Modeling Uncertainty About Low--level Features of Natural Images

Submission ID 3000271

Submission Type Poster

Topic Neuroscience

Status Submitted

Submitter Dylan Festa

Affiliation Albert Einstein College of Medicine, Department of Neuroscience

SUBMISSION DETAILS

Presentation Type Either Poster or Oral Presentation

Presentation Abstract Summary A central hypothesis about early visual processing is that it is tuned to the statistical regularities of the natural environment. Simple versions of this hypothesis explain properties of receptive fields and nonlinear responses in primary visual cortex (V1). Yet existing models fall short of capturing V1 responses to natural images, particularly the structure and variability of population activity. To address these issues, we combine two recent advances in the field. First, Coen-Cagli et al. (2015) showed that a flexible model of spatial interactions in images, whereby neural activity is selectively modulated by high-order statistical dependencies (image homogeneity), accurately predicts firing rates evoked by natural images. Second, Orbán et al. (2016) accounted for several aspects of spike-count variability in V1 single-neurons and pairs, by hypothesizing that variability reflects sampling from the probability distribution over latent variables in a simple model of image statistics. Here we further extend the model of Coen-Cagli et al. (2015), and we use sampling to perform inference and relate it to response variability. The model recapitulates known properties of response variability, and generates new predictions for how population variability is influenced by the statistical homogeneity of the visual inputs, independently from the modulation of firing rate.

Paper Upload (PDF) FestaCoen-Cagli_CCNAbstract.pdf

Co-author Information

* Presenting Author

First Name	Last Name	Affiliation	E-mail
Dylan *	Festa *	Albert Einstein College of Medicine, Department of Neuroscience	dylan.festa@einstein.yu.edu
Ruben	Coen-Cagli	Albert Einstein College of Medicine	ruben.coen-cagli@einstein.yu.edu

Keywords

Keywords
neural coding
primary visual cortex
V1
neural variability
sampling hypothesis