



# The Nature of Visual Statistical Learning

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Our world is largely stable: we repeatedly encounter the same people, places, and things, and over time these objects tend to show up in similar environments and in predictable sequences. Statistical learning involves the incidental detection and representation of this structure: for example, learning the boundaries between words, learning which objects belong in a kitchen, learning what to do at an airport, and learning the trajectory of a looming tennis ball. This kind of learning has been studied empirically by exposing observers to hidden statistical regularities in perceptual input, and subsequently testing how these regularities influence behavior. Effects of statistical learning have been observed across a variety of contexts in cognitive and developmental psychology, and yet little is known about how statistical learning works. The studies presented herein address several fundamental questions about the underlying nature of statistical learning, revealing that statistical learning: (1) requires selective attention but can operate without intent or awareness (2) operates in an object-based manner but also helps to define which features are integral to an object (3) results in representations that can be flexibly applied in new contexts but that nevertheless preserve some specific details of training (4) rapidly engages brain systems that mediate other forms of learning and memory even before resulting in conscious familiarity and (5) can be exploited by the brain to implicitly anticipate the future and facilitate behavior. As a whole, these studies suggest that statistical learning is a robust and efficient process that helps us to represent the complex structure of our world, illustrating the inherently reciprocal nature of attention, perception, and memory.

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