

## Lecture 5 - Attention

**The abstract:** In this lecture, I will introduce the problem of limited capacity and present selective attention as a solution. My favorite tool for studying selective attention is visual search, so you will hear a lot about visual search experiments. These experiments lead us to the conclusion that we are only recognizing one item in the world at a time. This leads to some curious problems. After all, it looks like you are seeing quite a few objects. The end of the lecture will point toward some solutions.

***The truth-in-advertising disclaimer:** Visual selective attention is the topic of my research so some of the ideas in today's lecture may not quite be ready for the textbooks yet. They are this week's Truth According to Me.*

We can frame the topic by a series of questions:

### **Question 1: What is the problem that attention is solving?**

We can't process everything fully.

Some auditory examples

Some visual examples

### **Question 2: What escapes the bottleneck of attention?**

Basic features "pop-out"

### **Question 3: How can we study this?**

Visual search methods

Reaction time (RT), set size,  
slope of RT x set size functions as a measure of search efficiency

Anne Treisman and Feature Integration Theory

### **Question 4: How do we find real objects that are not defined by a single feature?**

Conjunction search

Guided Search

Bottom-up guidance

Top-down guidance

### Question 5: Is attention guided to features or objects

Before attention arrives you have *bundles* of features attached to a proto-object

Attention is required to *bind* features to objects  
(*What is binding? & the binding problem*)

### Question 6: Is attentional binding like glue? Do the objects stay bound?

What can you learn from dancing chickens? (and a few other cool demos)

Change blindness - Why don't you "see" what happens right in front of your eyes?

Some conclusions

- 1) You only recognize one (or maybe a few) objects at a time
- 2) You can store maybe 4 objects in a Visual Short Term Memory (VSTM)
- 3) You *know something* (maybe quite a lot) but maybe you only *see* the current object of attention.

### Question 7: Does this mean that perception is a "grand illusion"?

My answer to that question changes as we sift the data. September's answer is....

#### Something to write about, #5: Guiding Features

I have spent a lot of time on the question of what visual features can guide attention. So, if you are looking for a friend in the crowd, it helps to know that she is wearing a red coat because color *guides* attention. My latest effort to summarize the literature on this topic is

Wolfe, J. M., & Horowitz, T. S. (2004). What attributes guide the deployment of visual attention and how do they do it? *Nature Reviews Neuroscience*, 5(6), 495-501.

It is on the website in the #5 GUIDING FEATURES folder.

If you want to write on this topic, pick one candidate feature and discuss the evidence that it is or is not able to guide attention. (I can provide more things to read if you send me an email.)

**THE CHALLENGE:** Even better. Read the review. Think up a new, hitherto unsuspected feature. Use your computer graphics talents to create some sample stimuli. Write up a proposed experiment. If you take this option, send me a copy of your paper (Don't forget to give it to your TA, too!). If it seems *really* promising and clever, maybe we can do an experiment together.