



DR. B. C. ROY ENGINEERING COLLEGE, DURGAPUR
Department of Computer Science & Engineering

Presents...

A KEYNOTE SPEECH ON

Interactive Actor-Critic for RL in Cooperative-Competitive Environments

THINC
lab

@



**UNIVERSITY OF
GEORGIA**



SPEAKERS



Dr. Prashant Doshi

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University of Georgia, USA



Mr. Keyang He

Research Scholar, THINC Lab
University of Georgia, USA

Date: 11.03.2022

Time: 10:30 - 12:00 PM

Platform: Google Meet

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ABSTRACT

Reinforcement learning (RL) has delivered astounding performance in both classic board games and modern video games. However, the approaches behind these successes in multiagent settings often do not explicitly model the other agents during learning, and benefit from perfectly observing the state. Recent methods have begun to model others in the environment but rely on a perfect exchange of information between the agents. In this talk, we introduce a deep RL technique that explicitly models interacting agents in settings with noisy observations of both the state and others' actions. The interactive advantage actor-critic (IA2C) utilizes a decentralized actor and critic pair, where the critic integrates a Bayesian belief filter that updates beliefs over other agents' models. Next, we introduce the Organization problem as a quintessential domain involving mixed cooperation-competition, while exhibiting both partial observability and history-dependent rewards. Experiments in this domain show that IA2C learns the optimal policy faster and more robustly than several MARL techniques. Our experimentation also reveals that IA2C struggles to scale beyond a handful of agents due to the exponentially increased joint action space. To address this curse of dimensionality, we bring the idea of joint-action permutation invariance from planning to learning. This allows us to replace joint actions with configurations, which grow polynomially in the number of agents. Then, the classic Dirichlet multinomial distribution can be used to model the whole agent population rather than model each other agent. Additional experiments provide preliminary evidence of IA2C scaling up to a hundred agents organized in various interaction topologies.

ABOUT THE SPEAKERS



Prashant is a tenured professor of computer science at the University of Georgia (UGA), Athens, USA. He received his Ph.D. in CS from the University of Illinois at Chicago in 2005, where his doctoral dissertation was supervised by Piotr Gmytrasiewicz. He directs the THINC Lab (<http://thinc.cs.uga.edu>) at UGA, which conducts research in multiagent systems and robotics. Prashant's contributions have significantly advanced decision making in multiagent settings, its interdisciplinary applications in computational modeling of human strategic behavior, and more recently, MARL and inverse RL with applications in robotics. Along with Piotr, he introduced the I-POMDP framework, which is now a leading framework for modeling sequential decision making in multiagent settings, finding several diverse use cases including in the study of money laundering, UAV reconnaissance, and theory-of-mind modeling. His paper demonstrating the benefit of using I-POMDPs toward active cyber deception won the best application paper award at AAMAS 2021.



Keyang is a senior doctoral candidate in the Dept. of Computer Science at UGA and conducts his research in the THINC Lab under the supervision of Prashant. He started his PhD in 2017 and expects to graduate shortly. Keyang's research has primarily focused on RL in partially-observable multiagent settings where he has published multiple papers



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