

REASON Capabilities Statement

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1: Introduction

I am a philosopher working primarily in epistemology, decision theory, the foundations of probability and formal logic. My work in these areas intersects heavily with cognitive psychology, behavioral economics and artificial intelligence research. Below I briefly describe three specific areas of technical expertise that are pertinent to the primary objectives of the REASON program. I would be interested in participating in any research projects that could make use of these technical capabilities to contribute towards REASON's main goals.

2: Formal Models of Uncertain Reasoning and Decision Making

Much of my research focuses on the philosophical and mathematical foundations of uncertain reasoning and decision making. Specifically, I have worked extensively on Bayesian approaches to uncertain reasoning, focusing especially on e.g. Bayesian decision theory, Bayesian updating and Bayesian confirmation theory. As well as developing Bayesian approaches to the norms of uncertain reasoning, I've also been interested in identifying the fundamental limitations of those approaches (including e.g. their psychological implausibility and the problem of setting prior probabilities in a principled way), and developing alternative frameworks that overcome those limitations. In this context, I've worked on e.g. the theories of imprecise Bayesianism, Dempster-Shafer belief functions and rational comparative confidence.

Given the fundamental role that uncertainty plays in almost every realistic reasoning context, it is clear that any attempt to systematically improve the reasoning processes of intelligence analysts will have to confront issues pertaining to the basic norms of uncertain reasoning. I would be eager to contribute to this problem, either through helping to design systems that help analysts to respect orthodox Bayesian norms of uncertain reasoning, or through using the novel insights of non-Bayesian frameworks to improve reasoning under uncertainty in a way that can't be achieved within a traditional Bayesian approach.

Sample Publications:

1. (2019) 'Principles of Indifference', *The Journal of Philosophy*, 116(7): 390–411.
2. (2022) 'Four Approaches to Supposition' (with Branden Fitelson and Ted Shear), *Ergo*.
3. (2022) 'Comparative Opinion Loss' (with Reuben Stern), *Philosophy and Phenomenological Research*, <https://doi.org/10.1111/phpr.12921>.

3: Causal Inference and Causal Reasoning

The second relevant research area concerns causal inference and causal reasoning. Specifically, I am interested in (i) the problem of inferring causal structure from observational data, (ii) the role that beliefs about causal structure play in rational decision making, and (iii) identifying and understanding human causal reasoning biases. I approach all three of these problems primarily through the lens of the axiomatic framework of causal Bayesian networks. This technical capability is also directly relevant to the REASON program, since judgements about causal relations are ubiquitous in almost every domain of human reasoning. I would be eager to contribute to any projects that aim to improve the way that analysts (i) infer causal relationships from relevant bodies of evidence, (ii) use causal judgements to evaluate possible courses of action, and (iii) use beliefs about causal structure to influence the way that they interpret the significance of available evidence.

Sample Publications:

1. (2019) 'The Similarity of Causal Structure' (with Stephan Hartmann and Reuben Stern), *Philosophy of Science*, 86(5): 821–835.
2. (2019) 'Causal Explanatory Power' (with Reuben Stern), *British Journal for the Philosophy of Science*, 70(4): 1029–1050.
3. (forthcoming) 'Anti-Reductionist Interventionism' (with Reuben Stern), *British Journal for the Philosophy of Science*

4: Logical Reasoning Under Uncertainty

Finally, I have a strong research interest in the relationship between logical and probabilistic reasoning processes, viewed from both a normative and an empirical perspective. In particular, I have worked on e.g. belief revision theory, conditional reasoning, and the way that logical and probabilistic reasoning norms can cohere and/or conflict with one another. Again, this is an area of competence that has direct relevance to REASON's main objectives. Human reasoners have a tendency to articulate their reasoning qualitatively, in the form of logical argumentation, even in conditions of high uncertainty where probabilistic reasoning processes may seem to be more appropriate. Understanding the connection between logical and probabilistic reasoning will help to evaluate and guide the way that analysts construct arguments on the basis of uncertain and incomplete evidence.

Sample Publications:

1. (2018) 'Bayesian Argumentation and the Value of Logical Validity' (with Stephan Hartmann), *Psychological Review*, 125(5).
2. (2019) 'A New Probabilistic Explanation of the Modus Ponens–Modus Tollens Asymmetry' (with Henrik Singmann and Stephan Hartmann), *Proceedings of the 41st Annual Meeting of the Cognitive Science Society*.
3. (2020) 'The Logic of Conditional Belief', *Philosophical Quarterly*, 79(281): 759–779.
4. (2021) 'The Logic of Partial Supposition' (with Stephan Hartmann), *Analysis*, 81(2): 215– 224.