### Pinky and the Brain

### What’s the task:

This project proposes to analyze the behavioral and neural time series data of mice taken from experiments conducted to examine its free roam foraging behavior. Specifically, mice are placed into an operant box where if a lever is pressed for a certain threshold of duration (800ms) then the mouse is rewarded with sucrose or food pellets.

### How will you do it

The model would use past behavioral and neural data as inputs. Behavioral data consists of the duration of past lever presses as well as the time between past lever presses. Neural data consists of recordings of calcium concentrations in the secondary motor cortex that directly corresponds to voltage differences in the actual neural activity.

We want to start with binary classification where we’ll be looking at the behavioral and neural data to predict whether the mouse will pass the threshold of the duration of lever pressing or not. For the threshold, we’ll be using the (800 millisecond), which is the minimum duration needed in order for the mouse to get the reward.

If we notice that the binary classification model has a good performance, we’ll be moving to multi-class classification where we’ll be subsetting the predicted duration of the lever press into N classifications with intervals of size k. k and N will be determined based on preliminary descriptive statistical analysis and model performance.

We’re thinking of using Multilayer perceptrons as one model to solve this task. Additionally, we’ll be exploring transformers as another model.

### How will you evaluate success

In order to evaluate the success of the model, we are going to do a train/test data splitting. If we continue working with binary classification, we’ll be using AUC-ROC as a model evaluator. As for multiclass classification we’ll be using Goodness of fit and goodness of prediction.

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