

Psych 205

Dan Birman

4/16/15

Yamins et al. set out to find a mapping between artificial neural networks designed for image categorization and the human ventral visual stream, which also performs image categorization. To do this they built a series of random deep convolutional neural networks based on neurally plausible computations. These were then selected based on optimization algorithms to generate an optimal model which is able to categorize images as well as explain the variance in neural responses recorded from macaque IT cortex. They base their measure of success at explaining IT variance on a classification-based approach. They attempt to classify, based on the activity of different network layers, as well as using linear regression to see whether their model layers predict IT responses to image inputs. They show that early layers fail to do predict IT responses, while later layers succeed. Their evidence corroborates other findings, such as that V4 may be an intermediate processing step on the path to IT cortex. They conclude that their findings suggest that we shouldn't be overly focused on the visual hierarchy as a feed-forward model, where each step represents a basic property of vision (edges, motion, etc). Instead, we might want to consider the hypothesis that early visual cortex optimizes its representations based on the inputs necessary for the higher regions—which may have no mapping on to fundamental image properties. One question that comes up for me is that they choose ** cells from monkey IT/V4 instead of human—is this really the correct comparison to make in their model design? In particular, their object and image choices are decidedly “human”. I think that one issue with this approach is the possibility of misidentifying topographic “maps” rather than localized “regions”—i.e. the debate between whether there is an FFA or only a set of dimensions (for example size, animacy, etc) that are mapped on to visual cortex. Their cross-model species approach here is likely to identify topographic mapping of human categories in monkeys, whereas in humans we might believe that these object images might differentiate more clearly into specific regions.

** (Note: uploaded on 4/20/15, I realized that I sent in the wrong version of this on the due date, here's the correct version)