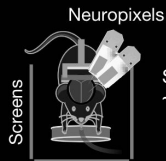# Neuromatch Academy Project

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Mentor: Michael Okun (THANK YOU SO MUCH)
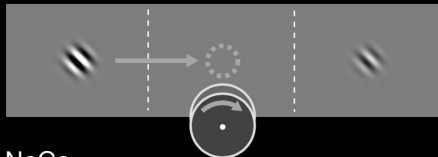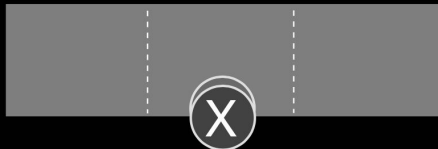
Dataset: Steinmetz *et al.* 2019

Neuropixels

Spiking activity recorded from
~30k neurons in 42 brain regions
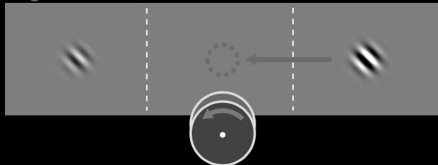
Screens

2 alternative forced choice w/ go-nogo

Left

NoGo

Right

Goal: *infer wheel rotation from spiking activity*

Considerations

Neurons that care about *choice* can/usually differ from *action* neurons
(choice precedes action and may indicate wheel rotation direction)

Choice leads to wheel rotation that causes stimuli movement on screen
> *infer choice based on primary visual cortex (V1) activity?*
> *compute wheel rotation from stimulus movement encoded in V1?*

Initial approach

Profile V1 activity using raster/peristimulus time histograms of neuronal activity

Trials

Neurons

Single neuron response across trials

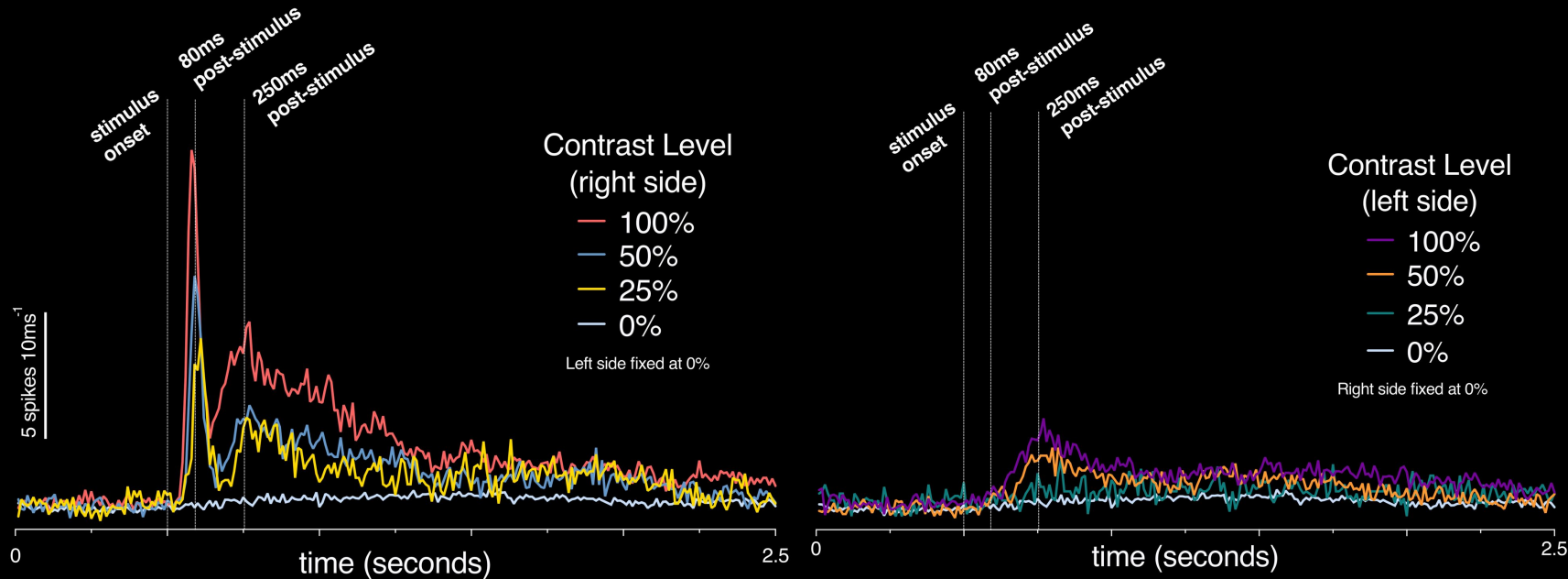Average (smoothed) activity over many trials
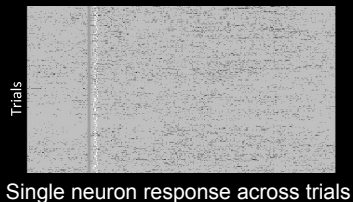
Second approach

Select V1 neurons that best predict *outcome* (wheel direction)
> multiple regression with cross-validation (8-fold)
> select top 50 neurons

LARGE MANATEE POD

Selected V1 neurons average activity for different stimuli (right side is contralateral to recording)

Neurons that best predict outcome respond differently for different levels of contrast

But… mice were well trained! ~98% correct choices when contrast at 100%

Neurons that predict outcome may actually encode stimuli location

Unfinished analysis:

Investigate neuronal activity in V1 for different wheel dynamics for the stimulus of the same contrast on either side.

Cluster trials by wheel dynamics
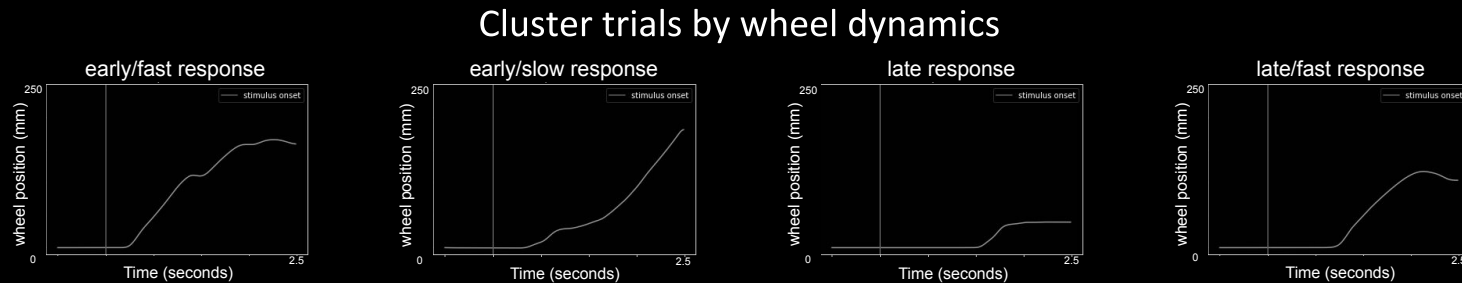
If V1 neurons respond differently to different wheel dynamics, inferring wheel rotation may be possible from visual perception encoding alone.

Then...

Redo analysis in motor and action encoding neurons