Multiagent decision-making and control

Course information

Maryam Kamgarpour

Professor of Engineering (IGM, STI), EPFL

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Course logistics

- 14 Sessions
  - Wednesdays, 13:15-15:00 Lectures, 15:15-16:00 Exercise hour
- Course
  - In-class lecture and exercise hour
  - Material will be available on Moodle
  - Questions: ask in lecture, exercise hour, or write on EdDiscussions
- “Soft” prerequisites
  - Linear algebra
  - Real analysis
  - Convex optimization

Course staff

- Instructor: Prof. Maryam Kamgarpour
- Teaching staff:
  - Philip Jordan
  - Giulio Salizzoni
- You have a question?
  - Ask us in lecture or exercise hour
  - Write to us on Moodle through EdDiscussions
  - Write to us on on Moodle through private message

Course topics

1. Static games
2. Zero-sum games
3. Potential games
4. Dynamic games, dynamic programming principle
5. Dynamic games, dynamic programming for games
6. Dynamic games, linear quadratic games, Markov games
7. Convex games, Nash equilibria characterization
8. Convex games, Nash equilibria computation
9. Auctions
10. Bayesian games
11. Learning in games
12. Extensive form games
13. Feedback games in extensive form
14. Final project presentations

Reference books

Slides are the main course resource and are posted on moodle.
The following books help deepen your understanding. They are available online or at EPFL library

1. Hespanha, Noncooperative Game Theory, 2015
2. Başar and Jan Olsder, Dynamic Noncooperative Game Theory, 1982
3. Fudenberg and Tirole, Game Theory, 1991
4. Osborne and Rubinstein, A Course in Game Theory, 1994
5. Nissan, Roughgarden, Tardos, and Vazirani, Algorithmic Game Theory, 2007
6. Shoham and Leyton-Brown, Multiagent Systems, Game-Theoretic, and Logical Foundations, 2009
7. Karlin and Peres, Game Theory, Alive, 2016

Assessment

The quizzes and the presentations are in person and in class. The dates are not negotiable and remote attendance is not an option.

- 40%: 2 Quizzes, 20% each
  - based on material in lecture and exercise hours
- 60% Project
  - project abstract, presentation (10%)
  - final project presentation (25%)
  - final report (25%)
- Project must be done in group of 2
  - topic: related to the course material, in agreement of the course staff
  - suggestions will be provided

Important dates and assessment

The quizzes and the presentations are in person and in class. The dates are not negotiable and remote attendance is not an option.

- March 26: in-class quiz 1, 20%
- April 16: in-class presentation and abstract,10%
- April 30: in-class quiz 2, 20%
- May 26: Final report, 25%
- May 28: in-class final project presentation, 25%

Why attend the lectures and participate in class discussions?

My interest: I enjoy teaching by sharing my passion with you!
Your potential interests:

- we will play games and have in-class activities: these are not recorded
- the in-class feedback helps me understand what concepts you are struggling with so I can focus more on those
- you might find the partner for your project
- you might make a new friend!
- active learning: being engaged in-person can be more effective than passive watching
- you'll have to spend the time on the course anyway, either through watching the video or through class. you might as well be present in the allocated time in class to get it done!

References for the pre-requisite

to brush up your background on mathematics as discussed in the prerequisite section, I recommend the following books

1. Axler, Linear Algebra Done Right, 2015
2. Pugh, Real Mathematical Analysis, 2002
3. Boyd and Vandenberghe, Convex optimization, 2004
4. Ross, A First Course in Probability, 2014

Acknowledgements for lecture material

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Activity - introduction, questions and goals

Think-Pair-Share activity

- (2 minutes) Think of the following:
  1. any question you might have about this course
  2. what you hope to learn
- (5 minutes) Pair with another colleague:
  - record your group number
  - introduce yourself: name, program, background
  - discuss answers to questions 1, 2 above with your pair
- (3 minutes) Share your answers with the class: I will pick on groups randomly
  - say your names
  - ask any questions you might have about the class from me
  - share with classmates what each of you hopes to learn