two conjectures for the generic Hecke algebra associated to the finite quotients of B_3.

Cleopatra CHRISTOFOROU : An exposition on hyperbolic balance laws with application to self-organized systems

Mathematical models introduced to capture the emergent behavior of self-organized systems have brought new challenges in the mathematical community and a lot of attention in the recent years. Most studies on flocking models have been on the behavior of the particle model or the corresponding kinetic formulation and its hydrodynamic limit that yields an Euler-type flocking system is of special interest. This area has been investigated so far in the context of smooth solutions. In this talk, we will first have an overview of the theory of entropy weak solutions to hyperbolic balance laws and then focus on the application to self-organized systems. We will discuss how the theory of balance laws is developed to establish the global existence of entropy weak solutions to Euler-type flocking systems with arbitrary initial data and also capture the time-asymptotic flocking behavior. This is a joint work with Debora Amadori from University of L'Aquila.

Paraskevi GKEKA : Deciphering protein function with artificial intelligence

The dynamical behavior of biomolecular systems is typically governed by a small number of collective modes, alternatively collective variables (CVs) or reaction coordinates, the number of which has been previously coined as the intrinsic or effective dimension of a system. CVs were traditionally identified using empirical approaches and intuition. Nevertheless, the complex nature of the CVs makes it particularly challenging or even impossible to intuit for real-life systems. Recent efforts focus on automating the definition of CVs from molecular simulation data, using either supervised or unsupervised Machine Learning (ML) techniques [1]. These CVs are then used to obtain new understanding on the system at hand, perform molecular design, and guide enhanced sampling [2]. In this talk, I will first introduce a new iterative method involving CV learning with autoencoders: Free Energy Biasing and Iterative Learning with AutoEncoders (FEBILAE). Using the alanine dipeptide system and the solvated chignolin mini-protein system as examples, I will present results of our algorithm using the extended adaptive biasing force technique. In the second part of my talk, I will present the application of our method to a real-life problem, i.e. HSP90.

References

[1] P. Gkeka, G. Stoltz, A. Barati Farimani, Z. Belkacemi, M. Ceriotti, J. Chodera, A. Dinner, A. Ferguson, J. Maillet, H. Minoux, C. Peter, F. Pietrucci, A. Silveira, A. Tkatchenko, Z. Trstanova, R. Wiewiora, T. Lelièvre, J. Chem. Theory Comput., 16, 4757–4775 (2020).
[2] Z. Belkacemi, P. Gkeka, T. Lelièvre, and G. Stoltz, Chasing collective variables using autoencoders and biased trajectories, J. Chem. Theory Comput., 18, 1, 59–78 (2022).

Marina ILIOPOULOU : Some small progress on the Mizohata-Takeuchi conjecture

The restriction conjecture, one of the most central problems in harmonic analysis, studies the Fourier transform of functions defined on curved surfaces; specifically, it claims that the level sets of such Fourier transforms are relatively small. The Mizohata-Takeuchi conjecture further studies the shape of these level sets, and in particular the extent to which they can avoid clustering on lines. In this talk we will present a small improvement on the Mizohata-Takeuchi conjecture. This is joint work with Anthony Carbery and Hong Wang.

Christina KARAFYLLIA : Conformal mappings in spaces of holomorphic functions

This talk is about a classical problem in complex analysis and geometric function theory: finding geometric conditions for functions to belong in spaces of holomorphic functions. In particular, we will talk about necessary and sufficient conditions for a conformal mapping of the unit disk to belong to Hardy or weighted Bergman spaces by studying the harmonic measure and the hyperbolic metric in the image region. Moreover, we will describe the Hardy number of conformal mappings in terms of the harmonic measure and the hyperbolic distance and give some applications in comb domains.

Georgia KARALI : Stochastic interface motion and properties of reaction-diffusion equations from phase transitions

We study the motivation and properties of deterministic and stochastic reaction-diffusion equations. More precisely, we review recent results on stocastic interface motion and their sharp interface limits for spatial dimensions one, two or three. If the noise is sufficiently small, the stochastic dynamics (in one-dimension) are given by the Wiener process suitably projected on the slow manifold. In the general stochastic interface motion, where the slow manifold is infinitely dimensional, the limiting dynamics of the interface is given by a stochastic free boundary problem. We also discuss about existence, regularity and density of the stochastic solutions.

Dimitra KOSTA : On the strongly robustness property of toric ideals

To every toric ideal one can associate an oriented matroid structure, consisting of a graph and another toric ideal, called bouquet ideal. The connected components of this graph are called bouquets. Bouquets are of three types; free, mixed and non mixed. We prove that the cardinality of the following sets - the set of indispensable elements, minimal Markov bases, the Universal Markov basis and the Universal Gröbner basis of a toric ideal - depend only on the type of the bouquets and the bouquet ideal. These results enable us to introduce the strongly robustness simplicial complex and show that it determines the strongly robustness property for toric ideals. For co-dimension 2 toric ideals, we study the strongly robustness simplicial complex and prove that robustness implies strongly Robustness. Co-authors: DIMITRA KOSTA, APOSTOLOS THOMA, MARIUS VLADOIU.

Marianthi MARKATOU : Smoothing Kernels for Categorical and mixed-scale Data

Kernels are essential elements in the construction of learning systems and have received considerable attention in machine learning. In statistics, kernels are used as tools for achieving specific data analytic goals, such as density estimation. We discuss the construction and properties of a special class of kernels, the class of diffusion kernels. We first offer a statistical definition of this class, and present an important sub-class, the set of canonical diffusion kernels. We next present an algorithm to construct kernels for categorical scale, either nominal or ordinal, data, and extend this construction to obtain kernels appropriate for use with mixed-scale, that is both categorical and interval scale, data. Our algorithm uses ideas that relate to the theory of continuous time Markov processes and the theory of Toeplitz matrices. We illustrate the construction of these kernels in high-dimensional density estimation. Time permitting we will indicate

the construction of tests statistics, akin to chi-squared tests of independence.

Evita NESTORIDI : Cutoff for the non-backtracking random walk on Ramanujan graphs

Lubetzky and Peres proved that both the non-backtracking and the simple random walk on any Ramanujan graph exhibits the cutoff phenomenon, which describes a sharp transition from being not mixed at all to being very well mixed. In joint work with Peter Sarnak, we consider a different non-backtracking random walk on Ramanujan graphs. Using simple algebraic arguments, we prove that this version of the non-backtracking random walk exhibits cutoff and that in some natural cases the window is bounded.

Eleni PANAGIOTOU : Knotting and entanglement complexity of open curves in 3-space

A novel framework in knot theory will be introduced that can characterize the complexity of open knots and open curves in 3-space in general. In particular, it will be shown how the Jones polynomial, a traditional topological invariant in knot theory, is a special case of a general Jones polynomial that applies to both open and closed curves in 3-space. Similarly, Vassiliev measures will be generalized to characterize the knotting of open and closed curves. When applied to open curves, these are continuous functions of the curve coordinates instead of topological invariants. Using the second Vassiliev measure, the knotting complexity of open random walks in confinement is studied for the first time without any closure scheme and it is proved that it grows as $O(n^2)$ with the length of the walk. A major problem in Applied Knot Theory is the computational cost of such functions in practice. It will be shown that preliminary theoretical results suggest the existence of closed formulas for the computation of the second Vassiliev measure, which would enable a dramatic improvement in the computational methods for identifying complexity or knotting of open or closed curves in applications. We will apply our methods to proteins and show that these enable us to create a new framework for understanding protein folding, which is validated by experimental data. These methods can thus help us understand biopolymer function and biological material properties in many contexts with the goal of their prediction and design.

Effie PAPAGEORGIOU : The probabilistic method in analysis

The probabilistic (counting) method in mathematics is the proof of the existence of a certain object by examining the average behavior of an appropriate collection of candidates. The prototype example of the probabilistic method in this form is the so-called, pigeonhole principle of expectation: a random variable cannot always be smaller (or always greater) than its expectation. Albeit simple, this observation can be proven extremely useful in the sense that, it is often significantly less involved to show the existence of a solution to a problem, compared to a bare-hands constructive proof. In this talk, we present several applications of the probabilistic method in analysis, and discuss older and newer results.

Maria VLASIOU : Queues on interacting networks

Abstract: We introduce the notion of interacting networks and give an overview of surprising results of queues acting on an interacting network, which go against the general principles obtained in classical queuing theory. We mention implications of these new insights for applications on EV charging.

Thalia ZARIPHOPOULOU : Human-machine interaction systems: an overview

I will provide an overview of the new and rapidly developing area of human-machine interaction systems (HMI). Such systems are ubiquitous in personalized sectors like wealth and retirement management, concierge medical care, management of chronic conditions, and others. There is a plethora of challenges on how to model such systems, how to solve the associated mathematical problems and how to actually apply the theoretical findings.

Considerable modeling difficulties stem from the limited ability to quantify the human's risk preferences and describe their evolution, but also from the fact that the stochastic environment, in which the machine optimizes, adapts to real-time incoming information that is exogenous to the human. Furthermore, the human's risk preferences and the machine's states may evolve at different scales.

This interaction creates an adaptive stochastic cooperative game with both asymmetric and incomplete information exchange between the two parties. As a result, challenging questions arise on, among others, how frequently the two parties should communicate, how the human reacts to exogenous events, how to improve the inter-linked reliability between the human and the machine, and others.

HMI systems give rise to new, non-standard optimization problems that combine adaptive stochastic control, stochastic differential games, optimal stopping, multi-scales and learning.