Workshop Invitation

University of Cyprus

UNIVERSITÉ DU LUXEMBOURG

Tuesday, 30 October 2018, 14:30-17:30
Room 007, Building XOD02, New Campus
University of Cyprus

"Increasing Crops Biomass by Uncovering the Circadian Clock Network using Dynamical Models"

Organizer: Prof. Christoforos N. Hadjicostis
Speakers: Prof. Jorge Goncalves, Prof. Costas Pitris, and Dr. Ioannis Tzortzis

The workshop is open to the public

REPUBLIC OF CYPRUS EUROPEAN UNION ΔΕΣΜΗ 2009-2010 Research Promotion Foundation ERASysAPP ERA-Net for Applied Systems Biology

Supported by the Cyprus Research Promotion Foundation's Framework Program for Research, Technological Development and Innovation (DESMI 2009-2010), under project KOINA/ERASysAPP-ERA.NET/1113/01.

PROGRAM	
14:30-14:35	Opening Remarks Prof. Christoforos N. Hadjicostis (Univ. of Cyprus)
14:35-15:25	Uncovering circadian clock networks with dynamical models Prof. Jorge Goncalves (Univ. of Luxembourg)
15:30-16:00	Optical and multimodal interfaces to molecular communication systems Prof. Costas Pitris (Univ. of Cyprus)
16:00-16:20	BREAK
16:20-17:00	Reconstruction of gene regulatory networks using an error filtering learning scheme Dr. Ioannis Tzortzis (Univ. of Cyprus)

ABSTRACTS:

UNCOVERING CIRCADIAN CLOCK NETWORKS WITH DYNAMICAL MODELS

Circadian clocks consist of gene regulatory networks that produces rhythms of about 24 hours to coordinate the daily cycle of most organisms. The identification of the regulatory interactions between the genes that form these networks is a major challenge of systems biology. On one hand, this is due to the complexity of the interlocked network and on the other hand to the partial observations of the species and mechanisms involved. Our focus is on the identification of the structure of such regulatory systems using gene expression data over time (time-series). Using tools originating from system identification and control theory, we devised an inference strategy that has the potential to identify several transcriptional pathways with a high confidence level. As a result, we established a preliminary, but biologically and computationally relevant, topology of the yet unknown circadian clock of barley. We further used this knowledge to successfully identify key period synchronization mechanisms of the circadian clock of Arabidopsis Thaliana.

OPTICAL AND MULTIMODAL INTERFACES TO MOLECULAR COMMUNICATION SYSTEMS

Molecular communications are emerging as an exciting new information and communication paradigm extending the concepts of Shannon's communication model to biological and bioengineered systems. The medical and clinical ramifications of molecular communications are promising to be particularly important, especially in the understanding of the pathways of disease, leading to better diagnosis, treatment and management. Light, as a carrier of information is a promising enabler for interfacing between the nano, micro and macro devices involved in complete molecular communication implementations. Molecular to optical conversion and switching can be employed at all stages of the communication process, including monitoring the encoding/decoding process, the transmission and the reception. In addition, optical molecular sensing and imaging can provide the interface to macroscopic techniques visualizing molecular events in cells and living organisms.

RECONSTRUCTION OF GENE REGULATORY NETWORKS USING AN ERROR FILTERING LEARNING SCHEME

One of the fundamental and most challenging problems in system biology is the reconstruction of gene regulatory networks from input-output data based on nonlinear differential equations. This work presents an approach to estimate the unknown nonlinearities and to identify the true network that generated the data, based on an error filtering learning scheme and a Lyapunov synthesis method. Unknown nonlinearities are modeled by linearly and nonlinearly parametrized networks, and model validation is performed by taking advantage of the so-called persistency of excitation of input signals, a condition that is shown to play a significant role in the problem of uncovering the true network structure.

BIOGRAPHIES:

Jorge Goncalves is currently a Professor at the Luxembourg Centre for Systems Biomedicine, University of Luxembourg and a Principal Research Associate at the Department of Engineering, University of Cambridge. He received his Licenciatura (5-year S.B.) degree from the University of Porto, Portugal, and the M.S. and Ph.D. degrees from the Massachusetts Institute of Technology, Cambridge, MA, all in Electrical Engineering and Computer Science, in 1993, 1995, and 2000, respectively. He then held two postdoctoral positions, first at the Massachusetts Institute of Technology for seven months, and from 2001 to 2004 at the California Institute of Technology with the Control and Dynamical Systems Division. At the Information Engineering Division of the Department of Engineering, University of Cambridge he was a Lecturer from 2004 until 2012, a Reader from 2012 until 2014, and since 2014 he is a Principal Research Associate. From 2005 until 2014 he was a Fellow of Pembroke College, University of Cambridge. From June to December 2010 and January to September 2011 he was a visiting Professor at the University of Luxembourg and California Institute of Technology, respectively. Since 2013 he is a Professor at the Luxembourg Centre for Systems Biomedicine, University of Luxembourg.

Constantinos Pitris is currently an Associate Professor at the KIOS Research and Innovation Center of Excellence and the Department of Electrical and Computer Engineering, University of Cyprus. He is heading the "Optical Diagnostics Laboratory" which he established in 2004. Prof. Pitris has completed his studies at the University of Texas at Austin (BS Honors in Electrical Engineering, 1993, MS in Electrical Engineering, 1995), Massachusetts Institute of Technology (Ph.D. in Electrical and Medical Engineering, 2000), and Harvard Medical School (MD Magna Cum Laude in Medicine, 2002). His main research interests include the areas of optical diagnostics, biomedical imaging and spectroscopy, as well as signal/image analysis and computational intelligence. Prof. Pitris has served as a PI or a co-PI in competitive research grants totalling over €2.5 million. He is also one of the co-founders and a member of the executive committee of the KIOS Center of Excellence, which was the recipient of a H2020 TEAMING grant of over €40 million. Prof. Pitris has published 44 peer reviewed journal publications, 129 conference proceedings, 4 book chapters, and one book. He also holds 11 US, European and other patents, and is the cofounder of two start-up companies aiming to commercialize important research findings. The citations to his work have reached more than 10,000 (with an h-index of 37) according to Google Scholar. Prof. Pitris is a grant reviewer for the European Commission (FP7 - Nanomedicine), National Institutes of Health, USA (Biomedical Optics), the Cyprus Ministry of Commerce, Industry and Tourism (Start-up Incubators).

Ioannis Tzortzis is currently a Postdoctoral Researcher at KIOS Research and Innovation Center of Excellence (appointed in March 2018). He received the Diploma degree in electrical engineering from Higher Technical Institute, Cyprus, in 2003, and the B.Sc. degree in electrical engineering and informatics from Budapest University of Technology and Economics, Hungary, in 2007. He completed his M.Sc. and Ph.D. studies in electrical and computer engineering from the University of Cyprus, in 2009 and 2015, respectively. Following his PhD, he worked as a research scientist (from Jan 2015-Jan 2016) at the Department of Electrical and Computer Engineering, University of Cyprus. Between February 2016 and February 2018, he worked at the Department of Electrical and Computer Engineering, University of Cyprus, as a Postdoctoral Researcher. His research focuses on control and optimization subject to ambiguity, mini-max dynamic games, dynamic programming and algorithms, model order reduction, Markov decision processes, communication, systems biology and on active fault diagnosis and control of distributed dynamical systems.