Faculty: Larry Abbott, Stefano Fusi, Ashok Litwin Kumar, Ken Miller

TAs: Matteo Alleman, Dan Biderman, Salomon Muller, Amin Nejatbakhsh, Marjorie Xie

Meetings: Tuesdays & Thursdays, JLGSC L5-084, Lecture 2.00 - 3.30pm


January
21 (Larry) Introduction to the Course and to Theoretical Neuroscience
23 (Larry) Mathematics Review
28 (Larry) Electrical Properties of Neurons, Integrate-and-Fire Model (Assignment 1, neuron models)
30 (Larry) Adaptation, Synapses, Spiking Networks (Numerical methods)

February
4 (Larry) Numerical Methods, Filtering (Assignment 2)
5 Assignment 1 Due
6 (Larry) The Hodgkin-Huxley Model (I&F Model, White Noise, Synapses-Networks)
11 (Larry) Types of Neuron Models and Networks (Assignment 3, Poisson Spiking, Networks)
12 Assignment 2 Due
13 (Ashok) Linear Algebra I (Notes)
18 (Ashok) Linear Algebra II (Notes, Assignment 4, Solutions)
19 Assignment 3 Due
20 (Ashok) Introduction to Probability, Encoding, Decoding (Notes)
25 (Ashok) GLMs (Notes, Assignment 5)
26 Assignment 4 Due
27 COSYNE

March
3 COSYNE
5 (Ashok) Decoding, Fisher Information I (Notes)
10 (Ashok) Canceled
12 (Ashok) Information Theory (Notes, Assignment 6, google-1000-english.txt, Recitation Notes)
14 Assignment 5 Due
17 Spring Break
19 Spring Break
24 (Ken) Canceled – PCA and Dimensionality Reduction I
26 (Ken) – PCA and Dimensionality Reduction II (Notes)
27 Assignment 6 Due
31 (Ken) – Rate Networks/E-I networks I (Notes, Assignment 7, Codes)

April
2 (Ken) – Rate Networks/E-I networks II (Notes)
7 (Ken) – Unsupervised/Hebbian Learning, Developmental Models (Notes, Assignment 8, Ring-Model)
8 Assignment 7 Due
9 (Ken) – Optimization (Notes)
15 Assignment 8 Due
16 (Ashok) Optimization (Notes)
21 (Stefano) Perceptron (Notes, Assignment 10)
23 (Stefano) Multilayer Perceptrons and Mixed Selectivity (Notes)
28 (Stefano) – Deep Learning I (backpropagation) (Assignment 11, Notes, Codes - please note more codes are available on courseworks)
30 (Stefano) – Deep Learning II (convolutional networks) (Notes, Visualizing and Understanding Convolutional Networks, YaminsDiCarlo)

May
1 Assignment 9 & 10 Due
5 (Stefano) Learning in Recurrent Networks (Notes)
7 (Stefano) Continual Learning and Catastrophic Forgetting (Notes)
12 (Stefano) Reinforcement Learning (Notes)
15 Assignment 11 Due