

Forgetful inference in a sophisticated world model

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Presentation Abstract Summary Humans and other animals are able to discover underlying statistical structure in their environments and exploit it to achieve efficient and effective performance. However, the largest scale structures such as 'world models' are often difficult to learn and use because they are obscure, involving long-range temporal dependencies. We analyzed behavioral data from an extended experiment with rats, showing that the subjects discovered and exploited a world model, albeit suffering at times from immediate inferential imperfections as to their current state within it. To describe this process, we built a hidden Markov model (HMM) of the subjects' models of the experiment, describing overall behavior as integrating recent observations with the recollections of an imperfect memory. Over the course of training, we found that subjects came to track their progress through the task more accurately, indicating improved inference of the partially-observable state. Model fits attributed this improvement to decreased forgetting of the previous state. This 'learning to remember' decreased reliance on more recent observations, which can be misleading, in favor of a more dependable memory.

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