Πανεπιστήμιο Κύπρου
University of Cyprus

School of Engineering
Department of Electrical and Computer Engineering

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Department of Electrical and Computer Engineering

Title: « **Multi-scale periodicities in the functional brain networks of patients with epilepsy**»

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Room KENTP. A019, Old Campus – University of Cyprus

Abstract:
The task of automated epileptic seizure detection and prediction, by using either non-invasive measurements such as EEG signals at the scalp or invasive intracranial recordings, has been at the heart of epilepsy studies for at least three decades. By far, the most common approach for tackling this problem is to examine short-length recordings around the occurrence of a seizure - normally ranging between several seconds and up to a few minutes before and after the epilectic event - and identify any statistically significant changes that tend to occur before any event. The assumption in these studies is the presence of a relatively constant EEG activity in the interictal period, that is presumably interrupted by the occurrence of a seizure, at the time the seizure starts or slightly earlier. Recently, we have put this assumption under test, by examining long-duration (ranging between 22 hours and 3 days) functional brain networks constructed from scalp EEG recordings of patients with epilepsy. Our results suggest not only that the network varies over time, but it does so in a periodic fashion, with multiple periods ranging between one and a half hours and one day. Some of these periodicities in humans have been known for very long, for instance the circadian rhythm, although few studies have examined their occurrence in functional brain networks. However, this is the first time that the periodic variance of functional brain networks is examined in conjunction with the occurrence of epileptic seizures. Preliminary results show that the effects that the occurrence of a seizure have on the functional brain network are significantly less abrupt than the changes due to the periodic cycles of the signal. Hence, seizure detection or prediction algorithms are likely to benefit in identifying 'abnormal' changes due to the seizure, by taking into consideration the time of the event with respect to the signal's periodicities.

Biography:
Manolis Christodoulakis is currently working as a researcher at the KIOS Research Center for Intelligent Systems and Networks, and as a special scientist at the Department of Electrical and Computer Engineering, University of Cyprus. Previously, he worked as a visiting lecturer at the University of Cyprus (2009-2011), lecturer at the University of East London (2007-2009), and as a teaching assistant, then research associate and later as external lecturer at King's College London (2001-2006). He received his BSc from the Department of Computer Engineering and Informatics, University of Patras (2001), and his PhD from the Department of Computer Science in King's College London (2005). Manolis' research activity has contributed to the design of algorithms mainly in the interdisciplinary field of bioinformatics, and more recently in the related field of biomedical engineering. His current work at KIOS focuses on the detection and prediction of epileptic seizures from long-term EEG and ECG measurements, using algorithms from the fields of graph theory and from the theory of complex networks.