**DYNAMICAL SYSTEMS AND COMPLEXITY**

**CHANIA, CRETE, 18 - 26 JULY 2022**

**DAILY PROGRAM**

**Monday, July 18 (On Line)**

***Chairman: Tassos Bountis***

9:30 - 10:30: Tassos Bountis (University of Patras),

“*Introductory Remarks*”

10:30 - 11:30: Stavros Anastassiou, (University of W. Macedonia)

“*Dynamical Systems and Chaos: A Mathematical Approach*”

11:30 - 12:00: **Coffee Break**

12:00 - 13:00: Frank Nijhoff (University of Leeds)

“*Lagrangian Μultiform Structure of KP Type Systems*”

13:00 - 13:30: Johanne Hizanidis (University of Crete, Heraklion)

*“Dynamical Properties of Neuromorphic Josephson Junctions”*

13:30 - 15:00: **Lunch Break**

15:00 - 16:00: Anastasios Bezerianos (University of Patras)

“*Neural Correlates of Human - Machine Trust in Autonomous Vehicle Context*”

16:00 - 16:30: Astero Provata (NCSR “Demokritos”)

*“Chimera States in 2-Dimensional Networks of Neuronal Oscillators”*

16:30 - 17:00: **Coffee Break**

17:00 - 17:30: Apostolos Dollas (Technical University of Crete, Chania)

*“Reconfigurable Logic - Based Acceleration of Cellular Automata Models”*

**17:30 - 18:30: Presentations by Young Researchers (15’ each)**

Kostas Anesiadis, Vassilios Vachtsevanos, Alexandra Tiganouria (in this order)

**Tuesday, July 19 (On Line)**

***Chairman: Vassilios Constantoudis***

9:30 - 10:30: Haris Skokos (University of Cape Town, South Africa)

“*Chaos in Hamiltonian Systems*”

10:30 - 11:00: Mirella Harsoula (Research Center for Astronomy and Applied Mathematics,

Academy of Athens)

*“The Building Blocks of the Spiral Arms in Galaxies”*

11:00 - 11:30: Matthaios Katsanikas (Research Center for Astronomy and Applied

Mathematics, Academy of Athens)

*“Phase Space and Dynamics in a Caldera-type Hamiltonian system”*

11:30 - 12:00: **Coffee Break**

12:00 - 12:30: Athanassios Tzemos (Research Center for Astronomy and Applied

Mathematics, Academy of Athens)

“*Order and Chaos in Bohmian Quantum Mechanics*”

12:30 - 13:30: Panos Patsis (Research Center for Astronomy and Applied Mathematics,

Academy of Athens)

*“Nonlinear Phenomena Shaping the Structure of Spiral Galaxies”*

13:30 - 15:00: **Lunch Break**

15:00 - 15:30: Kostantinos Kaloudis (University of the Aegean)

*“Energy Transport in 1-Dimensional Oscillator Arrays with Hysteretic Damping”*

15:30 - 16:00: Stavros Komineas (University of Crete, Heraklion)

“*Skyrmionic Textures in Chiral Magnets”*

16:00 - 16:30: Vassilios Rothos (University of Thessaloniki)

*“Homoclinic Solutions in Nonlocal Dynamical Systems”*

16:30 - 17:00: **Coffee Break**

17:00 - 17:30: Dimitris Frantzeskakis (University of Athens)

*“Solitons in Multicomponent Nonlinear Schrödinger Equations”*

17:30 – 18:00: Spyros Kamvyssis (University of Crete, Heraclion)

“*Semiclassical Non-self-adjoint WKB and Focusing NLS: a Fundamental*

*Integrable Model of Unstable Phenomena”*

**18:00 - 19:00: Presentations by Young Researchers (15’ each)**

Konstantina Kyriakoudi, Leonidas Gimissis, Vasileios Konstantakos, Alexandros Konti (in this order)

**Wednesday, July 20 (On Line)**

***Chairperson: Astero Provata***

9:30 - 10:30: Christos Efthymiopoulos (University of Padova)

*“Rotation of Celestial Bodies and its Role in the Development of Chaos Theory”*

10:30 - 11:30: Dimitris Kugiumtzis (University of Thessaloniki)

*“Complex Networks Estimation from Multivariate Time Series”*

11:30 - 12:00: **Coffee Break**

12:00 - 12:30: Filippos Vallianatos (University of Athens)

“*Tsallis Entropy in Geoscience Applications*”

12:30 - 13:00: Theodoros Karakasidis (University of Thessaly)

*“Applications of Non-linear Time Series Analysis in Physics and Engineering”*

13:00 - 13:30: George Papaioannou (University of Patras)

*“Comparison of Nonlinear Complexity Measures of EEG Rhythms in Cognitive*

*Tasks of ASD and ADHD Patients”*

13:30 - 15:00: **Lunch Break**

15:00 - 16:00: Miguel Sanjuan (University of Rey Juan Carlos)

“*Measuring the Unpredictability of Physical Systems: Basin Entropy and Wada*

*Basins*”

16:00 - 16:30: Vassilios Constantoudis (NCSR “Demokritos”)

“***The Challenge of Complexity in Nanotechnology***”

16:30 - 17:00: **Coffee Break**

17:00 - 17:30: Kyriakos Hitzanidis, (National Technical University of Athens)

*“Clifford Algebras and Waves in Plasmas: Dirac type Integral-Differential*

*Equations”*

17:30 - 18:00: Ko van der Weele (University of Patras)

“*A Dynamical Systems View of Granular Waves”*

**18:00 - 18:45: Presentations by Young Researchers**

George Kanellopoulos, Dimitrios Razis, Efthymios Alkiviadis Prapas (in this order)

**Thursday, July 21 (On Line)**

***Chairman: Theodoros Karakasidis***

9:30 - 10:30: Vassilios Basios (Université Libre de Bruxelles)

“*Biological Information Processing, Chaos, and Extended Bayesian Inference”*

10:30 - 11:30: Marko Robnik (University of Maribor)

*“Brief Introduction to Quantum Chaos”*

11:30 - 12:00: **Coffee Break**

12:00 - 12:30: Aikaterini Mandilara (University of Athens)

*“Quantum Key Distribution Networking”*

12:30 - 13:00: Dimitrios Angelakis (Technical University of Crete, Chania)

*“Analog Quantum Simulation and Computation: From Condensed Matter to*

*Quantum Supremacy”*

13:00 - 13:30: Yannis Kominis (National Technical University of Athens)

*“Action-Angle Formulation of Charged Particle Dynamics in Toroidally*

*Confined Plasmas”*

13:30 - 15:00: **Lunch Break**

15:00 - 15:30: Nikolaos Efremidis (University of Crete, Heraklion)

*“Statistical Mechanics and Pressure in Discrete Nonlinear Multimoded*

*Photonic Systems”*

15:30 - 16:00: Vassilios Kovanis (Virginia Polytechnic University, USA)

“*Injection-Locked Tunable Photonic Oscillators: Going Quantum Again!”*

16:00 - 16:30: Athanassios Manos (CY Cergy Université de Paris)

*“The Role of Synaptic and Structural Plasticity in the Long-term*

*Desynchronization Effect by Coordinated Reset Stimulation”*

16:30 - 17:00: **Coffee Break**

17:00 - 18:00: George Dassios (University of Patras)

“*Fractional Calculus: The Tailor Made Method to Solve Real Problems*”

18:00 -18:30: Serge Aubry (CEA Saclay, Gif-sur-Yvette cedex, France), *“Diffusion without*

*spreading of a Wavepacket in Nonlinear Random Lattices”*

**18:30 - 19:15: Presentations by Young Researchers (15’ each)**

Francesca Minicucci Athanassios Vassiliadis, Makrina Agaoglou, (in this order)

**Friday, July 22 (Live/Online “Cultural Center of Chania”)**

***Chairman: Tassos Bountis***

9:30 - 10:30: George Dassios (University of Patras)

*“Athanasios Fokas: A Renaissance Scientist”*

10:30 - 11:00: Colin Rogers (University of New South Wales)

*“Moving Boundary Problems for a Canonical Member of the WKI Inverse*

*Scattering System”*

11:00 – 11:30: Maria Christina van der Weele (Cambridge University)

*“Multidimensional Integrable Systems”*

11:30 - 12:00: **Coffee Break**

12:00 - 12:30: Jingsong He (Shenzhen University, China)

*“High-order Localized Wave Solutions of the New (3+1)-Dimensional*

*Kadomtsev - Petviashvili equation”*

12:30 – 13:00 George Kastis (Academy of Athens Research Center Mathematics)

*“Analytic Reconstruction Methods for Positron Emission Tomography”*

13:00 - 13:30: Nikolaos Protonotarios (Academy of Athens Research Center Mathematics)

“*Fokas on Medical Imaging: Analytic Reconstructions for Emission Tomography”*

13:30 - 15:00: **Lunch Break**

15:00 - 15:30: Georgia Paraskevopoulou (National Kapodistrian University of Athens)

*“A hybrid analytical-numerical algorithm for determining the neuronal current*

*via EEG”*

15:30 - 16:00: Manolis Floratos (University of Athens)

*“The Ultra-Relativistic Limit of the Post Minkowskian Gravity and the Strong*

*Force”*

16:00 - 16:30: Kostas Kalimeris (University of Crete, Heraklion)

*“The Large t-asymptotics of the Riemann Zeta Function”*

16:30 - 17:00: **Coffee Break**

17:00 - 17:30: Efthymios Kaxiras (Harvard University)

*“The Fokas Method for Solving PDEs - An Educational Perspective"*

17:30 - 18:00: Mark Ablowitz (University of Colorado, Boulder)

*«Water Waves, Integrability, Stability»*

18:00 - 18:30: David Smith (National University of Singapore, Singapore)

*“Fokas Diagonalization”*

**21:00 - : Summer School – Conference Dinner**

**Saturday, July 23 (Live/Online at “Cultural Center of Chania”)**

***Chairman: George Dassios***

9:30 - 10:00: Dionyssios Mantzavinos (University of Kansas)

*“The Fokas Method for the Analysis of Dispersive PDEs in Domains with a*

*Boundary”*

10:00 - 10:30: Alex Himonas (University of Notre Dame)

*“Progress in Initial-Boundary Value Problems for Nonlinear Evolution Equations*

*and the Fokas Method”*

10:30 - 11:00: Matthew Colbrook (Cambridge University)

*“The Fokas method for Elliptic PDEs, Wiener-Hopf revisited, and Beyond”*

11:00 -11:30: Yannis Saridakis (Technical University of Crete, Chania)

*“Fokas Transform Method for Classes of Advection-Diffusion IBVPs”*

11:30 - 12:00: **Coffee Break**

12:00 - 12:30: Türker Özsari (Bilkent University, Ankara, Turkey)

“*Existence of Unattainable States for Schrödinger Type flows on the Half Space”*

12:30 - 13:00: Arran Fernandez (Eastern Mediterranean University)

*“Adapting the Fokas method to Fractional-Order PDEs”*

13:00 - 13:30: Beatrice Pelloni (Herriott Watt University)

*“The Unified Fokas Transform: The Key to Unlock the Behaviour of Odd-Order*

*Linear Differential Operators”*

13:30 - 15:00: **Lunch Break**

15:00 - 15:30: Mathew Colbrook (Cambridge University)

*“Robust and Verified Koopmania!”*

15:30 – 16:30: Jonathan Lennels (KTH Royal Institute of Technology)

*“The Implementation of the Fokas Method to Nonlinear Integrable Evolution*

*Equations on the Circle”*

16:30 - 17:00: **Coffee Break**

17:00 – 17:30: Nikolaos Dikaios (Mathematics Research Center, Academy of Athens)

*"Deep Learning and Mathematical Modelling for the COVID-19 Pandemic"*

17:30 – 18:00: Tassos Bountis (University of Patras)

18:00 – 18:30: Thanassis Fokas (Cambridge University)

“*Understanding Nature and Ourselves Through Mathematics*”

**SUNDAY FREE DAY**

**Monday, July 25 (Live at “Cultural Center of Chania”)**

***Coordinators of the Session: G. Tsironis, G. Neofotistos, G. Barmparis (University of Crete)***

***Lab support: Eleni Angelaki (University of Crete)***

9:30 - 11:30: **Part I of the Course**

1. The Fundamentals of Machine Learning
2. End-to-End Machine Learning Project
3. Classification
4. Support Vector Machines
5. Decision Trees

11:30 - 12:00: **Coffee Break**

12:00 - 14:00: **Part II of the Course**

1. Introduction to Artificial Neural Networks with “Keras”
2. Training Deep Neural Networks
3. Processing Sequences Using RNNs and CNNs
4. Representation Learning and Generative Learning Using Autoencoders and GANs

14:00 - 15:00: **Lunch Break**

15:00 - 17:00: Project work in teams of three students

17:00 - 17:30: **Coffee Break**

17:30 - 19:00: Project delivery, evaluation and discussion

**Tuesday, July 26 (On - Line)**

***Chairman: Dimitris Kugiumtzis***

9:30 - 10:30: Costantinos Valagiannopoulos (Nazarbayev University)

*“Nonlinear Photonic Metasurfaces: Multistability via Input Intensity,*

*Angle, and Wavelength”*

10:30 - 11:00: Sotiris-Konstantinou Rizos (Yaroslavl State University)

*“Discrete Integrable Systems and Yang–Baxter Maps”*

11:00 - 11:30: Pavlos Xenitidis (Liverpool Hope University)

*“A discrete Darboux-Lax scheme for Integrable Difference Equations”*

11:30 - 12:00: **Coffee Break**

12:00 - 12:30: Pavlos Kassotakis (University of Kent, UK)

*“Hierarchies of Compatible Maps and Integrable non-Abelian Difference*

*Systems”*

12:30 - 13:00: Theodore Kouloukas (University of Lincoln)

*“Integrable Maps from Deformations of Cluster Mutations”*

13:00 - 13:30: Helen Christodoulidi (University of Lincoln)

*“The Impact of Adiabatic Invariants on the Dynamics of the Fermi-Pasta-*

*Ulam-Tsingou model”*

13:30 – 14:00: Closing Remarks, discussion about the 29th Summer School 2023

**End of the Summer School**