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Integration of Sensory Evidence With Reward History in Sequential Decision Making in Humans and Rats

Throughout our lives, we observe, interact with, and immerse ourselves in the external world through sensory perception. Sensory stimuli are perceived in the context of the history of our past sensory percepts and actions. When performing standard tactile discrimination tasks in a lab setting, animals and humans are influenced by the history of the stimuli they receive. In this context, the history of stimuli has a measurable effect on the participants'decisions, but it is not known whether and how the sensory information may interact with the history of past rewards to influence perception and decision making. To investigate this, we develop a set of Bayesian ideal observer models and analyze them in a Bayesian Data Analysis framework. Our results suggest that subjects integrate the sensory evidence with the reward history in sequential decision making. Specifically, when sensory information is uncertain, or when subjects'sensory acuity is low, observers rely more heavily on the history of past rewards to make choices. In future work, we aim to address questions about the optimality of integration of reward history and sensory evidence, increase environmental volatility and incorporate more model complexity by considering a broader set of models for the history of rewards in order to determine the most suitable version of the model to capture the behavior recorded in ongoing experiments in rats and humans.

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