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Unsupervised categorization as similarity-based generalization

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Abstract

Unsupervised learning is widely recognized as an important problem in cognitive science, but unsupervised learning in humans has received relatively little empirical investigation to date. We investigate unsupervised categorization using a new task in which people generate verbal labels to novel objects, with objects given the same label assumed to be in the same mental category. Our main finding is that categorization is determined by similarity, i.e., the probability of placing two objects into the same category is an exponentially declining function of their dissimilarity, consistent with Shepard's (1987) universal law of generalization. We present data demonstrating the overall exponential pattern, plus specific predictions regarding selective attention, sensitivity to correlated features, and the effects of category size (number of examples). Taken together, the results suggest that the similarity-based approach used successfully in models of supervised categorization (e.g., Nosofsky 1986, 1992) may also extend to the domain of unsupervised categorization.