Topics in Game Theory

5th module, 2023/24 academic year

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Course information

Course Website: my.nes.ru

Instructor's Office Hours: TBA

Class Time: TBA

Room Number: TBA

TAs: TBA

Course description

This course explores the applications of game theory to various fields of human activity including business, international relations, politics, sports and climate. We will discuss both seminal papers and recent advancements of applied game theory. The goal of this course is to illustrate the power of game theory in predicting equilibrium outcomes in a broad variety of settings.

Course requirements, grading, and attendance policies

Successful completion of Game Theory is a prerequisite for this course.

Grading policy is as follows.

Final grade = 0,6 Exam + 0,4 Essay

At the A4-format exam, students will be asked to solve and analyze modifications of the models discussed during regular classes.

A take-home essay is an exercise where students will develop their own models to explain given phenomena. Detailed requirements for this form of control will be communicated at the classes. Failing to submit an essay before the deadline means 0 mark for this form of control.

Course contents

1. **A brief history of Game Theory** from simple card games to Nobel prizes.
2. **Backward induction**. Do players respect backward induction? Evidence from chess and bargaining experiments.
3. **Contests**. Tullock contest, first-price auction, all-pay auction, rank-order tournaments. Incentivizing performance. Contests in business, sports, and nature.
4. **Politics**. Simultaneous and sequential spatial competition. Osborne conjecture.
5. **International relations**. Bargaining. Power change and war. Arms competition.
6. **Sports**. Professionals play minimax? A Doping game.
7. **Online dating**. Estimation of mate preferences. Stable matchings vs actual matchings.
8. **Climate**. Tragedy of commons. Climate negotiations. Market for emissions.
9. **Solving complex games**. Calculating equilibria on computers. Epsilon-equilibria. Checkers is solved. Heads-up fixed limit poker is solved.

Sample tasks for course evaluation

1. Consider Osborne model of sequential spatial political competition with a tie-breaker condition: if several parties get the same share of votes, the earliest entrant wins. Prove that in such a game there exists a single subgame perfect Nash equilibrium. In this SPNE, the first party decides to enter the competition, while all other parties abstain.

2. Suppose that a new country is considering joining a Kyoto-type protocol. Propose a *fair* way to redistribute quotas for emissions. Make an induction step: define a redistribution rule that assigns a set of new quotas for N+1 countries for any initial set of quotas for N countries. Discuss why your rule is fair.

Course materials

Required textbooks and materials

1. Mesterton-Gibbons, M. (2019). An introduction to game-theoretic modelling. Third Edition. American Mathematical Society. Vol. 37.

Additional materials

1. Binmore, K., McCarthy, J., Ponti, G., Samuelson, L., & Shaked, A. (2002). A backward induction experiment. Journal of Economic Theory, 104(1), 48-88.
2. Levitt, S. D., List, J. A., & Sadoff, S. E. (2011). Checkmate: Exploring backward induction among chess players. American Economic Review, 101(2), 975-990.
3. Lazear, E. P., & Rosen, S. (1981). Rank-order tournaments as optimum labor contracts. Journal of Political Economy, 89(5), 841-864.
4. Corchón, L. C., & Serena, M. (2018). Contest theory. Handbook of Game Theory and Industrial Organization, 2, 125-146.
5. Mowles, S. L., & Ord, T. J. (2012). Repetitive signals and mate choice: insights from contest theory. Animal Behaviour, 84(2), 295-304.
6. Frick, B. (2003). Contest theory and sport. Oxford Review of Economic Policy, 19(4), 512-529.

7. Connelly, B. L., Tihanyi, L., Crook, T. R., & Gangloff, K. A. (2014). Tournament theory: Thirty years of contests and competitions. Journal of Management, 40(1), 16-47.
8. Kydd, A. H. (2015). International relations theory. Cambridge University Press.
9. Haugen, K. K. (2004). The performance-enhancing drug game. Journal of Sports Economics, 5(1), 67-86.
10. Palacios-Huerta, I. (2003). Professionals play minimax. The Review of Economic Studies, 70(2), 395-415.
11. Chiappori, P. A., Levitt, S., & Groseclose, T. (2002). Testing mixed-strategy equilibria when players are heterogeneous: The case of penalty kicks in soccer. American Economic Review, 92(4), 1138-1151.
12. Hitsch, G. J., Hortaçsu, A., & Ariely, D. (2010). Matching and sorting in online dating. American Economic Review, 100(1), 130-163.
13. Forgó, F., Fülöp, J., & Prill, M. (2005). Game theoretic models for climate change negotiations. European Journal of Operational Research, 160(1), 252-267.
14. Wood, P. J. (2011). Climate change and game theory. Annals of the New York Academy of Sciences, 1219(1), 153-170.
15. Fowlie, M., Reguant, M., & Ryan, S. P. (2016). Market-based emissions regulation and industry dynamics. Journal of Political Economy, 124(1), 249-302.
16. Grofman, B. (2004). Downs and two-party convergence. Annual Review of Political Science, 7, 25-46.
17. de Vries, J. P. (2015). Duverger's (f)law: Counterproof to the Osborne Conjecture (Doctoral dissertation, MSc thesis. Available at: https://thesis. eur. nl/pub/17645).
18. Osborne, M. J. (1993). Candidate positioning and entry in a political competition. Games and Economic Behavior, 5(1), 133-151.
19. Bowling, M., Burch, N., Johanson, M., & Tammelin, O. (2015). Heads-up limit hold'em poker is solved. Science, 347(6218), 145-149.
20. Schaeffer, J. et al. (2007). Checkers is solved. Science, 317(5844), 1518-1522.

Academic integrity policy

Cheating, plagiarism, and any other violations of academic ethics at NES are not tolerated.