ANALYSING STEINMETZ DATASET
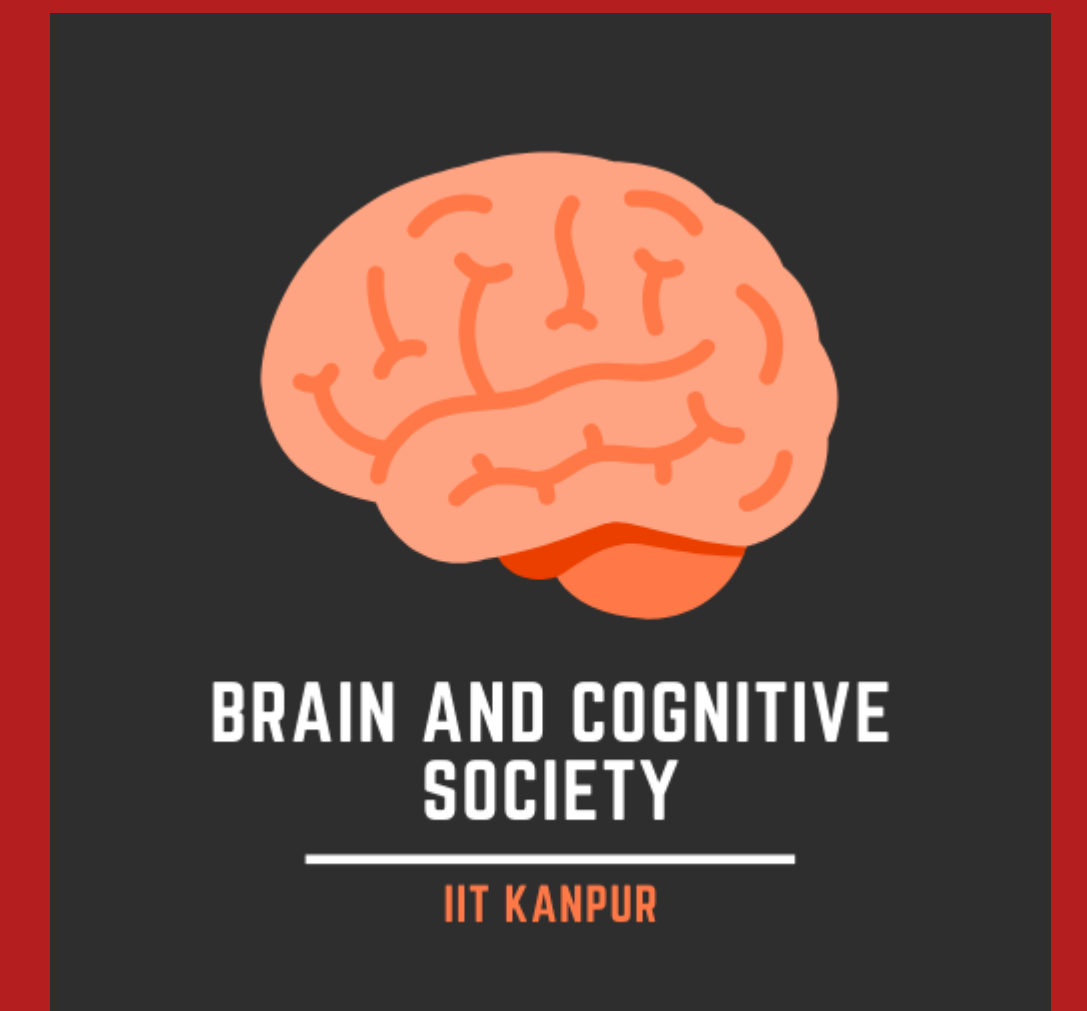
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BRAIN AND COGNITIVE SOCIETY
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INTRODUCTION

- The dataset published by Nickolas Steinmetz contains information about the behaviour of 10 mice under visual discrimination task over 39 sessions.
- The dataset provided us with the opportunity to understand/predict the behaviour of the mouse using its neural activity.
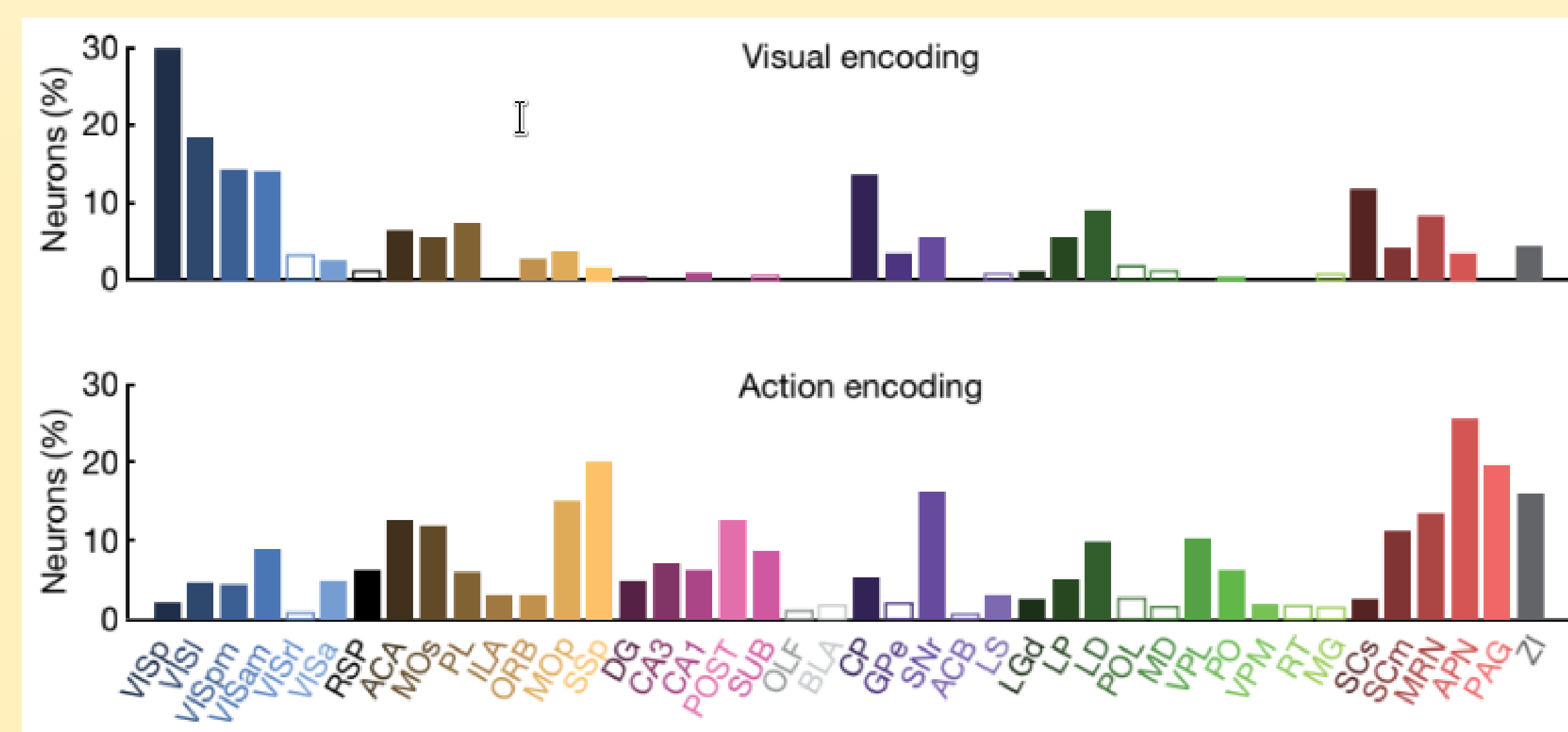

OBJECTIVE

- To understand the relation between neural activity and the response of the mouse.
- To explore the dataset and get some insights on some of the complex parts of the brain which may be used for further research on that part for a given task.
- To build a model which can predict the response given the neural data.

RESULTS

- The logistic regression model was successfully made with an F1 score of 90% accuracy.

- There is a problem with this model: the model relies more on outer data like gocue sound, contrast ratio, etc. This deviates us from making actual predictions using just the neurons. It seemed that neural activity is just random.
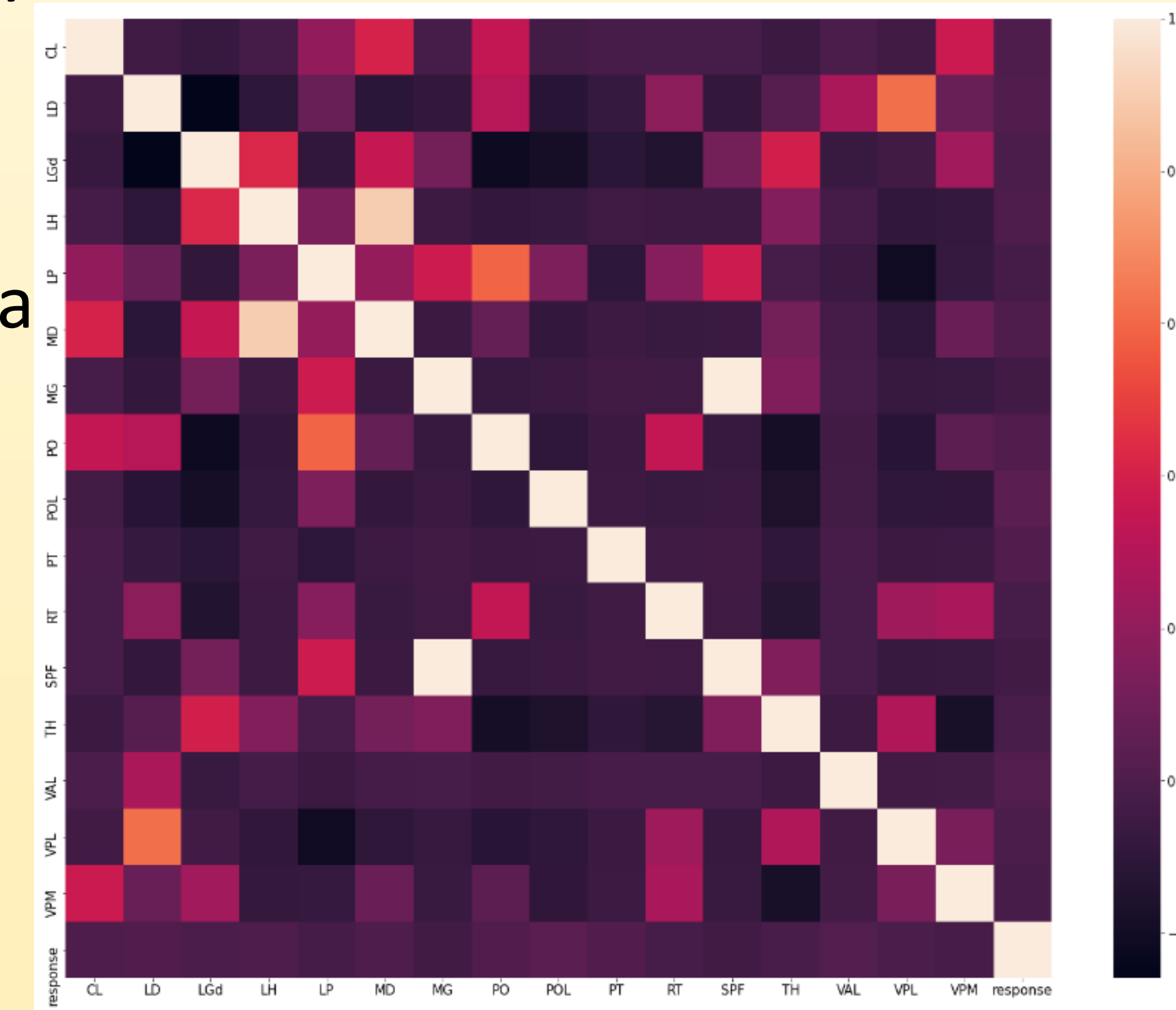

- Then we studied the Neural Activity of each brain group in different brain areas and found out that there are certain brain group that encoded response/no response and certain neuron that got more activated in case of right response and some in case of left response.
- However, the observations are from cumulative data (from all sessions) and neural network model based on single experiments' spikes was futile.

ACB
(response/no response)

CP
(right encoding)

MS
(left encoding)
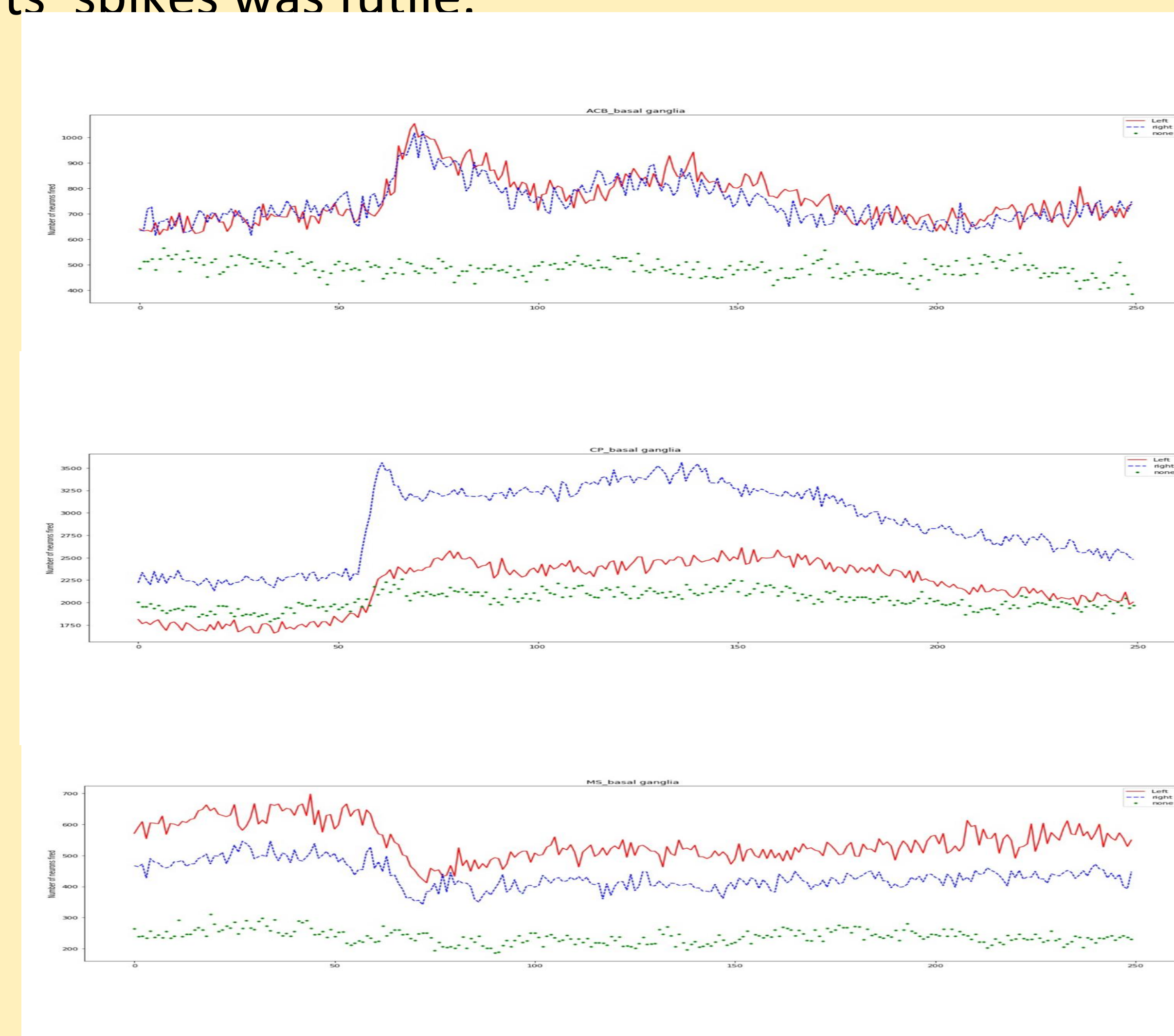
DISCUSSION AND FUTURE WORK

- Designing a model based on cumulative data that predicts from inputs from single experiment.
- A probability based model can be designed based on the probability of activation of a particular neuron at each timestep for these 3 responses and then use it to predict the response.
- A time series model (RNN or LSTM) can be fitted, using spikes of particular neurons (the ones which can shows a clear margin of activation in 3 cases like "ACB", "CP", "MS") as features and responses as output.
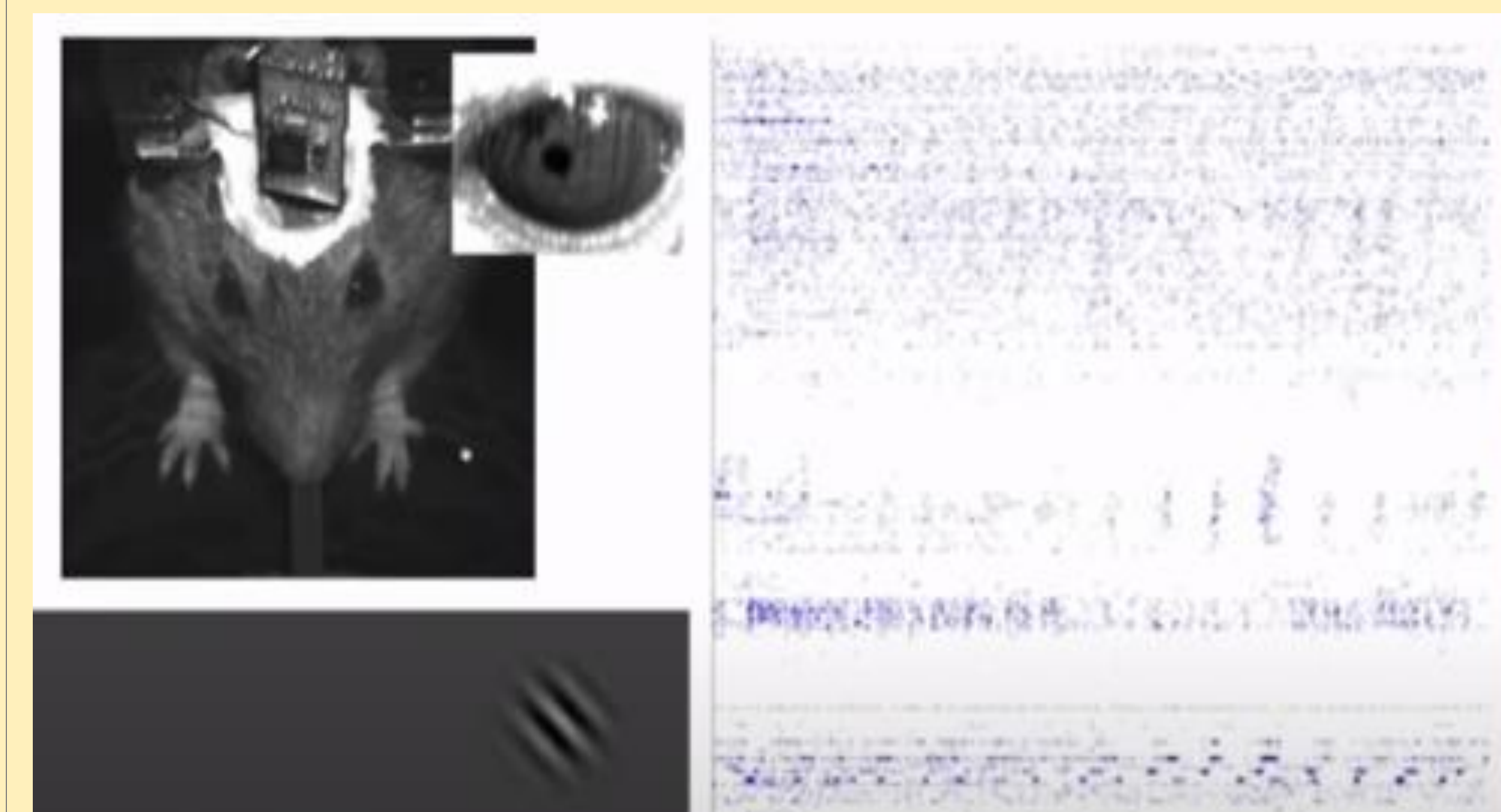
REFERENCES

- Distributed Coding of choice, action and engagement across the mouse brain
- Github
- Documentation
- Midterm evaluation slides
- ResourWces