

## Blog posts on Palmeri and Cottrell

### Categorization and Object Recognition

#### **An overview of the relation and the difference between object processing models and perceptual categorization models** (Soumyajit Chakraborty)

"Even though the working procedures are different for these two types of models, all of these can recognize physical objects in real world. Thus, computer models help us to diagnose various problems in real world."

#### **Comparing Object and Category Processing** (Gabriela Gresenz)

"However, unlike view-based models, exemplar models can be used for both object and category processing (Nosofsky 1984, 1986, 1987) by implementing dimensional weighting (216). In practice, many models of object processing do not use dimensional weighting and thus solely perform categorization (Jiang, et al., 2007)."

#### **Comparison of Hybrid Perceptual Models to a Recent Object Tracking Algorithm** (Caleb Vatal)

"Also, Palmeri describes exemplar-based models as primarily retrieval, meaning that the current perception is solved based on the example which is closest to it. However, this is not the kind of model that Karthik's system learns from its rule-based experiences. While it is not identical, it is fascinating to see a model that closely mimics these cognitive models but was not developed to be a cognitive model in itself."

Bewley, A., Ge, Z., Ott, L., Ramos, F., & Upcroft, B. (2016). Simple online and realtime tracking. 2016 IEEE International Conference on Image Processing (ICIP), 3464-3468.

Karthik, S., Prabhu, A., & Gandhi, V. (2020). Simple Unsupervised Multi-Object Tracking. ArXiv, abs/2006.02609.

## Categorization and Object Recognition continued

### **Consolidating entry level phenomena between experts and novice categorization.** (Carlos Olea)

"I would like to offer a line of reasoning to consolidate the two phenomena. Firstly, the phenomenon that the entry level into a categorization hierarchy is deeper for experts than for novices. Secondly, the phenomenon that the entry level for atypical basic-level category members is deeper, even for many novices. I think the key to this question lies in representation."

### **Deep entry level for atypical members seen in novices** (Neel Kurupassery)

"One phenomenon discussed in class and in the paper was the deep entry level for atypical basic-level category members even for novices [2]. One possible reconciliation for this seemingly odd occurrence is that atypical instances are very memorable and allow for easy retrieval on the part of the novice. This allows novices to gain "expertise" on the atypical instances much faster than the normal instances."

### **Expert and novice in relation to object processing and categorization** (Bikram De)

"Thus, we can draw a broad conclusion that object recognition is a novice level analysis whereas perceptual categorization is for experts. The expert level identification requires matching similarity to a category as well as dissimilarity to other category whereas matching similarity to stored representations is sufficient for novice level identification. However, similarity between these two tasks lie in the fact that Nosofsky 1986 [3] showed how exemplar models could naturally account for both categorization and identification using the same exemplar representations."

## Goals

### **Brain Activity in Perceptual Expertise used for Cognitive Modeling** (James Raubenheimer )

"A question I struggled to answer after the article and the in-class discussion was whether Cottrell and Palmeri have "discovered that specialized domains of expertise require specialized domain-specific computational model" (198). In modern AI breakthroughs, domain-specific computation models have been extremely successful."

Burns, E. J., Arnold, T., & Bukach, C. M. (2019). P-curving the fusiform face area: Meta-analyses support the expertise hypothesis. *Neuroscience and Biobehavioral Reviews*, 104, 209–221. <https://doi.org/10.1016/j.neubiorev.2019.07.003>

### **Interactions between known and unknown domains** (Ali Ozdagli)

"Above, you see the progress of recent machine learning algorithms that can label objects correctly. We already reached to the models that can discriminate images correctly better than humans. While they are superior in terms of object categorization, adapt invariant features, and are well generalized, they are dubious of explaining how human perception is working. I am still curious at this point if it will be ever possible to create object categorization models that adhere to the perceptual expertise. Indeed, these models introduce some key elements such as neurons, convolutions, and memory to mimic the brain to some certain yet primitive degree. To my understanding, Palmeri's paper still considers those as valid view-based models<sup>1</sup>, but they lack prime features such as selective attention the way I see it. In summary, the neurophysiological realism in those models is inadequate."

### **Convince me of the utility of cognitive models in CS** (Derek Gloudemans)

"It wasn't really until the publication of "ImageNet Classification with Deep Convolutional Neural Networks "(Krizhevsky et al. 2012) that the promise of neural networks with today's computational capabilities was made abundantly clear. I am curious to hear how people think Palmeri and Cottrell would have treated such modern works."

### **Switching to New Frames of Reference Drives Innovation** (Evan Segaul)

"Finally, this reading induced critical analysis of what exactly the goals of a model are. "