

Categorical Statistical Learning using Real World Scenes

Timothy F. Brady

Aude Oliva



MIT BCS

Motivation

One of the primary goals of the brain is to extract statistical regularities from the environment to make inferences and guide behavior when faced with novel situations.



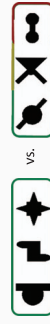
Are we implicitly sensitive to high-level regularities, like what types of scenes often appear together in the world?

Visual Statistical Learning

Fiser & Aslin, 2002; Turk-Browne et al, 2005

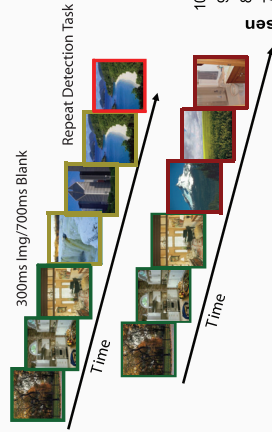


Observers viewed a stream of shapes in which, unbeknownst to them, triplets of shapes always appeared together.



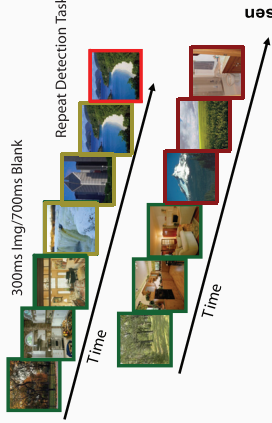
Afterwards they demonstrated familiarity with these triplets in a 2AFC task, suggesting they extracted the statistical regularities in the sequence.

Exp. 1: Image Regularities



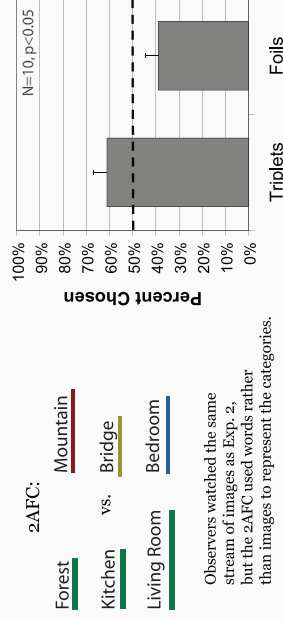
Observers incidentally learned which scenes co-occurred, despite the pictures' complexity and observers' prior associations with such scenes.

Exp. 2: Categorical Regularities



Observers extracted regularities at a categorical level, even when category was irrelevant to the task.

Exp. 3: Lexical Transfer



Observers transferred the regularities they learned to words, suggesting that they learned abstract representations.

Conclusions

Unsupervised statistical learning occurs at an abstract categorical level, even when category is task-irrelevant. This suggests observers automatically extract the basic-level category of images, and that they learn the subtle statistical regularities of what categories appear together. Thus, the human brain is capable of identifying co-occurrence of complex stimuli at many different levels of abstraction.

Fiser, J. & Aslin, R.N. (2002). Statistical Learning of Higher-Order Temporal Structure From Visual Input. *Journal of Experimental Psychology: Applied*, 8(1), 17-31.
Turk-Browne, N.E., Jang, J.A., & Scholl, B.J. (2005). The Automaticity of Visual Statistical Learning. *JEP: General*, 134(4), 552-564.