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Explaining Full Response Distributions in Causal Reasoning Tasks: The Bayesian Mutation Sampler

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Abstract

A recent sampling-based model of causal cognition, the Mutation Sampler, can explain the average responses of participants on a wide variety of tasks (Davis & Rehder, 2020). Careful analysis, however, shows that the predicted response distributions do not match empirical data. As an explanation for the observed response distributions, we propose that people engage in mutation sampling when confronted with a causal query and subsequently integrate this information with a prior. Several theoretical arguments can be made for the notion that people use priors in causal judgements; it is rational and matches the phenomenology of making such judgements. We have modelled this process with a new model called the Bayesian Mutation Sampler (BMS). We fit the BMS to experimental data and find that, in addition to average responses, the BMS explains multiple 'distributional phenomena', such as the moderate conservatism of the bulk of responses and the lack of extreme responses.