Workshop on Mathematical Modeling Methodologies in Computational Neurodegeneration

The **Laboratory of Bioinformatics and Human Electrophysiology Department of Informatics of the Ionian University (Greece**) in cooperation with the **CARGO Lab (Computer Algebra Research Group) of Wilfrid Laurier University (Canada)** are organizing the **"Workshop on Mathematical Modeling in Computational Neurodegeneration"**, which will be held in **Fields Institute**, Toronto at the 26th of October, 2018.

Dates and location: 26 October 2018, Fields Institute, Toronto, Canada

Topic of the Workshop:

The last decade has witnessed important advances in a wide spectrum of applications and methodologies in the realm of Computational Neurodegeneration. In particular, up to now there has not been a single source of detailed descriptive interpretations on the bringing up of neurodegeneration research, mathematical modeling and computational approaches. With this workshop, we aim to provide a comprehensive orientation work to better describe this new research area.

Computational Neurodegeneration embraces a holistic approach by offering a synergy of numerous approaches and novel qualities to be gained by using mathematical methodologies applied with computational methods in the study of neurodegeneration.

The workshop reviews the central issues and methodological approaches of the main mathematical topics related to the field for which we pursue a thorough overview. New techniques and platforms are described which combine advances in biomedical sciences and computing. It also conveys more advanced knowledge presenting the mathematical tools that are currently applied, thus serving both as a starting point for an in-depth study of a specific area, as well as a quick reference source for the expert by reflecting the state of the art and future prospects. The workshop includes topics that are usually missing or are only marginally represented in standard non-interdisciplinary conferences.

The broad scope of this workshop is reflected by five major parts that facilitate an integration of mathematical and computational concepts, methods and applications in the study of neurodegeneration. Each part is intended to stand on its own, giving an overview of the topic and the most important problems and approaches, which are supported by examples, practical applications, and proposed mathematical methodologies. The basic concepts and knowledge, standard procedures and methods are presented, as well as recent advances and new perspectives.

Program:

Part I - Neurodegenerative disease mathematical modelling

09:00-09:30

Mathematical Modeling in Computational Neurodegeneration

Panayiotis Vlamos, Professor and Head of the Department of Informatics, Ionian University

09:30-10:00

Chimera states in the dynamics of neuron networks

Astero Provata. Research Director, Institute of Nanoscience & Nanotechnology, NCSR Demokritos, Vice-Chairman of the Complex Systems and Applications (COSA) Network

10:00-10:30

Mathematical aid for understanding cardiovascular diseases related to aging

Maria Hadjinicolaou, Professor of Applied Mathematics, School of Science and Technology, Hellenic Open University

10:30-11:00

Questions - Discussion

11:00-11:30 Coffee break

Part II – Applied information processing and visualization

11:30-12:00

Decision support systems in neurodegenerative diseases diagnosis, treatment and management

Themis Exarchos, Assistant Professor, Department of Informatics, Ionian University, Greece

12:00-12:30

Neural basis of movement education

Greg Anderson, Dean Office of Applied Research & Graduate Studies at Justice Institute of British Columbia

12:30-13:00

Questions - Discussion

13:00-14:00 Light Lunch

Part III - Digital health and mixed realities

14:00-14:30

Predicting progression from normal cognition to mild cognitive impairment for individuals at 5 years

Ioannis Tarnanas, Senior Researcher at the University of Bern, Switzerland, Gerontechnology and Rehabilitation group at the ARTORG Center for Biomedical Engineering Research

14:30-15:00

The Effects of Quantum Entanglement on Chromatin and Gene Expression

Michael Harney, MS Bioinformatics, Sr. Data Architect, Health Catalyst, Salt Lake City, Utah

15:00-15:30

Questions - Discussion

15:30-16:00 Coffee break

Part IV - Data Mining, Metaheuristics, High-performance Computing

16:00-16:30

The convergence of data analytics techniques in medical applications

Phivos Mylonas, Associate Professor, Department of Informatics, Ionian University

16:30-17:00

Data Mining Techniques in Neurodegeneration

Ilias Kotsireas, Professor in Physics & Computer Science, Wilfrid Laurier University-Waterloo, Ontario, Canada

17:00

Closing