

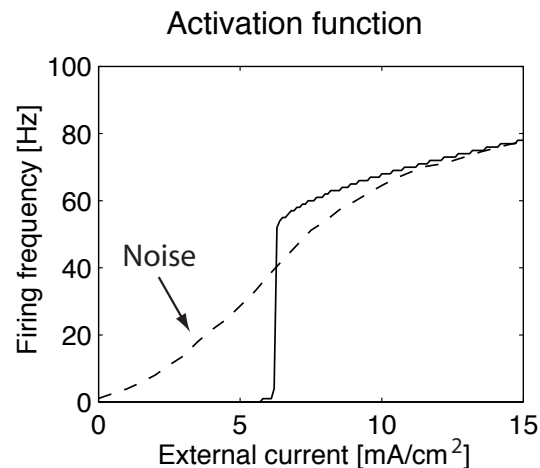
Assignment 2

for NeuroComputing/ Theoretical Neuroscience 2013

1. What is the difference between an EPSP and an action potential? (2 points)
2. A membrane has capacitance $1000 \mu\text{F}$ and a voltage-gated and time-dependent ion channel. This channel has a reversal potential of -1 mV and supports an inward current of positive ions with conductance $g_1 = 1\text{S}$ in its base state. When the membrane potential exceeds 0.5 mV , this channel opens for an additional inward current of negative ions with conductance $g_2 = 5\text{S}$ for a time window of $\Delta t = 1 \text{ ms}$. Write a simulation program that shows the time course of the membrane potential for 10ms . (4 points)

Hint: 'Positive in' means voltage goes up (drives it towards spike). The program is similar to the EPSP.m program with the addition of a time counter to code for the time dependence of the channel.

3. Use the Hodgkin-Huxley program to plot the current-response (activation) function as shown in Figure below (Fig. 2.11 in the textbook). (4 points)



Send your answers to prof6508@cs.dal.ca with subject line A2. Please write your answer for question 1 in the email and attach the Matlab program for question 2 and a figure for question 3. This assignment must be received on Thursday, Jan 31 before 4pm.