

Deep RePReL

Combining Planning and Deep RL for acting in relational domains



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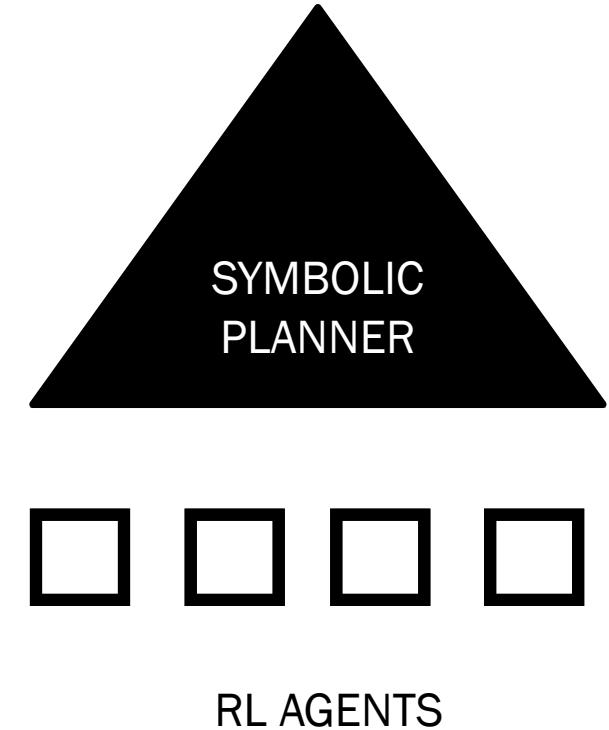


Relational Domains



RePReLU

- Plan the sequence of high level subgoals and learn to execute each subgoal at lower level
- Advantage:
 - *Compositionality*
 - *Task specific state representations*
- Relational MDP which is deterministic and fully observable
- Adapt First Order Conditional Influence statements to specify bisimulation conditions of MDPs for ‘safe’ abstractions.



D-FOCI

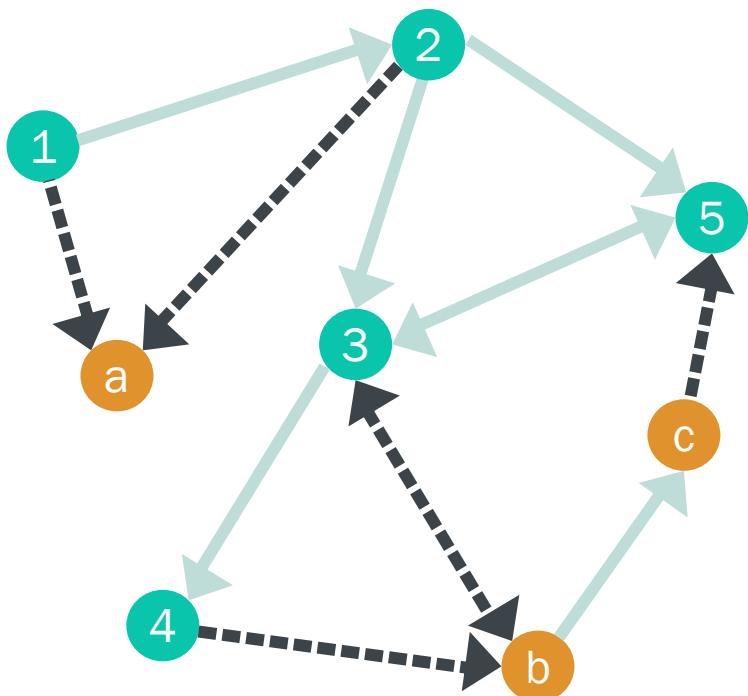
First Order Conditional Influence (FOCI) statements

if *condition* then X_1 influence X_2

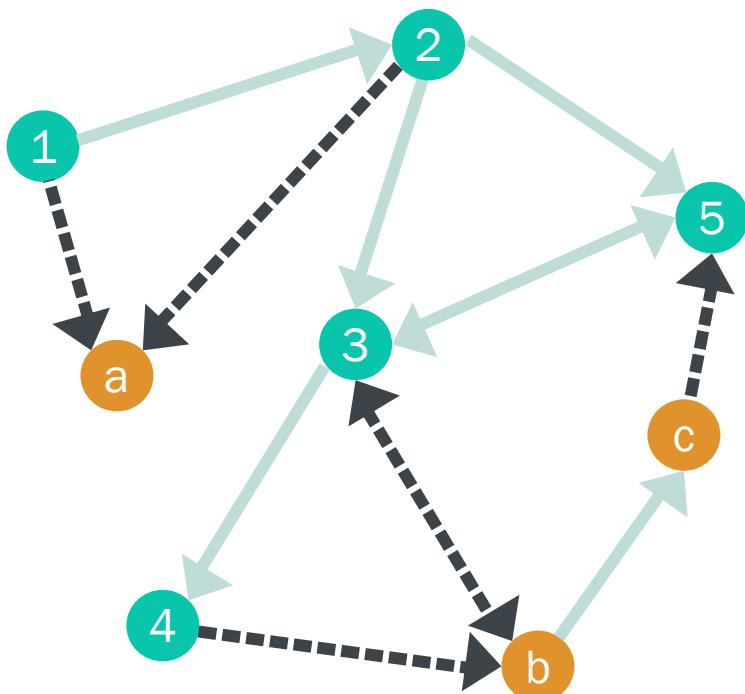
Dynamic FOCI statements

sub-task : $X_1 \xrightarrow{+1} X_2$

Example

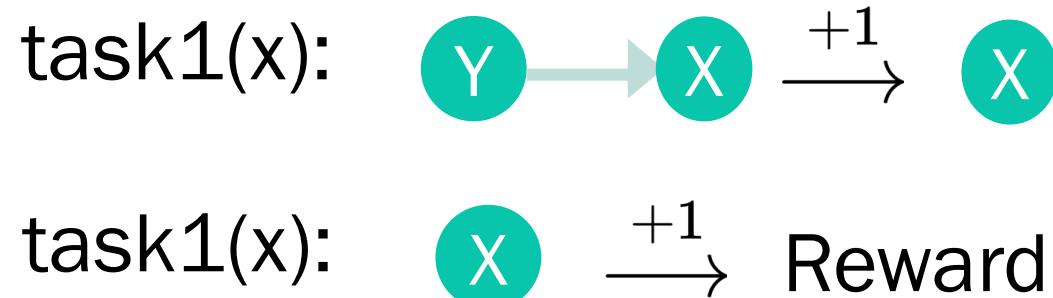
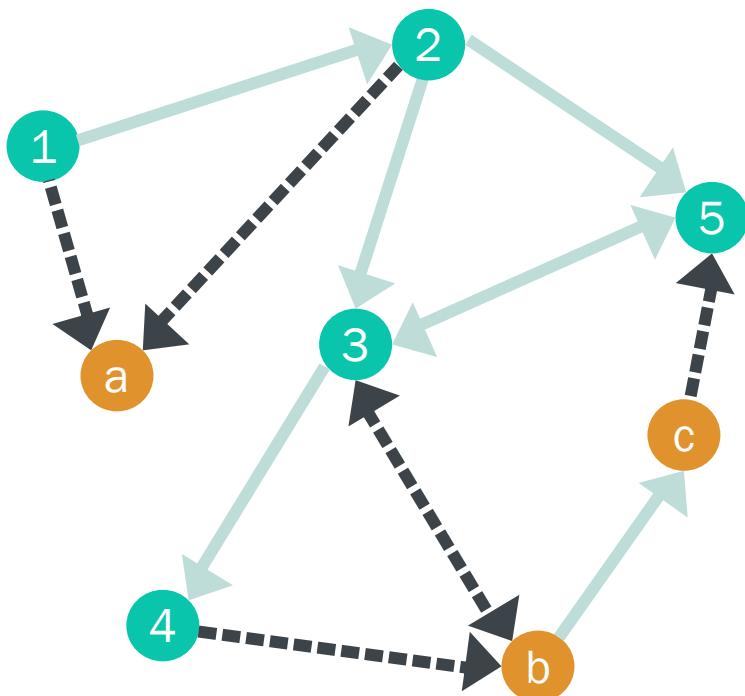


Example

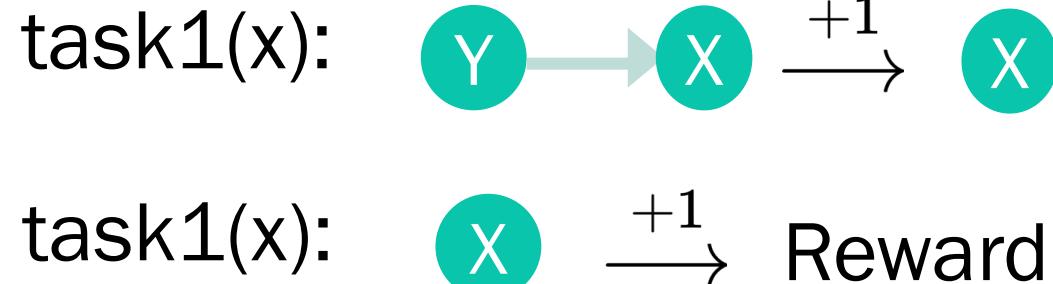
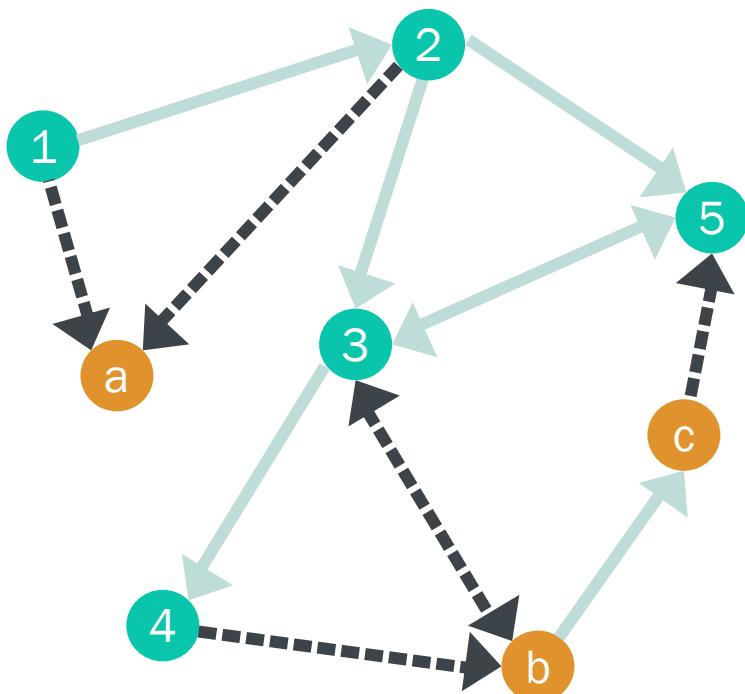


task1(x):
Y → X →⁺¹ X

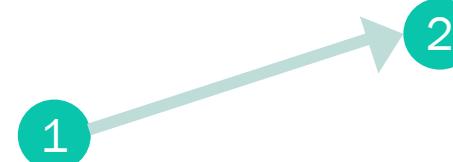
Example



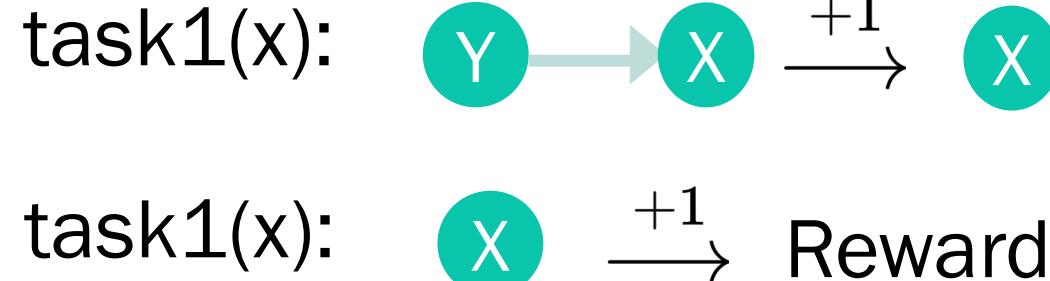
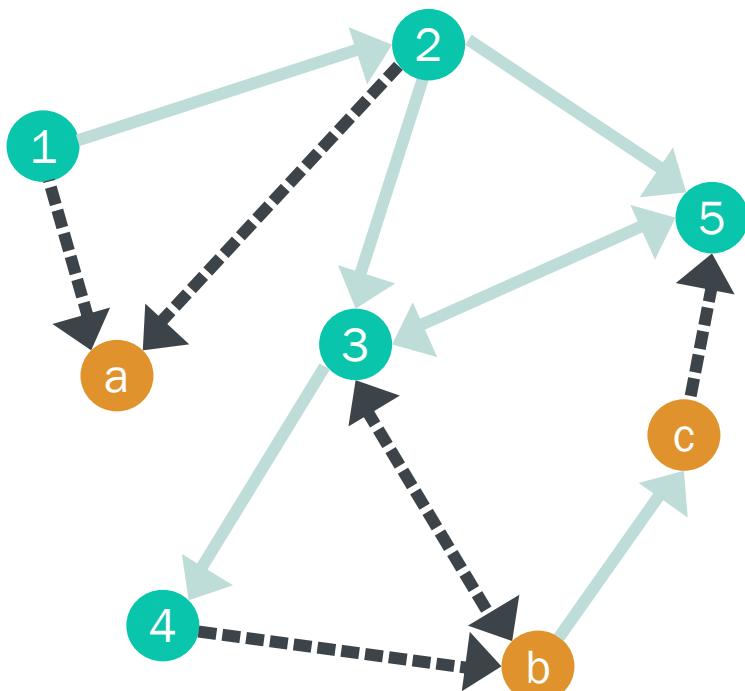
Example



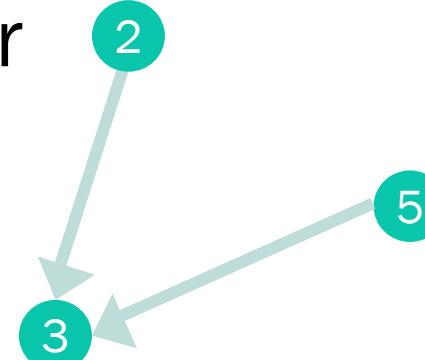
Abstract state for
task1(2):



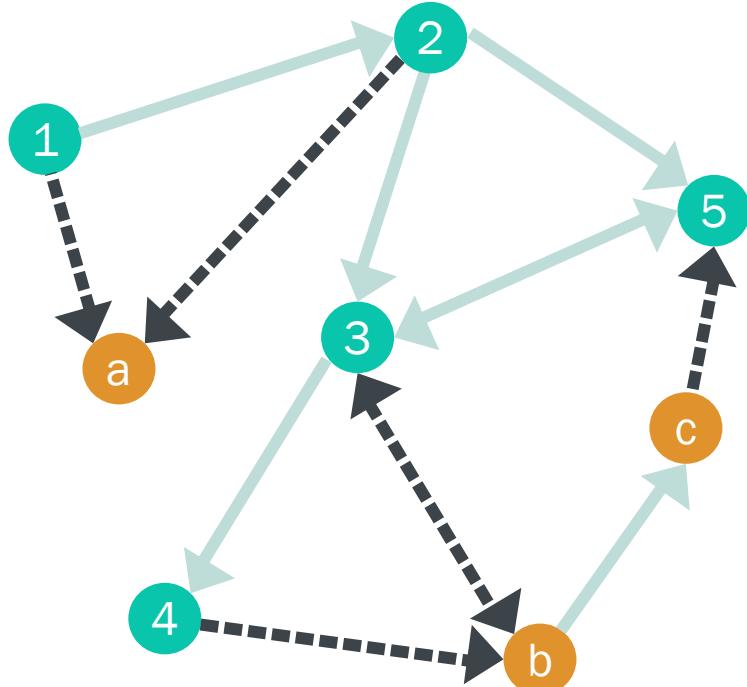
Example



Abstract state for
task1(3):



Example



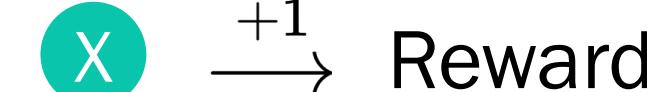
task1(x):



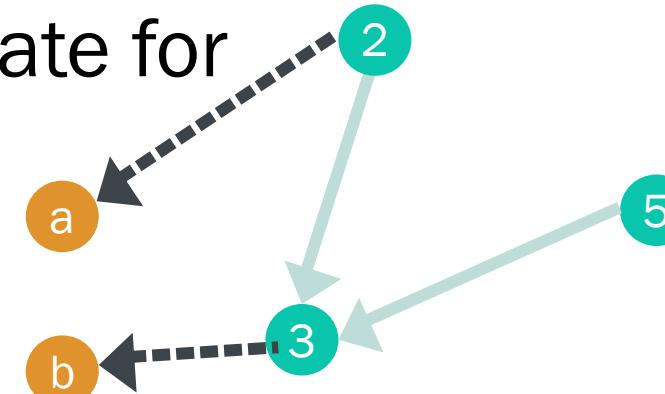
task1(x):



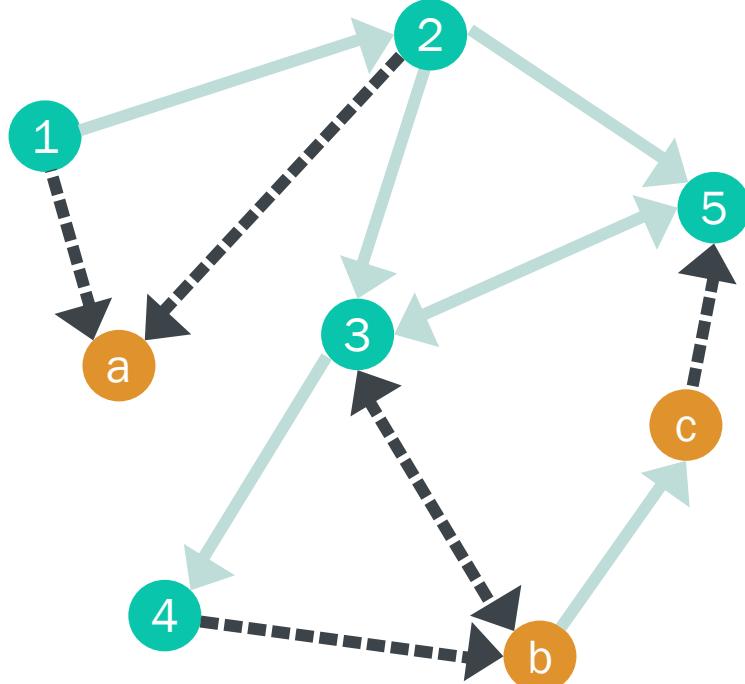
task1(x):



Abstract state for
task1(3):



Example



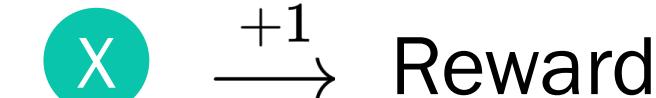
task1(x):



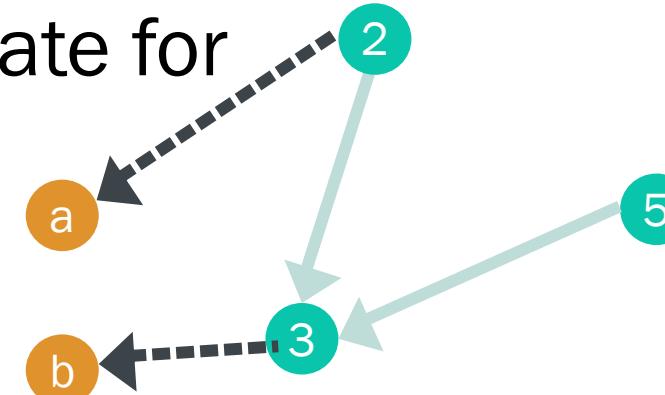
task1(x):



task1(x):

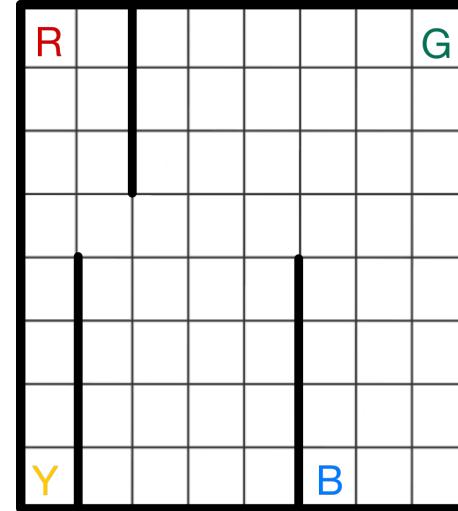


Abstract state for
task1(3):

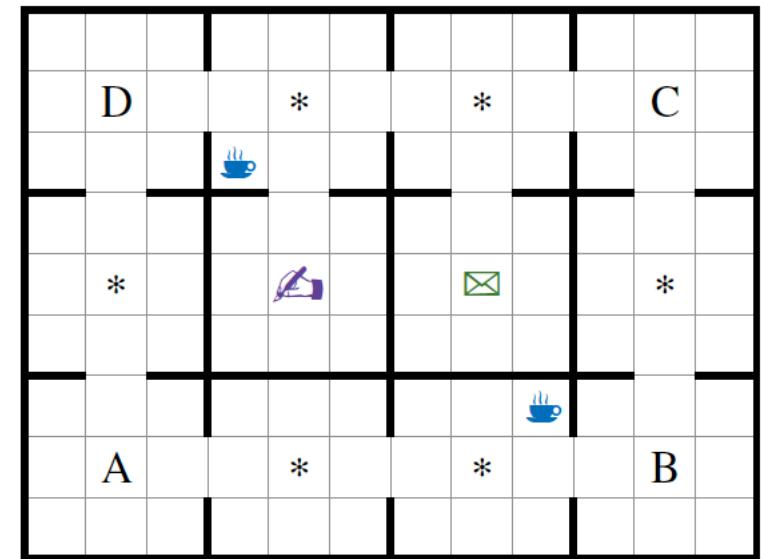


Experiments

- Domains
 - *Taxi and Office World*
- Baselines
 - *DQN*
 - *HDQN*
 - *TRL (Taskable RL, Illanes et al. 2020)*



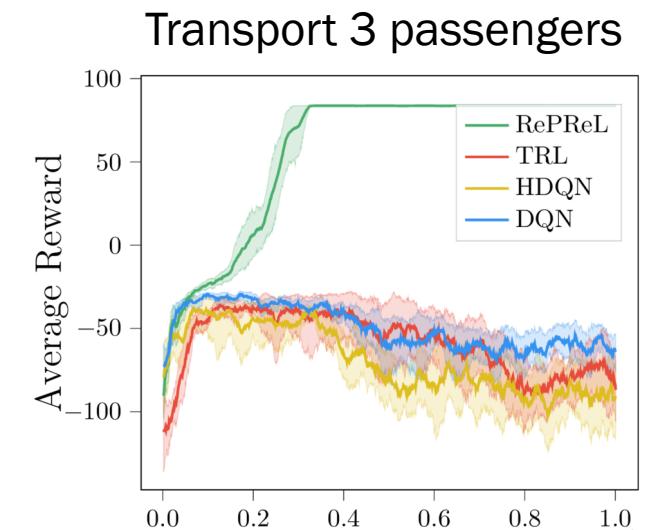
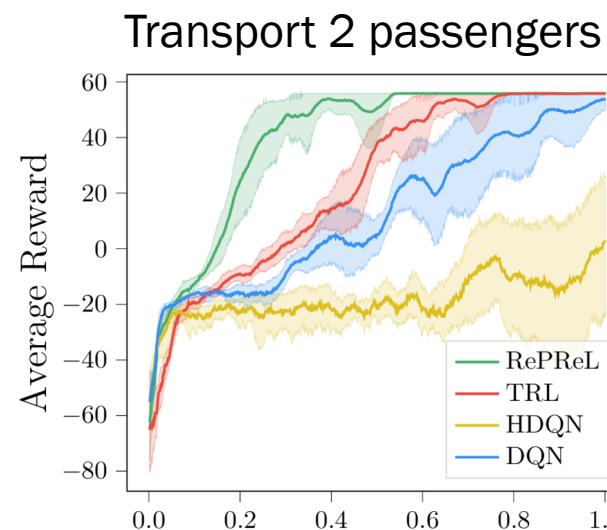
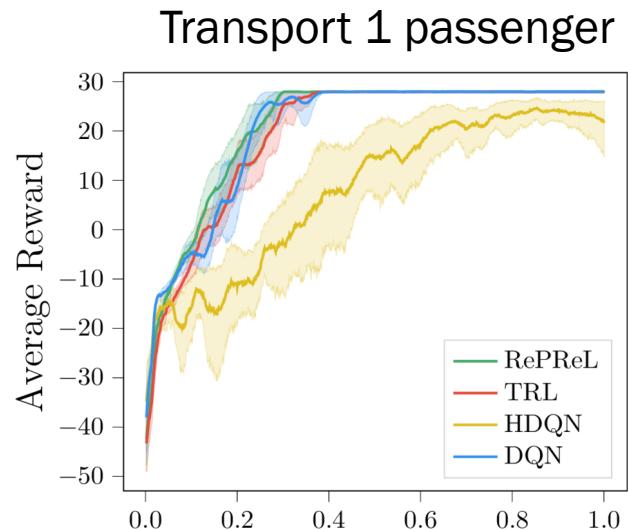
Taxi



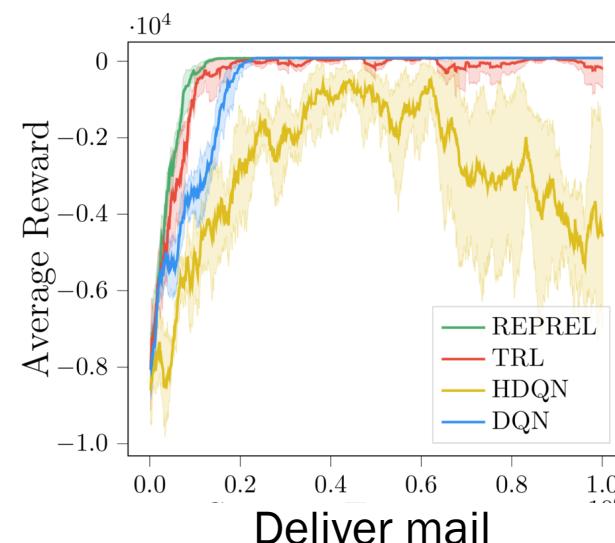
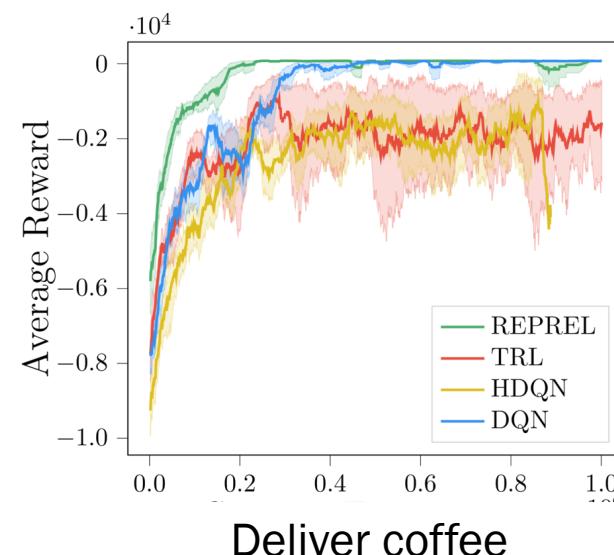
Office

Sample Efficiency

Taxi

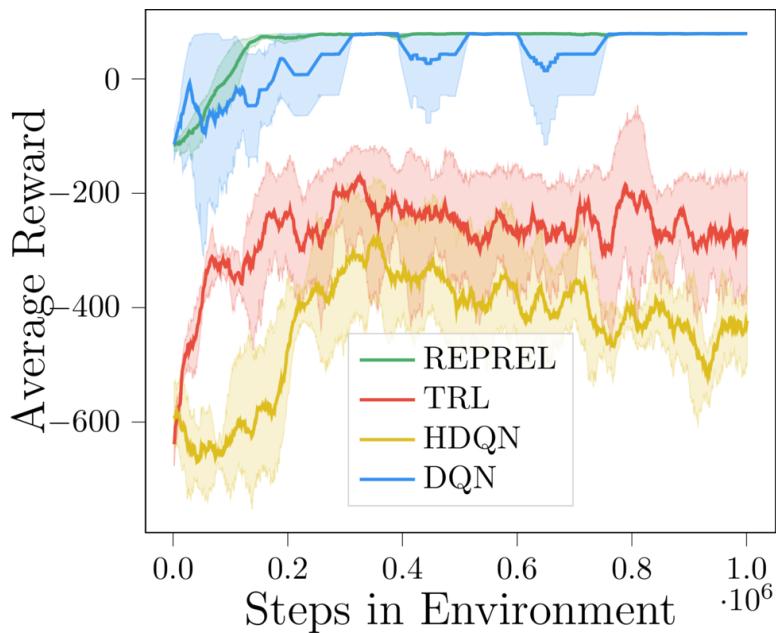


Office

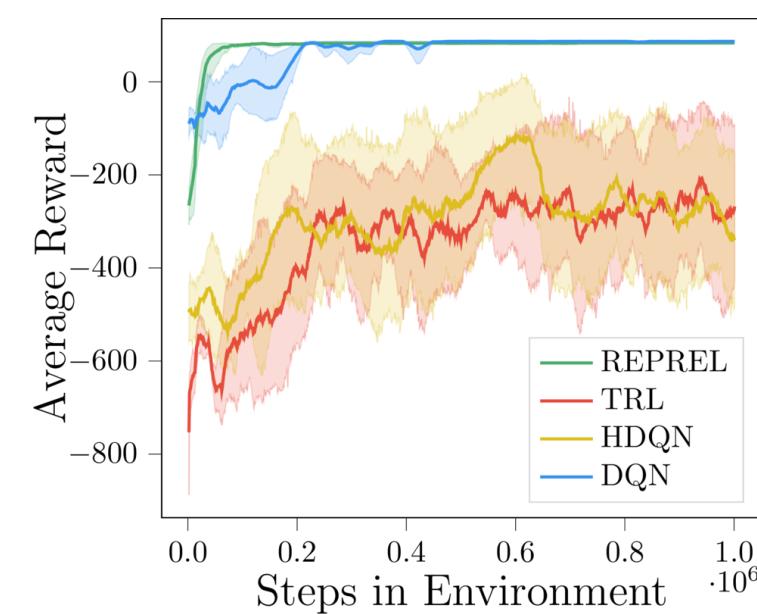


Transfer

With Transfer



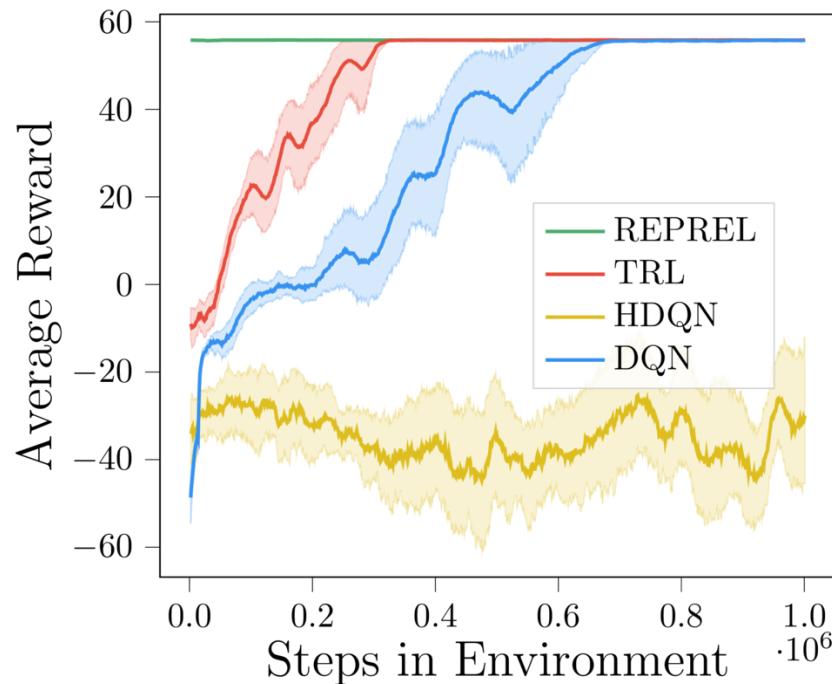
Deliver Coffee



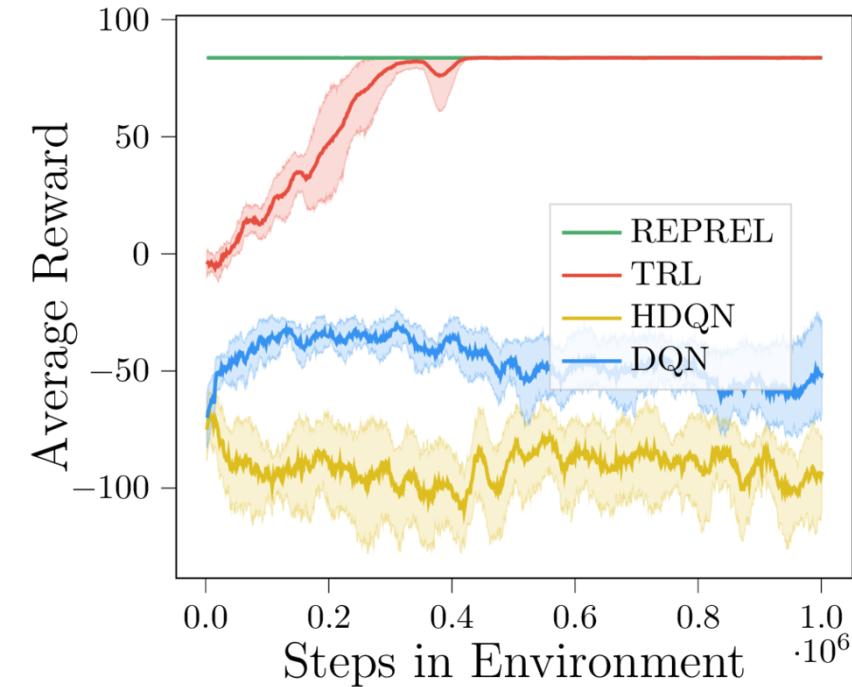
Deliver Mail

Generalization

With Transfer



Transport 2 passengers



Transport 3 passengers

THANKS

