Encoding model of simple stimulus features in V1 and higher visual areas of ventral pathway

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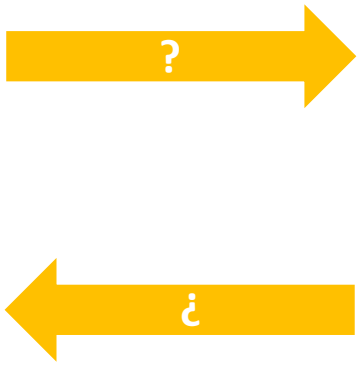
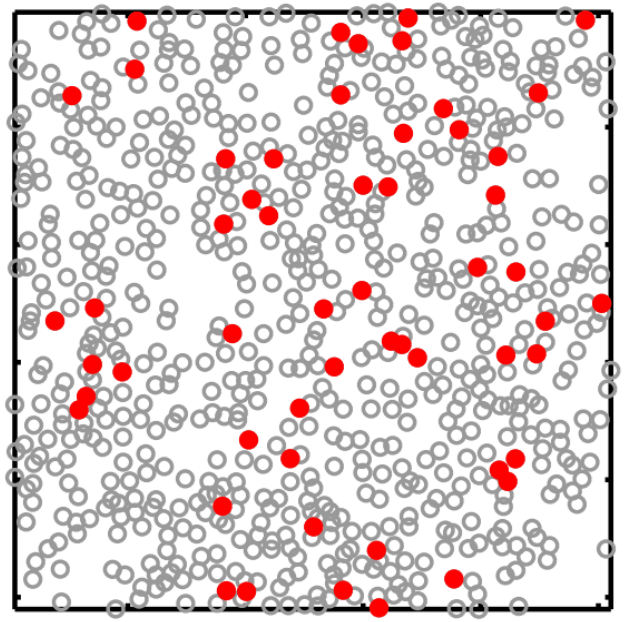
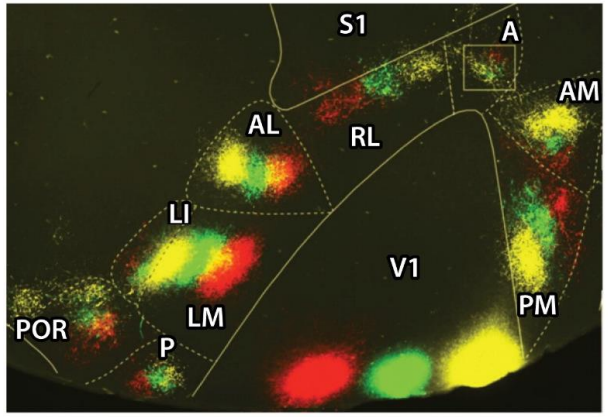
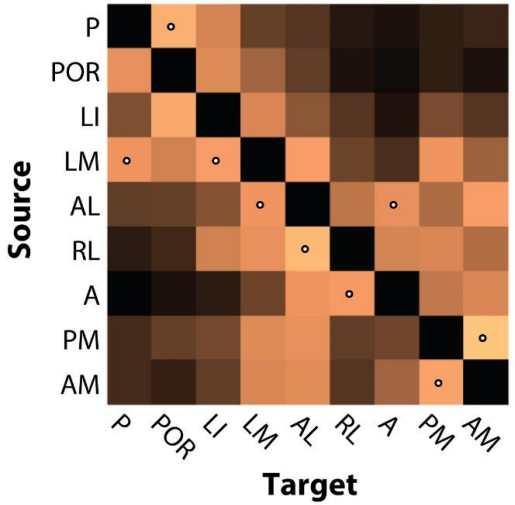
Question

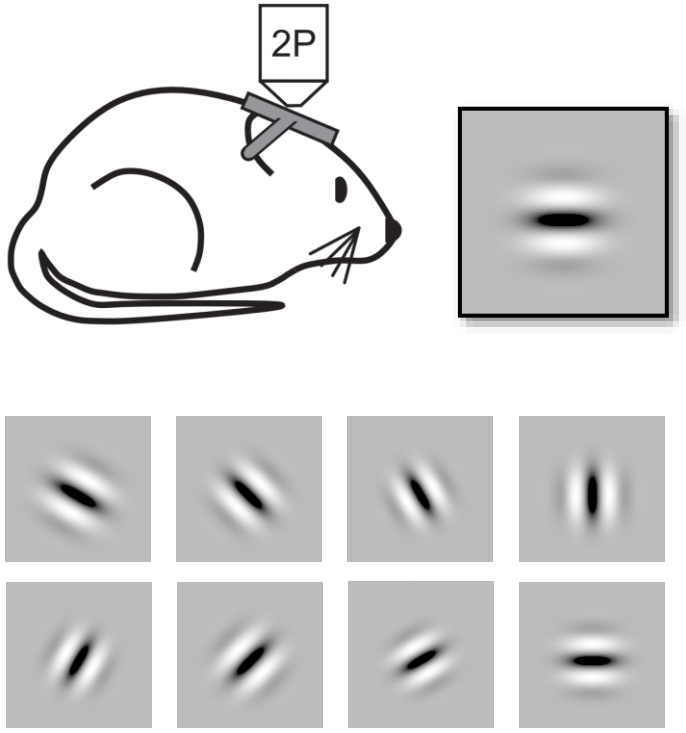




Two photon imaging of responses to static grating from V1, LM, and LI neuron populations

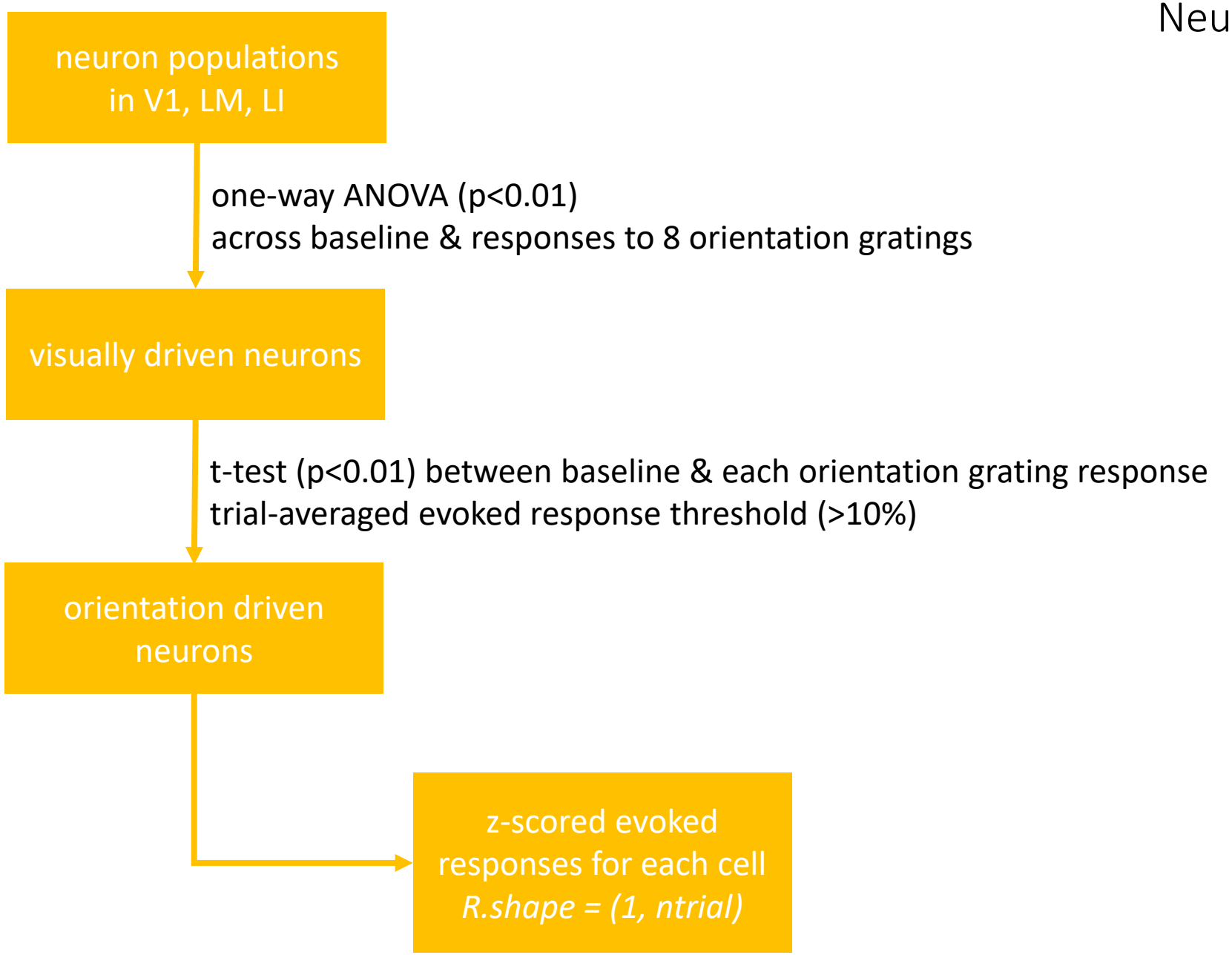




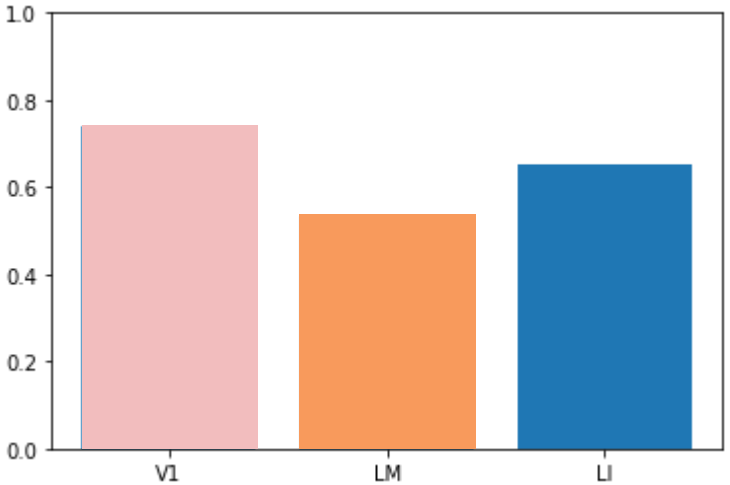


Glickfeld and Olsen, 2017
Jin et al, 2019

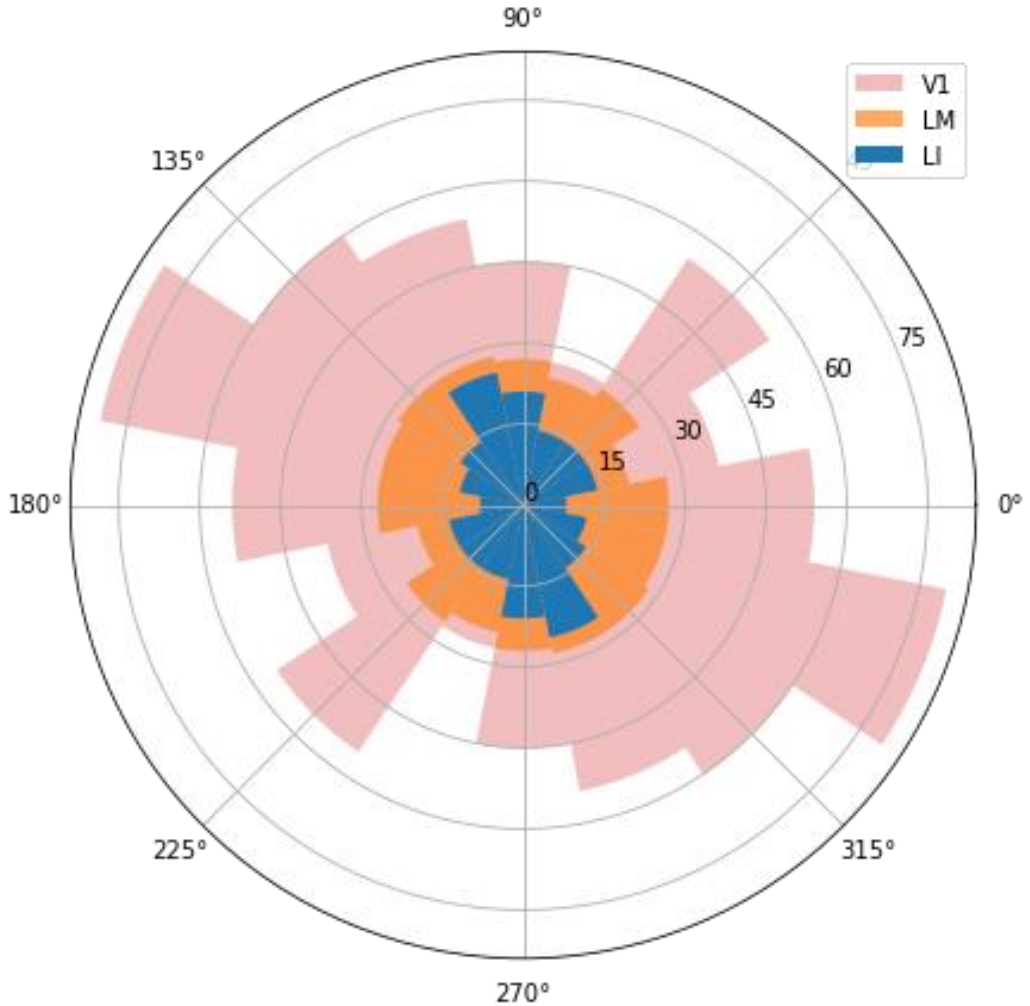
Neural data processing



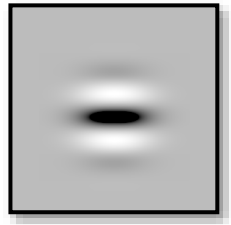
visually driven neurons across areas

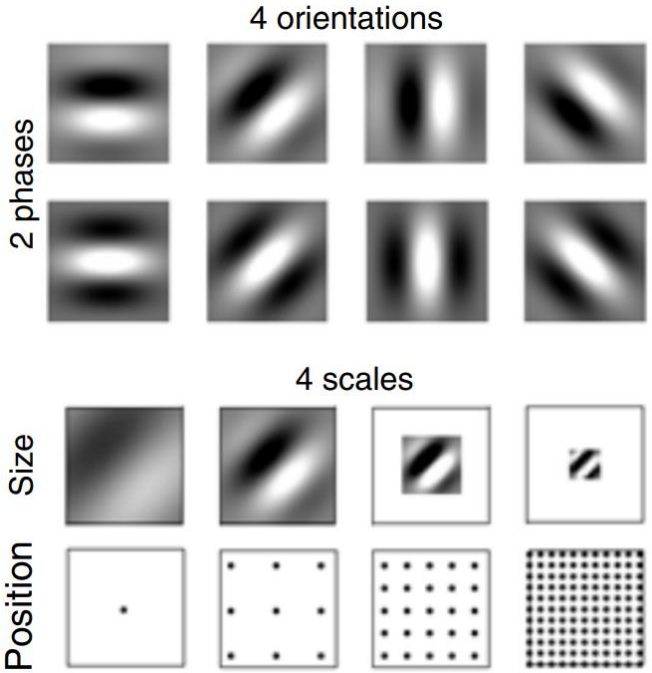


orientation driven neurons across orientations and areas



Grating stimulus processing and Gabor feature extraction





feature value matrix
F.shape = (nfeature, ntrial)

Linear encoding model fitting with ridge regression

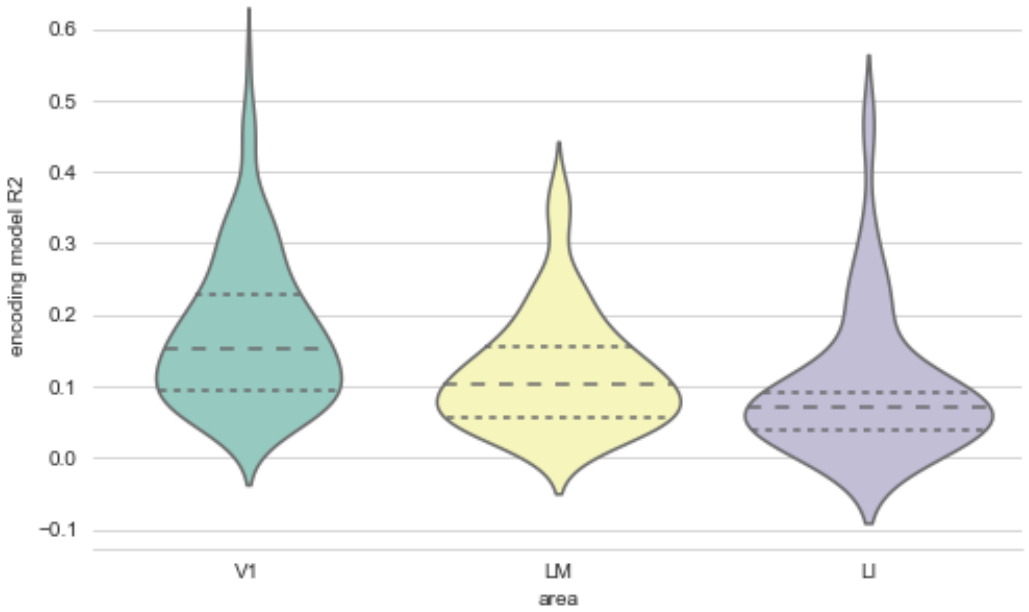
for each cell:

$\mathbf{R}_i = \mathbf{W}_i * \mathbf{F} + b_i$

Loss function = $\text{sum}(\mathbf{R}_i - \mathbf{W}_i * \mathbf{F})^2 + \text{alpha} * \text{sum}(\mathbf{W}_i^2)$

10 fold cross validation

encoding model performance metrics: R^2



Next step

refining neural data cleaning

- test false positive rate of cell criteria

improving encoding model

- feature selection
- nonlinear scaling

image reconstruction

- $\mathbf{F} = \mathbf{H}_i * \mathbf{R}_i + c_i$
- $\mathbf{I}_{recon} = \mathbf{G}_{rev} * \mathbf{F}$