University of Pittsburgh
CAASI Reading Group
Community Centric Analytic Approaches

Summer 2021, 8 Weeks

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Reading Group Description

In this reading group we will look at papers in Market Design and Algorithm Design (and everything in between) that focus on social good. We will take a very broad view of what constitutes Market/Algorithm Design, drawing on classic and recent papers in Economics, Operations Research, Computer Science, as well as Sociology and Public Policy.

Learning Goals for this Read Group

The purpose of this reading group is expose all of us to an extremely exciting and emerging field, and start thinking about Market Design and Algorithm questions we have, as well as equip us with techniques we can apply in our own communities. Most papers selected have been chosen either for their historical importance/importance to the field or because they represent the cutting edge of research in that area, making them important reference points for researchers looking to get started in these areas.

Reading Group Prerequisites

There are no formal prerequisites but interest in doing socially conscious research. Some familiarity reading academic papers would be a plus! Several papers are mathematically technical, but no papers will be chosen on the basis of their technicality.

Tentative Reading Schedule!

Below I've listed groups of three or four papers that I believe are fundamental or enlightening. Roughly speaking, the first four weeks overview important concepts for market design and the last four weeks examine application areas. Papers have been chosen with an emphasis on readability over technical detail, and from a broad number of perspectives.

Week 1: Introduction to Market Design

Unlike traditional market design we're going to mostly ignore auction design which historically has driven much of the work in this area. These papers are absolute classics in the field that will give us a sense of the parameters we're going to be working with. Perspectives from both econ, cs, and or are represented.

- The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics by Roth.
- An invitation to market design by Kominers, Scott Duke, Alexander Teytelboym, and Vincent P. Crawford.
- Mechanism Design for Social Good by Abebe, Rediet and Goldner, Kira.

Some Bonus Material!

There's a lot of great introductions to market design. Because I can't help myself I'll include a few more here.

- Algorithmic Game Theory by Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V. Vazirani. See especially Ch. 1, 2, 9, 10.
- Artificial Intelligence for Social Good: A Survey by Zheyuan Ryan Shi, Claire Wang, Fei Fang.

Week 2: Principles and Ethics

Having gotten a taste for mechanism design, for this week I've collected some papers about the ethics (and well intentioned pitfalls!) of mechanism design. I think this is an important perspective for any socially conscious designer to keep in mind. I've included a survey of some principles for OM approaches in this area.

- Ethics and market design by Li, Shengwu.
- Designing markets for prediction by Chen and Pennock.
- Not-for-profit operations management by Feng, Qi, and J. George Shanthikumar.

Week 3: Fairness

In this week we look at the intersection of mechanism design and fairness, both in theory and practice.

- The Normative Gap: Mechanism Design and Ideal Theories of Justice by Zoe Hitzig.
- Algorithmic Fairness by J. Kleinberg, J. Ludwig, S. Mullainathan, A. Rambachan.
- Fairness and Discrimination in Mechanism Design and Machine Learning by Finnochiaro, Jessie, Roland Maio, Faidra Monachou, Gourab K Patro, Manish Raghavan, Ana-Andreea Stoica and Stratis Tsirtsis.

Week 4: Casual Inference

In the last of the four prelimary weeks, I've collected some papers on causal inference. As mechanism designers we want to have a casual effect in the world, and thus it's important to understand and apply ideas from casual inference. As an aside, this is a beautiful area in it's own right.

- Statistics and Causal Inference by Paul W. Holland.
- An Introduction to Causal Inference by Judea Pearl.
- Prediction Policy Problems by Jon Kleinberg, Jens Ludwig, Sendhil Mullainathan, and Ziad Obermeyer.
- Avoiding Discrimination Through Causal Reasoning by Kilbertus et al.

Week 5: School Choice

In this week we look at one fantastic application of mechanism for social good: matching students to schools (i.e., school choice). This is one of the big wins of mechanism design approaches, I cured the classical papers here with an emphasis on the design aspects. It should be noted that work on this problem is still extremely active.

- College admissions and the stability of marriage by Gale, David, and Lloyd S. Shapley.
- School Choice: A Mechanism Design Approach by Abdulkadiroğlu and Sönmez.
- What Really Matters in Designing School Choice Mechanisms by Parag A. Pathak.

Week 6: Mechanism Design in Healthcare

Another big win in mechanism design is residency match which coordinates residents to hospitals. I'm very interested in this problem, and I think that it's more nuanced than it appears at first blush. Medical residents in this country are some of the most exploited workers in the US, due perhaps in no small part to the match itself. The papers here will help us understand what were the goals of the match, and perhaps directions for improvement.

- The Evolution of the Labor Market for Medical Interns and Residents: A Case Study in Game Theory by Roth.
- The Redesign of the Matching Market for American Physicians: Some Engineering Aspects of Economic Design by Roth, A. E. and Elliott Peranson.
- FutureMatch: Combining Human Value Judgments and Machine Learning to Match in Dynamic Environments by Dickerson and Sandholm.

Week 7: Mechanism Design for Environmental Issues

Climate change is the greatest threat facing our societies. In this week's papers we look at some approaches to regulating carbon output, and why approaches that seem clean and natural in theory have been largely ineffective.

- Natural capital market design by Teytelboym, Alexander.
- Time to come clean? Disclosure and inspection policies for green production by Kim, Sang-Hyun.
- Lessons learned from three decades of experience with cap-and-trade by Schmalensee, Richard and Robert N. Stavins.

Week 8: Improving Online Dating

In the final week I would like to look at a problem I find particularly interesting: the design of dating markets. I wonder how profit motivies hamstring efficient match making, and to this end I have curated popular and cutting edge papers studying the design of these markets.

- Matching and Sorting in Online Dating by Günter J. Hitsch, Ali Hortaçsu and Dan Ariely.
- Online Dating: A Critical Analysis From the Perspective of Psychological Science by Eli J. Finkel1, Paul W. Eastwick2, Benjamin R. Karney3, Harry T. Reis.
- Facilitating the Search for Partners on Matching Platforms by Y. Kanoria and D. Saban.
- Improving Match Rates in Dating Markets Through Assortment Optimization by I. Rios, D. Saban and F. Zheng.

Week 9+??: Food allocation, Energy, Homelessness, Recidivism, etc

There's many more topics to look at it!

Similar Course/Reading Groups

If you'd like to read even more papers in this area and/or see how other group have organized the material check out these incredible courses!

- Classic Market Design Course at Stanford
- Market Design from a CS Perspective
- Wonderful Course on AI for Social Good at Harvard
- Amazing Course on Applied Mechanism Design for Social Good at Maryland
- Very Approachable Interdisciplinary Course at Cornell
- This list is heavily inspired by Market Design for Non-Profits at Stanford