NEURAL SIMULATION

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TIMMY

- Student at Isoneday High School
- TEMSay program
- AP Biology
- Hottest student

- Uses NEST Software

WHAT IS NEST?

- NEural Simulation Technology (NEST)
- Library of tools
- Mimics neurons
- Various software
- Works with graphing

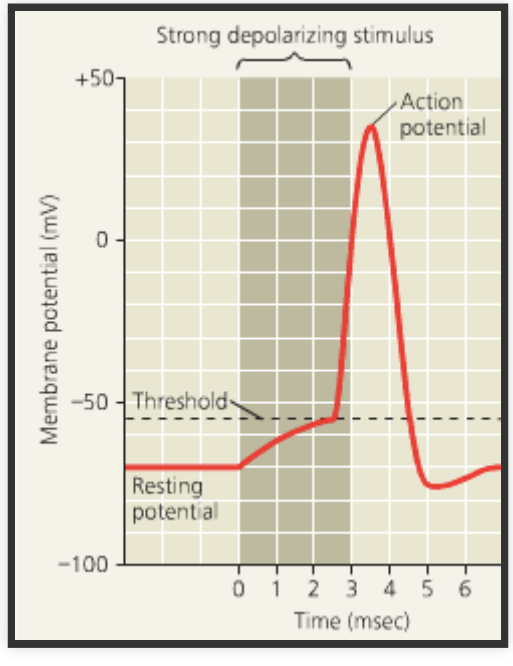
NEST SOFTWARE(S)

NEST Standalone

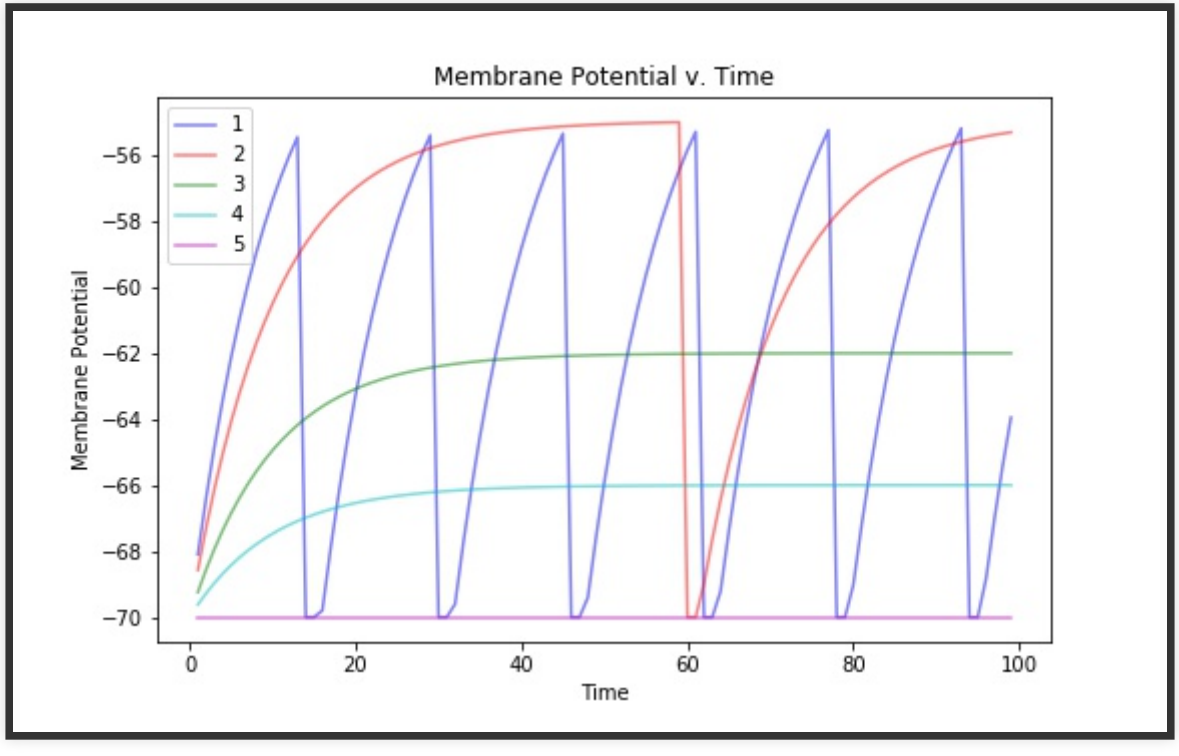
Python (PyNEST)

NEURONS: A REVIEW

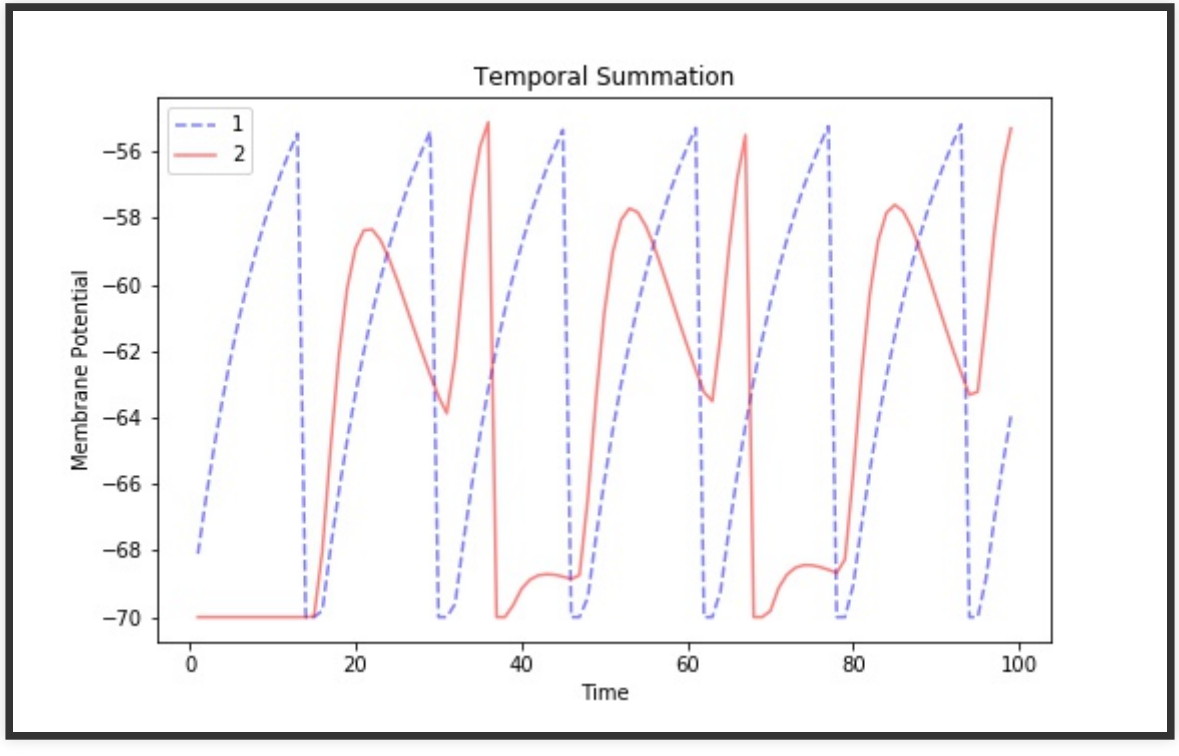
- Cell body + axon
- Electrical gradient
- Action potential threshold
  - Action potential travels along axon



GENERATING POTENTIALS



CONNECTION AND SUMMATION



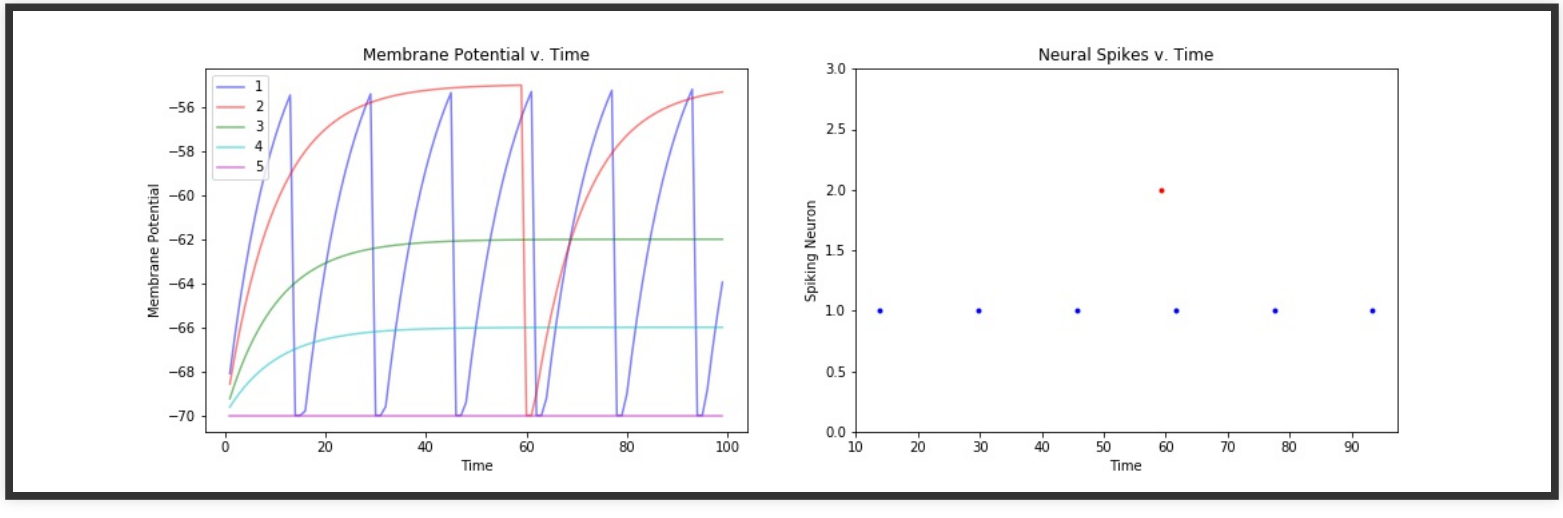
TIMMY'S CHOICE: PYTHON

```
import nest
import numpy
from matplotlib import pyplot
```

- Libraries to Import
  - NEST - Neural simulation
  - NumPy - Powerful computation
  - MatPlotLib - Graphing

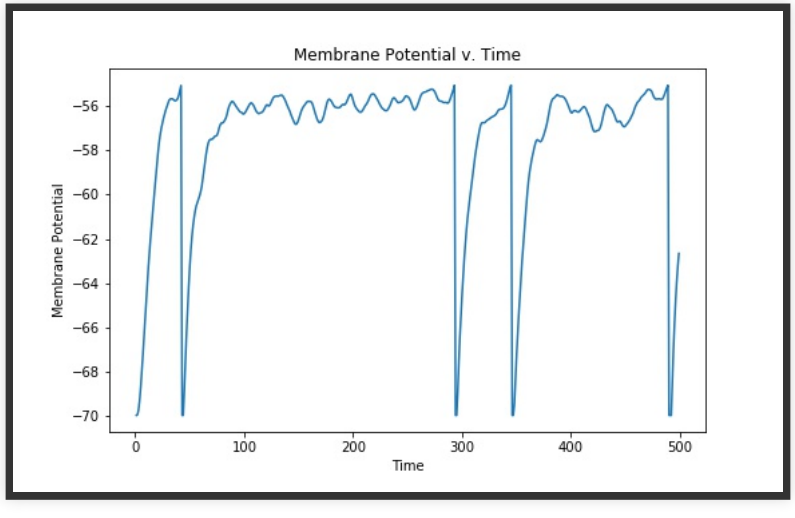
BACKGROUND NOISE POTENTIAL

```
neurons = nest.Create("iaf_psc_alpha", 5)
nest.SetStatus(neurons, [{"I_e": 500.0}, {"I_e": 376.0}, {"I_e":
nest.Simulate(100.0)
pyplot.show()
```



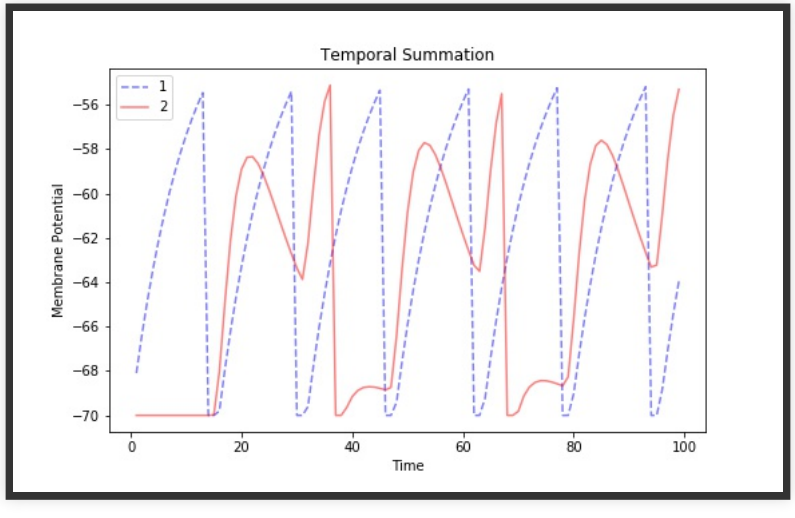
POISSON GENERATOR

```
poisson = nest.Create("poisson_generator"); neuron = nest.Create(
nest.Connect(poisson, neuron, syn_spec={'weight': 1.2})
nest.Simulate(100.0)
pyplot.show()
```



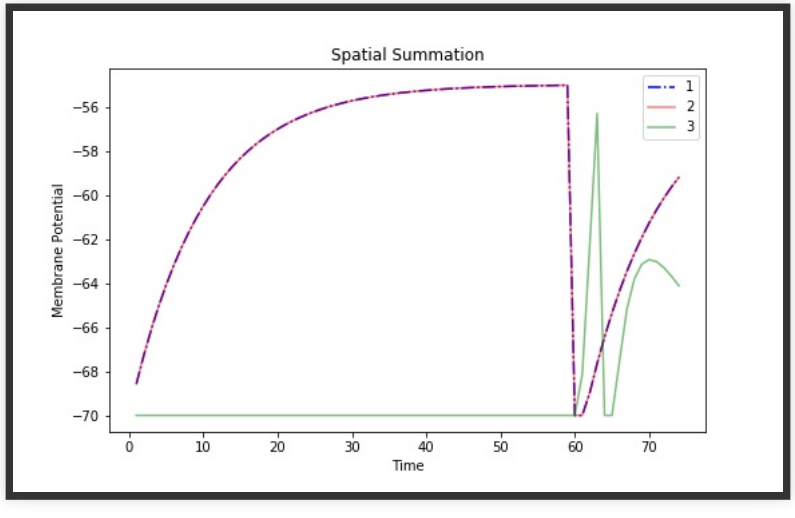
TEMPORAL SUMMATION IN NEST

```
pre = nest.Create("iaf_psc_alpha", params={"I_e": 500.0}); post=n
nest.Connect(pre, post, syn_spec={'weight': 1.2})
nest.Simulate(100.0)
pyplot.show()
```



SPATIAL SUMMATION IN NEST

```
pre = nest.Create("iaf_psc_alpha", params={'I_e': 5}, 2); post =
nest.Connect(pre, neuron, syn_spec={'weight': 900.0})
nest.Simulate(100.0)
pyplot.show()
```



A WORD OF EXPLANATION

- Yes, "Timmy" is me
  - "Timmy" clearly is the hottest student though
- For clarity certain details were excluded
  - Multimeter (detecting voltage)
  - Spike Detector (detecting spikes)
  - MatPlotLib details (plotting, labelling, etc.)
- I also did not touch on installation

SOURCES

- http://www.nest-simulator.org/
- https://anaconda.org/
- https://www.umass.edu/wsp/resources/poisson/
- http://www.cns.nyu.edu/~david/handouts/poisson.pdf
- https://matplotlib.org/
- https://stackoverflow.com/