



Hybrid Deep RePReL

Integrating Relational Planning and Reinforcement Learning for Information Fusion







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* Assumed homogeneous and obtained from a single source

Motivation



• Type of data might be different

Given: A sequential decision making problem with a combination of structured and unstructured data.To Do: Develop a hybrid architecture that learns to act.

Structured Data:

 Symbolic representations like tabular data, predicate logic, knowledge graph, etc

Unstructured Data:

Raw, free-form data like text, image, audio, etc

Structured Data:

Passenger's details at(p1,l1), dest(p1,d1) at(p2,l2), dest(p1,d2)

Unstructured Data:

- Taxi Location
- Geography

from images



RePReL



Kokel et al ICAPS 2021

RePReL

Goal directed relational MDP: <S, A, P, R, γ, G> state p1



RePReL

- Plan the sequence of high level subgoals and learn to execute each subgoal at lower level
- Advantage:
 - Compositionality
 - Task specific state representations
- Dynamic First Order Conditional Influence statements to obtain task-specific abstract representations





Hybrid Deep RePReL



HD RePReL Learning



- Initialize buffers
- Get high level plan
- For each subgoal
 - Loop till the subgoal is achieved or # steps exceeds
 - Get the abstract state
 - Get the policy for that subgoal
 - Take a step and observe reward, next state
 - Add <S, A, R, S> to the buffer
- Update the subgoal policy using samples from the buffers

Experiments

- Sample efficiency
- Generalization across objects





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Summary

- Combined a symbolic planner with a Deep RL agent for information fusion
- Provide a batch learning algorithm for RePReL framework
- Demonstrate sample efficiency, that is significant reduction in the number of steps required for the model to learn an optimal policy for the task
- Demonstrate efficient generalization over number of objects
- Provide hybrid approach for structured and unstructured data



QUESTIONS?

THANKS



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