Introduction to Theoretical Neuroscience
Larry Abbott, Stefano Fusi, Ashok Litwin Kumar, Ken Miller

Meetings:  Tuesdays Lecture 12.30 – 2.00     Recitation 2.00 – 3.30
           Thursdays Math Supplement 12.30 – 2.00  Lecture 2.00 – 3.30

TAs:        Ella Batty (erb2180)   Danil Tyulmankov (dt2586)
           Ramin Khajeh (rk2899)     Marjorie Xie (mx2183)
           Salomon Muller (szm2106)


Webpage: https://ctn.zi.columbia.edu/courses

January
22  Math Intro: Differential Equations (Ashok)
24  Electrical Properties of Neurons, Integrate-and-Fire (Larry) - Assign 1
    Calculus Review (Dan)
29  Adaptation, Izhikevich Model, Phase-Planes, Stability Analysis (Larry)
    Recitation (Ramin)
30  Assign 1 Due
31  The Hodgkin-Huxley Model (Larry)
    Taylor Series, Linearization (Dan)

February
  5  Synapses, Short-Term Plasticity, Release Probability (Stefano) - Assign 2
      Recitation (Ramin)
  7  Probability / Poisson spiking, Central Limit Theorem/Gaussian (Larry)
      Combinatorics (Dan)
 12  Probability / Encoding I (Ken) - Assign 3
      Recitation (Ramin)
 13  Assign 2 Due
 14  Linear Algebra I (Ken)
    Linear Algebra 0 (Dan)
 19  Linear Algebra II (Ken) Assign 4
      Recitation (Marjorie)
 20  Assign 3 Due
 21  Dimensional Reduction I (Ken)
      Lagrange Multipliers (Dan)
 26  Dimensional Reduction II (Ashok) - Assign 5
      Recitation (Marjorie)
 27  Assign 4 Due
 28  COSYNE

March
  5  COSYNE
    Recitation (Marjorie)
  7  Receptive Fields, GLMs, and Maximum Likelihood (Ashok)
      Multivariate Calculus (Dan)
 12  Spike and Rate Networks I (Larry)
      Recitation (Marjorie)
 13  Assign 5 Due
 14  Spike and Rate Networks II (Stefano) - Assign 6
 19  Spring Break
 21  Spring Break
 26  E/I Networks I (Ken)
      Recitation (Salomon)
 28  E/I Networks II (Ken) – Assign 7
      Convolution (Dan)
April
2  Decision-Making Networks (Stefano)
   Recitation (Salomon)
3  Assign 6 Due
4  Recurrent Networks - Hopfield and Random (Larry) - Assign 8
   Fourier Transforms (Dan)
9  Optimization I (Ashok)
   Recitation (Salomon)
10 Assign 7 Due
11 Optimization II (Ashok) - Assign 9
16 Perceptron and Decoding (Stefano)
   Recitation (Salomon)
17 Assign 8 Due
18 Multilayer Perceptrons (Ashok)
23 Learning in Recurrent Networks (Larry) - Assign 10
   Recitation (Ella)
24 Assign 9 Due
25 Deep Learning I (Stefano)
   Bifurcations (Dan)
30 Deep Learning II (Stefano)
   Recitation (Ella)

May
1  Assign 10 Due
2  Reinforcement Learning (Stefano) - Assign 11
   Information Theory (Dan)
7  Recitation (Ella)
8  Assign 11 Due