

# Networks and Markets

## Lecture 3: Mechanism + Market Design

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# Last time: Game theory

- What is a game: participants, strategies, payoffs
- Best response strategies to other people's strategies
  - Dominant Strategies
- Nash equilibria: when everyone's strategy is the best response to everyone else's strategy
- Price of Anarchy: what society loses because everyone is selfish

*Given a game matrix, what are player's strategies?*

## **Game theory**

Given a game, what are the equilibria?

## **Mechanism design**

How do you design a game such that the equilibria has nice properties?

## **Market design**

Here's a complicated marketplace. Given human behavior and real-world constraints, how do you design a component of it such good things happen?

### **What are examples of real-world aspects?**

People don't behave "rationally"

Informational + attentional + computational constraints

Limited levers to influence behavior

Physics

*Market design is a kind of economic engineering, utilizing laboratory research, game theory, algorithms, simulations, and more. Its challenges inspire us to rethink longstanding fundamentals of economic theory.*

-- Paul Milgrom

Physics → Engineering at scale

Game theory → Mechanism design → Market design

# Core areas and platform examples

**Auctions:** at what price do you sell a good?

- Auctions in ad markets
- Algorithmic pricing (and driver payments) in ride-hailing
- Price recommendations for sellers on Airbnb, Etsy, etc.

**Matching:** Who gets what (and why) [Without payments]

- Medical residency matching – assigning doctors to residencies
- School choice: matching students to high schools
- Matching customers to drivers in ride-hailing
- Recommending jobs to workers, workers to clients on labor platforms
- Showing sets of people to each other on dating apps

# This course

We'll cover some mechanism design theory

[Today] – Mechanism design intro + Auction theory

[Next time] – Matching theory

Paper presentations + guest lectures will often be about “market design” – how do these core concepts play out in real life?