Offline Reinforcement Learning with Simulated Trajectories in Latent Space

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Presentation Abstract Summary Many animals, including humans, can rapidly adapt to changing rewards in well-known environments. While recent advances in machine learning have resulted in human-level performance on a variety of tasks, they rely on model-free paradigms, which fail to leverage the learned structure of the environment when the reward landscape changes. Here, we show how an agent with a variational autoencoder-based architecture can learn the transition structure of an environment. When the agent then observes a new reward location, it can quickly build up a new policy by sampling from random locations in the environment and simulating extended trajectories offline. Values are assigned to simulated episodes using a k-nearest neighbour method. These trajectories, resembling observed "replay" dynamics in the hippocampus, provide a functional link between episodic and model-based views of the role of the hippocampus in navigation.

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