Problem: Understanding how the brain codes 3D objects

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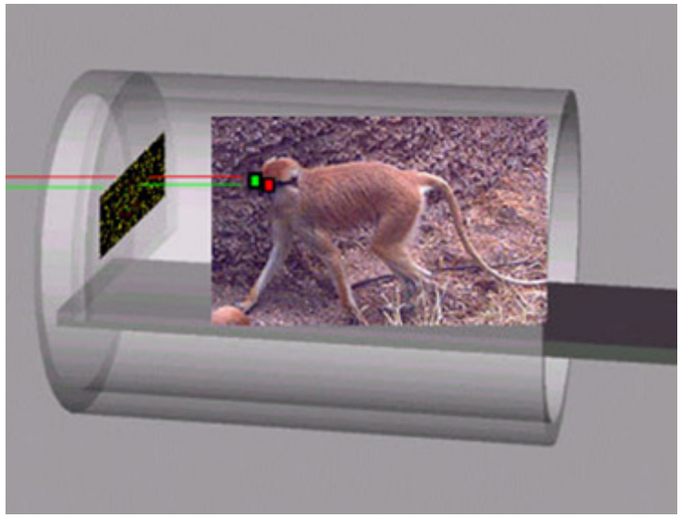
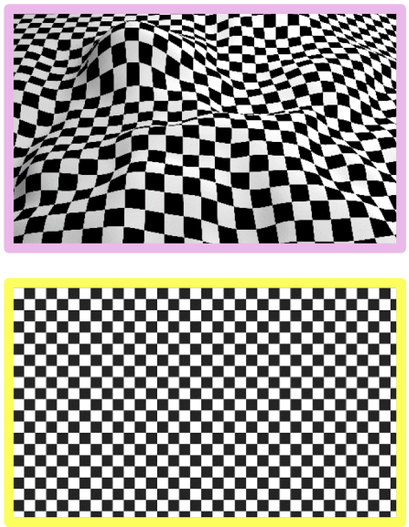
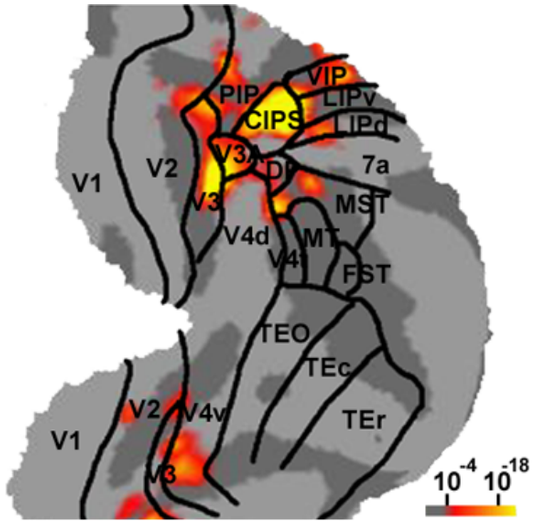
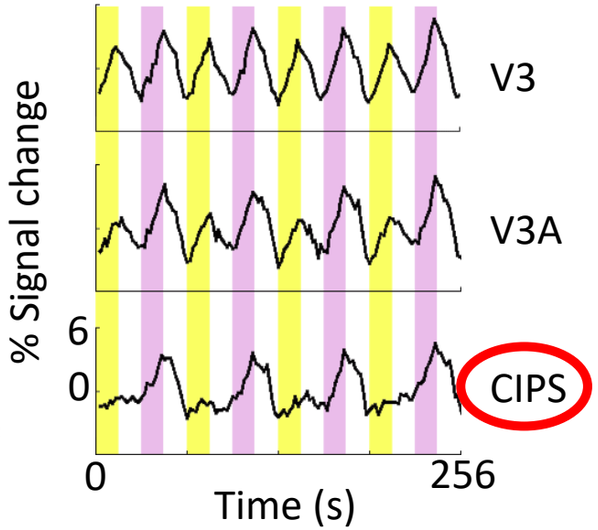
Area CIPS harbors brain's geometric engine





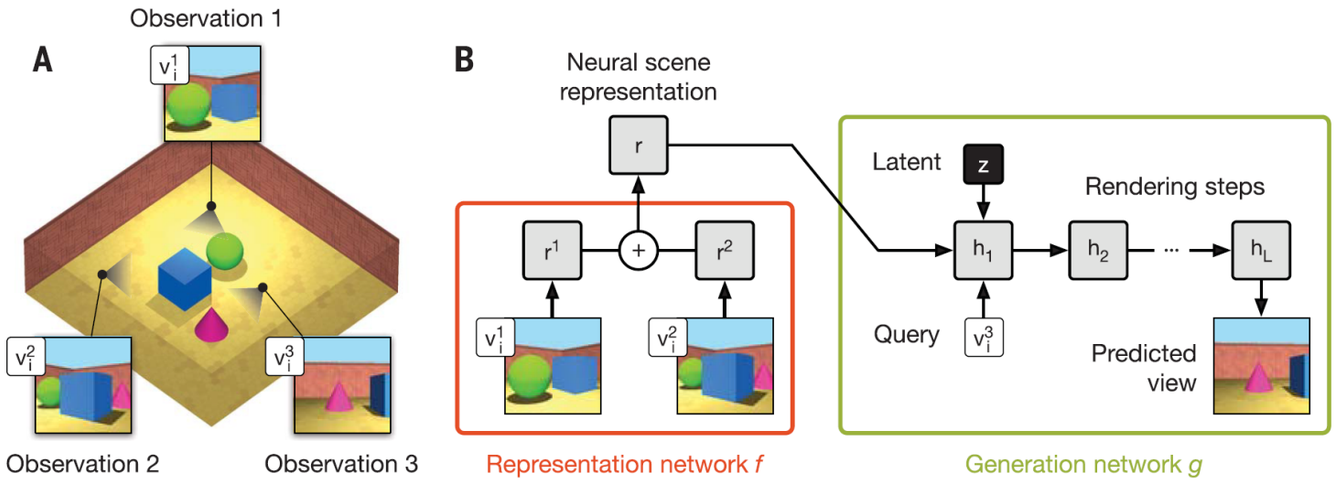


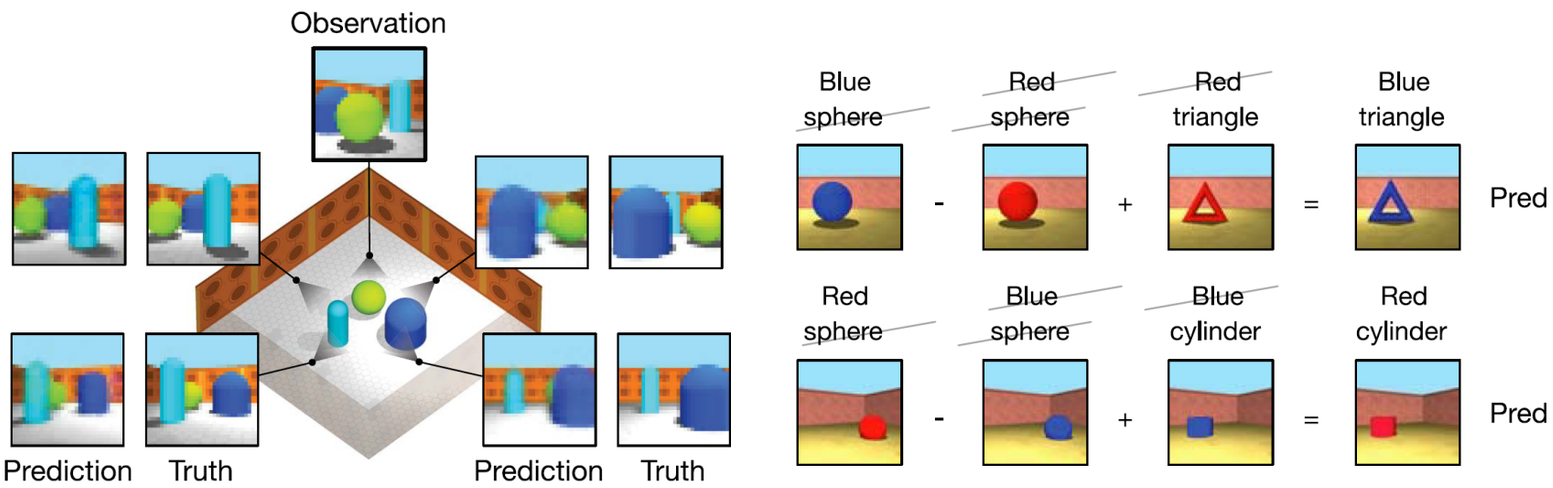


Tsao et al., Neuron 2003

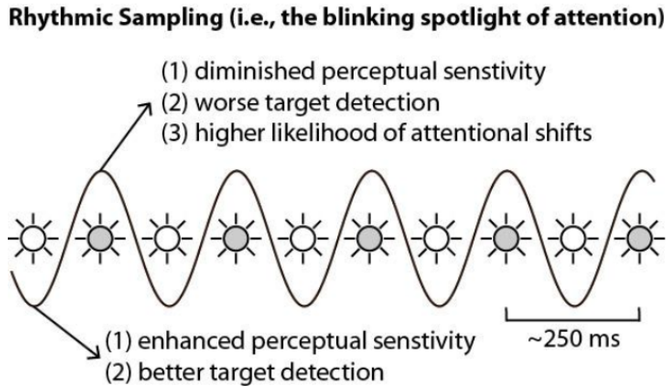
What is the neural code for 3D object geometry in CIPS?

Deep networks for 3D scene representation



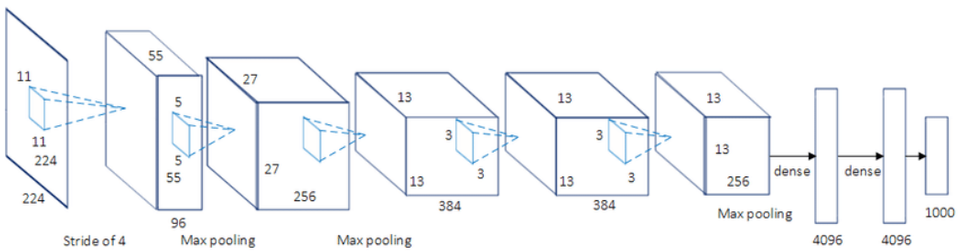


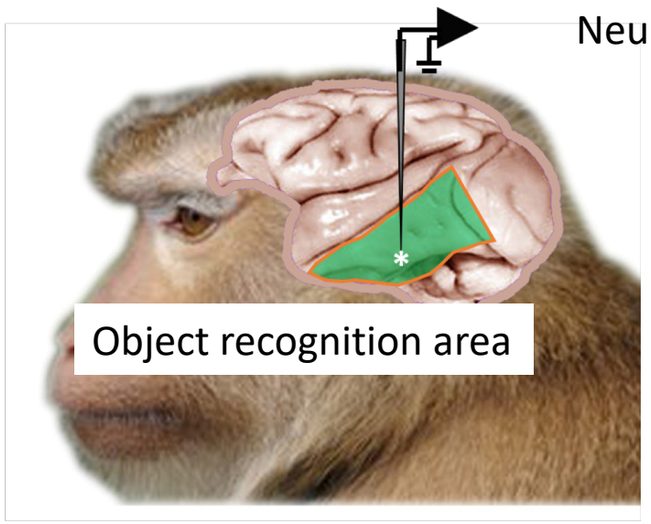
Eslami et al., Science 2018



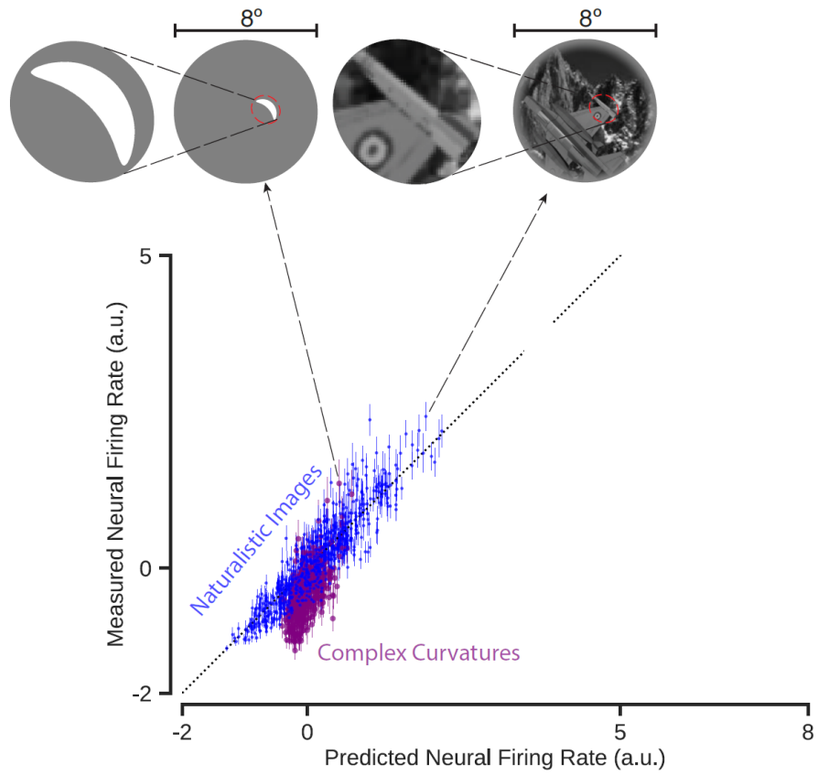
Fiebelkorn et al., Neuron 2018

A method for understanding deep networks





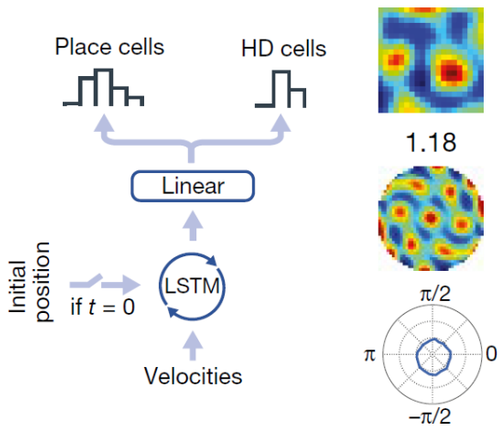
Neuron's response = $\sum w_i * unit_i$



Yamins & DiCarlo, PNAS 2014
Bashivan & DiCarlo, biorxiv 2018

CMS 273 Project: Use 3D scene representation networks to understand the brain

- Understand in explicit terms how high-level geometric variables (e.g., number of objects, surface geometry + location of each object) represented by neurons in networks trained to perform 3D scene representation (“in silico electrophysiology”)
- Evaluate different models for explaining responses of actual CIPS neurons
- Construct optimal stimuli for CIPS neurons assuming different models, and test on actual neurons



Banino et al., Nature 2018

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