

Repository Entry
Embedded EthiCS @ Harvard Teaching Lab

Overview

Course: CS 136: Economics and Computation
Course Level: Upper-level undergraduate

Course Description: “The interplay between economic thinking and computational thinking as it relates to electronic commerce, social networks, collective intelligence and networked systems. Topics covered include: game theory, peer production, reputation and recommender systems, prediction markets, crowd sourcing, network influence and dynamics, auctions and mechanisms, privacy and security, matching and allocation problems, computational social choice and behavioral game theory. Emphasis will be given to core methodologies, with students engaged in theoretical, computational and empirical exercises.”

Module Topic: Fair Equal Opportunity & Mechanism Design
Module Author: Ellie Lasater-Guttmann
Semesters Taught: Fall 2021

Tags: mechanism design [CS], strategy-proof[CS], equality of resources [phil], equality of opportunity [phil], fair equality of opportunity [phil], discrimination [phil]

Module Overview: The module uses the Boston Public School System as a case study to see how mechanism design can lead to discriminatory outcomes. It concludes that fair equality of opportunity is a worthwhile goal when designing matching mechanisms.

Connection to Course Material: Over the three previous lectures, students learned how to design mechanism systems as compared to normal games. The primary case in the module is an instance of mechanism design in the real world, where a specific technical feature (strategy-proofness) was absent and therefore violated fair equality of opportunity.

The Boston Mechanism is a highly publicized case of mechanism design gone wrong - it therefore came with ample documentation and ethical discussion. It also provided the perfect in-class activity.

Goals

- Module Goals:**
- Understand the concepts of equality of resources, equality of opportunity, and fair equal opportunity
 - Relate these concepts to strategy-proofness
 - Follow a method for evaluating a mechanism in a lifelike scenario with ethical stakes
 - Compare the ethical drawbacks of difference mechanisms

Key Philosophical Questions:

1. What does fairness look like in mechanism design?
2. What is the difference between equal opportunity and equal resources?
3. How do we assess fair equal opportunity?

These questions build over the course of the module, as students perform different steps in the in-class activity, described below.

4. Is there anything wrong with “gaming the system”?
 5. When is strategy-proofness a good goal?

Materials

Key Philosophical

Concepts:

- Equality of resources
- Equality of opportunity
- Fair equality of opportunity
- Discrimination
- Evaluating outcomes vs. evaluating entering circumstances

These concepts build one after the other in the in-class activity. We begin with equality of resources and discuss how it is insufficient. Then we perform the Boston Mechanism live to see that equality of opportunity is also insufficient. Then we end by conducting deferred acceptance to see the benefits of fair equality of opportunity.

Assigned Readings:

- Rawls, John (1971), “A Theory of Justice” (Section II:13)
- Shields, Liam, Anne Newman, and Debra Satz, "Equality of Educational Opportunity", *The Stanford Encyclopedia of Philosophy* (Summer 2017 Edition), Edward N. Zalta (ed.), URL = <<https://plato.stanford.edu/archives/sum2017/entries/equal-ed-opportunity/>>
- Optional (for after the module): Abdulkadiroglu, A. et al (2006), “Changing the Boston School Choice Mechanism: Strategy-proofness as Equal Access”

The Rawls section was our primary reading. Though short, it provided the meat to understand fair equality of opportunity as compared to equality of opportunity.

Implementation

Class Agenda:

1. Refresher on mechanism design.
2. Ethics Take 1: Equality of resources = fair?
3. Ethics Take 2: Equality of opportunity = fair?
4. Activity Part 1: You are a parent in the Boston Public School system
5. Ethics Take 3: fair equality of opportunity = fairness?
6. Activity Part 2: What does a fair mechanism look like?

Sample Class Activity:

Activity Background: Students number off and are assigned into one of two even groups (A or B) randomly. Each student will model being a family in the Boston Public School System. Students are assigned preference orderings of 3 schools in the school system. Two of the schools are desirable and the third is undesirable.
 Activity Part 1: Group A uses their computers to visit a document with instructions. These instructions are

This module centered on this interactive activity. The module would have been substantially less effective if it had been removed. I would recommend spending less time discussing equality of resources so that there is more time to discuss after the strategy-proof mechanism. You need time

relatively limited and require them on Step 1 to begin playing an online video game. (This models the business and lack of strategy knowledge poorer families have in the BPS system.) Group B has good instructions and no distractions. Students are told to select disclosed preference orderings of the three schools. As a group, those students then announce their disclosed preferences and are assigned (live) to schools using the 1999 Boston Mechanism. We then take time as a group to discuss the results - seeing that students who with helpful instructions and little distractions were able to game the system and get their students into better schools, while the distracted families were not. This becomes the opportunity to compare equal opportunity and fair equal opportunity.

Activity Part 2: The same process occurs again, this time with the Deferred Acceptance Mechanism. This is a strategy-proof mechanism and we see that preoccupied families are able to get their students into better schools given the strategy-proof features. This is now an example of fair equal opportunity. Students discuss the results now as compared to the Boston Mechanism.

to add the kicker that strategy-proofness saves those families who are already disadvantaged.

Module Assignment:

Later in the semester, students will return to matching mechanisms (of which the Boston Mechanism is an example). On that homework assignment, students give short answers to the following questions:

1. How did the Boston Mechanism work?
2. How would you evaluate the fairness of a mechanism?
3. When does strategy-proofness matter ethically?

These questions were designed to jog memories later in the semester. A different essay prompt may be worthwhile if the assignment happens closer to the module itself.

Lessons Learned:

1. The activities were successful and integral to learning our philosophical concepts. The mechanisms themselves are not difficult to run, and the professors and other members of the course's teaching team can help you run them live during the session. It's worth it!
2. Given the module, I'd strongly recommend shortening the discussion on equality of resources to accommodate a larger discussion after the final mechanism. Students need to see how that mechanism was strategy-proof and how students who were preoccupied had better outcomes than in the Boston Mechanism.
3. Finally, I would take 5 minutes to discuss walk-zones more specifically. Due to our

way of implementing the mechanisms, the center of the room regularly got unassigned. This (poorly) mirrors what happens with students outside of walk-zones. I would change the implementation so there is no longer a problem with the center of the room, and I would spend time discussing walk-zones.