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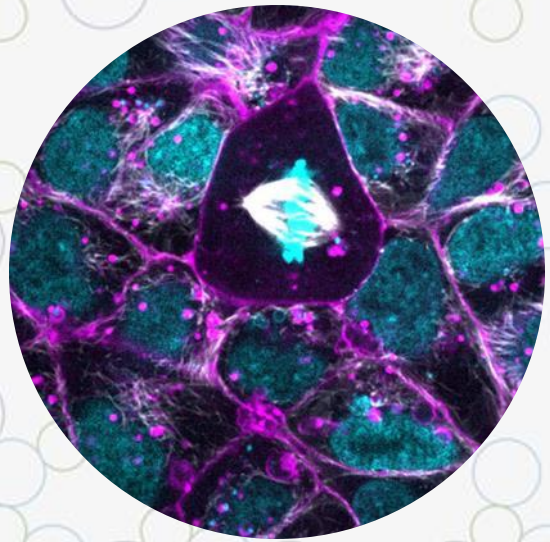
Visual Behavior Dataset

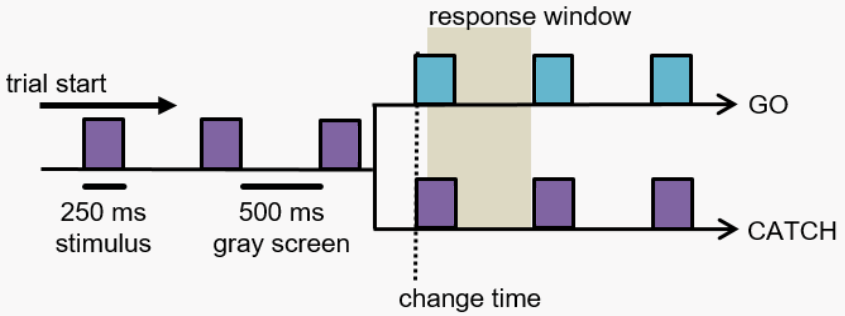
Interactive notebook:
https://github.com/AllenInstitute/CNS_2021

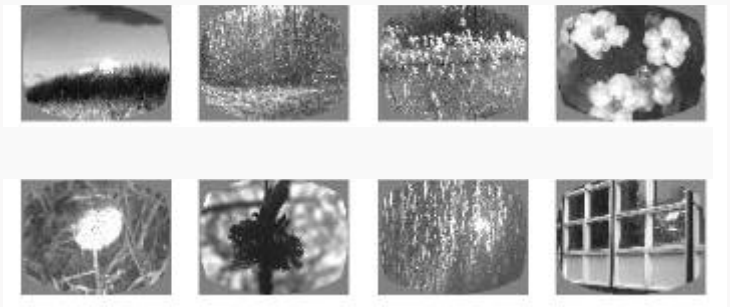


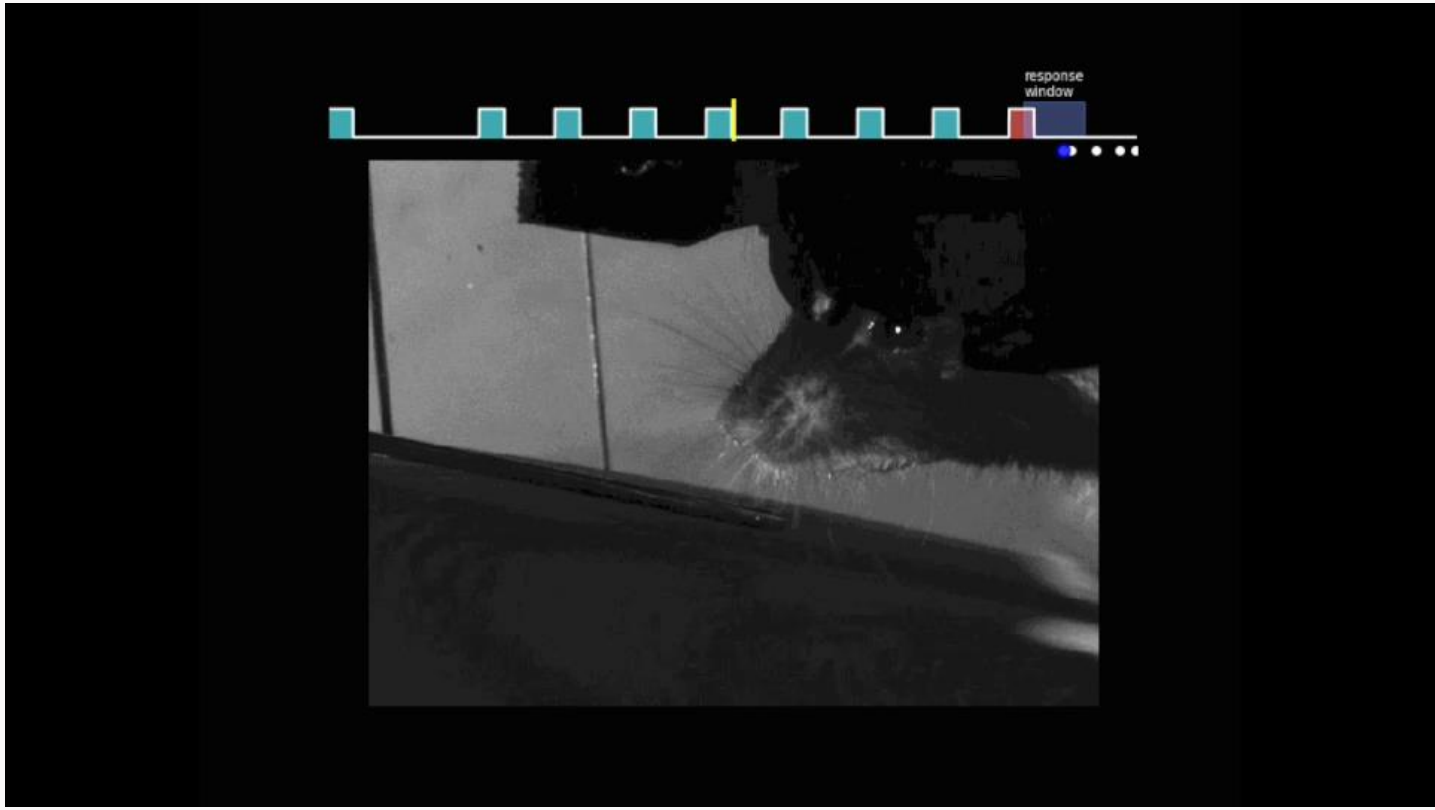
Visual Behavior Project

The Visual Behavior project aims to use large-scale physiology in behaving animals to characterize how sensation and behavior are encoded in activity across the thalamocortical visual system and how these representations are influenced by behavior state, expectation, and experience during an image change detection task.

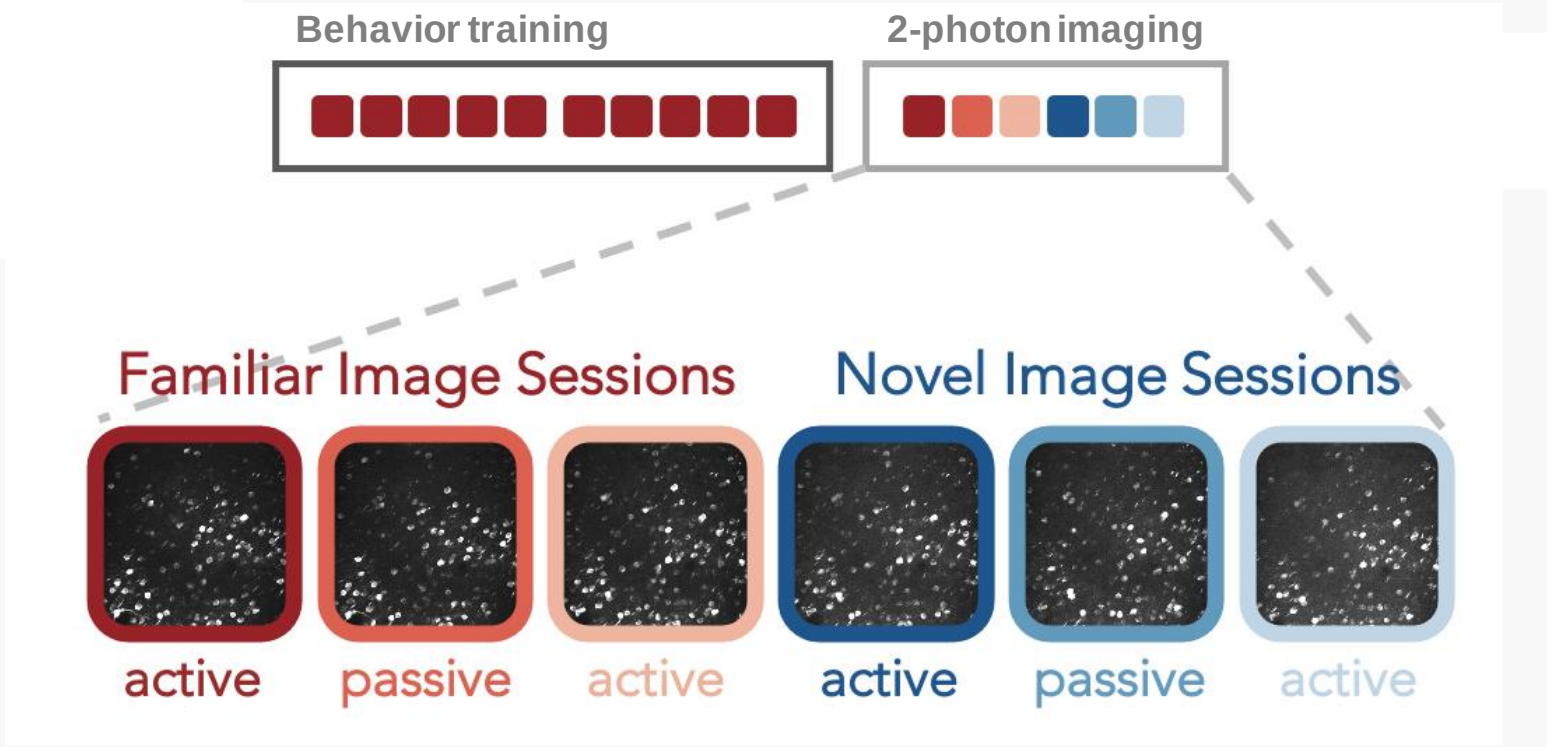
Change Detection Task

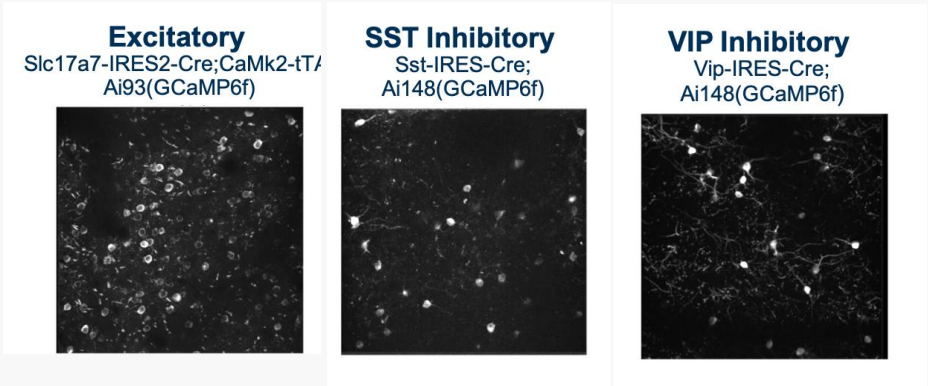






Experimental design





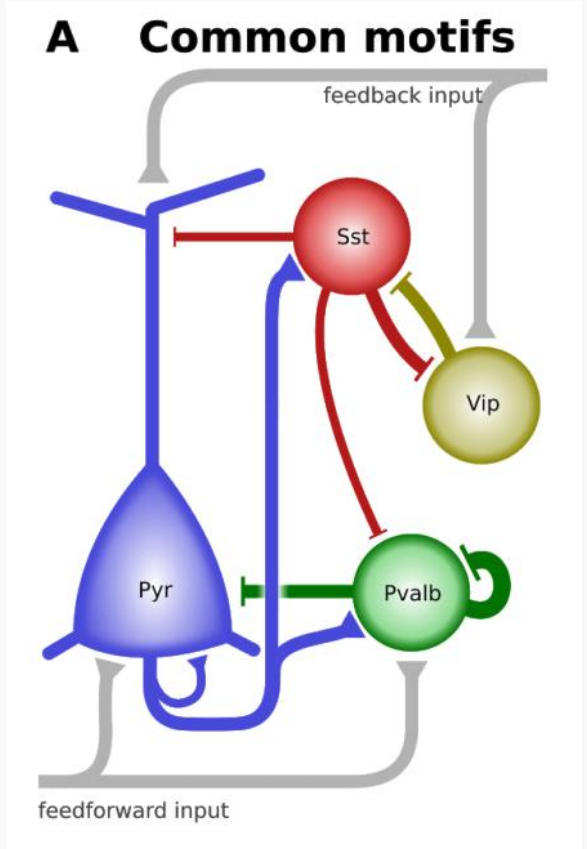


Diagram from Campagnola, biorxiv, 2021

Dataset features

- **Visual Change Detection Behavior**
  - Mice respond to changes in image identity
  - 5% of images are randomly omitted
  - Running, licking, and pupil diameter
- **Multi-day Cell tracking**
  - Three sessions on a familiar image set
  - Three sessions on a novel image set
  - Active and passive behavior sessions
- **Cell Type specific 2-photon calcium imaging**
  - Pan-Excitatory
  - SST Inhibitory
  - VIP Inhibitory
  - V1 and LM cortical areas
  - Up to 8 simultaneous imaging planes, 4 depths per cortical area
- **AllenSDK**
  - NWB files
  - Python codebase
  - https://portal.brain-map.org/explore/circuits/visual-behavior-2p

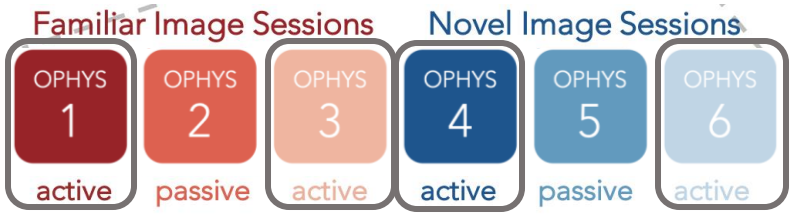
Example Findings from this dataset

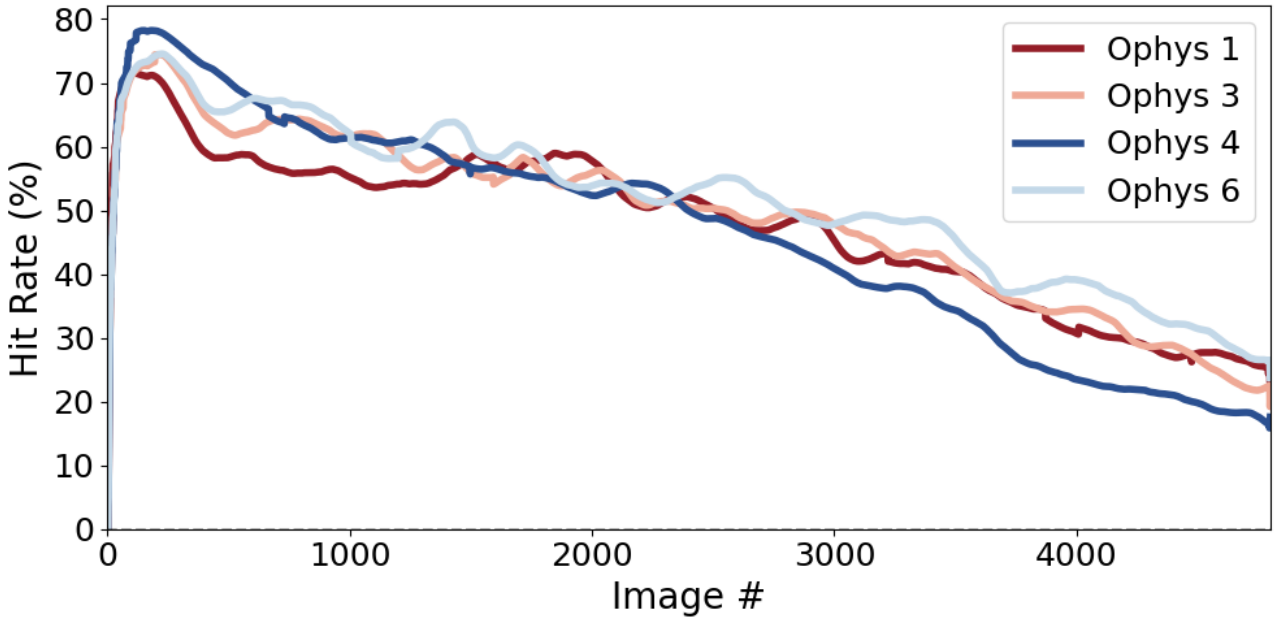
- **Behavior**
  - Task performance generalizes to novel images
  - Mice disengage over the course of a session

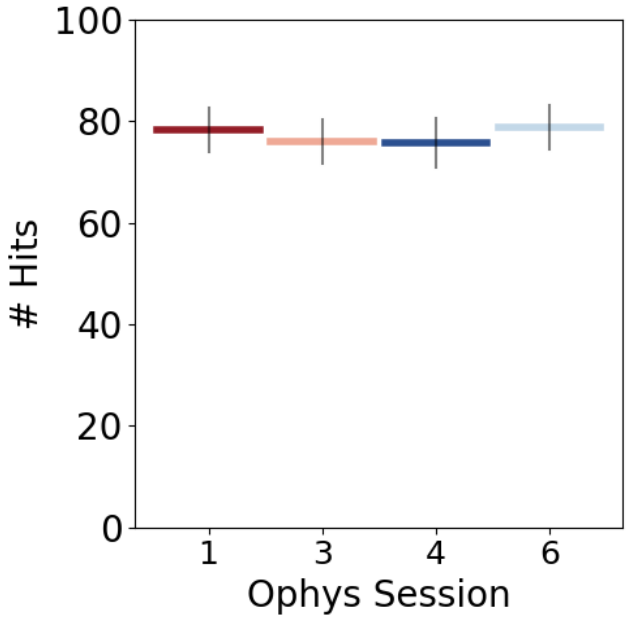
- **Image novelty modulates neural responses**
  - Increased activity from Excitatory and VIP neurons

- **VIP neurons respond to image omissions**
  - But only during familiar image sessions

Task performance generalizes with novelty

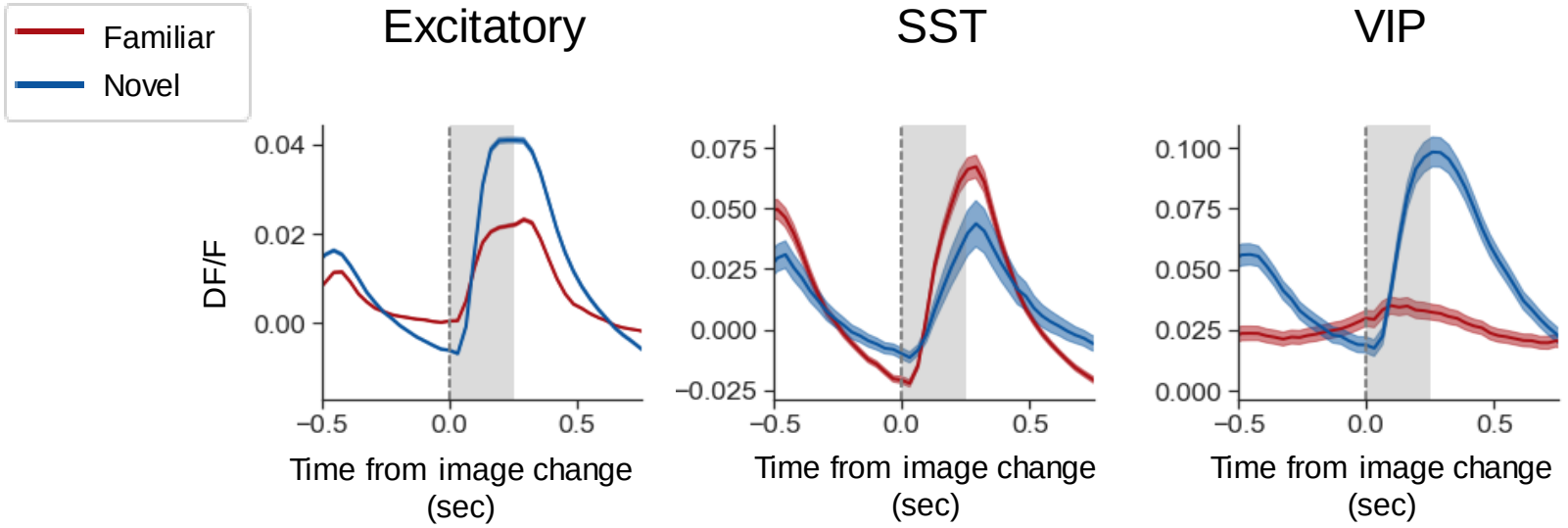




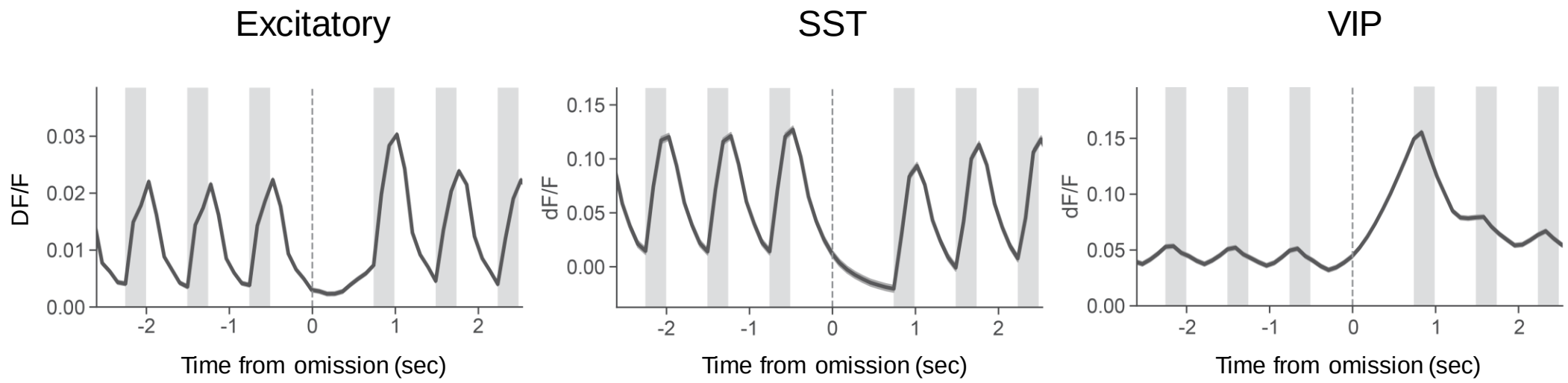


- Performance is similar across familiar and novel image sets
- Mice perform best at the start of sessions, and then disengage

Novelty increases the magnitude image-evoked responses



Population averages reveal strong VIP activity after omissions during familiar image sessions



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