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An automatic method for discovering rational heuristics for risky choice

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Abstract: What is the optimal way to make a decision given that your time is limited and your cognitive resources are bounded? To answer this question, we formalized the bounded optimal decision process as the solution to a meta-level Markov decision process whose actions are costly computations. We approximated the optimal solution and evaluated its predictions against human choice behavior in the Mouselab paradigm, which is widely used to study decision strategies. Our computational method rediscovered well-known heuristic strategies and the conditions under which they are used, as well as novel heuristics. A Mouselab experiment confirmed our model's main predictions. These findings are a proof-of-concept that optimal cognitive strategies can be automatically derived as the rational use of finite time and bounded cognitive resources.

Keywords: *Decision making (primary keyword)*

Artificial Intelligence

Cognitive Science

Psychology

Intelligent agents

Machine learning

Bayesian modeling

Computer simulation

Experimental research with adult humans

Mathematical modeling

Other Keywords: Heuristics; Bounded Rationality; Strategy Selection; Rational Metareasoning

[Submission in PDF format](#) (256 KB)

Type of Submission

Paper (six pages)

Marr Prize

First author is a student

Modeling Prizes

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I want to apply for a Travel Grant

Short Title

Discovering Rational Heuristics

[Back to previous page](#)

