

The importance of mind-wandering for cognitive computing and its long-term adaptation

What is mind-wandering?

- Also referred to as task-unrelated thinking
- Associated with activation in Default Mode Network
- Behaviorally associated with performance decrements
- but also improvements in planning and creativity

Incubation Condition	Improvement in ULT (%)
No Break	-40
Rest	-20
Demanding	20
Undemanding	60

Modern reinforcement learning: Dyna for offline replay and updating

Solution:
Dyna architecture (Sutton) does not only apply temporal difference equation to actual experiences but also to simulated (future) experiences.
Successor representations is the set of future states that can be replayed
Preferential replay of policies associated with higher rewards or uncertainty (PE).

Daw (2018)

SR-Dyna can learn changes in task
Russek et al (2017)

Simulating mind-wandering in a cognitive architecture

ACT-R = cognitive architecture/simulated theory of cognition

Anderson et al. (2010)
Model simulations reproduce basic behavior

van Vugt & van der Velde (2018)

Speculations about cognitive materials

- Associative learning of rewards associated with (series of) actions
- Periods during which memories are replayed not associated with main task
- Perform RL updating in "off-task periods"
- Making the randomness smart using the Dyna algorithm

replaying each pair -> strengthening connections when connection changes, rewards are updated