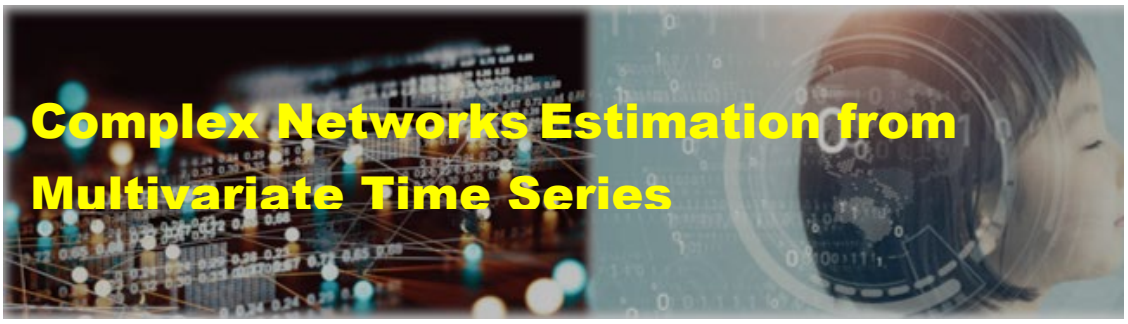

Conferencia:
"Complex Networks Estimation from Multivariate Time Series"

Jueves *27 de octubre de 2022*, a las *12:15h*, en la sala de Teleenseñanza del Edificio A de Electrónica y Telecomunicación tendrá lugar la conferencia **"Complex Networks Estimation from Multivariate Time Series"**, organizada por la *Escuela de Ingeniería de Telecomunicación y Electrónica* (EITE).

Abstract: In the study of complex dynamical systems, such as brain dynamics and financial market dynamics, from multivariate time series, a main objective is the estimation of the connectivity structure of the observed variables (or subsystems), where connectivity is also referred to as inter-dependence, coupling, information flow and Granger causality. Having selected a connectivity measure to estimate the driving-response connections among the observed variables, the complex network is then formed, also called connectivity or causality network, where the nodes are the observed variables, and the connections are the estimated inter-dependencies. For a network with binary connections the inter-dependencies are discretized to zero (not significant) and one (significant) by applying a criterion for the significance, e.g., arbitrary threshold or statistical testing. There is a main and practical issue in the connectivity analysis: estimation of direct inter-dependence in the presence of many observed variables, where direct inter-dependence between two variables excludes the inter-dependence mediated by the presence of the other observed variables. To address this issue, inevitably one must involve a dimension reduction scheme in the estimation of direct connectivity.

I will present the framework of connectivity analysis of multivariate time series and focus on direct connections and many observed variables. In our research group, we have developed appropriate methodology for this scope and in the last part I will attempt to introduce causality measures that apply dimension reduction. I will illustrate on simulated data the ability of causality measures using dimension reduction to identify the underlying complex network (connectivity structure of the underlying complex system) solely based on the observed multivariate times series. I will then move to real-world applications and estimate changes of the connectivity structure in time series records of epileptic electroencephalograms and world financial markets.

Short CV: Dimitris Kugiumtzis (http://users.auth.gr/dkugiu) has BSc in Mathematics at the Aristotle University of Thessaloniki (AUTh), MSc and PhD at the Department of Informatics, University of Oslo. He is at the Department of Electrical and Computer Engineering, AUTh, since September 2013, as Professor since February 2017. He was Assistant and Associate Professor at the Department of Mathematical, Physical and Computational Sciences, AUTh (2001-2013), Lecturer B at the Department of Statistics, University of Glasgow, UK (2000-2001), guest scientist (PostDoc) at

the Max-Planck-Institute for Physics of Complex Systems, Dresden, Germany (1998-1999), and Research Associate at the State Center for Epilepsy, Norway (1997). He is currently the Head of the Lab of Informatics at the Faculty of Engineering, AUTh. and the Director of the MSc in Biomedical Engineering, AUTh. His main research area is time series analysis and complex systems, as well as computational statistics, data analysis and machine learning. Applications of the methodology he develops extend from neurophysiology to geophysics and finance. He has published 90 journal papers, 24 papers in international proceedings and 29 papers in national proceedings, h-index=25 and 2047 sum of times cited (source: Web of Science, as of 14 October 2022). He is regular referee for many international journals and academic editor for four international journals. He has participated in several national and EU research projects and acted as evaluator in several EU and national research programs. He currently supervises 2 PhDs and 6 MScs and has supervised 7 completed PhDs and over 40 MScs and 10 graduate theses.