

## **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 26<sup>th</sup> of October, 2018.

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

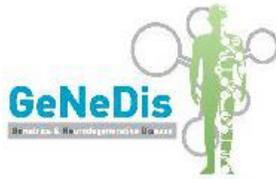
### **Topic of the Workshop:**

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

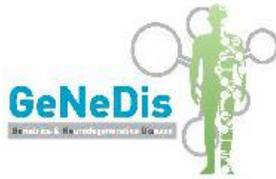
**12:00-12:30**

#### **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**