Motivation

Fast Readout of Object Identity from Macaque Inferior Temporal Cortex

Slow EON: "benefitted by side-read"

Fast EON: "NOT benefitted by side-read"

These decoding models posit that downstream brain regions receiving input from IT drive object categorization. However, such hypothetically regions (e.g., PFC) likely receive inputs from areas all along the ventral stream hierarchy (making "side-readouts"). When do these "side-readouts" become functionally relevant?

Current feedforward DCNN models of the ventral stream allow us to construct functional hypotheses about "readouts" e.g. V1-V4. DCNN Representations across layers (projected in object space)

Neural Probe

OBJECT RECOGNITION TASK DURING BACKWARD VISUAL MESSAGING

We developed a novel image-level metric (EON) to quantify how rapidly object-identity evolves across layers in a DCNN. We identified images with comparable categorization performance at the final DCNN layers but that evolved faster or slower along the processing hierarchy. Images that evolve faster over networks show less deficit upon masking and IT microstimulation. These effects are most prominent for low presentation times, or early phases of microstimulation. These findings support that, for some objects, information might be accessed faster via "side-readouts". We developed a battery of competing neural network architectures based on hypothetical combinations of readout strategies.

Future work will test these models with large-scale neural recordings and perturbation datasets from the ventral stream in the monkey cortex.