

AI4004/CS5055 - Game Theory & its Applications

MultiAgent Systems

Course Project

Due: December 8th 2022

1 Objective

The project is an important part of this course and makes up a significant portion(i.e. 20%) of your final mark. The project gives you a chance to explore a topic of your interest in the area of Game Theory and MultiAgent Systems.

In particular, you will be expected to become familiar with existing research on your topic, implement some ideas (either suggested by existing work or devised on your own), and experimentally evaluate them. You may do your implementation within any freely-available infrastructures. (e.g. Jade, JaCaMo, Gambit etc.).

2 Term Paper

Near the end of the term, you will report on your project in a paper in the style of a AAMAS research paper (approx. 6—8 pages), and give an overview of your project in a 10-minute presentation to the class (maybe on Zoom!).

3 Project Topics

You must choose a topic with the sub-areas described below. Ideally you should chose a topic that interests you and is also related to the area that you wish to continue further research and study your chosen topic in depth. You must chose one of the following three areas for your project. Multiple projects are possible within each suggested area.

1. **Computational Social Choice** — Social choice theory concerns the design and formal analysis of methods for aggregating the preferences of multiple agents. Examples of such methods include voting procedures, which are used to aggregate the preferences of voters over a set of candidates. We study some of the basics in class and you will independently study this area in depth. Several datasets are also available at www.preflib.org.
2. **Mechanism Design** — Mechanism design is a field in MultiAgent systems that takes an engineering approach to designing economic mechanisms or incentives, toward desired objectives, in strategic settings, where players act rationally. Mechanism design theory allows us to analyze and compare the way in which markets or institutions, such as a government, efficiently allocate goods and services given a gap in information between self interested agents.
3. **Applications** — MultiAgent systems research has permeated a variety of domains and applications, both as central to the application and in key supportive roles. For example, the MultiAgent experts pursue research in topics including resource allocation, constrained optimization, learning, scheduling, agent-based simulation, and game-theoretic equilibrium computation, and applies them in domains ranging from security to biomedicine to robotics to financial and internet market design. Ideas and

technologies from this research are responsible for significant revenue-generation and cost-saving, as well as for supporting important public policy and business strategy decision-making. You can apply the concepts from MultiAgent systems to an area of your interest.

4 Project Scope

Graduate projects are individual whereas undergraduate projects are in groups of 2-3. It is preferred that you chose from among the following.

1. Grad Students — Your own idea, preferably related to your own area of interest
2. Undergraduate Students — Implementation of a recent idea presented at AAMAS or AAAI
3. Undergraduate Students — A survey of a topic that we have not studied in class such as Cake Cutting, VCG Mechanisms, Auctions, Trust Systems etc.

5 Relevant Conferences

- AAMAS - International Conference on Autonomous Agents and Multiagent Systems
- EC - ACM Conference on Economics and Computation
- AAAI - Conference on Artificial Intelligence (MultiAgent Tracks)
- IJCAI - International Joint Conference on Artificial Intelligence (MultiAgent Tracks)
- JAAMAS - Journal of Autonomous Agents and Multi-Agent Systems