Single Cell NEURON Simulation

Alexandre Chiasson, Université de Moncton
Supervisor(s): Melanson, Alexandre

NEURON for python is a powerful library integrating the Hodgkin-Huxley model and the cable equation to a python environment allowing customizable single cell model creation. Initial parameters were based off the giant squid axon experiment from Alan Hodgkin and Andrew Huxley and showed similar voltage graphs as Hodgkin & Huxley's action potentials for constant current input. We also tested the effects of increasing and oscillatory currents. Our "ball and stick" model was pushed further, adding a small dendritic tree and more realistic current input in the form of alpha synapses. The dendritic tree spread for 3 layers and could range from 3 to 27 dendrites per layer. Synapses were distributed randomly between end-layer dendrites. The results show a clear refractory period between voltage spikes, and a current threshold, following the "all or none" principle.