

Computational Neuroscience

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TAs:

Meetings: Tuesdays 2:00-3:30 & Thursdays 1:30-3:00

Text - Theoretical Neuroscience by P. Dayan and L.F. Abbott (MIT Press)

Webpage - <https://ctn.zuckermaninstitute.columbia.edu/courses>

September

- 7 (Larry) Introduction to the Course and to Theoretical Neuroscience
- 9 (Larry) Electrical Properties of Neurons, Integrate-and-Fire Model
- 14 (Larry) Numerical Methods, Filtering (Assignment 1)
- 16 (Larry) Types of Neuron Models and Networks
- 21 (Stefano) Adaptation, Synapses, Synaptic Plasticity
- 23 (Sean) Generalized Linear Models
- 28 (Larry) The Hodgkin-Huxley Model (Assignment 2)
- 29 Assignment 1 Due
- 30 (Ken) Linear Algebra I

October

- 5 (Ken) Linear Algebra II (Assignment 3)
- 6 Assignment 2 Due
- 7 (Ken) PCA and Dimensionality Reduction
- 12 (Ken) Rate Networks/E-I networks I (Assignment 4)
- 13 Assignment 3 Due
- 14 (Ken) Rate Networks/E-I networks II
- 19 (Ken) Unsupervised/Hebbian Learning, Developmental Models (Assignment 5)
- 20 Assignment 4 Due
- 21 (Ashok) Introduction to Probability, Encoding, Decoding
- 26 (Ashok) Decoding, Fisher Information I
- 27 Assignment 5 Due
- 28 (Ashok) Decoding, Fisher Information II (Assignment 6)

November

- 2 Holiday
- 4 (Ashok) Information Theory
- 9 (Ashok) Optimization I (Assignment 7)
- 10 Assignment 6 Due
- 11 (Ashok) Optimization II
- 16 (Stefano) The Perceptron (Assignment 8)
- 17 Assignment 7 Due
- 18 (Stefano) Multilayer Perceptrons and Mixed Selectivity
- 23 Holiday
- 25 Holiday
- 30 (Stefano) Deep Learning (Assignment 8)

December

- 1 Assignment 8 Due
- 2 (Sean) Learning in Recurrent Networks
- 7 (Stefano) Continual Learning and Catastrophic Forgetting (Assignment 10)

- 8 Assignment 9 Due
- 9 (Stefano) Reinforcement Learning
- 15 Assignment 10 Due