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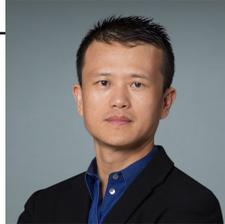
Department of Electrical Engineering

Seminar

Uncovering neural representations of large-scale rat hippocampal population codes

Dr. Zhe Sage Chen

Associate Professor

School of Medicine, New York University

Date: **12 July 2019 (Friday)**

Time: **11:00 am – 12:00 nn (Reception with light sandwiches at 10:55am, talks start at 11am. To facilitate the order of sandwiches, please register through email chchung33@cityu.edu.hk.)**

Venue: **G5314, Yeung Kin Man Acad. Bldg., City University of Hong Kong**

Abstract

Advances in neurotechnology have recently enabled us to collect large-scale neural activity from one or multiple brain regions. Furthermore, closed-loop neuroscience experiments impose a time constrain to process and analyze those high-throughput recordings. We are facing two important challenges in neural data analysis: (1) scaling and speeding up; (2) extracting latent structures from high-dimensional neural data. In this talk, we will use the rat hippocampal recordings as an illustrated example and address these two issues. We develop statistical and unsupervised machine learning methods to uncover neural representations of large-scale rat hippocampal ensemble spikes as well as local field potentials (LFPs), during both spatial navigation and sleep. For closed-loop neuroscience experiments, we also develop real-time decoding methods to estimate the animal's position or memory replays based on either unsorted hippocampal ensemble spikes or LFPs. In some benchmark datasets, our GPU-empowered decoding approach achieved ~20- 50-fold increase in speed, with real-time speed (approximately fraction of a millisecond per spike) and scalability up to thousands of channels.

About the speaker

Zhe Sage Chen is an associate professor and principal investigator at New York University (NYU) School of Medicine, with joint appointment at the Department of Psychiatry and Department of Neuroscience and Physiology. He is the director of the CN^3 (Computational Neuroscience, Neuroengineering and Neuropsychiatry) Laboratory at NYU.

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