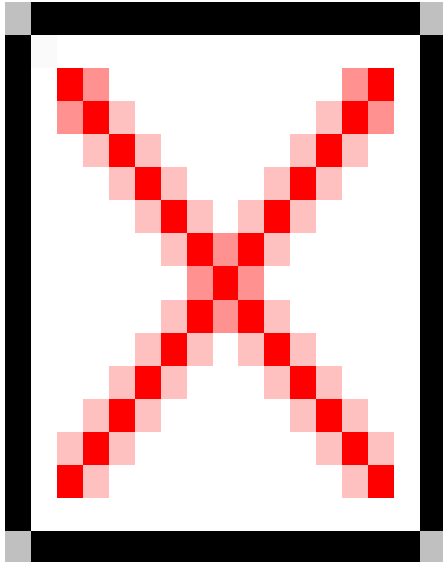




# ELSC Seminar - Prof. Gadi Goelman, Dec. 08, 2016 at 17:00

December 4, 2016 - December 9, 2016



Nonlinear coherences among multiple time-series: Use of MRI data to identify brain temporal organization and directionality of information flow

**ELSC cordially invites you to the lecture given by:**

**Prof. Gadi Goelman**

MRI Lab of the Human Biology Research Center, Hadassah Medical Center

*On the topic of:*

**"Nonlinear coherences among multiple time-series: Use of MRI data to identify brain temporal organization and directionality of information flow"**

***The lecture will be held on Thursday December 8th, at 17:00***

***at ELSC: Silberman Bldg., 3rd Wing, 6th Floor,***

***Edmond J. Safra Campus***

***Light refreshments served at 16:45***

Abstract:

Networks are advancing the field of neuroimaging. They are generally constructed from pairwise interactions with an assumption of linear relations between them. I will describe a novel high-order statistical framework to calculate interactions among multiple coupled time-series. Based on wavelet

analysis and spectral coherence, the mathematical expression for 4 time-series was derived and its validity and dependency on coupling strength and noise was tested by computer simulations of the Kuramoto model. The analysis enables to characterize quartets of time-series (i.e. brain regions) as **linear**, nonlinear or of higher (>4) order networks. Phase delays between time-series are used to obtain network's temporal hierarchy and to infer directionality of information flow. The analysis can be used in a variety of disciplines including fMRI, electrophysiology, EEG or MEG. I will demonstrate the analysis strength using resting-state fMRI data to show that the ventral visual system is composed of **linear** networks and exhibits its known temporal hierarchy, while the motor system and the default mode network (DMN) are composed of nonlinear networks. The motor system exhibits **center-out** hierarchy and the DMN has **dorsal-ventral** and **anterior-posterior** organizations. If time permitted, I will describe applications in fMRI hyperscanning data aiming to identify directionality of information flow during live social interactions.

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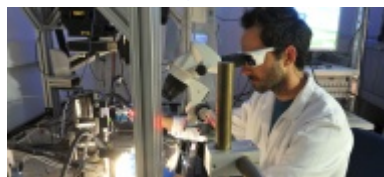
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