Physics AT QUEENS COLLEGE

Colloquium Notice

Nabil Imam

Cornell University

Neuromorphic Olfaction

It's exciting times at the intersection of machine learning and computational neuroscience. Deep neural networks grew out of 'connectionist' models in neuroscience and psychology in the 1980s and have found tremendous success in machine learning despite being based on models that are over three decades old. Since that time, an enormous amount has been learned about the circuit-level organization of the brain, yet it remains unclear how to use that knowledge to advance the capabilities of machine learning and AI. A particularly important research topic is to understand how the generation and manipulation of discrete pulses of neural activity, known as 'spikes', underlie neural computations. In this talk, I will describe a model of a neural circuit in biological olfaction that leverages spike-timing-dependent mechanisms of coding and computation to rapidly learn and identify signals from a chemosensor array. I will show how information encoded within the relative timing patterns of spikes is exploited by synaptic learning rules in the model, and how processes of neuromodulation and contextual priming enhance its computational capabilities. I will also discuss the model's performance compared to alternative techniques and describe its implementation in field-deployable neuromorphic chips.

About the Speaker:
Nabil Imam received his Ph.D. from the Department of Electrical and Computer Engineering at Cornell University in 2014, with minors in neuroscience and applied mathematics. During his time in graduate school he worked on DARPA's SyNAPSE program and built computing systems modeled after the architecture and dynamics of biological neural networks. He subsequently worked at IBM Research and Intel Labs, in the design teams of IBM's TrueNorth and Intel's Loihi neuromorphic systems. His research interests are in formal descriptions of neural computations and their applications to neuromorphic computing.

Zoom:
https://us02web.zoom.us/j/82926872594?pwd=RVdaRHU0YTZVSHQ5Q1BQbXlJcFlvUT09

Monday
June 28, 2021
Starts at **12:15 pm**
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