Neural Simulation in Nengo

Making Neural Networks Do Something!

1 Overview

Each individual in the class will implement a simple neural simulation in python building on the ideas discussed in class using the python package Nengo `https://www.nengo.ai/`.

We will simulate a simple population of neurons. These neurons will be stimulated by a piecewise constant step input current. This current will drive spiking in the neurons.

We will write code to simulate the population and test three conditions

- negative feedback
- positive feedback
- no feedback

We will then make plots of

- decoded neural state
- spike time splots
- phase plots

2 Details

Starter code is available here: `https://github.com/circuitinstitute/intersession2020`. Your main goal will be to combine two existing nengo tutorials, run them, change the parameters, and interpret the results. These are found here `https://www.nengo.ai/nengo/examples/dynamics/oscillator.html` `https://www.nengo.ai/nengo-extras/examples/plot_spikes.html`.

If you are using colab, you will need to upload the python notebook. There are no extra data or files needed to run this code.

3 Evaluation

- **code quality** (20 points) code is clean and well documented.
- **complete probes and plots** (30 points) complete code to create probes and plot data.

- **implement feedback connections** (25 points) You must implement the population with negative feedback.
- **test positive feedback and zero feedback** (25 points) Describe the transforms needed to do positive and zero feedback, and describe the results with text and or plots in your jupyter notebook.
- **total** (100 points)

4 Submission Requirements

- Jupyter notebook with code and results

5 Submission Deadline

The notebooks must be submitted to via Github no later than 15h20 on Friday, January 24th, 2020.