



华侨大学系统科学研究所

Institute of Systems Science, Huaqiao University

学术报告

Critical Dynamics of Multi-Level Brain Activities

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Abstract

In this talk, I will present several of my recent work about critical dynamics in multi-level brain system: Ascending Arousal System (AAS) for wake-sleep cycle; corticothalamic system for EEG/fMRI signals of various states as well as epileptic seizures, and local cortical neuronal networks for multiscale cortical activities, e.g. irregular firing, neuronal avalanches and synchronize oscillations. At first, I will introduce the experimental background and the proposed theoretical framework, also the theoretical models for multi-level brain system: neural mass model of AAS, neural field model of corticothalamic system, Wilson-Cowan model and neuronal network model. Then I will present two of my theoretical work about deriving normal forms of critical dynamics in AAS and corticothalamic system, which can be used to investigate the early-warning signal of the wake-sleep transition and the type of generalized seizures, respectively. Further, I will talk about my recent work about the results of spatiotemporal instability for focal seizure generalization. Finally, I will present one simulation work of investigating the underlying organizing principle of multiscale cortical activities—cost-efficient cortical dynamics. In the end of the talk, I will propose to discuss some of my ideas about linking the theory to data and the role of network structures in cortical activities.

杨冬平:

目前在悉尼大学物理系复杂系统脑动力学研究组担任博士后职位。2011年毕业于厦门大学，获得生物物理博士学位。博士期间致力于复杂网络和博弈共演化动力学以及细胞内钙离子通道的生物建模。之后前往香港浸会大学做博士后，开始转向研究计算神经科学，利用计算机模拟和理论分析发现脑皮层活动的多尺度性质在信息容量的成本—效益原理框架下可以很好地组织起来。专长于生物建模，数值模拟，和理论分析，特别是复杂系统和非线性理论。目前利用计算模拟和理论分析来理解大脑系统中临界动力学的时空特点以及探寻潜在的预警信号，例如，大脑清醒到睡眠的转变过程及其潜在的预警信号，大脑正常状态到癫痫状态的不同转变类型，以及癫痫抑制到癫痫扩散的转变过程及其潜在的预警信号。

时间：2018年1月4日，下午2:30-4:00

地点：机电信息实验大楼 B430 室