

数学与系统科学研究院

计算数学所学术报告

报告人: **Dr. Chengcheng Huang**

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报告题目:

**Modulation and propagation of information
in visual pathway**

邀请人: 刘歆副研究员

优化与应用中心

报告时间: **2017 年 12 月 26 日 (周二)**

上午 10:30--11:30

报告地点: 数学院科技综合楼

三层 311 报告厅

报告摘要:

How neuronal variability impacts neural codes is a central question in systems neuroscience, often with

complex and model dependent answers. Most population models are parametric, with tacitly assumed structure of neuronal tuning and population variability. While these models provide key insights, they cannot inform how the physiology and circuit wiring of cortical networks impact information flow. Attentional modulation is an often used tool to probe the neural correlates of cortical processing, since attention is well known to improve cognitive performance in discrimination tasks, as well as attenuate population-wide response variability. Attention offers key constraints that have allowed our group to propose and analyze a circuit-based cortical model which recapitulates the attentional modulation of both trial averaged and trial variable response. In this study, we use this model to investigate how the feedforward and recurrent structure of cortical circuits, and their attentional modulation, shape information flow within the visual system. When the stimulus has trial-to-trial fluctuations that are external to the network, the Fisher information grows sub-linearly with the number of neurons, showing

signs of saturation, consistent with past models. We show that a network with narrow feedforward and recurrent projections can transmit almost all of the Fisher information across layers. Moreover, the attentional manipulation in our model increases transmitted Fisher information from a finite network while decreasing pairwise correlations to an extent comparable to that observed in experiments.

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