CSE 486: INTRODUCTION TO NEURAL AND COGNITIVE MODELING

ASSIGNMENT 2 Marks: 40 Marks

Simulation Exercises on LIF & Hodgkin-Huxley (HH) Models

Due: 18-Feb-2020 (Tuesday by 6 pm)

Note: You can use resources from Wulfram Gerstner's Course Material. You can install and use the resources from the Python package called *Brian* to do the simulation exercises in this Assignment. Submit the answers to these questions in a pdf file with your name, roll no on the first page and clearly indicating the exercise number.

I) Look at the Python Exercises for LIF and Submit the answers to exercises 2.1-2.4 (including subparts: these numbers correspond to Gerstner's exercise series 2)
LIF Python exercises link: (20 Marks)
http://neuronaldynamicsexercises.readthedocs.io/en/latest/exercises/leaky-integrate-and-fire.html
2.1 LIF Exercise: minimal current (subparts 2.1.1 and 2.1.2)
2.2 Exercise: f-I Curve (subpart 2.2.1)
2.3 Exercise: "Experimentally" estimate the parameters of a LIF neuron (subpart 2.3.1)
2.4 Exercise: Sinusoidal input current and subthreshold response (subpart 2.4.1 visually estimate the phase and calculate the amplitude; 2.4.2; 2.4.3; 2.4.4)

II) Look at the Python Exercises with Numerical integration of the Hodgkin-Huxley model (HH) model of the squid axon and submit answers to Exercises in 6.1-6.4 (sub problems therein" these numbers correspond to Gerstner's exercise series 6)
HH Python exercises link: (20 Marks)
http://neuronaldynamics-exercises.readthedocs.io/en/latest/exercises/hodgkin-huxley.html
6.1. Exercise: step current response (subparts 6.1.1 and 6.1.2)
6.2. Exercise: slow and fast ramp current (subparts 6.2.1; 6.2.2; 6.2.3)
6.3. Exercise: Rebound Spike (subpart 6.3.1)
6.4. Exercise: Brian implementation of a HH neuron (subpart 6.4.1)