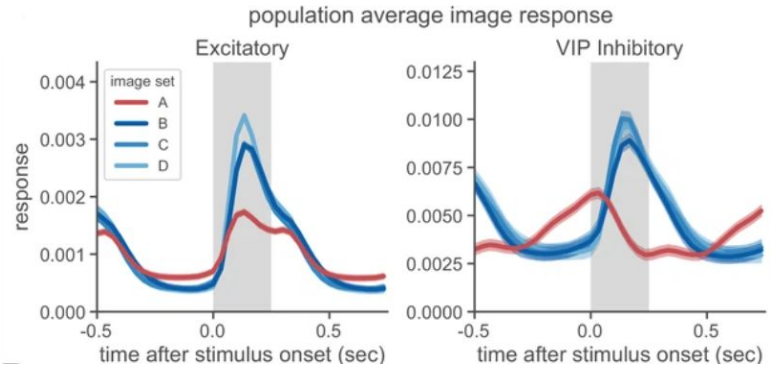
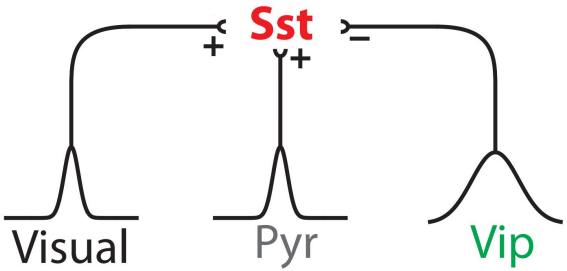
Exploring the role of VIP interneurons in (novel) image detection

VIP response dynamics to novel versus familiar



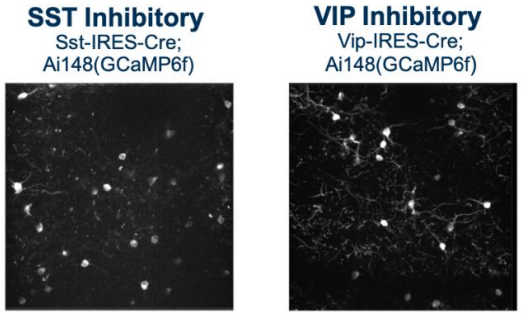
Garret et al 2020, eLife

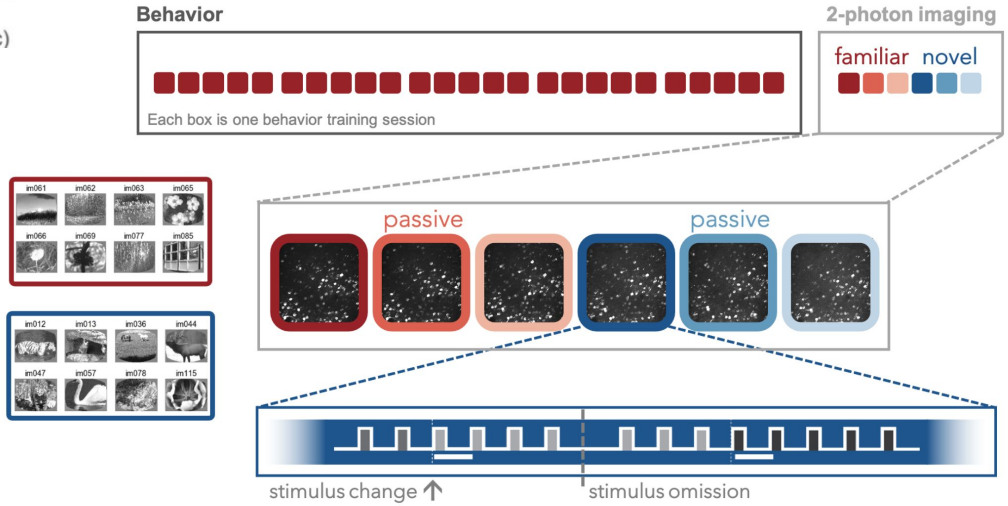
Feedback inhibition



Dippopa et al 2018, Neuron

Our dataset

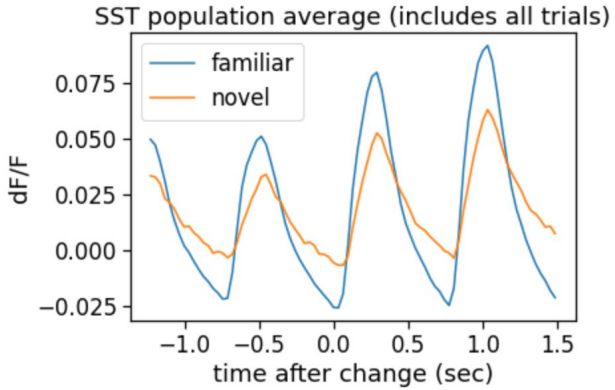


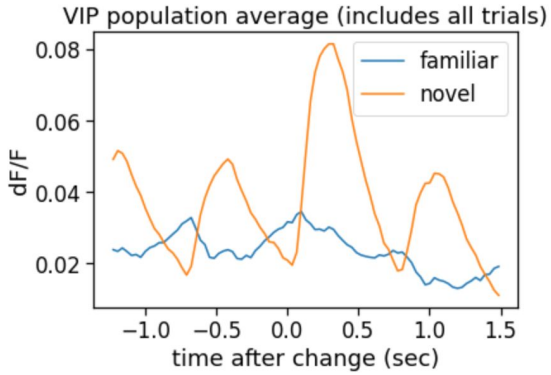


Do VIP neurons contain information to decode the novelty or familiarity of an image or the identity of the image itself?

Daniel Guerrero, Gabriela Manzano Nieves, Angelica Minier-Toribio, Emilio Recart, Cuauhtémoc Suárez

Hypothesis: **VIP neurons, but not SST neurons, would have sufficient information to decode novel vs familiar and image identities.**

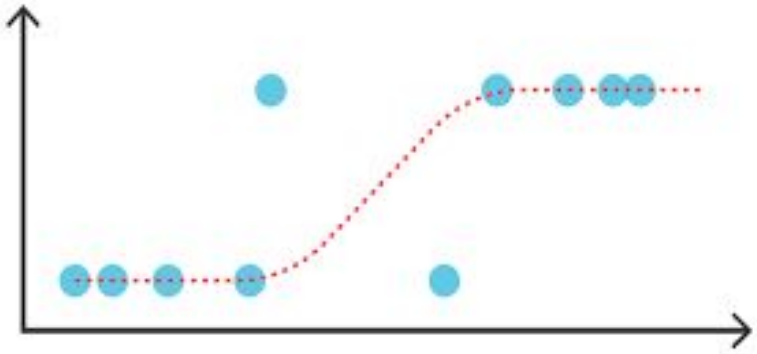




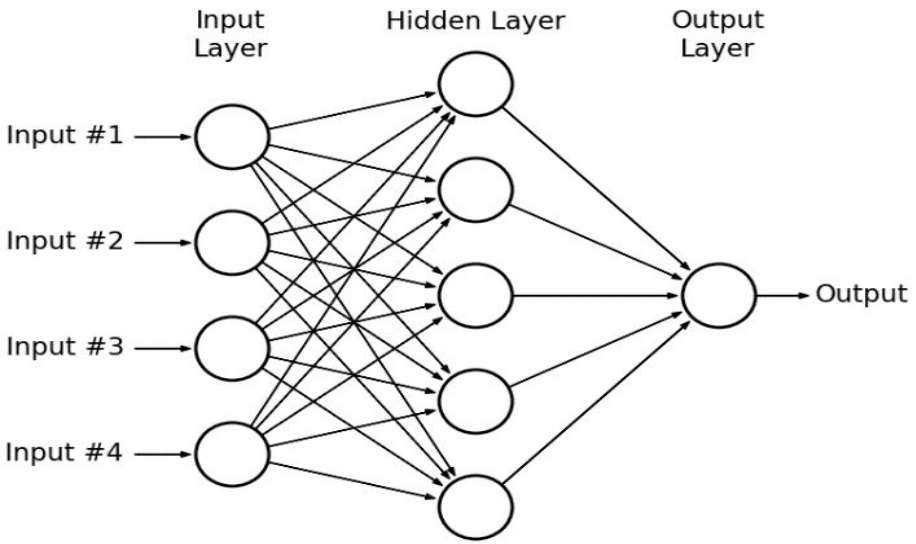
VIP population average dF/F is higher to novel versus familiar stimuli

Approaches: **Logistic Regression Model** & **Multilayer Perceptron (MLP)**

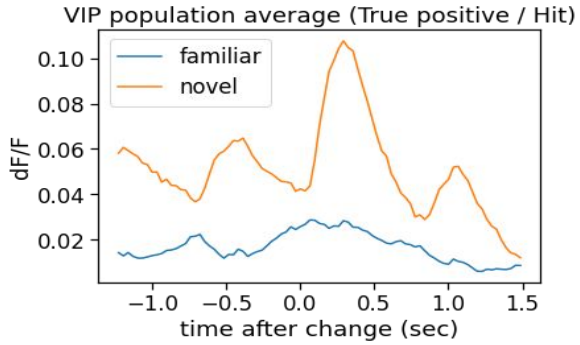
Logistic Regression

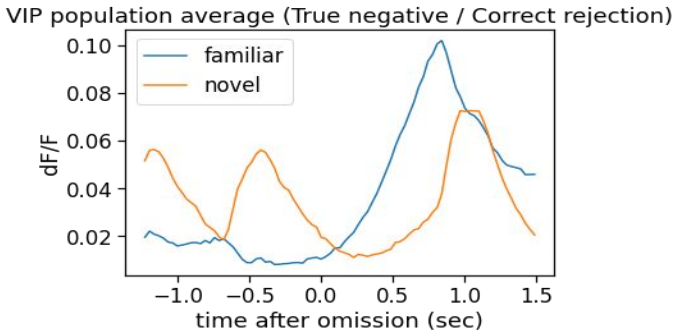


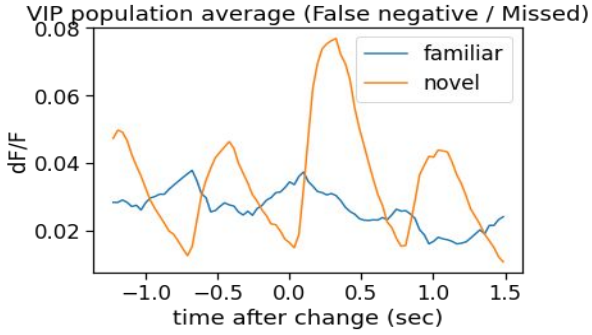
MLP

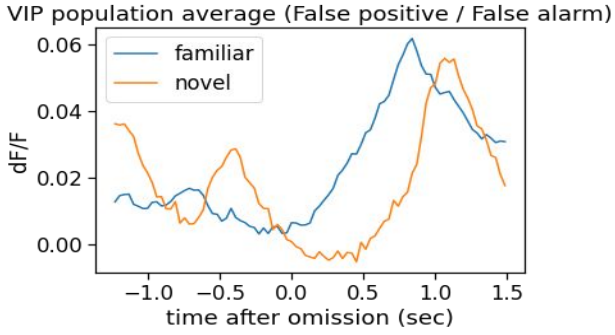


VIP population activity is affected by image change but not by reward acquisition

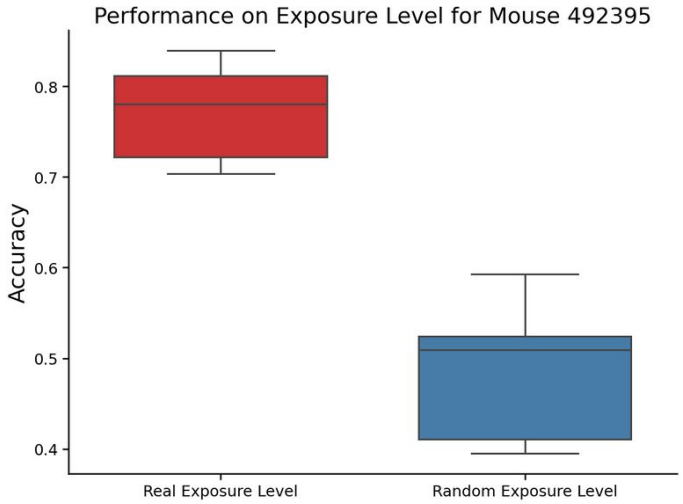


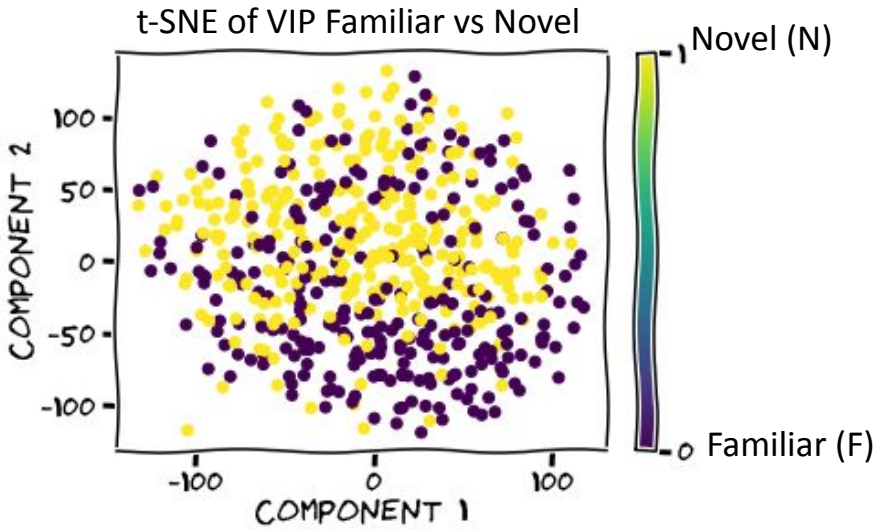




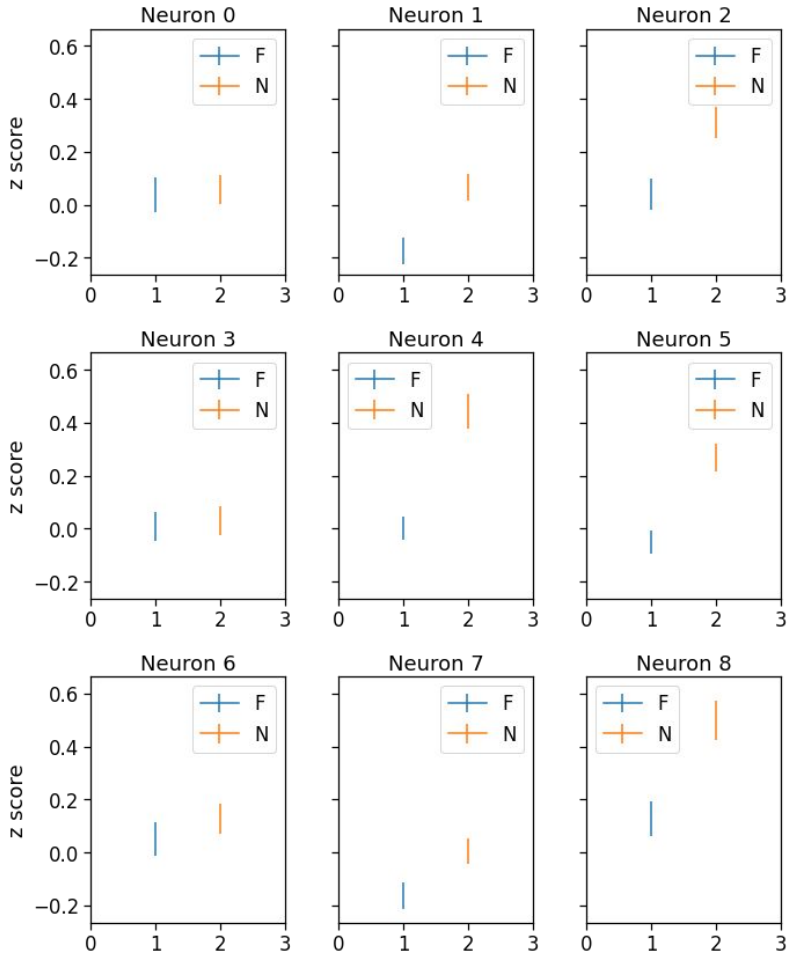


VIP neurons contain information to decode novel and familiar images



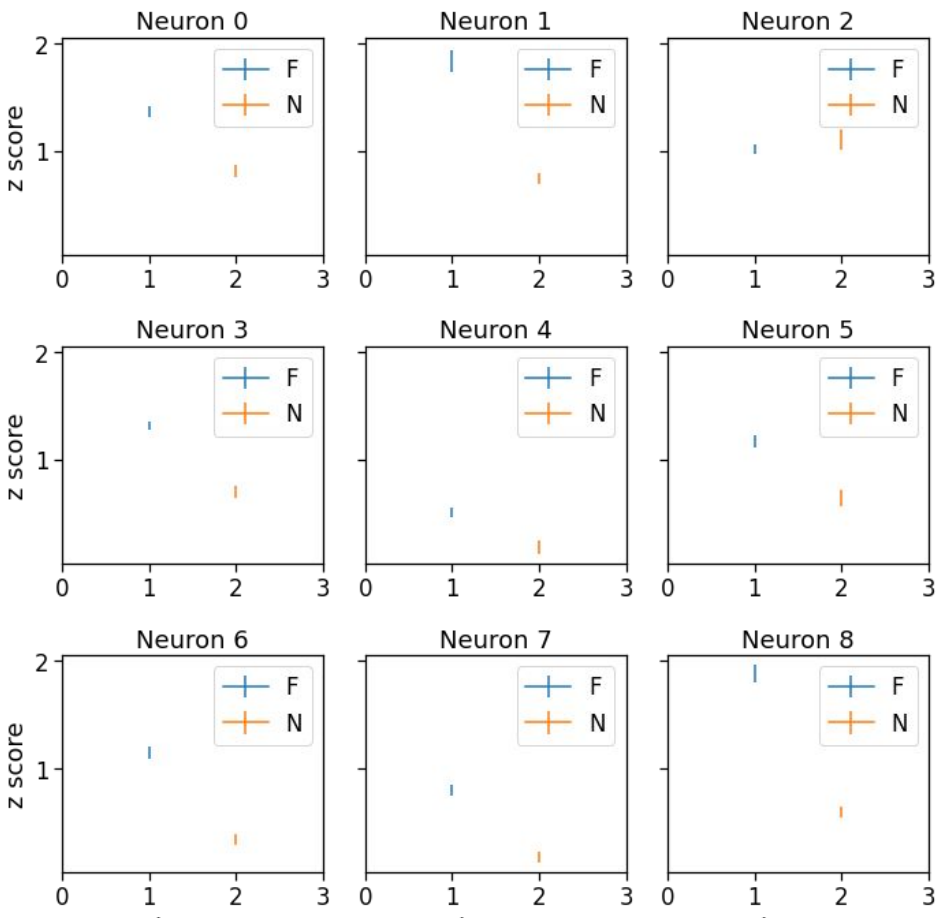


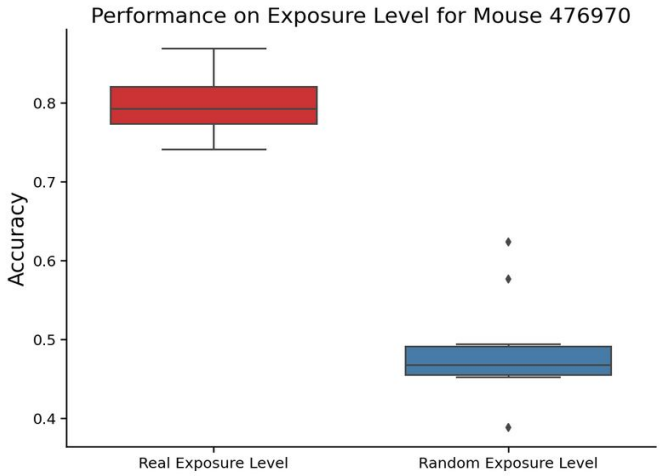
Individual Neurons' Mean Activity to Novel and Familiar

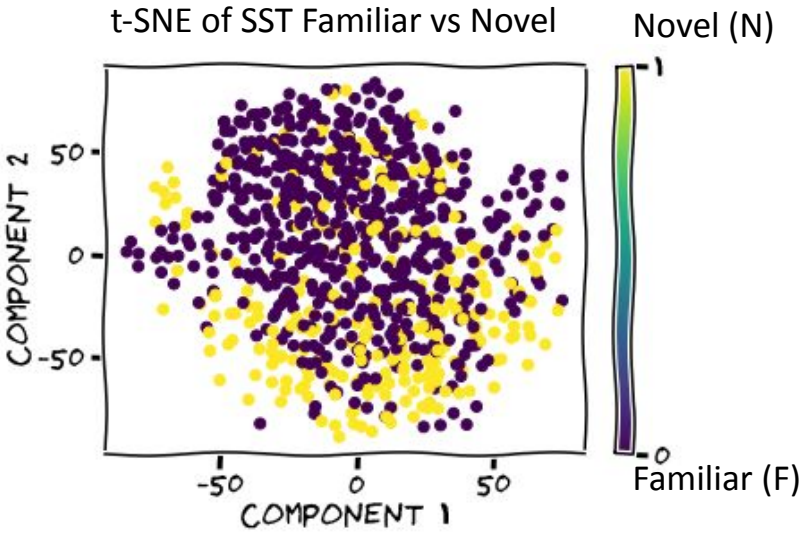


SST neurons contain sufficient information to decode novel and familiar images

Individual Neurons' Mean Activity to Novel and Familiar

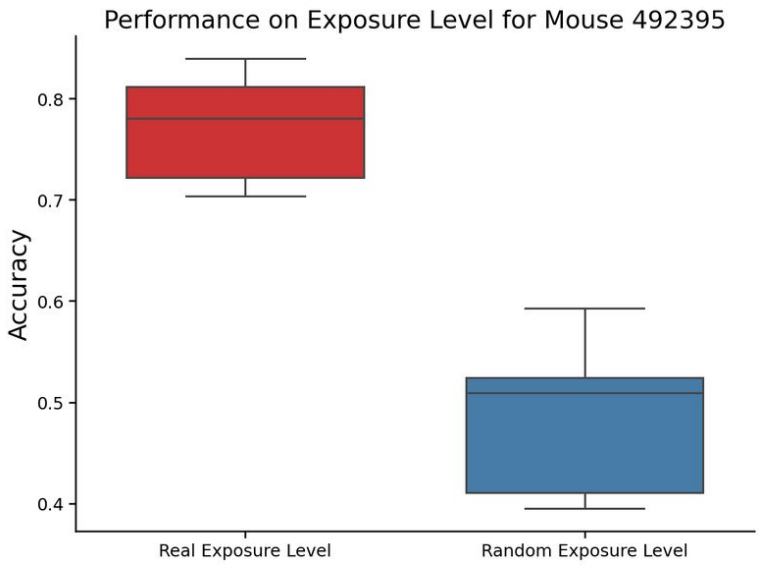




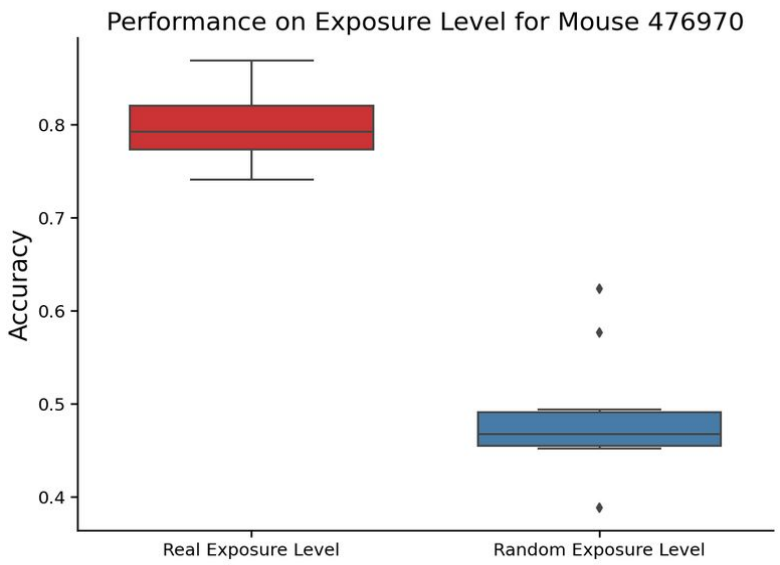


SST neurons were as capable as VIP neurons in decoding familiar and novel stimuli

Cross-validation accuracy using VIP interneurons only

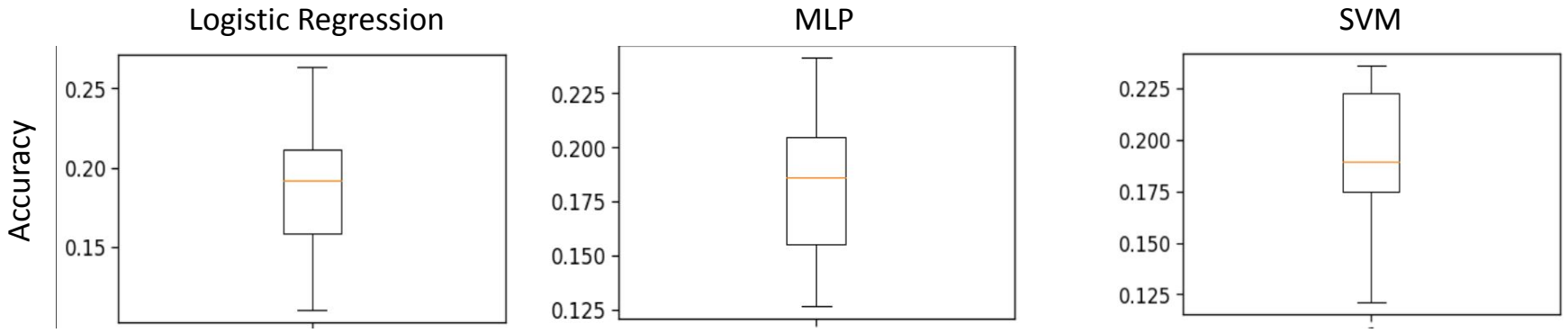


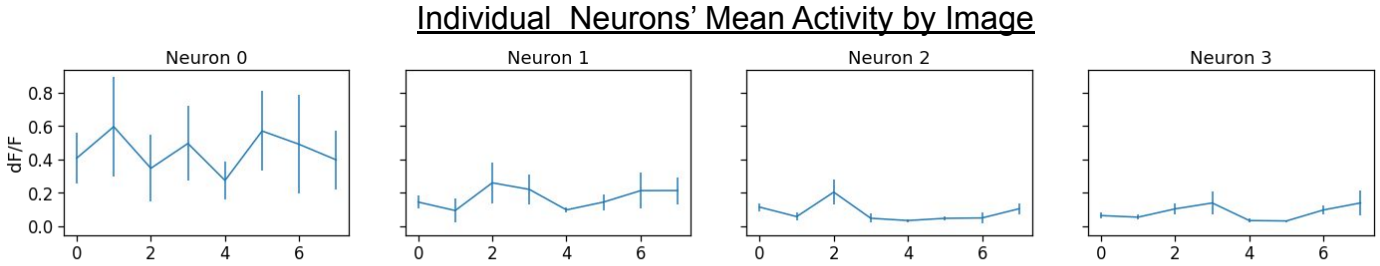
Cross-validation accuracy using SST interneurons only

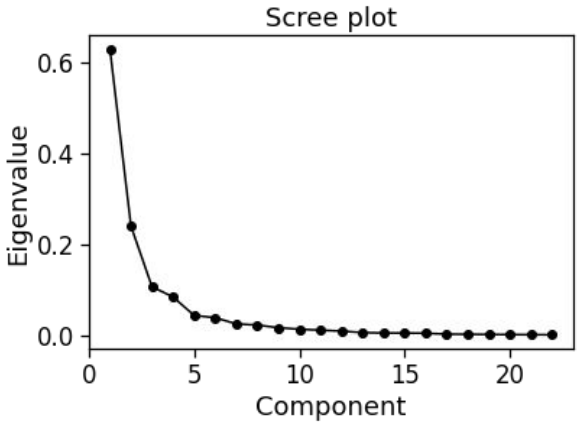


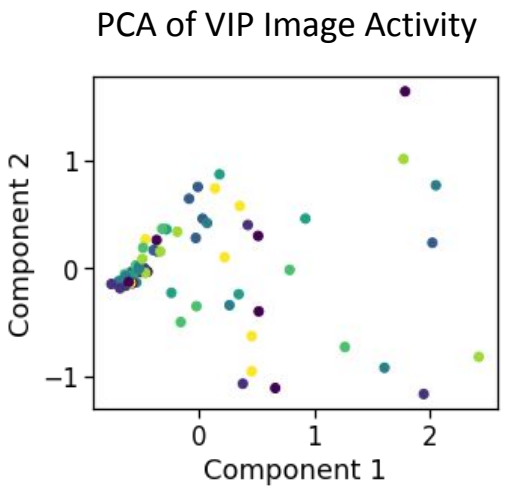
Using MLP to decode novel versus familiar with the mean z-scored activity from VIP or SST

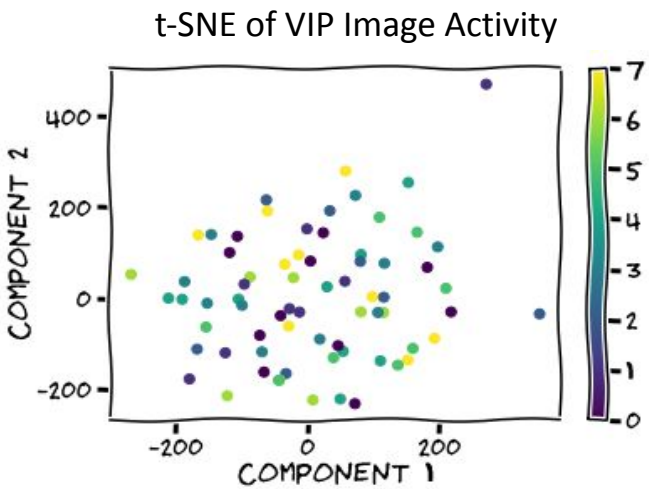
VIP does not contain sufficient information to decode image identity





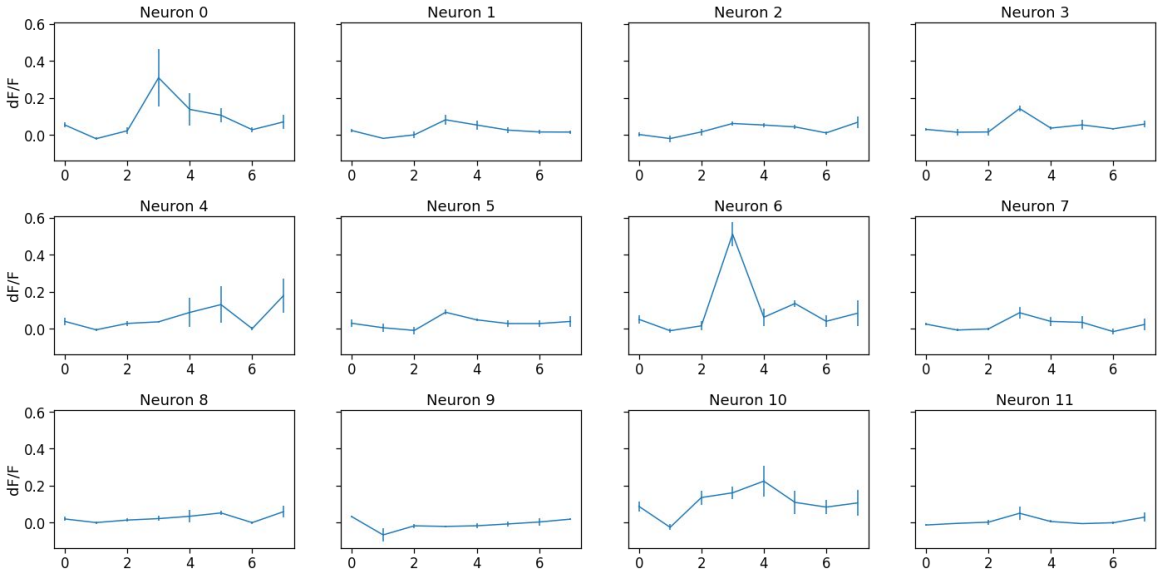


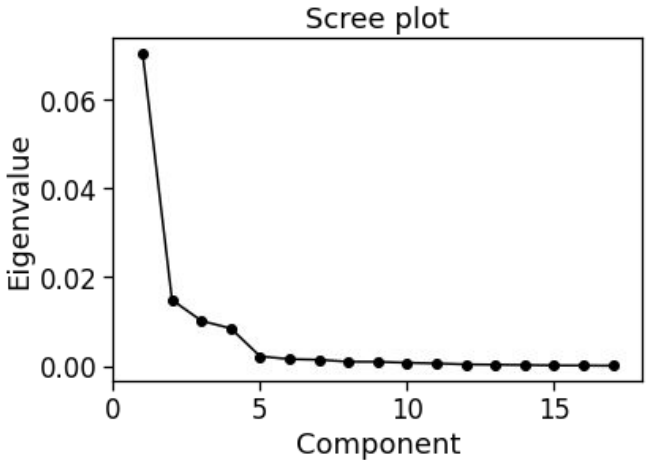




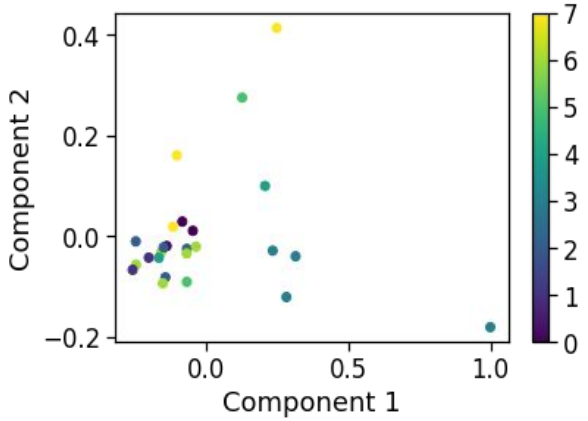
Preliminary analysis of SST neurons also suggested that they did not contain sufficient information to decode image identity

Individual Neurons' Mean Activity by Image

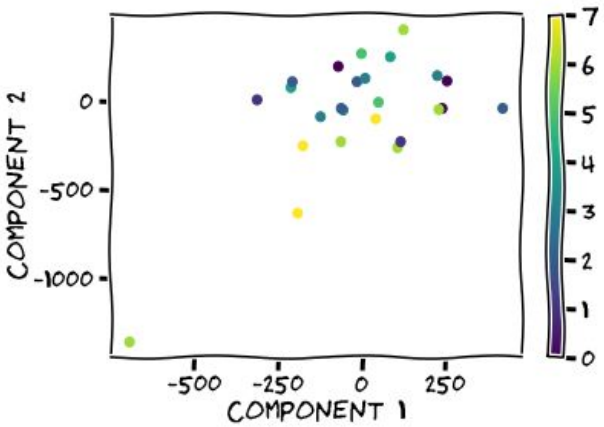




PCA of SST Image Activity



t-SNE of SST Image Activity



Conclusions

- Both VIP and SST neurons contain information to decode novel and familiar images.
- VIP neurons did not contain sufficient information to decode image identity.
- We were limited by our small dataset (and time).