Bayesian model learning in human visual perception

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Humans make optimal perceptual decisions in noisy and ambiguous conditions. Computations underlying such optimal behavior have been shown to rely on Bayesian probabilistic inference. A key element of Bayesian computations is the generative model that determines the statistical properties of sensory experience. The goal of perceptual learning can thus be framed as estimating the generative model from available data. In previous studies, the generative model that subjects had to infer was relatively simple, its structure was also assumed to be known a priori, so that only a few model parameters had to be estimated. We investigated whether humans are capable of inferring more complex generative models from experience. In a completely unsupervised perceptual task subjects learnt subtle statistical properties of visual scenes consisting of ?objects? that could only be identified by their statistical contingencies not by lowlevel features. We show that human performance in this task can be accounted for by Bayesian learning of model structure and parameters within a class of models that seek to explain observed variables by a minimum number of independent hidden causes.