BioE332B

Large-Scale Neural Modeling

Catalog Description: Emphasis is on cortical computation, from feature maps in the neocortex to episodic memory in the hippocampus, looking at the role of recurrent connectivity, rhythmic activity, spike synchrony, and synaptic plasticity, as well as noise and heterogeneity. Techniques to predict and quantify network behavior introduced in lectures are applied to data recorded from models programmed and ran in labs. Models run in real-time on neuromorphic hardware developed for this purpose, facilitating learning and discovery by exploring the model's parameter space.

Prerequisites: Psych 120, Math 51 and Stats 110. Biology students with no background in engineering are welcome. Engineering students should have an introductory neuroscience course. Undergraduates need the instructor's permission.

Goals: To develop computational models of neural computation by emulating the structure as well as the function of the nervous system. These models are simulated and tested in weekly lab exercises.

Target Audience: This course is intended to draw students from multiple disciplines with an interest in interdisciplinary approaches. Students are encouraged to pool their expertise in different areas by working in groups.

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Textbooks: None required.

Grading: Based on a quarter-long modeling project performed in groups of two (or three). There will be presentations in class (40%) and a written report (60%), due at the end of the quarter.

Late policy: The presentations will be given as scheduled and the final report will be due at the end of the final exams period (for dates, see *Course Calendar*). It is a third of a grade off the first day the final report is late, and another third of a grade off the second day. Reports more than two days late will not be accepted.