CS196

#5

# Today

2D Lists

Git

Game Theory

# Announcements

Hackathon/Projects Week 1

Slack

Reflections|Projections

Homework 3

# Hackathon

If you missed the hackathon last weekend, make sure you've reached out to or emailed your PM to ask them what you missed and joined the projects slack.

All project and PM assignments were sent out via email Saturday. If you are unsure of your project, please come talk to me or Victor after class.

# Slack

https://cs196projects.slack.com/

# September 25th - October 1st, 2017

Student-Run Tech Conference at the University of Illinois at Urbana-Champaign

Hosted at the Thomas M. Siebel Center for Computer Science

Website: http://reflectionsprojections.org

ACM@UIUC
59 YEARS

# Hackerspaces

Mobile Dev: Siebel 1105

Data Science: Siebel 0216

Web Dev: Siebel 1304

# Office Hours

Office Hours will take place after Hackerspaces from **8-9 pm**

Siebel 1111 on **Wednesday**
Siebel 0216 on **Thursday**

# Attendance

https://goo.gl/iYigpc

Ish

Modi

What can

# GAME THEORY

teach Computer Scientists?

Ohai, I'm

# Modi

CS196

# Tomorrow

8pm • Siebel Atrium

# Alums Welcome Freshmen

# *Tomorrow*

8pm • Siebel Atrium

*Tomorrow*

8pm • Siebel Atrium

bit.ly/hiFreshmen

What can

# GAME THEORY

teach Computer Scientists?

# Definition

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The branch of mathematics concerned with the analysis of strategies for dealing with competitive situations where the outcome of a participant's choice of action depends critically on the actions of other participants. Game theory has been applied to contexts in war, business, and biology.

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The branch of mathematics concerned with the analysis of strategies for dealing with competitive situations where the outcome of a participant's choice of action depends critically on the actions of other participants. Game theory has been applied to contexts in war, business, and biology.

# What does it mean for us?

# Given some set of rules

Given some set of rules, we can predict how people will behave!

# Does it work?

YES!

# Does it work?

YES*

*Kinda

# Does it work?

No worse than

4/3

(will take too long to explain)

# Why do we care about predicting behavior?

Making Better
**Decisions**

Designing Better
**Mechanisms**

# With that out of the way...

LET'S PLAY A
GAME

# Need *6* tributes

Who wants to win some real money!

Propose a Split

Accept/Reject Split

# Let's discuss the result

Why didn't I let you communicate?

Why did everyone not accept the split?

Why did people want to cause a loss to the other player?

Single Shot

Iterative

Canonical example:

# Prisoner's Dilemma

Canonical example:

~~Prisoner's Dilemma~~

Students' Dilemma

# Quiz

| Study | Don't Study |
| --- | --- |
| 92 | 80 |

# Presentation

| Both Prepare | 1 Prepares | No Prep |
| --- | --- | --- |
| 100 | 92 | 84 |

| | Victor: Presentation | Victor: Quiz |
|---|---|---|
| Ananya: Presentation | Victor 90<br>Aananya 90 | Victor 92<br>Aananya 86 |
| Ananya: Quiz | Victor 86<br>Aananya 92 | Victor 88<br>Aananya 88 |

The Cells Represent The Payoffs of the various strats. This is called a payoff Matrix

Here payoff =

$$\frac{quiz + presentation}{2}$$

| | Victor: Presentation | Victor: Quiz |
|---|---|---|
| Ananya: Presentation | Victor 90<br>Aananya 90 | Victor 92<br>Aananya 86 |
| Ananya: Quiz | Victor 86<br>Aananya 92 | Victor 88<br>Aananya 88 |

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| | Victor: Presentation | Victor: Quiz |
|---|---|---|
| Ananya: Presentation | Victor 90<br>Aananya 90<br>Pareto Optimal | Victor 92<br>Aananya 86 |
| Ananya: Quiz | Victor 86<br>Aananya 92 | Victor 88<br>Aananya 88<br>Nash Equilibrium |

The Cells Represent The Payoffs of the various strats. This is called a payoff Matrix

Here payoff =

$$\frac{\textit{quiz + presentation}}{2}$$

Designing Mechanisms,

Choosing Cooperation vs Competition,

Evolution of Trust

Enforcing Regulation...

# Questions?

# Generalized Harm, Live Markets

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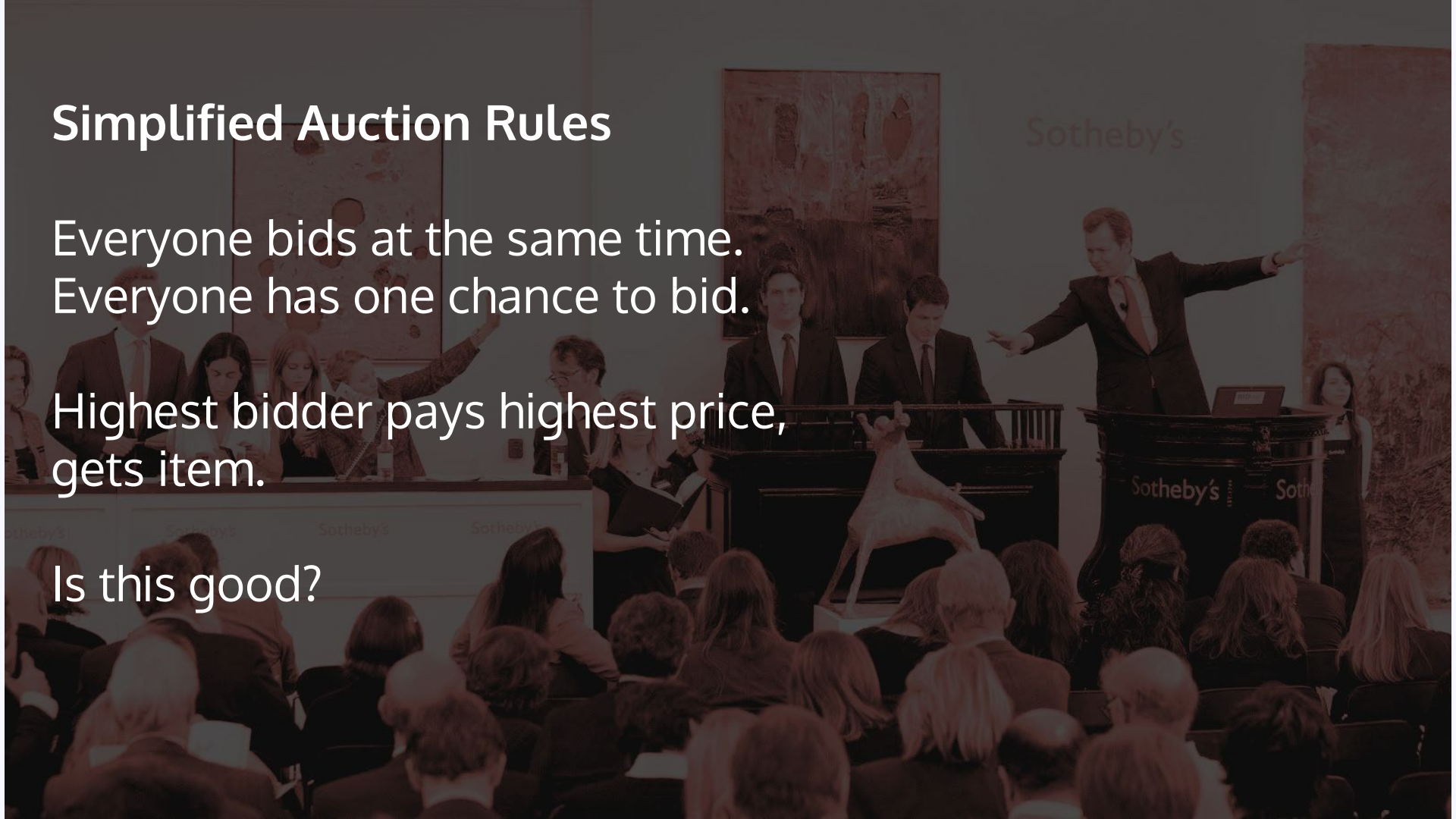
Let’s talk about auctions

# Generalized Harm, Live Markets

## Let's talk about auctions

# Utility = total value

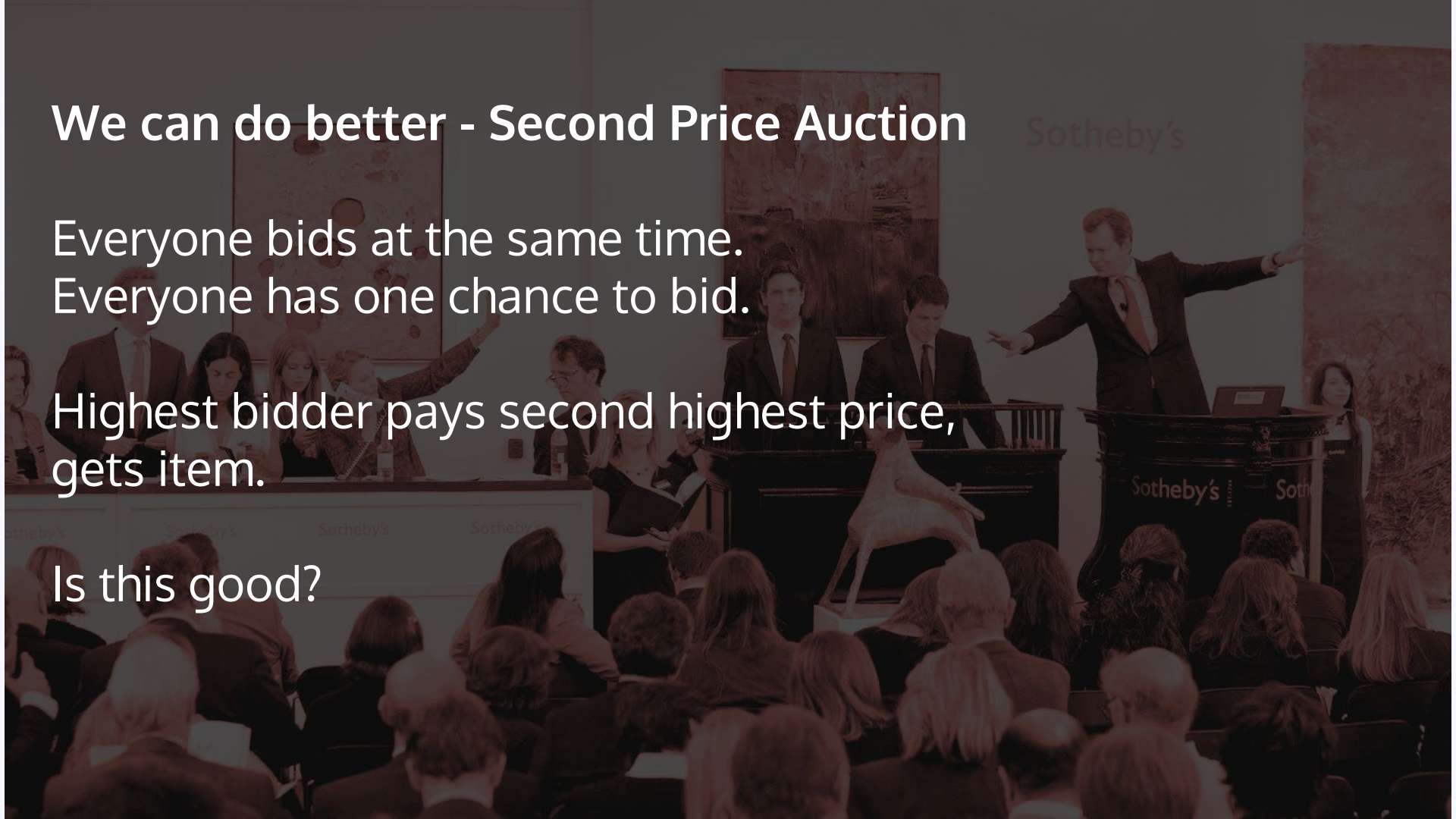



## Simplified Auction Rules

Everyone bids at the same time.
Everyone has one chance to bid.

Highest bidder pays highest price,
gets item.

Is this good?




## We can do better - Second Price Auction

Everyone bids at the same time.
Everyone has one chance to bid.

Highest bidder pays second highest price, gets item.

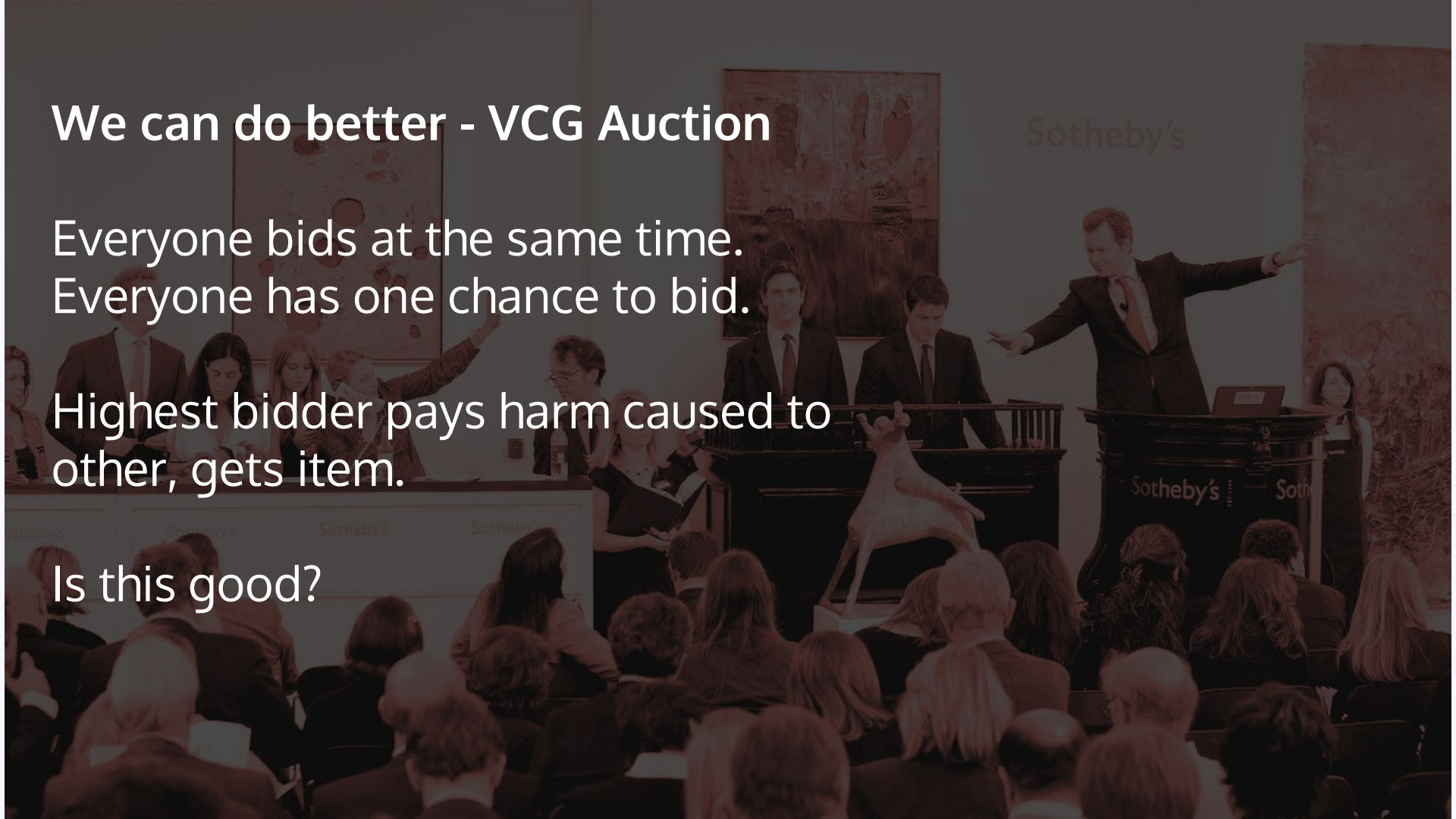
Is this good?

## We can do better - VCG Auction

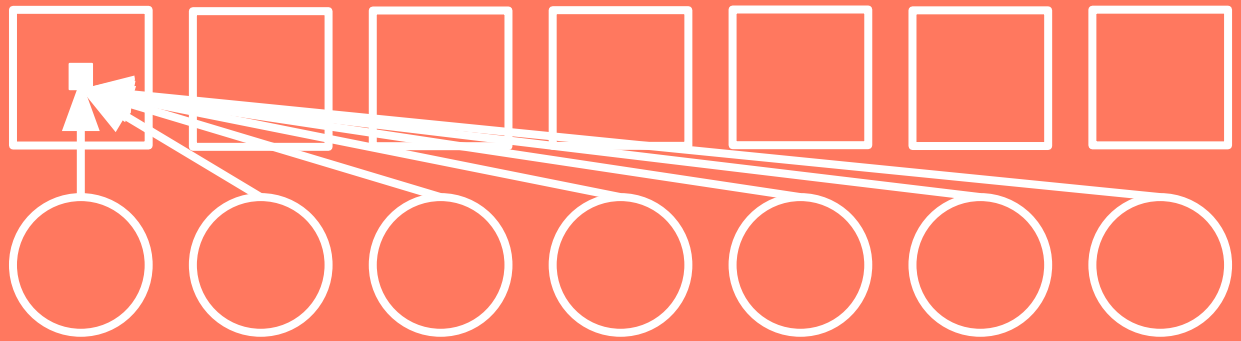
Everyone bids at the same time.
Everyone has one chance to bid.

Highest bidder pays harm caused to other, gets item.

Is this good?



harm = sum(lowered utility for everyone else)



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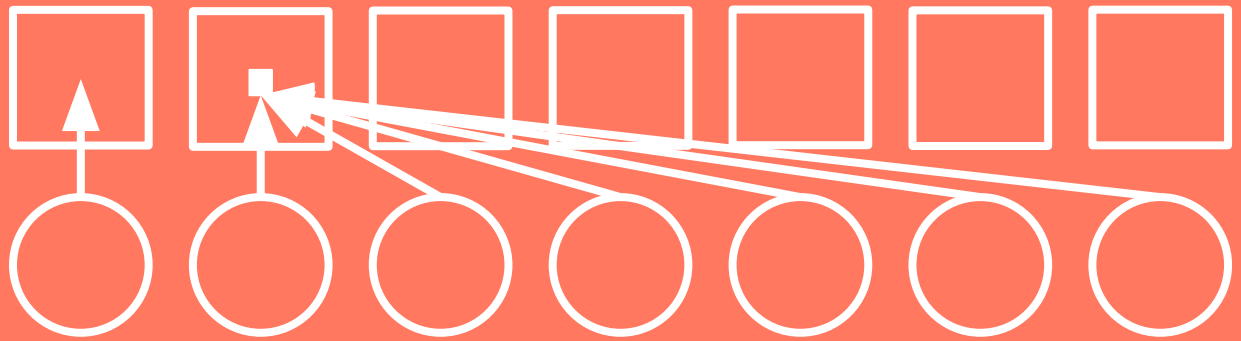
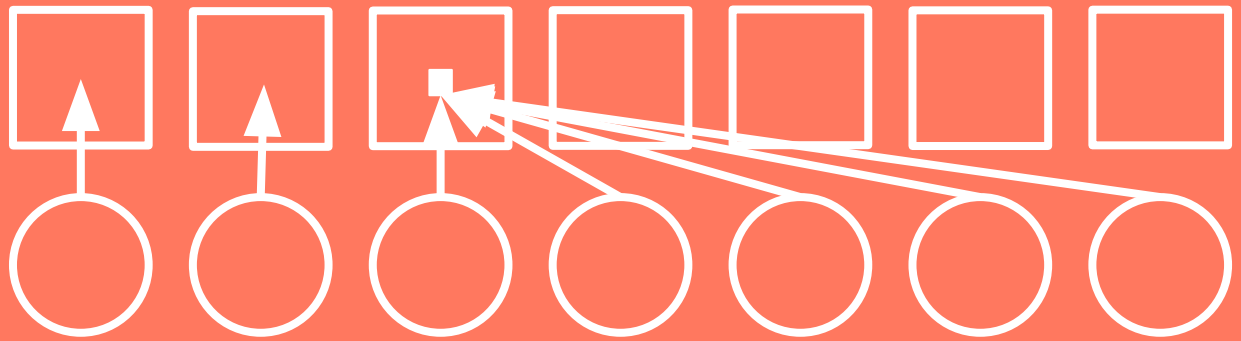


# harm = sum(lowered utility for everyone else)

harm to player 2 caused by player 1 = diff player2.util(1) - player2.util(2)



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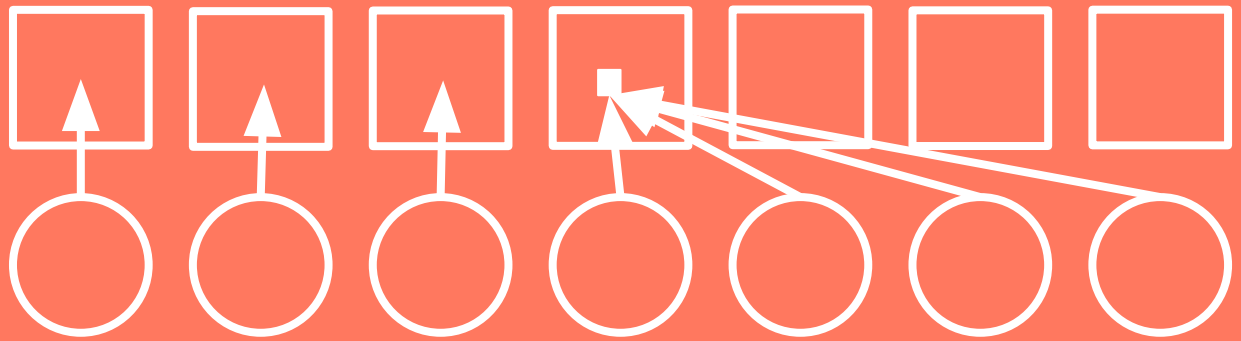

Don’t think too hard about this for now.

It’s actually a very difficult concept to grasp.

# But what does this look like IRL?

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## Example - coal power

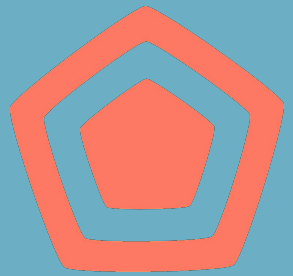
HiPPY
CHiCK-EN.
ORDER
Burrito
Fajita Burrito
Burrito Bol
Tacos
Salad
WITH
Chicken 5.60
Steak 5.70
Carnitas 5.75
Barbacoa 5.75
Vegetarian 5.10
SALSAS
Fresh Tomato
EXTRAS
Chips & Salsa 1.25
Guacamole 1.35
Chips Only .75

What if we let people pay to cut in line?

Should we let people break the law for a fee?

# Is this is moral debate?
# Maybe

# Questions?

# *Tomorrow*

8pm • Siebel Atrium