

Department of Electrical and Computer Engineering

Title: «Assessment of nonlinear interactions in event-related potentials (ERPs) elicited by stimuli presented at short inter-stimulus intervals»

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Room KENTP – A008, Old Campus

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Abstract: The recording of brain event-related potentials (ERPs) is a widely used technique to investigate the neural basis of sensory perception and cognitive processing in humans. Due to the low magnitude of ERPs, averaging techniques are typically employed to enhance the signal to noise ratio (SNR) before subsequent analysis. However, when the temporal interval between two consecutive stimuli used to elicit ERPs is smaller than the latency of the main ERP peaks, i.e., when the stimuli are presented at a fast rate, overlaps between the corresponding ERPs may occur. These overlaps are usually dealt with by assuming that there is a simple additive superposition between the latter, and consequently performing algebraic waveform subtractions. Here we examine this hypothesis rigorously, by providing a statistical framework that examines the presence of non-linear additive effects between overlapping ERPs elicited by successive stimuli with short inter-stimulus intervals (ISIs). The results suggest that there are no non-linear additive effects due to the time overlap but that, for the range of ISIs examined, the second ERP is modulated by the presence of the first stimulus irrespective of whether there is time overlap or not. In other words, two ERPs that overlap in time can still be written as an addition of two ERPs, with the second ERP being different to the first. This difference is also present in the case of non-overlapping ERPs with short ISIs.

Biography: Charalambos Loizides received his undergraduate degree in Mathematics and Statistics from the University of Cyprus in 2006. He then joined the Department of Statistics at the University of Oxford, UK, where he earned a M.Sc in Applied Statistics (2007) and a D.Phil in Statistics (2011). His research during his D.Phil was focused in Statistical Genetics and more specifically in Genome-wide Association Studies. In 2011 he joined the KIOS Research Center for Intelligent Systems and Networks at the University of Cyprus as a Research Associate. He currently works on an INTERREG funded project for the study of cancer tumor growth and the development of optimal treatment strategies. His current research interests include the derivation of statistical and mathematical models that can be used in cancer progression and optimal strategy studies as well as the incorporation of genetic and transcriptomic factors in those models.