

830:481 Advanced Topics in Visual Perception
Perceiving Objects and 3D Shapes
Professor Manish Singh
ARC 333 MW4 (1:40 – 3:00pm)

Prerequisites: 830: 301 (Sensation and Perception)
Jr/Sr 830 Major or permission of instructor

Perceiving Objects and 3D Shapes

Although seeing the world appears easy and effortless, we are very far from understanding how it works. As an example, we now have chess programs that can beat human chess masters, but no systems that can come close to even 4-year olds when it comes to visual recognition of objects. To appreciate the difficulty of visual perception, consider that the “inputs” to our visual systems are images projected on our retinas. These images are two-dimensional, unstructured, and always changing (e.g. as our eyes, head, and body move). The world as we perceive it, however, is three-dimensional (we see 3D objects embedded in 3D space), highly structured (organized into objects and scenes), and relatively constant. How is it possible for the human brain (indeed, any system) to compute 3D objects from 2D images?

This course will examine the visual perception of objects and their shapes. It is divided into two units. Unit I is foundational. It will begin by analyzing the fundamental problem that the visual system must solve, and reviewing various approaches to the study of perception. It will also survey the basic principles that the visual system uses to makes its "inferences" about the world. Unit II will then cover various specific topics relating to object perception, such as figure-ground perception, object completion (e.g. illusory contours), shape perception, and inferring 3D structure from 2D images.