

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

Evolutionary Theory Makes Predictions About Cognition Beyond Rational Optimization

Permalink

<https://escholarship.org/uc/item/39z678sd>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 48(0)

Author

Turner, Cameron Rouse

Publication Date

2026

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

Evolutionary Theory Makes Predictions About Cognition Beyond Rational Optimization

Cameron Rouse Turner (c.rouse.turner@princeton.edu)

Computational Cognitive Science Lab,
Departments of Psychology & Computer Science,
Princeton University, Princeton, NJ, USA

Thomas L. Griffiths

Computational Cognitive Science Lab,
Departments of Psychology & Computer Science,
Princeton University, Princeton, NJ, USA

Abstract

Evolution by natural selection produces the appearance of design in minds, brains, and behavior. While rational models of cognition are usually considered to be consistent with evolution, they are rarely derived from distinctively evolutionary assumptions. Bayesianism, reinforcement learning, rational analysis, and resource rationality all postulate optimization objectives of coherence in information use or maximization of expected value, potentially under resource constraints. However, cognition is performed by an individual within a lineage where success is determined by the persistence of the lineage across generations. Here, we present a signal detection model that shows how this distinctly evolutionary objective produces predictions that depart from those of rational models. We find that the source of environmental uncertainty determines cognitive design, with weak priors being favored in environments dominated by change. This ensures offspring vary so that some profit against novel challenges, and is favored even at the expense of accurate decision making.