

ECE1657 Project: Stochastic Markov Games for Multi-Agent Reinforcement Learning

Proposal (10 November)

- ☐ 1/2 Page
- ☐ Should broadly highlight the research interest of Multi-Agent Learning and its growing need
- ☐ Describe the objective of the project (to explore the role of Stochastic Markov Games in MARL and various agent interactions)
- ☐ Briefly touch upon the algorithms and their differences (QMIX, VDN, COMA, IQL)
- ☐ Describe the environment setup (StarCraft II) and why is this suitable from a Game Theoretic perspective
- ☐ End up by laying out the outcomes expected (coordination must prevail, agent interactions vary as per cost reduction, obtaining optimal strategies to defeat the enemy)

Related Work

- ☐ Multi-Agent Reinforcement Learning: QMIX, VDN, COMA, IQL, Shimon Whiteson papers, Jakob Foerster thesis, etc. for algorithms
- ☐ Stochastic Games: MARL Review Papers, Reports, Surveys, etc. for Markov Games
- ☐ Should cover thorough background from Game Theoretic and RL perspective
- ☐ StarCraft II: Emphasize on the application area and its relation to real world on the basis of coordination

Background

- ☐ Stochastic Markov Games: Focus should be on Stochastic Markov Games and their analytical description
- ☐ Multi-Agent Learning: Description should cover introduction, notation, background and expressions
- ☐ Each term should be explained clearly and concisely
- ☐ Nash Equilibrium, Optimal Responses and other important results must be highlighted

Learning in Stochastic Games

- ☐ Partial Observability: Describe and walk the reader through the partial observability setting
- ☐ Explain analytically and intuitively how agents tackle this problem
- ☐ Collaborative Agents: Explain each algorithm in detail and how it entails to collaboration between different agents (4 sections- IQL, COMA, VDN, QMIX)
- ☐ Note that the emphasis in this section should be mostly on algorithms and their functioning from Game Theoretic perspective

Experiments

- ☐ Success Rate Optimization: Emphasize and explain how agents maximize their rewards (plots presenting success rates)

- ☐ Cost Minimization: Argue that success rate optimization takes place due to collaboration via cost minimization (plots presenting absolute Bellman error)
- ☐ Optimal Strategies: Gain insights into agent behavior by visualizing optimal strategies (snapshots of game)