

ME-429

Multi-agent learning and control

Kamgarpour Maryam

Cursus	Sem.	Type
Mechanical engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	3 weekly
Lecture	2 weekly
Project	1 weekly
Number of positions	

Summary

Students will be able to formulate a multi-agent decision-making problem as a game and apply relevant mathematical theories and algorithms to analyze the interaction of the agents and predict the outcome of the decision-making problems.

Content

Elements of a non-cooperative game, Nash equilibrium, zero-sum games, pure and mixed strategies, minimax theorem, potential games, sequential games, feedback games, Stackleberg games, efficiency of equilibria, convex games, auctions and mechanisms, Bayesian games, computing equilibria, learning equilibria, no-regret dynamics.

Keywords

game theory, multi-agent decision-making, Nash equilibrium, optimization algorithms

Learning Prerequisites**Required courses**

math logic and experience with writing proofs, algebra, analysis, probability and optimization.

Learning Outcomes

By the end of the course, the student must be able to:

- Formulate a multi-agent decision-making problem as a game.
- Analyze the outcome of the game.
- Identify the class of game (sequential, one-shot, cooperative).
- Optimize each agent's decision based on her objective.
- Define various equilibrium concepts.
- Implement algorithms to compute Nash equilibria.
- Predict the outcome of the game.
- Derive an algorithm to learn equilibria.
- Assess / Evaluate centralized versus decentralized optimization approach

Transversal skills

- Assess progress against the plan, and adapt the plan as appropriate.
- Communicate effectively, being understood, including across different languages and cultures.
- Give feedback (critique) in an appropriate fashion.
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Keep appropriate documentation for group meetings.
- Set objectives and design an action plan to reach those objectives.

Teaching methods

in-class lecture notes, and slides. the notes will be available on moodle after each class.

Expected student activities

in-class participation and completion of a project

Assessment methods

There will be a class project and an exam.