Game Theory II: Information and Communication

Instructer: Jiawei Fu

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Course Description:

This is an advanced game theory course for graduate students in political science. The primary goal is to provide an overview of topics that we do not have time to cover in Game Theory I. We particularly focus on information and communication including information and mechanism design, contract theory, information choice, persuasion, global games. By no means we can cover all materials in the field; we aim to provide essential tools for students to digest the latest research and do their own projects. Therefore, this is assumed to be a math-heavy class; we will rigorously prove the main results and discuss potential applications.

Logistics:

Lectures: Tuesday 10am-12pm
Recitation: Thursday 4pm-6pm
Office Hour: Friday 9pm-11pm at Room 312
Email: jf3739@nyu.edu

Requirements and Grading

Reading: The material is hard to understand if it is your first time to see. It is highly recommended to read and digest those required readings after the class.

Problem sets: The best way to provide the incentive to learn and absorb new knowledge is by doing assignments. Therefore, there will be one problem set each week. The problems are not designed to embarrass you; Instead, everyone should easily finish them after understanding the materials. Typically, there are two kinds of questions. (1) Algebra: you only need to apply formulas taught in the Class. (2) Proof: prove some similar arguments that we have proofed in class, which means as long as you understand the notes, you can finish it easily. (70%)

Final Report: At the end of semester, there is no final exam; Instead, you are required to write a short report. The report has two general forms: (1) A research idea with a draft theoretical model; (2) A promising extension of the model that you find in the recommended literature. (30%)

Week 1: Introduction and Review

- Overview of the course

- Subjective Expected Utility

- Solution Concepts and Refinement

Recommendations:
Tadelis, S. (2013). Game theory: an introduction. Princeton university press.
Maschler, M., Zamir, S., Solan, E. (2020). Game theory. Cambridge University Press.
Perea, A. (2001). Rationality in extensive form games (Vol. 29). Springer Science Business Media.

Part I: Information and Design

Week 2: Mechanism Design and Implementation: Basics

- Basic Framework

- Examples: Screening and Nonlinear Pricing

- Revelation Principle

Required:
Börgers, T., Krahmer, D. (2015). An introduction to the theory of mechanism design. Oxford University Press, USA. Chapter 1-4 (One of the best introduction to Mechanism Design in a broad view: mechanism designer chooses mechanism to maximize his utility or certain objective function)
Recommendation:
Hurwicz, L. (1972). On informationally decentralized systems. Decision and organization: A volume in Honor of J. Marschak.
Myerson, R. B. (1979). Incentive compatibility and the bargaining problem. Econometrica: journal of the Econometric Society, 61-73.
Vohra, R. V. (2011). Mechanism design: a linear programming approach (Vol. 47). Cambridge University Press.
Groves, T. (1973). Incentives in teams. Econometrica: Journal of the Econometric Society, 617-631.

Week 3: Mechanism Design and Implementation: Transferable utility

- VCG mechanism

- Envelope Theorem

- Revenue Equivalence

Required:
Milgrom, P., Milgrom, P. R. (2004). Putting auction theory to work. Cambridge University Press. Chapter 2-3 (Auction theory is the most successful field of mechanism design with transferable utility.)
Recommendation:

Holmström, B. (1979). Groves' scheme on restricted domains. Econometrica: Journal of the Econometric Society, 1137-1144.

Vohra, R. V. (2011). Mechanism design: a linear programming approach (Vol. 47). Cambridge University Press.

Groves, T. (1973). Incentives in teams. Econometrica: Journal of the Econometric Society, 617-631.

Week 4: Mechanism Design and Implementation: Non-transferable utility

- Strategy-proof

- Implementation Theory

Required:
Jackson, M. O. (2001). A crash course in implementation theory. Social choice and welfare, 18(4), 655-708. (A great introduction to the paper written by Maskin (1999): necessary and sufficient conditions for Nash implementation.)

Börgers, T., Krahmer, D. (2015). An introduction to the theory of mechanism design. Oxford University Press, USA. Chapter 8 (This chapter re-writes many important results in Social Choice theory under the language of mechanism design.)
Recommendation:
Roth, A. E., Sotomayor, M. (1992). Two-sided matching. Handbook of game theory with economic applications, 1, 485-541.

Gibbard, A. (1973). Manipulation of voting schemes: a general result. Econometrica: journal of the Econometric Society, 587-601.

Moulin, H. (1986). Characterizations of the pivotal mechanism. Journal of Public Economics, 31(1), 53-78.

Moulin, H. (1991). Axioms of cooperative decision making (No. 15). Cambridge university press.

Barberà, S. (2011). Strategyproof social choice. Handbook of social choice and welfare, 2, 731-831.

Week 5: Incentive and Contract theory

- Adverse Selection

- Moral Hazard

Required:
Laffont, J. J., Martimort, D. (2002). Incentive theory. The principal-agent model. Chapter 2-4 (Classical introduction to the basic framework of Adverse Selection and Moral Hazard.)
Recommemdation:
Levin, J. (2003). Relational incentive contracts. American Economic Review, 93(3), 835-857.

Bolton, P., Dewatripont, M. (2004). Contract theory. MIT press.

Levin, J. (2002). Multilateral contracting and the employment relationship. The Quarterly Journal of Economics, 117(3), 1075-1103.

MacLeod, W. B., Malcomson, J. M. (1989). Implicit contracts, incentive compatibility, and involuntary unemployment. Econometrica: Journal of the Econometric Society, 447-480.

Caillaud, B., Guesnerie, R., Rey, P., Tirole, J. (1988). Government intervention in production and incentives theory: a review of recent contributions. The Rand Journal of Economics, 1-26.

Holmström, B. (1979). Moral hazard and observability. The Bell journal of economics, 74-91.

Maskin, E., Tirole, J. (1990). The principal-agent relationship with an informed principal: The case of private values. Econometrica: Journal of the Econometric Society, 379-409.

Maskin, E., Tirole, J. (1992). The principal-agent relationship with an informed principal, II: Common values. Econometrica: Journal of the Econometric Society, 1-42.

Week 6: Information Choice and Global Games I

- Beauty Contest Model

- Global Game

Required:
Morris, S., Shin, H. S. (2001). Global games: Theory and applications.
Recommendation:
Carlsson, H., Van Damme, E. (1993). Global games and equilibrium selection. Econometrica: Journal of the Econometric Society, 989-1018.

Brandenburger, A., Dekel, E. (1993). Hierarchies of beliefs and common knowledge. Journal of Economic Theory, 59(1), 189-198.

Morris, S., Shin, H. S., Yildiz, M. (2016). Common belief foundations of global games. Journal of Economic Theory, 163, 826-848.

Angeletos, G. M., Pavan, A. (2004). Transparency of information and coordination in economies with investment complementarities. American Economic Review, 94(2), 91-98.

Week 7: Information Choice and Global Games II

- Public Information and Private Information

- Social value of Information

Required:
Morris, S., Shin, H. S. (2002). Social value of public information. American economic review, 92(5), 1521-1534. (Discuss the effect of public information under the perspective of social welfare; discuss the conditions that public information increases welfare.)

Veldkamp, L. L. (2011). Information choice in macroeconomics and finance. Princeton University Press. Chapter 5 (Very good textbook on Information and Coordination)
Recommendation:
Angeletos, G. M., Pavan, A. (2007). Efficient use of information and social value of information. Econometrica, 75(4), 1103-1142.

Cornand, C., Heinemann, F. (2008). Optimal degree of public information dissemination. The Economic Journal, 118(528), 718-742.

Myatt, D. P., Wallace, C. (2008). On the Sources and Value of Information: Public Announcements and Macroeconomic Performance.

Amador, M., Weill, P. O. (2010). Learning from prices: Public communication and welfare. Journal of Political Economy, 118(5), 866-907.

Week 8: Information Theory and Rational Inattention I

- Measure Informative I

Required:
Thomas, M. T. C. A. J., Joy, A. T. (2006). Elements of information theory. Wiley-Interscience. Chapter 1-3 (Basics of information theory)
Veldkamp, L. L. (2011). Information choice in macroeconomics and finance. Princeton University Press. Chapter 2

Week 9: Information Theory and Rational Inattention II

- Rational Inattention

Required:
Maćkowiak, B., Matějka, F., Wiederholt, M. (2021). Rational inattention: A review. (A simple introduction to rational inattention literature; See how to combine information theory to utility maximization problem)
Recommendation:
Sims, C. A. (2003). Implications of rational inattention. Journal of monetary Economics, 50(3), 665-690.
Matějka, F., Tabellini, G. (2021). Electoral competition with rationally inattentive voters. Journal of the European Economic Association, 19(3), 1899-1935.
Matyskova, L. (2018). Bayesian persuasion with costly information acquisition. cERGE-EI Working Paper Series, (614).
Yang, M. (2015). Coordination with flexible information acquisition. Journal of Economic Theory, 158, 721-738.
Nimark, K. P., Sundaresan, S. (2019). Inattention and belief polarization. Journal of Economic Theory, 180, 203-228.

Part II: Communication

Week 10: Games with Pre-play Communication

- Correlated Equilibrium

- Unmediated Communication

Required:
Myerson, R. B. (1997). Game theory: analysis of conflict. Harvard university press. Chapter 6.
Forges, F. (1990). Universal mechanisms. Econometrica: Journal of the Econometric Society, 1341-1364. (This paper shows that if there are more than three players, then any equilibrium that is available under mediated communication is also available under unmediated Communication.)

Recommendation:

Jackson, M. O., Wilkie, S. (2005). Endogenous games and mechanisms: Side payments among players. The Review of Economic Studies, 72(2), 543-566.

Rabin, M. (1994). A model of pre-game communication. Journal of Economic Theory, 63(2), 370-391.

Lehrer, E., Sorin, S. (1997). One-shot public mediated talk. Games and Economic Behavior, 20(2), 131-148.

Di Tillio, A. (2004). A note on one-shot public mediated talk. Games and Economic Behavior, 46(2), 425-433.

Forges, F. (1986). An approach to communication equilibria. Econometrica: Journal of the Econometric Society, 1375-1385.

Krishna, R. V. (2007). Communication in games of incomplete information: Two players. Journal of Economic Theory, 132(1), 584-592.

Gerardi, D. (2004). Unmediated communication in games with complete and incomplete information. Journal of Economic Theory, 114(1), 104-131.

Week 11: Cheap Talk Extensions

- Multi-dimensional Cheap talk

- Cheap Talk with Evidence

Required:

Battaglini, M. (2002). Multiple referrals and multidimensional cheap talk. Econometrica, 70(4), 1379-1401. (They show the conditions under which there are full revelation equilibria in the cheap talk game with single- and multiple-dimensional state variable.)

Mathis, J. (2008). Full revelation of information in sender–receiver games of persuasion. Journal of Economic Theory, 143(1), 571-584. (This paper extends cheap talk games to the case that the set of Sender's available messages vary with his information.)

Recommendation:

Lipman, B. L., Seppi, D. J. (1995). Robust inference in communication games with partial provability. Journal of Economic Theory, 66(2), 370-405.

Chakraborty, A., Harbaugh, R. (2010). Persuasion by cheap talk. American Economic Review, 100(5), 2361-82.

Gordon, S., Kartik, N., Lo, M. P. Y., Olszewski, W., Sobel, J. (2021). Effective communication in cheap talk games. Working Paper, University of California-San Diego.

Mathis, J. (2008). Full revelation of information in sender–receiver games of persuasion. Journal of Economic Theory, 143(1), 571-584.

Week 12: Persuasion and Information Design I

- Measure Informativeness II

Required:

Notes on Blackwell's Comparison of Experiments by Tilman B orgers, June 29, 2009 (Compare experiments/signals in terms of informativeness.)

Recommendation:

Blackwell, D. (1953). Equivalent comparisons of experiments. The annals of mathematical statistics, 265-272.

Athey, S., Levin, J. (2018). The value of information in monotone decision problems. Research in Economics, 72(1), 101-116.

Brooks, B., Frankel, A. P., Kamenica, E. (2019). Information hierarchies. Available at SSRN 3448870.

Brooks, B., Frankel, A. P., Kamenica, E. (2019). Information hierarchies. Available at SSRN 3448870.

Week 13: Persuasion and Information Design II

- Bayesian Persuasion

- Information Design

Required:
Kamenica, E., Gentzkow, M. (2011). Bayesian persuasion. American Economic Review, 101(6), 2590-2615. (A new approach to modeling information transformation (with commitment and hard information); learn how to solve the persuasion game with concavity.)

Bergemann, D., Morris, S. (2019). Information design: A unified perspective. Journal of Economic Literature, 57(1), 44-95. (unify Bayesian persuasion and general games in a perspective of design)

Recommendation:
Kamenica, E. (2019). Bayesian persuasion and information design. Annual Review of Economics, 11, 249-272.

Ely, J. C. (2017). Beeps. American Economic Review, 107(1), 31-53.

Gentzkow, M., Kamenica, E. (2014). Costly persuasion. American Economic Review, 104(5), 457-62.

Bergemann, D., Morris, S. (2019). Information design: A unified perspective. Journal of Economic Literature, 57(1), 44-95.

Alonso, R., Câmara, O. (2016). Persuading voters. American Economic Review, 106(11), 3590-3605.

Week 14: Debate and Deliberation

- Cheap Talk

- Self-Discovery

Required:
Coughlan, P. J. (2000). In defense of unanimous jury verdicts: Mistrials, communication, and strategic voting. American Political science review, 94(2), 375-393. (Introduce an approach on modeling (cheap talk) deliberation and show that players truthfully reveal information if and only if their preferences are close enough.)

Austen-Smith, D., Feddersen, T. J. (2006). Deliberation, preference uncertainty, and voting rules. American political science review, 100(2), 209-217. (This paper study deliberation by assuming preference uncertainty. They also shows that there exists an equilibrium with fully revealing under any voting rule if there exists an equilibrium with fully revealing under unanimity rule.)

Hafer, C., Landa, D. (2007). Deliberation as self-discovery and institutions for political speech. Journal of theoretical Politics, 19(3), 329-360. (Contrast to cheap talk, they introduce a new approach to modeling deliberation that captures more realistic phenomena.)

Recommended:

Gerardi, D., Yariv, L. (2007). Deliberative voting. Journal of Economic theory, 134(1), 317-338.

Hummel, P. (2012). Deliberative democracy and electoral competition. Games and Economic Behavior, 75(2), 646-667.

Mathis, J. (2011). Deliberation with evidence. American Political Science Review, 105(3), 516-529.

Landa, D., Meirowitz, A. (2009). Game theory, information, and deliberative democracy. American journal of political science, 53(2), 427-444.