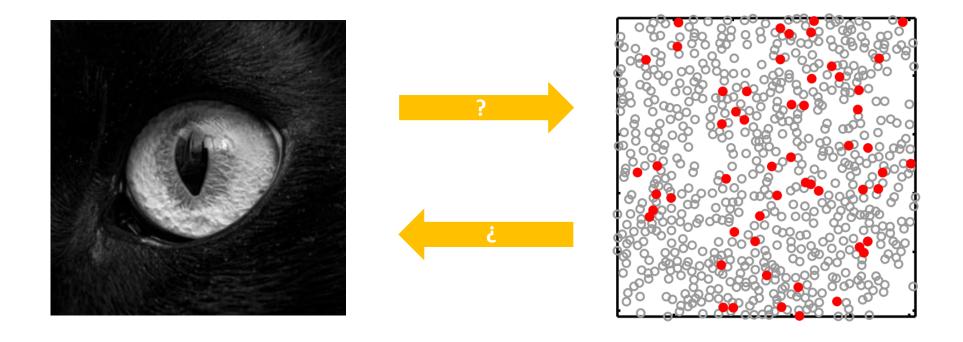
Encoding model of simple stimulus features in V1 and higher visual areas of ventral pathway

Lan Luo

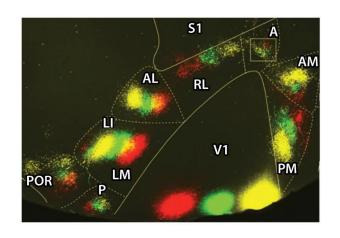
2021-04-27

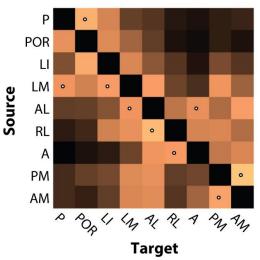
Question

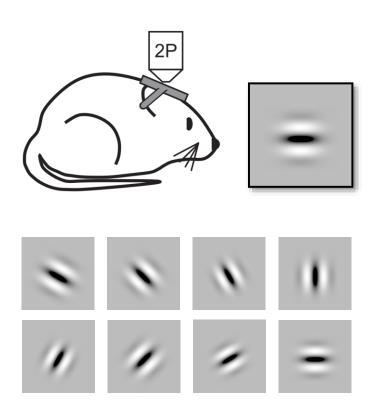


Yoshida & Ohki (2020) 2

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







Neural data processing

neuron populations in V1, LM, LI one-way ANOVA (p<0.01) across baseline & responses to 8 orientation gratings

visually driven neurons

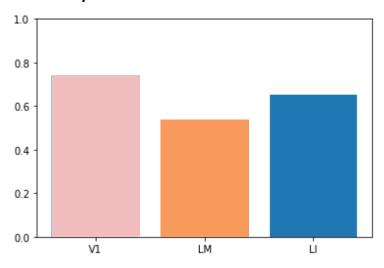
t-test (p<0.01) between baseline & each orientation grating response trial-averaged evoked response threshold (>10%)

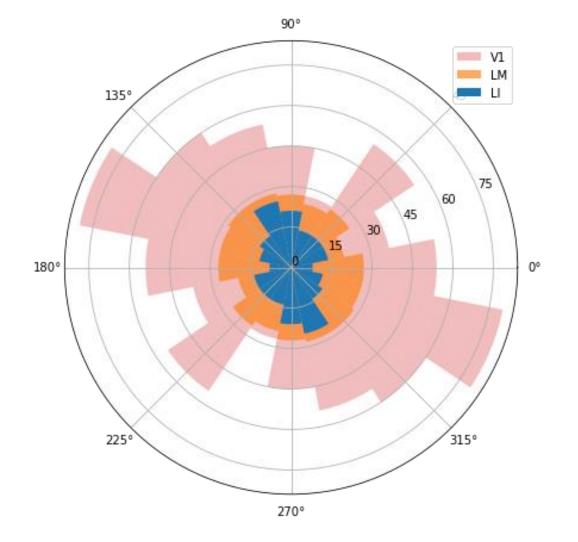
orientation driven neurons

z-scored evoked responses for each cell R.shape = (1, ntrial)

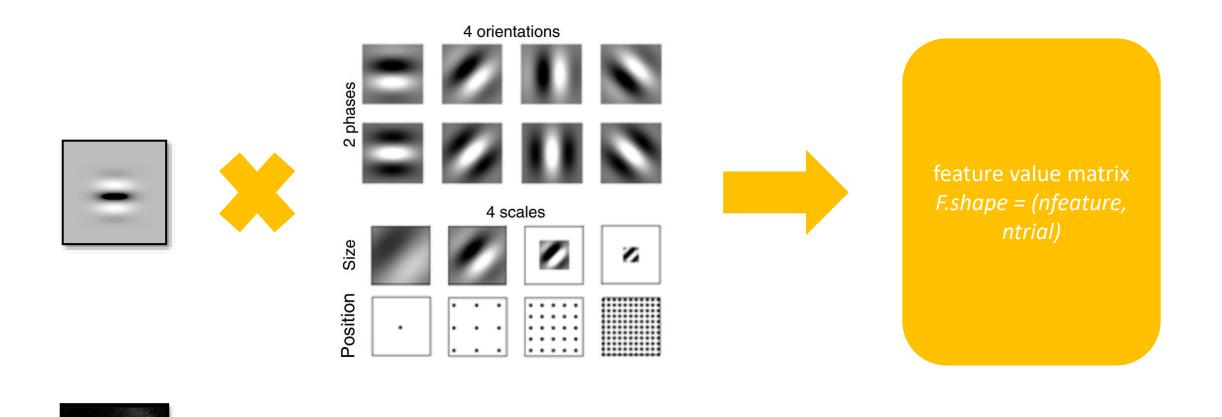
orientation driven neurons across orientations and areas

visually driven neurons across areas





Grating stimulus processing and Gabor feature extraction



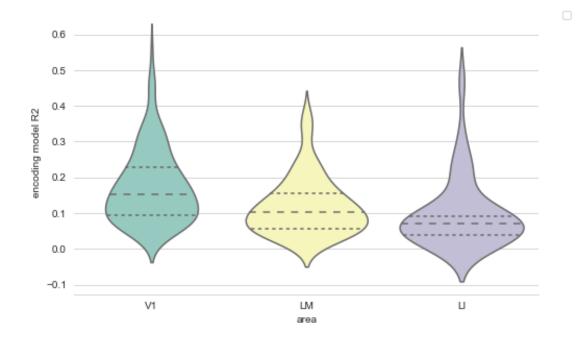
Linear encoding model fitting with ridge regression

for each cell:

$$\mathbf{R_i} = \mathbf{W_i} * \mathbf{F} + b_i$$

Loss function = sum($\mathbf{R_i} - \mathbf{W_i} * \mathbf{F}$)² + alpha * sum($\mathbf{W_i}^2$)

10 fold cross validation encoding model performance metrics: R²



Next step

refining neural data cleaning

- test false positive rate of cell criteria

improving encoding model

- feature selection
- <u>nonlinear</u> scaling

image <u>reconstruction</u>

- $F = H_i * R_i + C_i$
- $I_{recon} = G_{rev} * F$