



UC Berkeley

Modularity in Reinforcement Learning: An Algorithmic Causality Perspective on Credit Assignment

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Princeton

Question

What are the conditions for efficient modular transfer in reinforcement learning (RL)?

Contributions

Modularity Criterion

Algorithmic independence of decision mechanisms induced via credit assignment

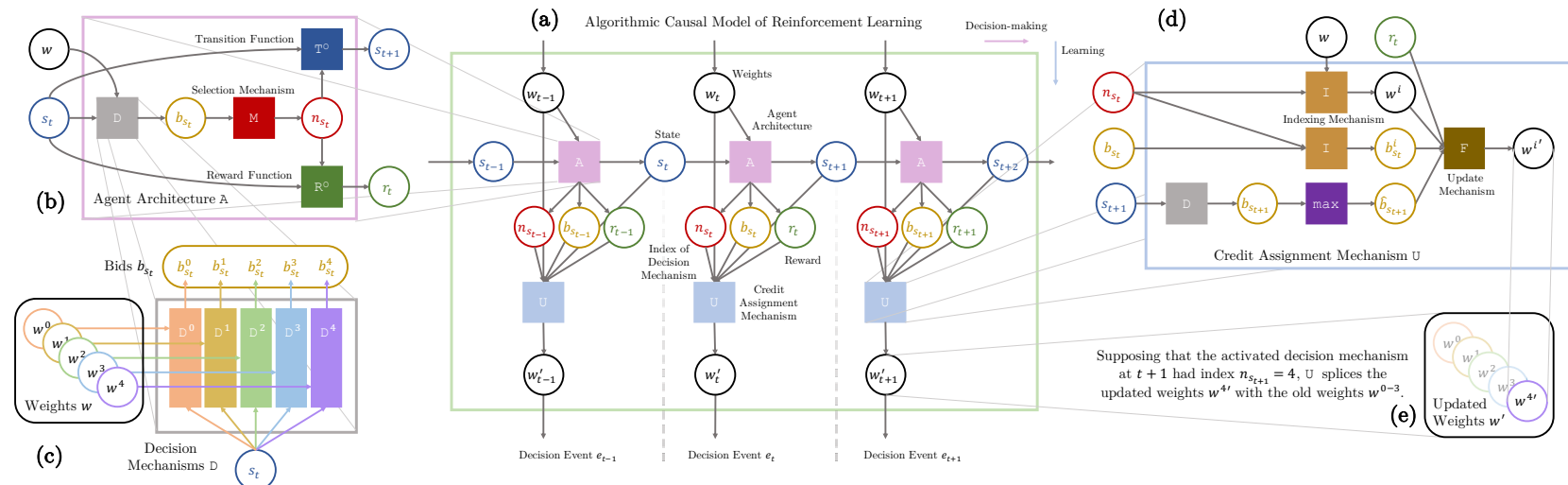
Theoretical

- We assess the modularity of major class of RL algorithms
- Single-step temporal difference algorithms with decoupled weights are modular

Empirical

Modularity improves sample efficiency in recovering from isolated changes in the environment dynamics

Modularity Criterion

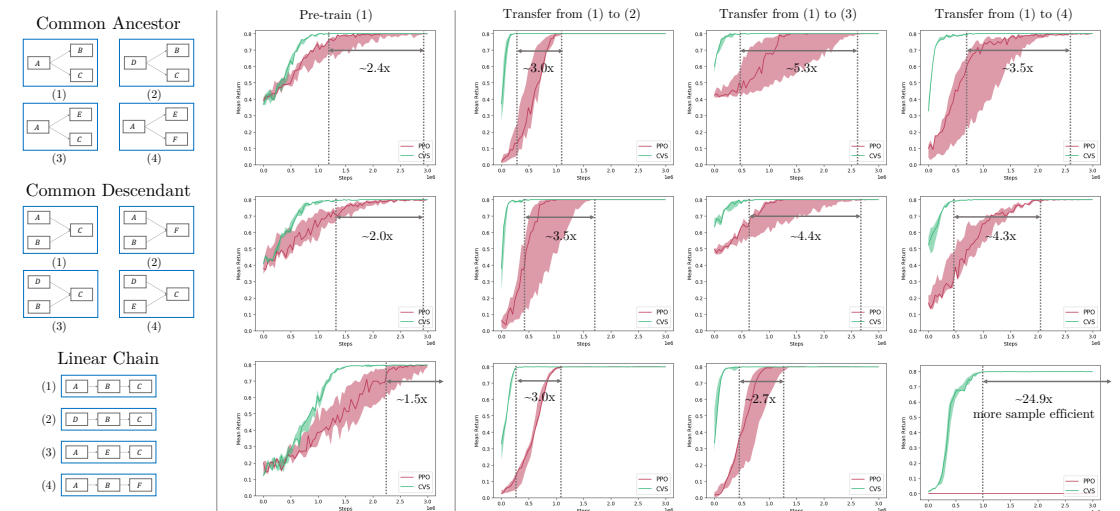


Theoretical Results

		Agent Architecture	
Modular RL Algorithms		Structurally Local	Structurally Global
Temporally Local	Credit Assignment	Tabular & Linear Function Approximation Q-learning, SARSA Cloned Vickrey Society	Actor-Critic methods
		Non-Linear Function Approximation Cloned Vickrey Society	
Temporally Global		n-step TD methods, $n > 1$	Policy Gradients

Cloned Vickrey Society: Chang, Kaushik, Weinberg, Griffiths, Levine (ICML 2020)

Empirical Results



Cloned Vickrey Society (modular) transfers more efficiently than PPO (not modular).



Paper



Talk