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Hierarchical Instance-Based Learning for Decision Making from Delayed Feedback

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Abstract

In real-world decision making, outcomes are often delayed, meaning individuals must make multiple decisions before receiving any feedback. Moreover, feedback can be presented in different ways: it may summarize the overall results of multiple decisions (aggregated feedback) or report the outcome of individual decisions after some delay (clustered feedback). Despite its importance, the timing and presentation of delayed feedback has received little attention in cognitive modeling of decision-making, which typically focuses on immediate feedback. To address this, we conducted an experiment to compare the effect of delayed vs. immediate feedback and aggregated vs. clustered feedback. We also propose a Hierarchical Instance-Based Learning (HIBL) model that captures how people make decisions in delayed feedback settings. HIBL uses a super-model that chooses between sub-models to perform the decision-making task until an outcome is observed. Simulations show that HIBL best predicts human behavior and specific patterns, demonstrating the flexibility of IBL models.