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Proceedings of the Annual Meeting of the Cognitive Science Society

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 39(0)

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Publication Date

2017

Peer reviewed

Adaptive response priors in context-dependent decision-making

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Abstract: Context (such as our location or current goal) informs everyday decisions, both by predicting stimuli and determining relevant responses. How do we develop priors that are general enough to apply in various contexts yet specific enough to maximize reward in a given context? We investigated this using the AX-CPT, a task in which a cue determines which button to press for a probe that appears seconds later. We manipulated the frequency of the probe given the cue across participants and built a diffusion model to estimate how the cue informs participants' priors for the decision. We found that participants' context-dependent priors were closer to each other and less extreme than those predicted by a model that maximizes reward rate given the true stimulus frequencies. However, participants' priors were optimal given their subjective frequency estimates, which showed that they averaged response probabilities across cues when the cues made sufficiently similar predictions.