Neuron Simulator

12/04/2024
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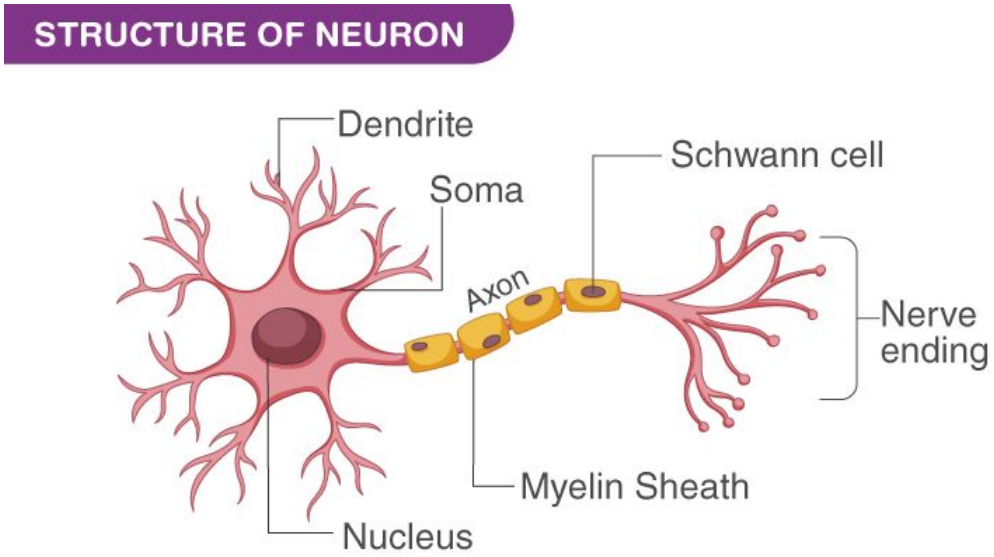
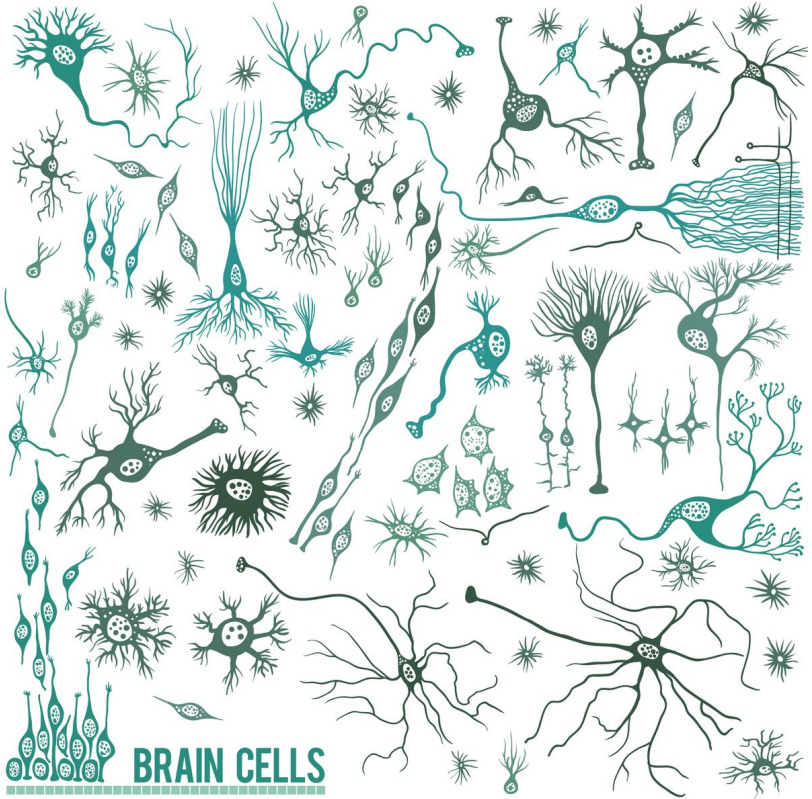
Background - Neuron



https://byjus.com/biology/neurons/

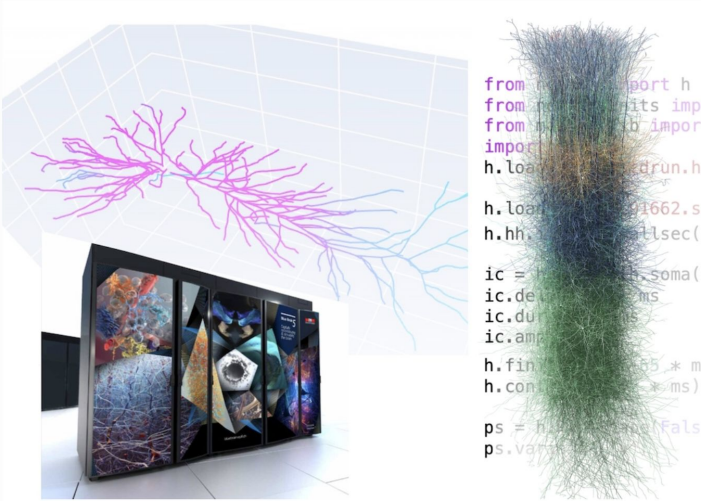


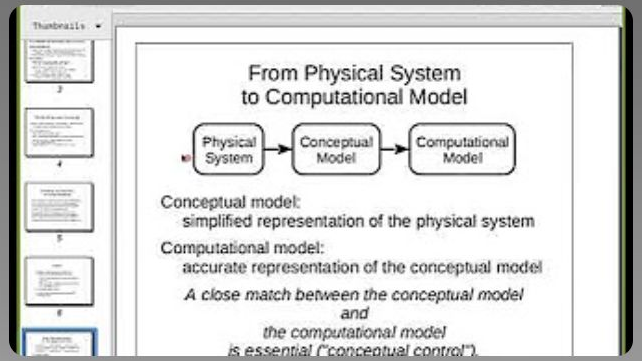
https://en.hdbuzz.net/287

NEURON python package

The NEURON Simulator

NEURON is a simulator for neurons and networks of neurons that runs efficiently on your local machine, in the cloud, or on an HPC. Build and simulate models using Python, HOC, and/or NEURON's graphical interface. From this page you can watch recorded NEURON classes, read the Python or HOC programmer's references, browse the NEURON forum, explore the source code for over 800 NEURON models on ModelDB, and more (use the links on the side or search).





2021 NEURON Online Course

by NEURON Simulation Environment

Playlist · 18 videos · 13,950 views

Play all

Use Case :

a. For researchers with little python experience who want to test out their model

b. For individuals who just begin to learn about neuron, as a interactive learning tool

Code:

```
from neuron_simulator import run_simulation

run_simulation('soma')
run_simulation('dend_soma')
```

Demo

SOMA

Soma Properties

Soma Diameter(μm): 10
Soma Resistance(Ω*cm): 1
Membrane Capacity(μF/cm²): 3

Ion Channels:

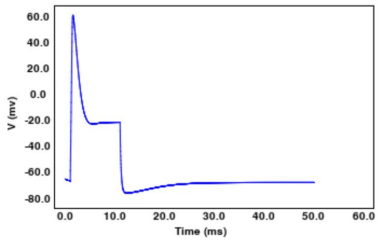
Passive Leaky Channel: Yes / No
Hodgkin-Huxley Na⁺, K⁺ Channel: Yes / No

Electrical Stimulation

Location (0-1): 0.4
Delay (ms): 1
Duration (ms): 10
Amplitude (nA): 3

Simulation

Record | Restart



User tips: 1. Hit 'Enter' to input values; 2. Ion channel cannot be unselected. Please restart to try new values!

Basic Neuron

Neuron Properties

Soma Diameter(μm): 10
Dendrite Length(μm): 2
Dendrite Diam(μm): 4
Membrane Resistance(Ω*cm): 2
Membrane Capacity(μF/cm²): 1

Ion Channels on Dendrite:

Passive Leaky Channel: Yes / No
Hodgkin-Huxley Na⁺, K⁺ Channel: Yes / No

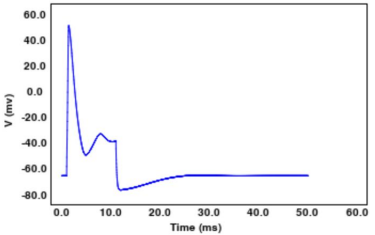
Electrical Stimulation

Soma / Dendrite

Location (0-1): 0.5
Delay (ms): 1
Duration (ms): 10
Amplitude (nA): 1

Simulation

Record | Restart



User tips: 1. Hit 'Enter' to input values; 2. Ion channel cannot be unselected. Please restart to try new values!

Project Structure

Lesson learned

- Familiar myself with how to use ‘class’ to define objects to better navigate interactive user interfaces
- Learned how to navigate Github using git/commit/push and pull commands
- Learned how to make a python package and upload it to pypi
- Learned how to use the NEURON package, which could be potentially beneficial for my later research