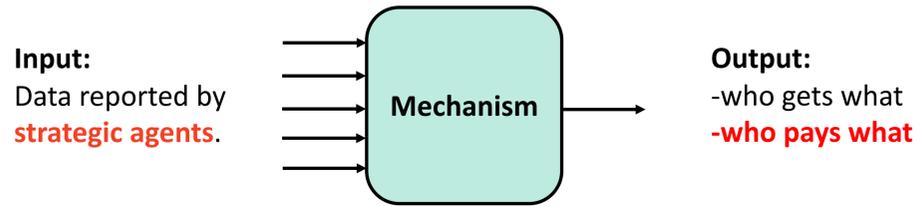


Algorithmic Mechanism Design

Objective: Maximize [revenue/efficiency/whatever]

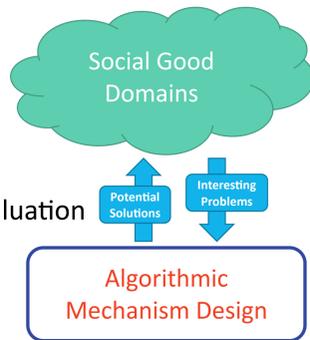


Q: What makes a mechanism **different** from an allocation algorithm?

A: Choose allocation, **payment** to incentivize agents to report **true data**.



Mechanism Design for Social Good



- **Housing:** low income housing allocation
- **Healthcare:** insurance, provider incentives
- **Economic Inequality:** redistribution of wealth
- **Online Labor Markets:** messaging, matching, pay
- **Education:** funding, parental engagement, student evaluation
- **Bias and Discrimination:** affirmative action
- **Sustainability:** prevent pollution
- **Civic Participation:** incentivize voting
- **The Developing World:** centralizing agriculture markets

Workshop call for papers:

- o AI and Machine Learning
- o Empirical Studies and Policy
- o Theory
- o Problem Pitches and Demos

Healthcare (Matt)	12/15/16	Overview on the Global Burden of Disease Study	1. Global Burden of Disease	Abraham Flaxman	PDF
Housing (Dan)	9/26/16	Eviction, Causal Effects of Place, and Low-Income Housing Assistance in the U.S.	1. Housing Affordability and Eviction 2. A nice 538 Article on the MARS study 3. Interim results from	Dan	PDF

bringing together researchers and practitioners from over **100 institutions in 30 countries**

Working Groups

- Development
- Environment
- Fairness
- Data Economies
- Inequality

Colloquium Series

<http://www.md4sg.com/>

A multi-institutional initiative using techniques from **algorithms, optimization, and mechanism design**, along with insights from other disciplines, to improve access to opportunity for historically underserved and disadvantaged communities.

- Events
- MD4SG '20
- DSA '20
- EC '20
- COMPASS '19
- MD4SG '19
- MD4SG '18
- WINE '17
- MD4SG '17

Carbon Emissions

with Nicole Immorlica and Brendan Lucier ITCS '20

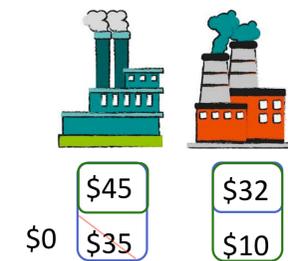


Most Emissions Trading Schemes worldwide use the **Uniform Price Auction**:

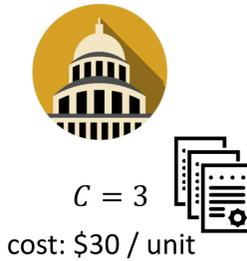
1. Government sets cap C
2. Firms submit (decreasing) bids
3. Allocate to highest C bids
4. Charge C th highest bid for each license

BUT this mechanism is not truthful.

Manufacturers: value to produce/pollute



Social cost of pollution



Welfare

Economic value – societal cost

Value \$112 – Cost \$90 = +\$22

Value \$87 – Cost \$90 = -\$3

Blue's Utility: $\$80 - 2(\$32) = \$16$

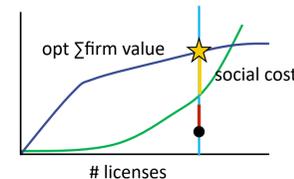
Blue's Utility: $\$45 - 1(\$10) = \$35$

Beneficial Deviation

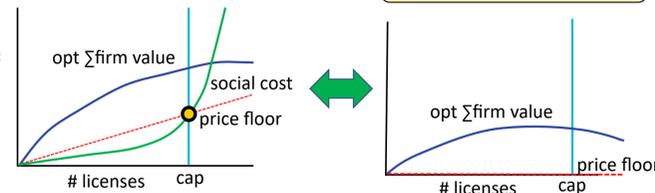
Modifications:

- **Reserve price:** never sell below \underline{p} (might sell $< C$)
- **Price ceiling:** can always buy extra for \bar{p} (might sell $> C$)

The usual Price of Anarchy bound fails due to social costs!



Idea: Set a "safe price" = average social cost per license up to the cap.



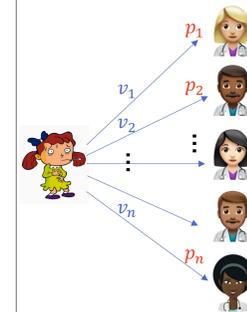
Fixes our Price of Anarchy bound. But, can it approximate what we thought we were getting before?

Theorem:

$$\text{Max} \left\{ \begin{array}{l} \text{Welfare of the best safe price auction} \\ \text{Opt welfare from any 1 single agent} \end{array} \right\} \geq \frac{1}{26} \text{Welfare of the best unif. price auction}$$

Health Insurance

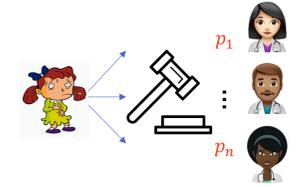
with Meryem Essaidi and Matt Weinberg '20



Question: Should a health insurance market designer regulate to improve patient utility?

Free Market:

- More choices
- High prices



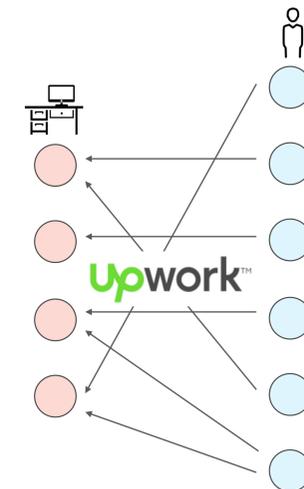
Limited Entry:

- Fewer choices
- Lower prices

Result: A characterization of symmetric equilibria, and a condition for when Limited Entry is better (based on the prior distribution).

Online Labor Markets

Goal: Maximize the quality of matches or "gains from trade". This is firm value for product of labor minus worker cost of labor for every match.



Approach 1: Recruit extra firms (or workers) and match simply!

with Moshe Babaioff and Yannai Gonczarowski SODA '20

Approach 2: For one big firm: design simple posted price mechanisms, give a $O(\log n)$ -approx.

with Yang Cai, Steven Ma, Mingfei Zhao '20

Finding A Research Problem

1. Learn about the systems in place and the issues with them

- Read policies in place
- Study existing work in: **economics, empirical work, public policy, sociology**

2. Review related CS work

- Try to draw connections between these

3. TALK TO A DOMAIN EXPERT!

- Communicate the types of problem we're interested in and have the tools to solve
- Start formulating interesting questions, jointly or going back and forth to ensure they're the right questions