U.M.G.
UNIVERSITA' DEGLI STUDI DI CATANZARO
PhD Programme

Seminar series:

Deep Learning and Integrative Systems Biology of Circadian Rhythms

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12 September h 16.00 Lecture Hall P Building H

Abstract:

Circadian rhythms date back to the origins of life, are found in virtually every species and every cell, and play fundamental roles in functions ranging from metabolism to cognition. These rhythms play also important roles in health and disease states and should be taken into account in precision medicine, for instance to determine the optimal time at which a drug should be taken.

Modern high-throughput technologies allow the measurement of concentrations of transcripts, metabolites, and other species along the circadian cycle under a variety of conditions, thus creating novel computational challenges and opportunities for improving our fundamental understanding of circadian biology and its applications to precision medicine. We will present several experimental results that have led to the development of new computational tools in circadian biology, including a general framework for understanding the pervasiveness and plasticity of circadian rhythms at the molecular systems biology level. We will also present deep machine learning methods to detect periodicity in time series and impute time from a set of high-throughput measurements, two necessary prerequisites for the application of circadian biology to precision medicine.

Background References:

V. Patel, N. Ceglia, M. Zeller, K. Eckel-Mahan, P. Sassone-Corsi, and P. Baldi. The Pervasiveness and Plasticity of Circadian Oscillations: The Coupled Circadian-Oscillators Framework. Bioinformatics 31 (19): 3181-3188, (2015).

K. L. Eckel-Mahan, V. R. Patel, S. de Mateo, N. J. Ceglia, S. Sahar, S. Dilag, K. A. Dyar, R. Orozco-Solis, P. Baldi, and Paolo Sassone-Corsi. Reprogramming of the Circadian Clock by Nutritional Challenge. Cell, 155, 7, 1464-1478, (2013).

V. Patel, K. Eckel Mahan, P. Sassone-Corsi, and P. Baldi. CircadiOmics: Integrating Circadian Genomics, Transcriptomics, Proteomics, and Metabolomics. Nature Methods, 9, 8, 772-773, (2012).

K. L. Eckel-Mahan, V. R. Patel, K. S.Vignola, R. P. Mohney, P. Baldi, and P. Sassone-Corsi. Coordination of Metabolome and Transcriptome by the Circadian Clock. PNAS, 109 (14) 5541-5546; published ahead of print March 19, 2012.

Short BIO:

Pierre Baldi was born in Rome, earned MS degrees in Mathematics and Psychology from the University of Paris, and a PhD in Mathematics from the California Institute of Technology. He is currently Chancellor's Professor in the Department of Computer Science, Director of the Institute for Genomics and Bioinformatics, and Associate Director of the Center for Machine Learning and Intelligent Systems at the University of California Irvine. The long term focus of his research is on understanding intelligence in brains and machines. He has pioneered the development and application of deep learning methods to problems in the natural sciences such as the detection of exotic particles in physics, the prediction of reactions in chemistry, and the prediction of protein secondary and tertiary structure in biology. He is the recipient of the 1993 Lew Allen Award at JPL, the 2010 E. R. Caianiello Prize for research in machine learning, and a 2014 Google Faculty Research Award. He is and Elected Fellow of the AAAS, AAAI, IEEE, ACM, and ISCB. He has published four books, over 300 peer-reviewed articles, and has Google Scholar H-index of 79.

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