Object Representation in the Brain

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Abstract

How does the brain represent objects? Can we draw any parallels between effective approaches in machine vision, and mechanisms used by the biological visual system? In general terms, in order to understand visual object perception, three critical problems need to be solved: (1) How is an object first generated, i.e., how are retinal pixels stitched together into units? (2) How are these stitched units identified? (3) How are identified units embedded in a context to enable scene understanding, and how is relevant information relayed to higher order brain areas to enable flexible, goal-directed behavior? During the past decade, work in my lab has focused largely on the second question, addressing the mechanisms for face processing in macaque inferotemporal (IT) cortex. In my talk, I will describe what we have learned about principles of object identification in the brain from studying a set of regions in the temporal lobe specialized for face processing, the macaque face patch system. This system has provided a unique opportunity to gain insight into the organizing principles of IT cortex and to dissect the neural mechanisms underlying form perception, because the system is specialized to process one class of complex forms, and because its computational components are spatially segregated. I will also discuss our work on understanding segmentation and tracking, as well as ideas in the literature on how visual information is used to guide behavior.

Keywords

Primate visual system, face patches, segmentation and tracking, inferotemporal cortex