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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 43(43)

Author

Markant, Doug

Publication Date

2021

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Capturing uncertainty in relational learning: A Bayesian model of discrimination-based transitive inference

Doug Markant
University of North Carolina at Charlotte, Charlotte, North Carolina, United States

Abstract

Research on discrimination-based transitive inference (TI) has demonstrated a widespread capacity for relational inference in people and non-human animals. In this domain individuals learn to choose the reinforced item in a set of interrelated discriminations (e.g., A–/B+; B–/C+) and are tested for transitive inference on novel, non-adjacent pairs (e.g., A vs. C). Existing models suggest that transitive responding can be supported by associative learning mechanisms, but they fail to account for evidence that knowledge about the hierarchical nature of the task, whether instructed or discovered during training, has a dramatic influence on learning. I present a model which formalizes TI as the estimation of items' positions along a latent dimension and tracks learners' uncertainty about the mapping between item position and feedback. The model naturally accounts for standard effects in TI, while going beyond associative models in explaining the effects of knowledge and rich feedback on relational inference.