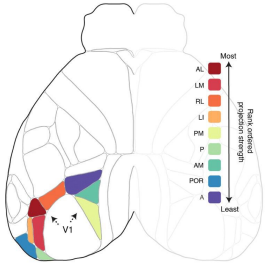
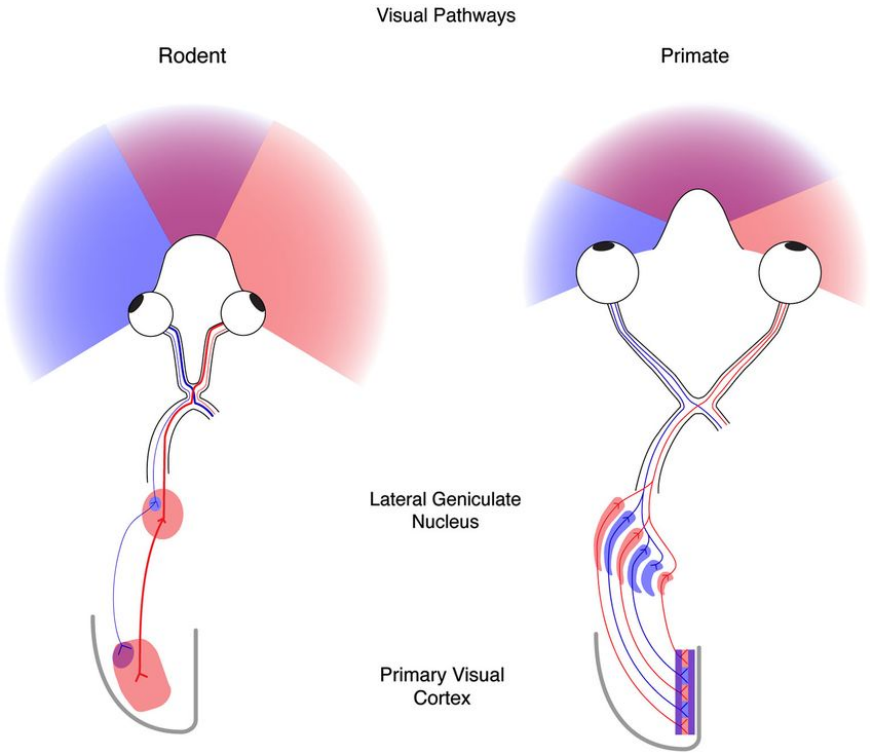


The overstimulated mice

Ouranosaurus Paso pod

The Axonal Avengers group

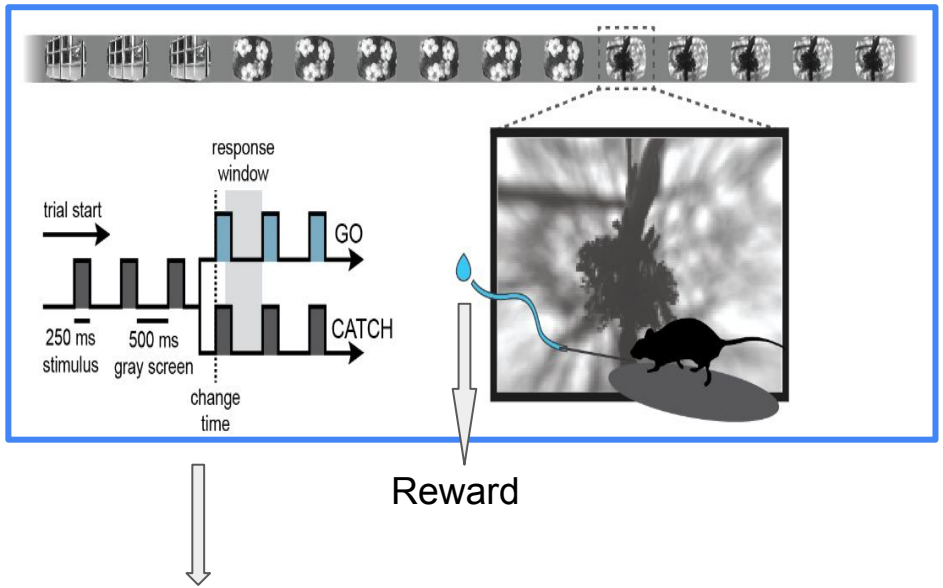
How mice process visual input



Projections from the V1 to the higher visual areas carry distinct visual information

Introduction

Allen Dataset - 2P calcium imaging data from mice V1 AND LM



Time interval we are interested in: the first 500 ms of activity from the image change

Stimulus → Novel Images / OR / Familiar Images

Our Hypothesis

1. Magnitude of activity in excitatory neurons at V1 and LM differ between familiar and novel image

2. Cross correlation coefficient of activity and time lag between both areas will differ when presented with a novel image compared to a familiar one

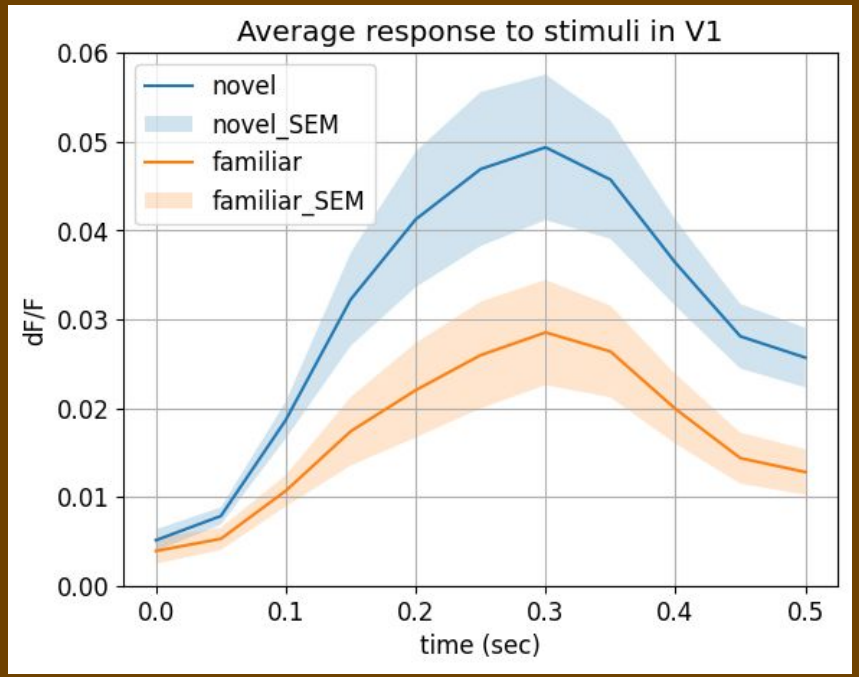
Plan of Approach

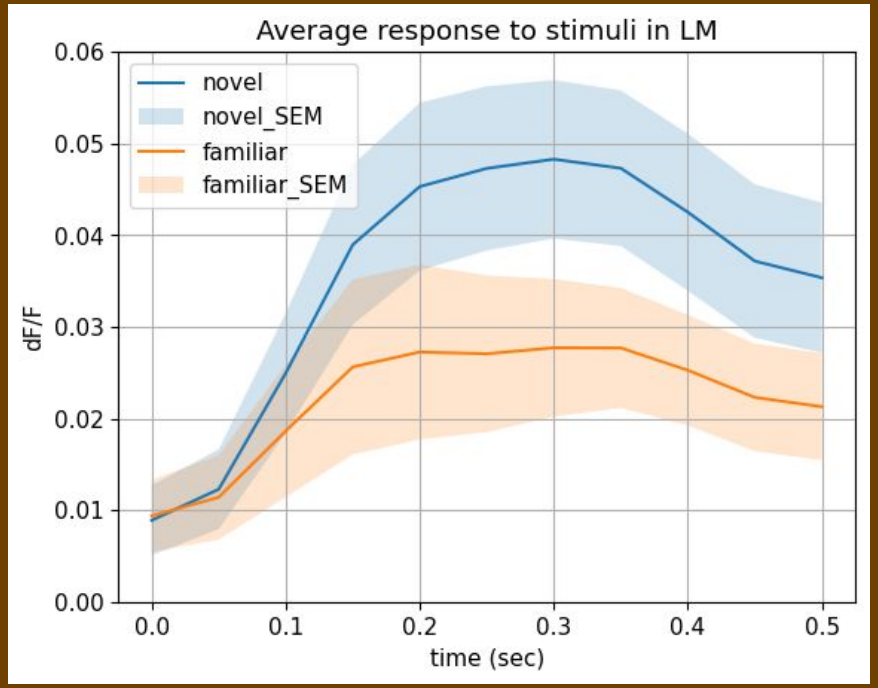
1. Plot the average neurons' activity in V1 and LM after novel and familiar image presentation to study the relationship of stimuli change and neuronal activity

2. Cross correlation analysis of the activity and delays in neuronal activity between V1 and LM will be conducted

3. Build a dynamic model of excitatory signal propagation between V1 and LM

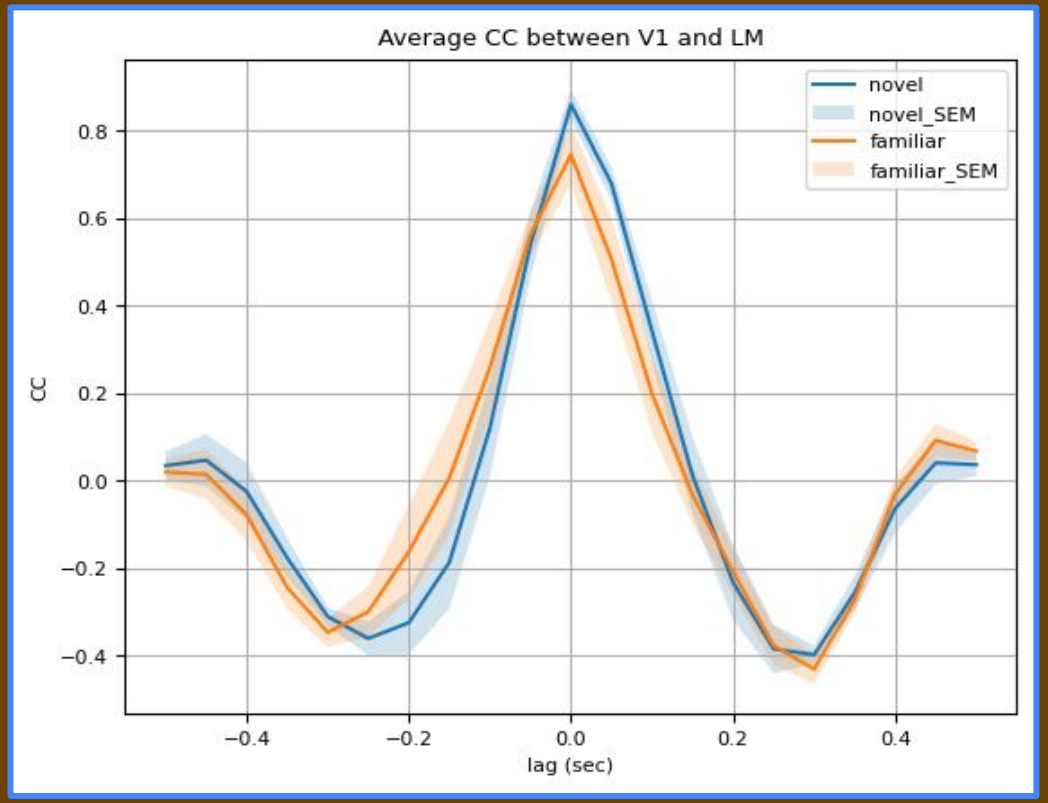
Average response to novel and familiar stimuli:





For both areas, the response is stronger for novel stimuli

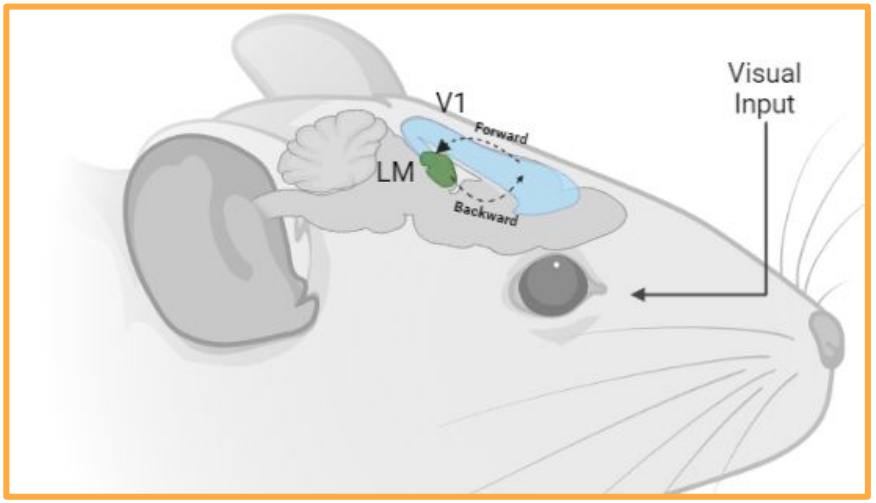
Correlation analysis



There is no evidence of a delay between the two areas responses

Correlation to novel stimuli appears slightly higher than correlation to familiar ones

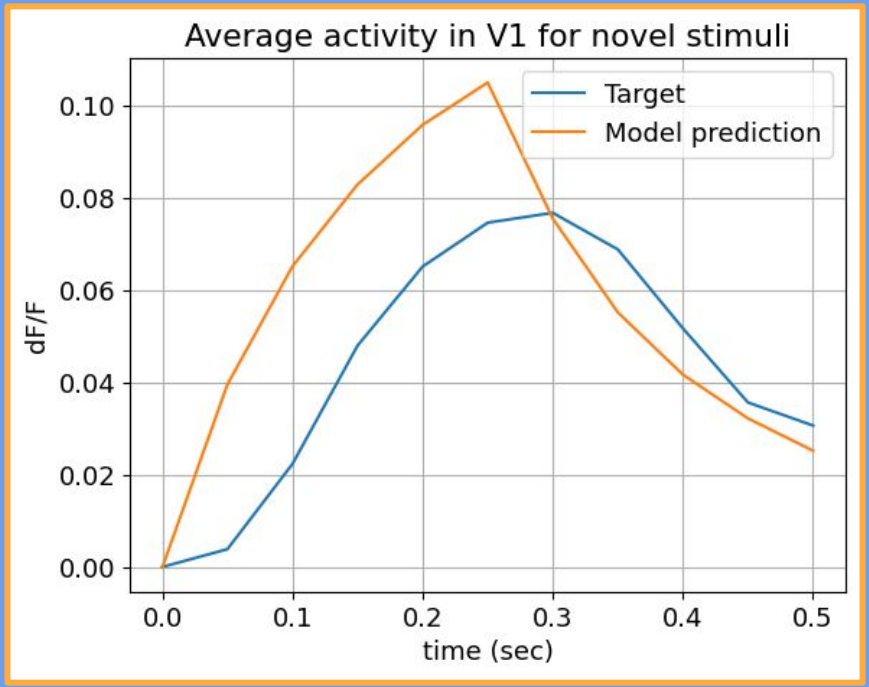
A dynamical model to simulate the V1-LM interaction

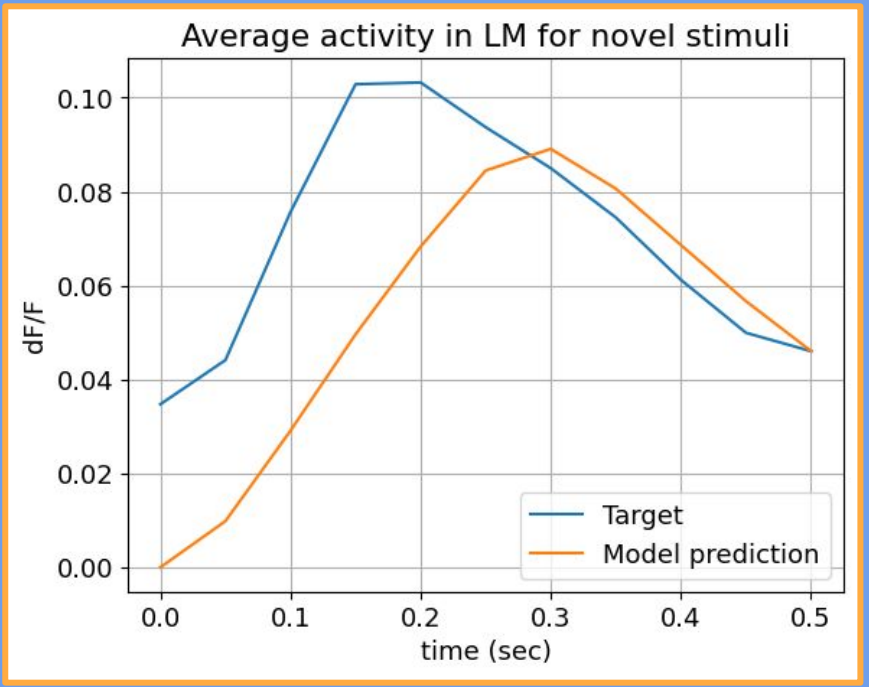


$$\dot{\mathbf{x}} = W\mathbf{x} + \mathbf{I}$$

$$\mathbf{x} = [V1(t), LM(t)]^T \qquad W = \begin{bmatrix} -k & w_{forw} \\ w_{back} & -k \end{bmatrix} \qquad \mathbf{I} = [I, 0]^T$$

A dynamical model to simulate the V1-LM interaction:





The model can predict a reasonable dynamic for the average response
(with many possibilities of improvements)

Conclusions

- Novel image led to more activity in both primary and secondary visual areas
  -> Suggesting the requirement of more processing

- There was no difference in time responses between the two areas.
  This could be due to slow dynamics of calcium, which prevents the capturing of faster time delays

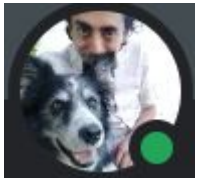
- The interaction between V1 and LM can be well described through a network dynamical system. However, the consideration of other factors such as the inhibitory actions could improve the results obtained in this work.

- The model can help us determine what communication is dominant between V1 and LM (feedforward or feedback)

Acknowledgements

Nikolai Safronov (TA)

Raúl Hernández (project TA)



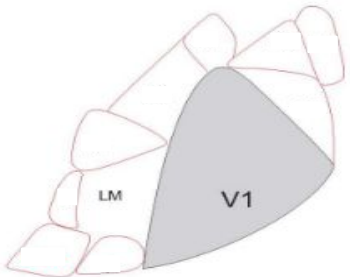
Matthijs oude Lohuis (project mentor)

Our mums-(Yash, Fabrizio, Quadri, Tuba, Chunxu)

Thank you for Listening

The mice were shown a series of familiar images or novel images, it earned a water reward by reporting changes in stimulus identity.

Build a dynamic model of excitatory signal propagation between V1 and LM



By 2-photon imaging, the neuronal activity of excitatory neurons from both V1 and LM of the mice were recorded

By analyzing the average neurons' activity in V1 and LM, we study on the relationship between V1 and LM