UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

Navigating uncertainty through information search

Permalink

https://escholarship.org/uc/item/6j7732td

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 40(0)

Authors

Wu, Charley M.
Meder, Bjoern
Nelson, Jonathan D.

Publication Date

2018

Navigating uncertainty through information search

Charley M. Wu

Max Planck Institute for Human Development, Berlin, Berlin, Germany

Bjoern Meder

Max Planck Institute for Human Development, Berlin, Berlin, Germany

Jonathan D. Nelson

University of Surrey, Guildford, United Kingdom

Abstract

Selecting informative queries is a crucial component of learning and decision-making, where models of information search have been widely used to provide normative guidance. Yet a typical requirement of these models is complete information about the underlying probabilistic structure of the environment, which is seldom met in real-world situations. Thus, information search models are blind to the epistemic uncertainty that comes with learning through experience, and do not distinguish between probabilities estimated from a sample of two and a sample of one million. We develop a learning paradigm where a successful strategy needs to balance the exploration of queries with high epistemic uncertainty, with the exploitation of queries already known to be useful. We show that a Bayesian sampling variant of traditional information search models learns faster and performs better, but most surprisingly, that a simple take-the-difference heuristic (TTD) performs competitively using only the absolute difference between observed frequencies.