

Mechanism Design

Ezekiel Olugbami

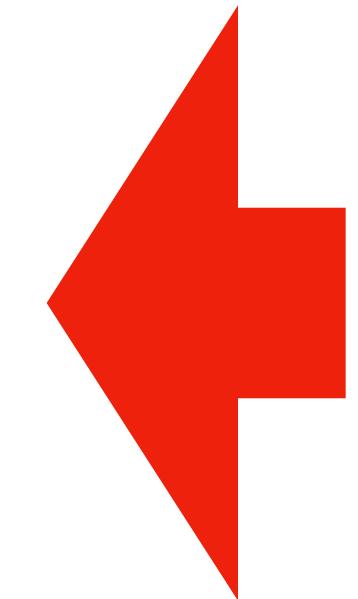
Ifeoluwa Oladeji

Akowe Israel

Abraham Musa

Femi Alayesanmi

Emmanuel Adeiza Ozi-yusuf



Past DSA Attendees

Tutorial author: Eric Sodomka

Based on lecture notes by Tim Roughgarden

Data Science Africa 2019 - Accra, Ghana

Announcing the winners of the Facebook Mechanism Design for Social Good research awards

March 22, 2019

Announcing the winners of the Facebook Mechanism Design for Social Good research awards

By Eric Sodomka



Last June, at the 19th ACM Conference on Economics and Computation (EC 2018), we introduced the Facebook research awards in mechanism design for social good.

We asked researchers to consider the following problem: Suppose there is an existing online platform that is actively used by the population, and an existing set of social ills (e.g., unemployment, disease, poverty, divisiveness, loneliness). How should one design mechanisms on top of such an online platform to build community in a way that alleviates those social ills?

We received 58 submissions for this award. Amongst those, we chose three winners to each receive an

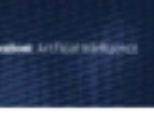
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The winners are as follows:

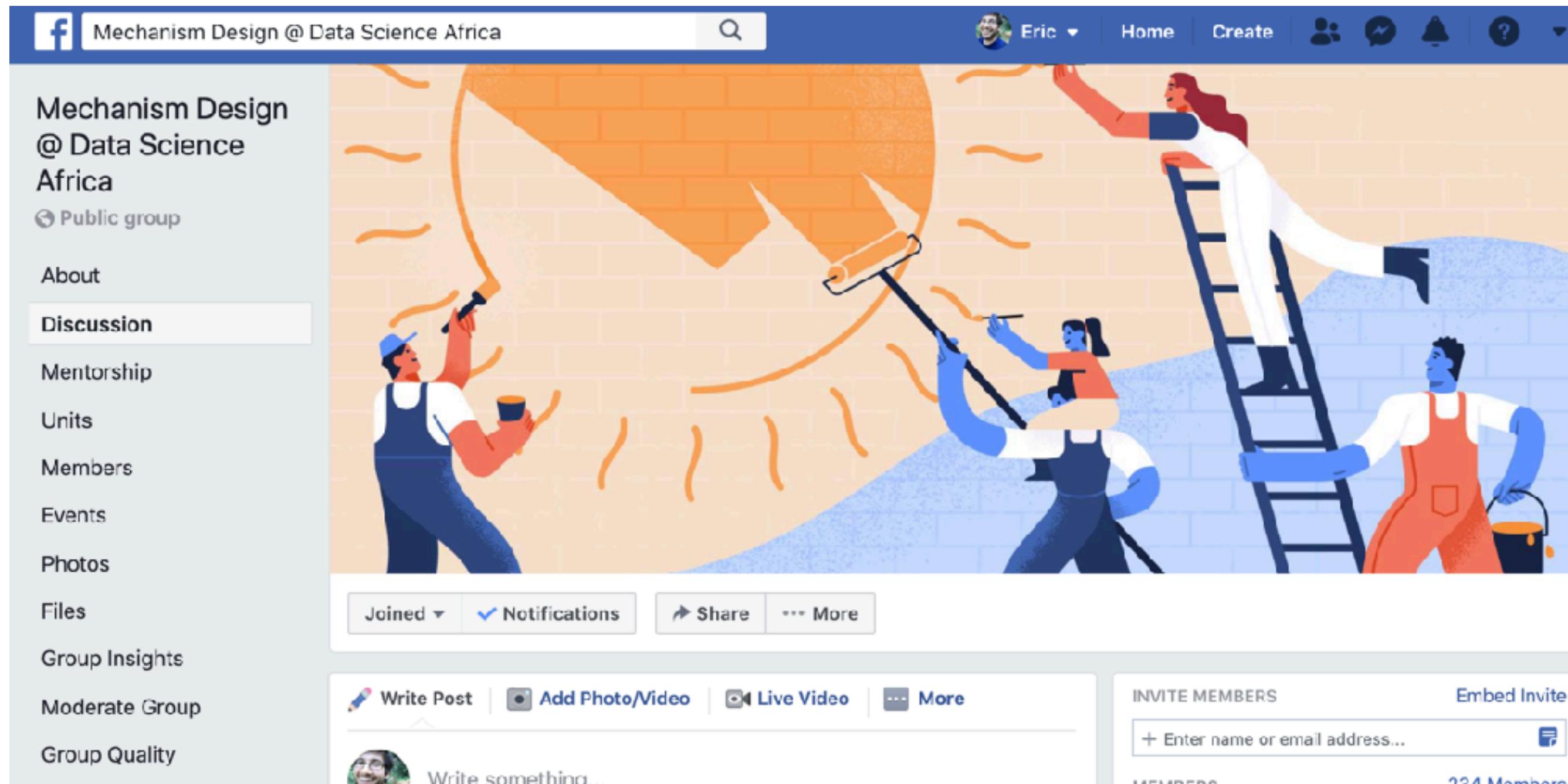
- **Mechanisms for Crowdsourcing with Small-Holder Farmers.** *PI: Mutembesa Daniel (Makerere University). Collaborators: Boi Faltings (EPFL); Christopher Omongo (National Crops Resources and Research Institute); Humphrey Mutaasa (Uganda National Farmers Federation).*
- **Modern Social Choice: Mechanisms and Platforms for Large Scale Deliberation.** *Co-PIs: Ashish Goel (Stanford University); James S. Fishkin (Stanford University); Kamesh Munagala (Duke University).*
- **Promoting Diversity in Peer Production through Mechanism Design.** *Co-PIs: Zhiwei Steven Wu (University of Minnesota); Haiyi Zhu (University of Minnesota).*

Mechanisms for crowdsourcing with small-holder farmers

The problem: Farmers in the developing world rely on a healthy crop to provide for their families, but that crop is continually at risk of being destroyed. Diseases and pests can ruin a farmer's entire harvest, and outbreaks can affect the broader farming community. Such dangers are hard to detect in their early stages, and farmers often don't have access to the tools they need to address them. To help farmers identify and respond to these challenges, we're announcing the winners of the Facebook Mechanism Design for Social Good competition.

**Join the group to be eligible for
a book at end of this tutorial:**

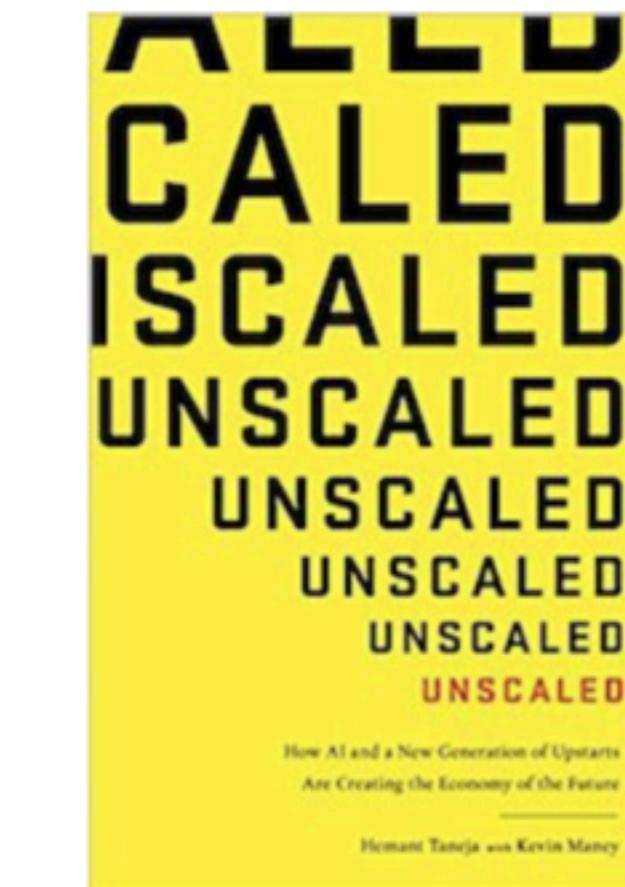
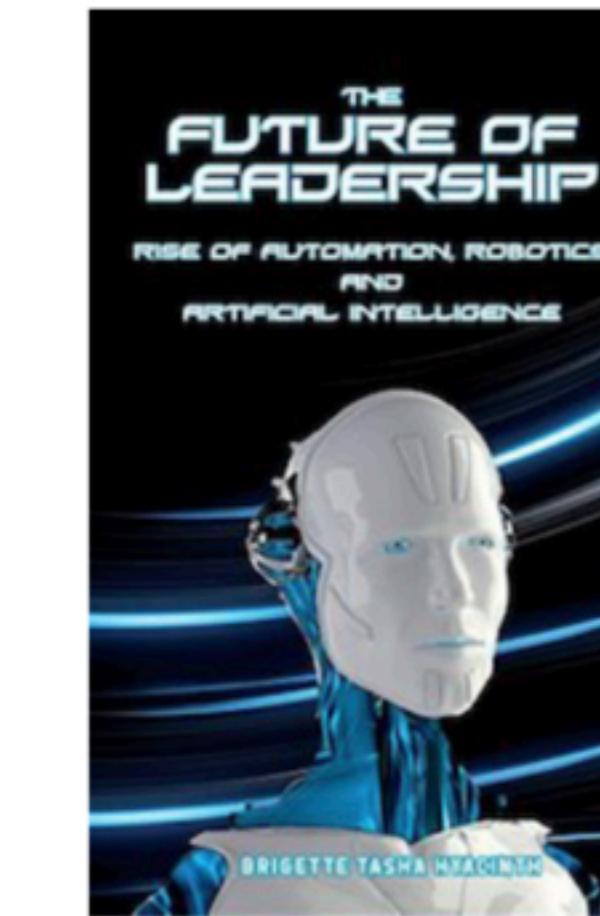
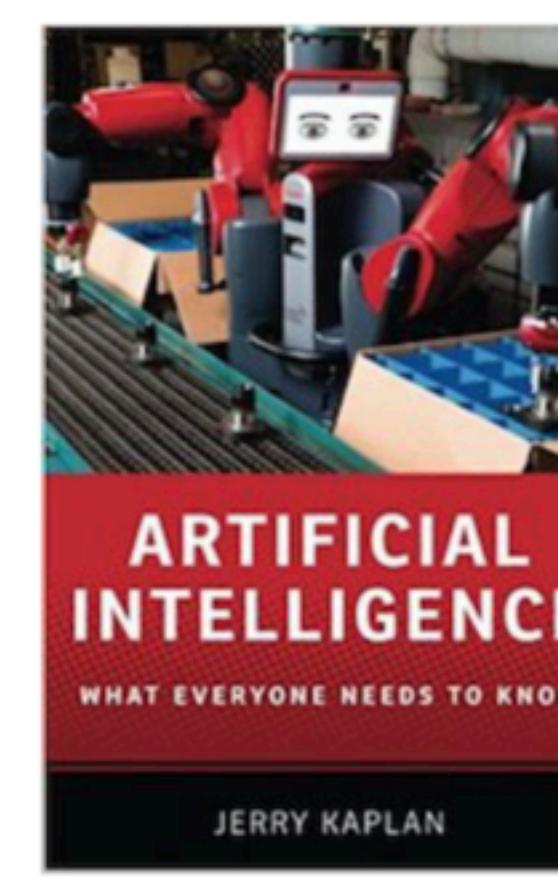
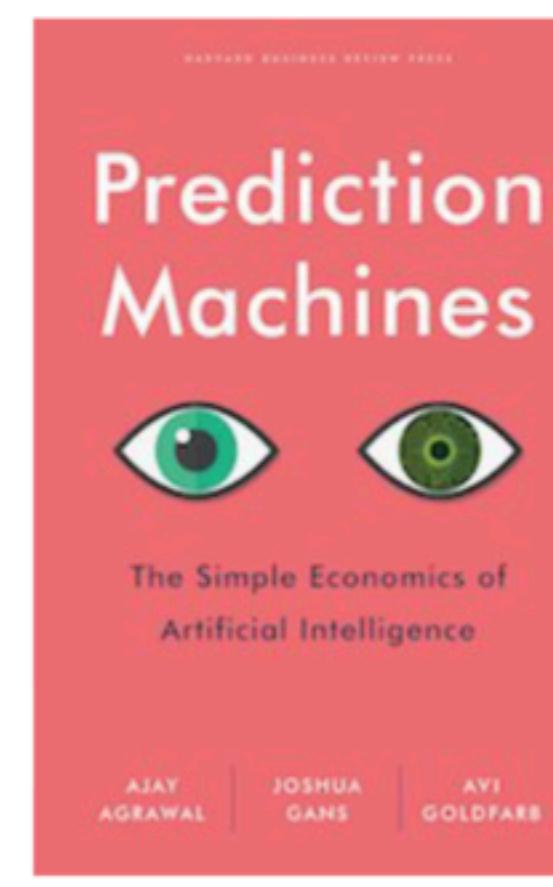
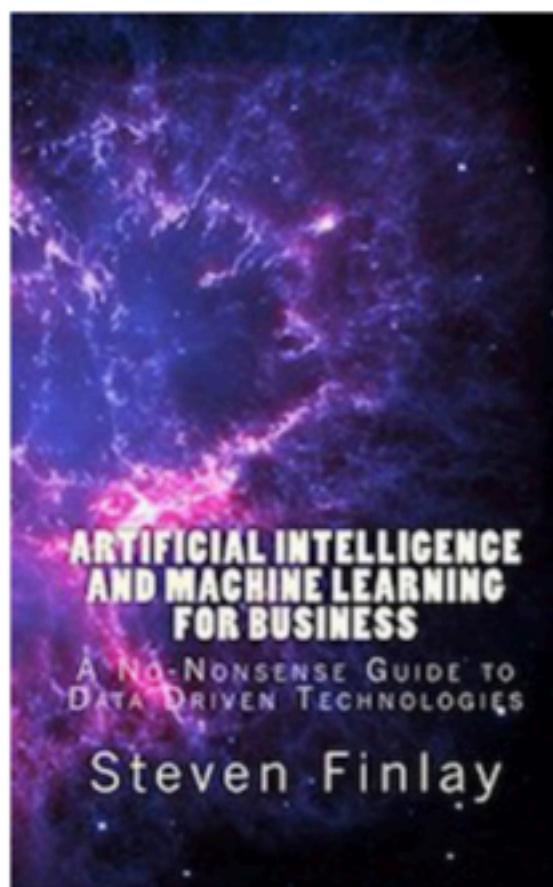
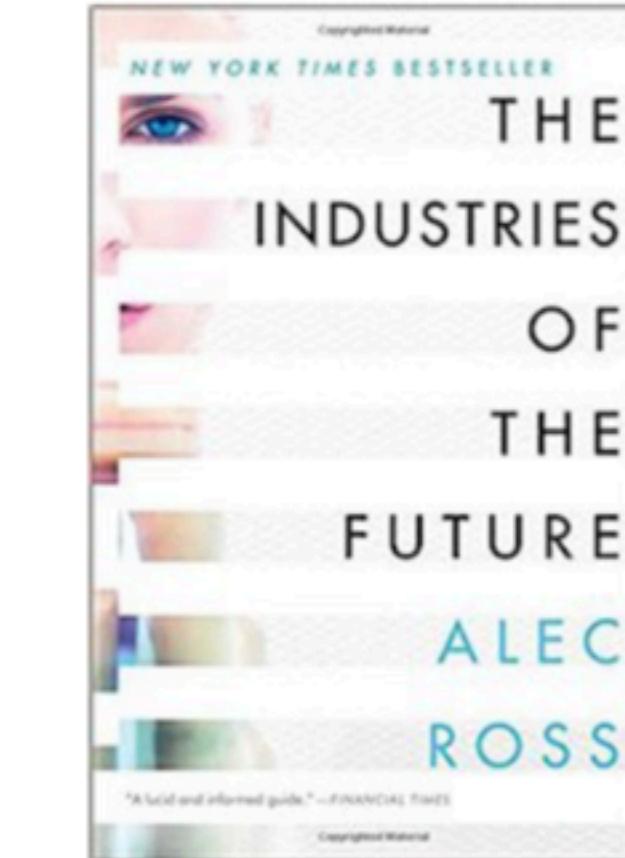
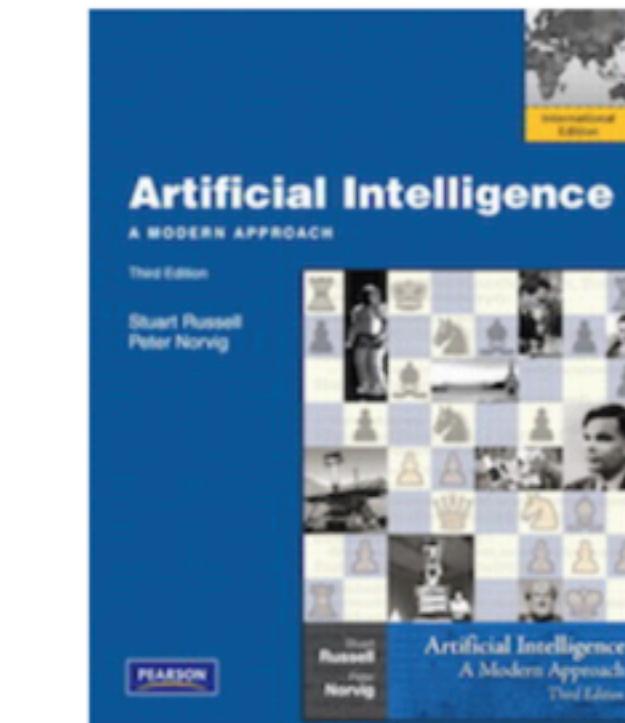
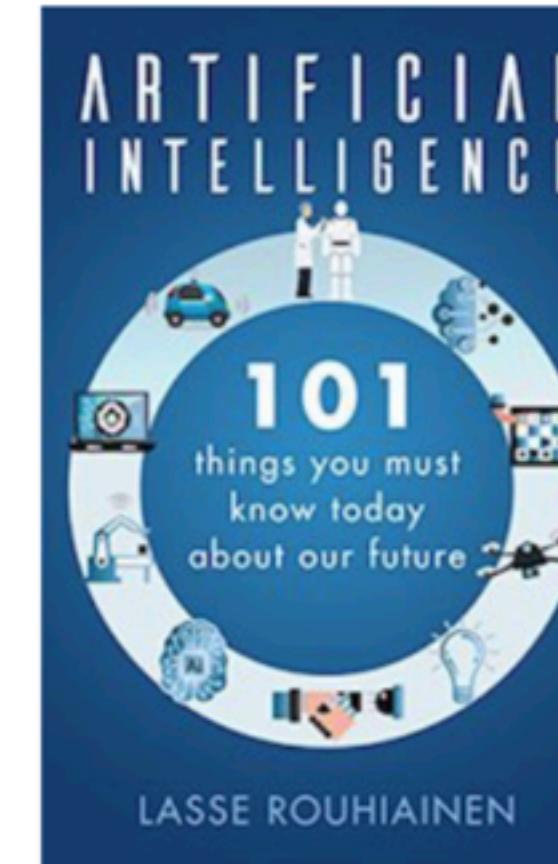
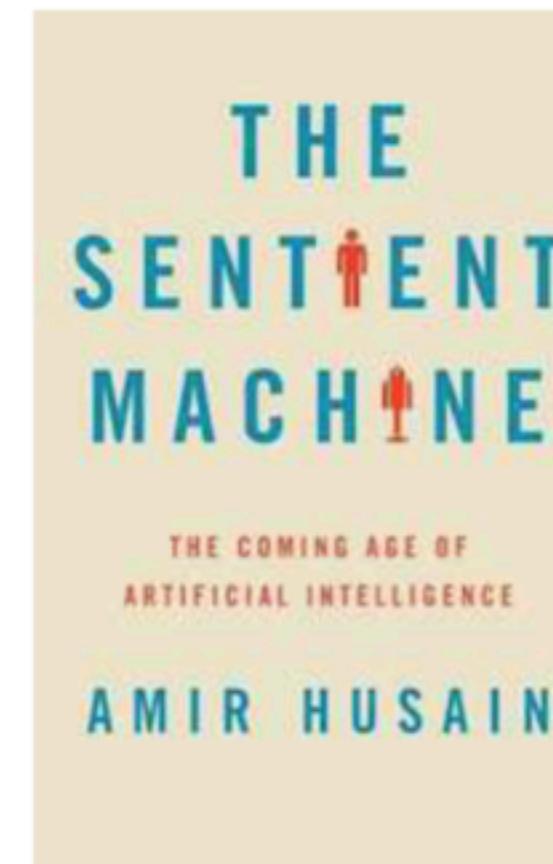
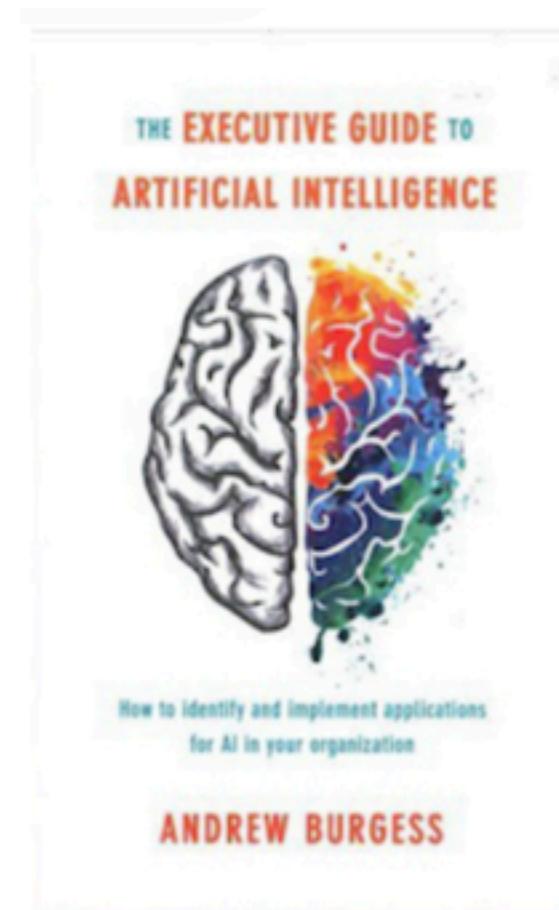
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A motivating example

Ezekiel Olugbami

The Problem: Giving out Books



An Initial Proposal

Random Assignment

1. **Randomly order attendees:** assign each a unique number 1 through 200.
2. In that attendee order, give each attendee a **randomly chosen book** amongst those remaining.

Discuss with your Neighbor

- Do you have any complaints about Random Assignment?
- Can you come up with anything better?

Random Assignment

1. **Randomly order attendees:** assign each a unique number 1 through 200.
2. In that attendee order, give each attendee a **randomly chosen book** amongst those remaining.

Done? Join Facebook Group **Mechanism Design @ Data Science Africa** tinyurl.com/dsa-fb-group.
We'll draw winners from that group at the end of the talk to play the "book giveaway" game.

Complaints about Random Assignment?

Random Assignment

1. **Randomly order attendees:** assign each a unique number 1 through 200.
2. In that attendee order, give each attendee a **randomly chosen book** amongst those remaining.

Complaints about Random Assignment?

- “It doesn’t consider what I want.”
- “I have to trade with people afterwards to get something better.”
- Benefit: “It’s quick and easy.”

Random Assignment

1. **Randomly order attendees:** assign each a unique number 1 through 200.
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Did you come up with anything better?

- “It doesn’t consider what I want.”
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- Benefit: “It’s quick and easy.”

Random Assignment

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Alternative mechanisms

Ifeoluwa Oladeji

Did you come up with anything better?

Choose Your Favorite

1. **Randomly order attendees:** assign each a unique number 1 through 200.
2. In that attendee order, give each attendee **the choice of their favourite book** amongst those remaining.

Random Assignment

1. **Randomly order attendees:** assign each a unique number 1 through 200.
2. In that attendee order, give each attendee a **randomly chosen book** amongst those remaining.

Can Ifeoluwa allocate books on his own time?

Can Ifeoluwa allocate books on his own time?

Choose Your Favourite (by proxy)

1. Have each participant submit their **preferences over books**.
2. **Randomly order attendees:** assign each a unique number 1 through 200.
3. In that attendee order, give each attendee **their favourite book** amongst those remaining, **according to their reported preferences**.

Can Ifeoluwa allocate books on his own time?

Serial Dictatorship

1. Have each participant submit their **preferences over books**.
2. **Randomly order attendees:** assign each a unique number 1 through 200.
3. In that attendee order, give each attendee **their favourite book** amongst those remaining, **according to their reported preferences**.

Evaluating mechanisms: Pareto optimality

Akowe Israel

Evaluating Mechanisms

- How is **Serial Dictatorship** better than **Random Assignment**?
- What does it mean for a mechanism to be “good”?

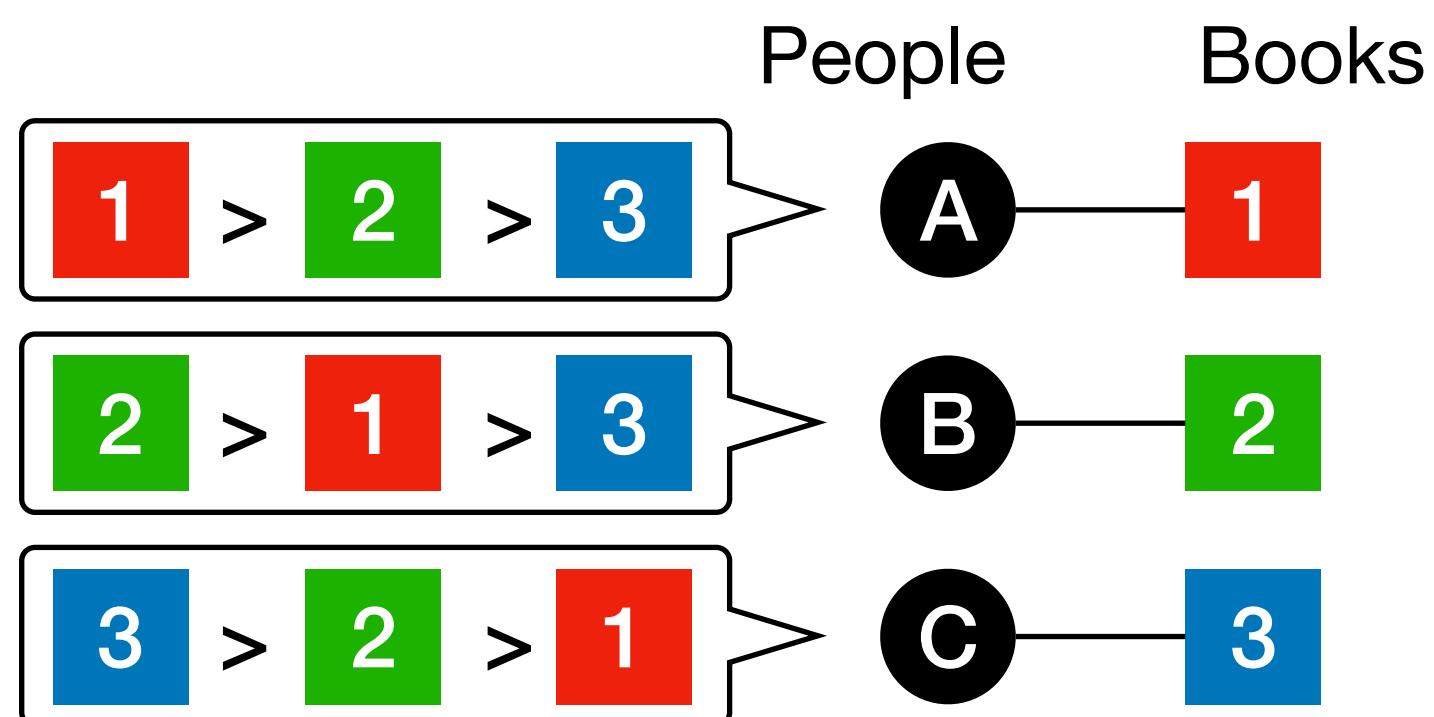
One Notion of Goodness

- An outcome is **pareto optimal** if you can't make someone better off without making someone else worse off.
- An outcome is pareto optimal if there is no alternative outcome for which (1) everyone is at least as happy, and (2) someone is happier.

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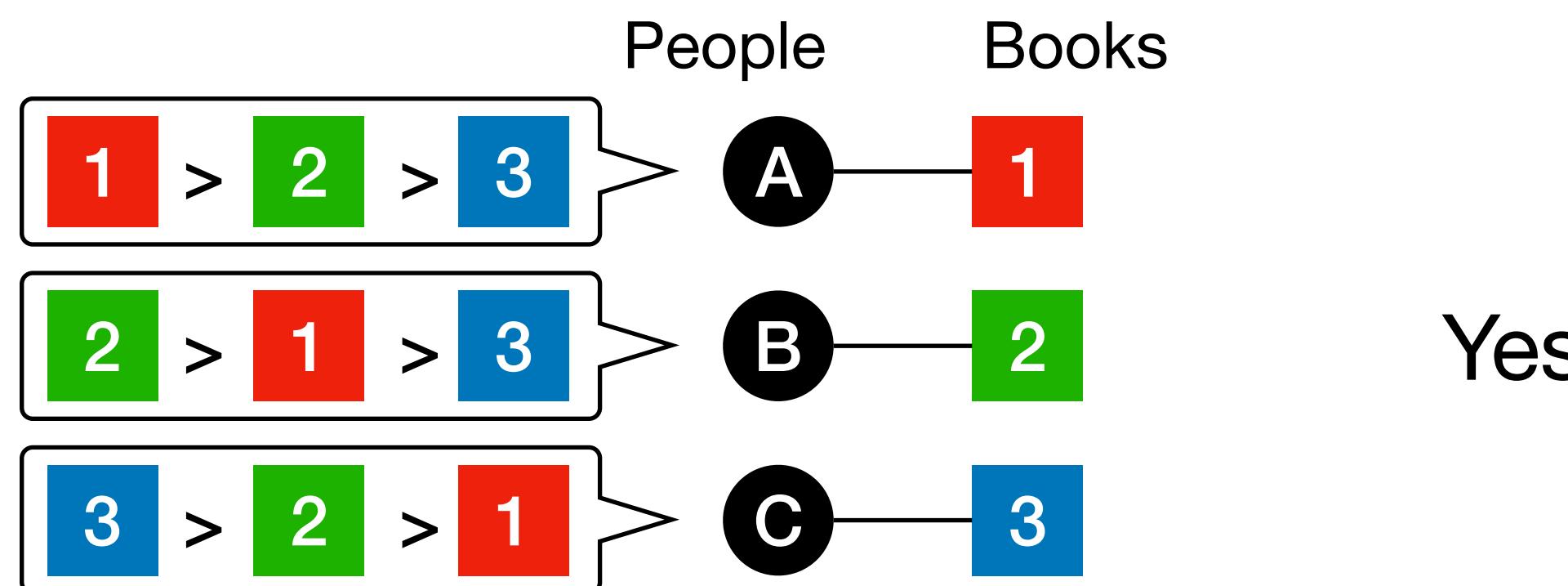
Is this outcome pareto optimal?



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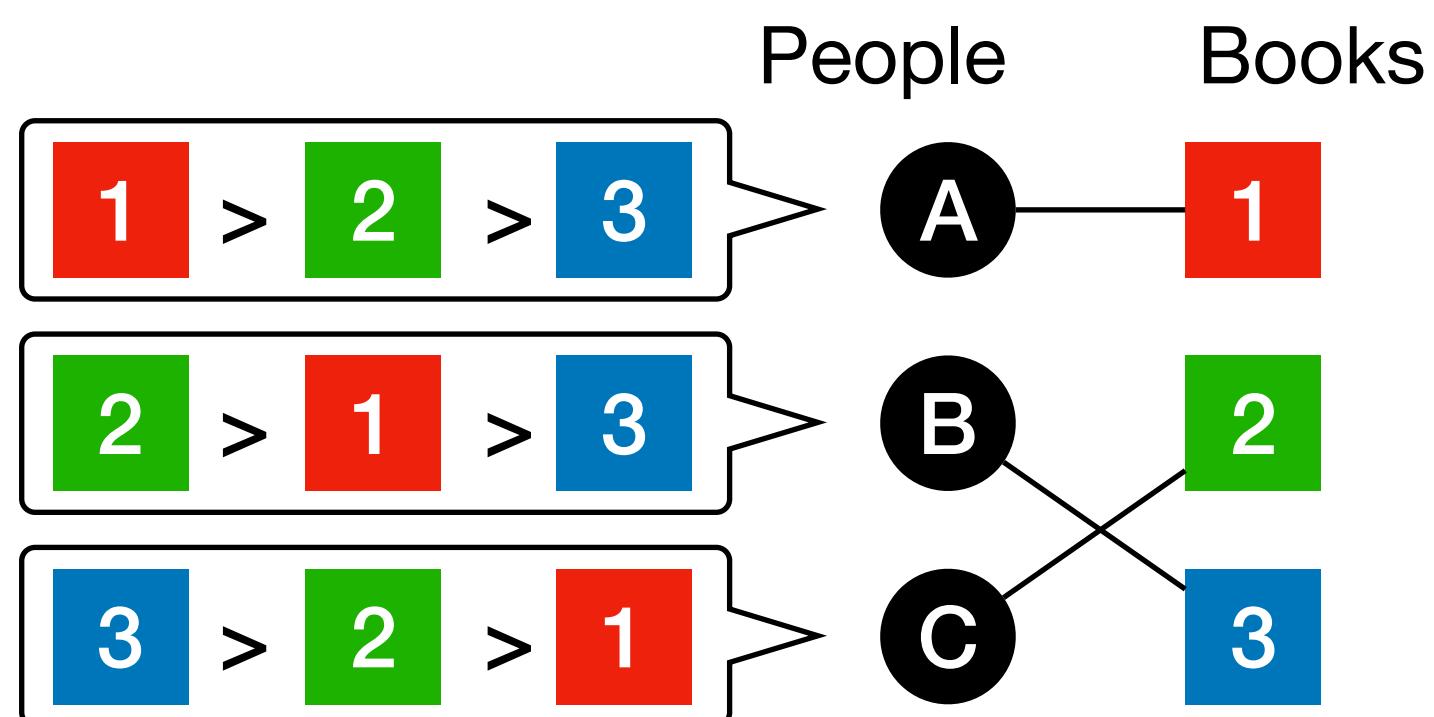
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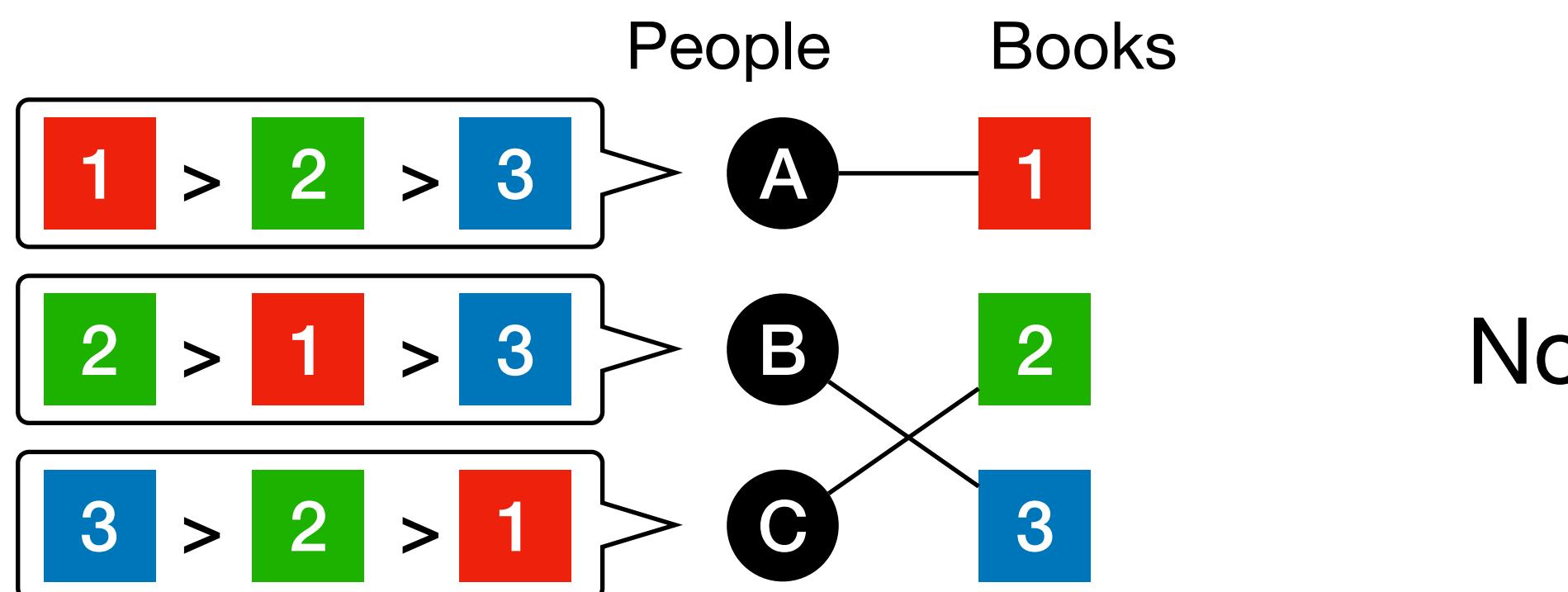
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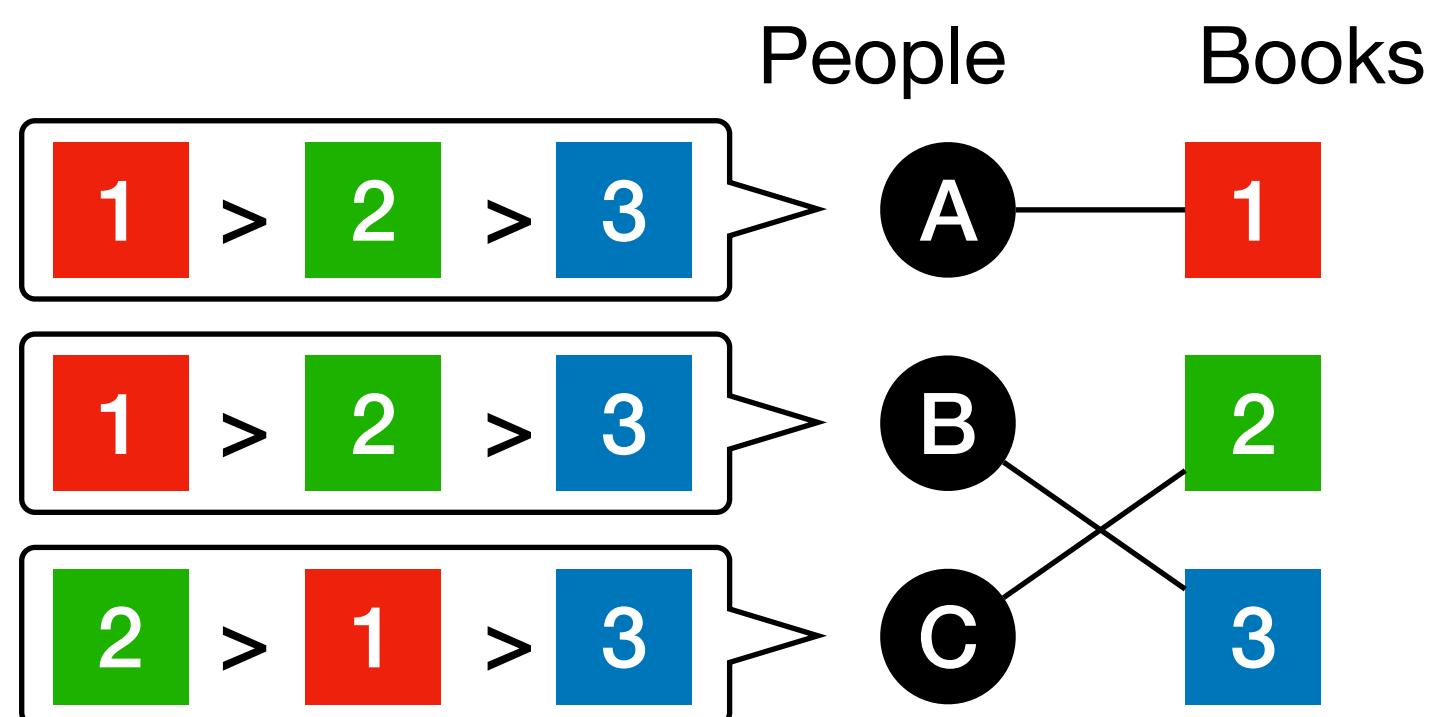
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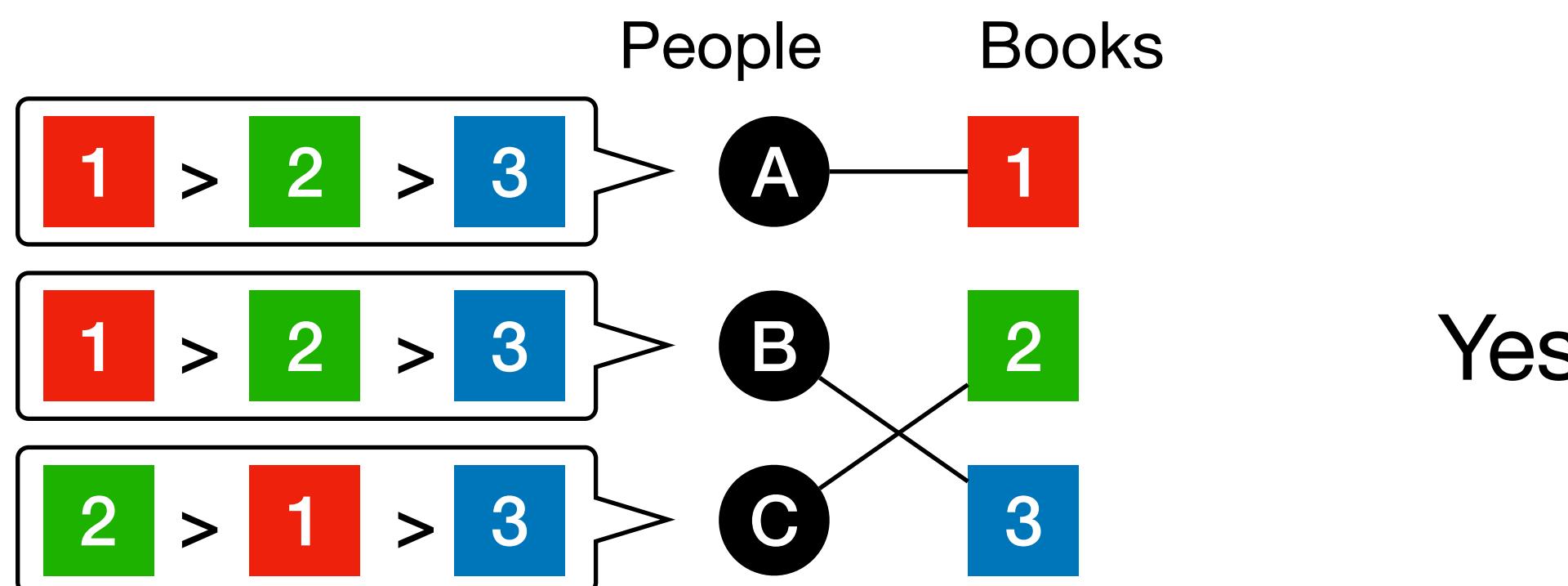
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Is this outcome pareto optimal?



Evaluating mechanisms: Strategy proofness

Abraham Musa

Another Notion of Goodness

- A mechanism is **strategyproof** if honesty is the best policy.
- A mechanism is strategyproof if lying about your preferences can't make you better off.

Is the Serial Dictatorship strategyproof?

- Your reported book preferences don't affect your turn order.
- Your reported book preferences don't affect what anyone before you gets.
- Thus, your reported book preferences don't affect what books are available on your turn.
- Serial Dictatorship gives you the best available book on your turn (according to reported preferences).
- Thus, any misreport of preferences could only result in you getting a book you like less.

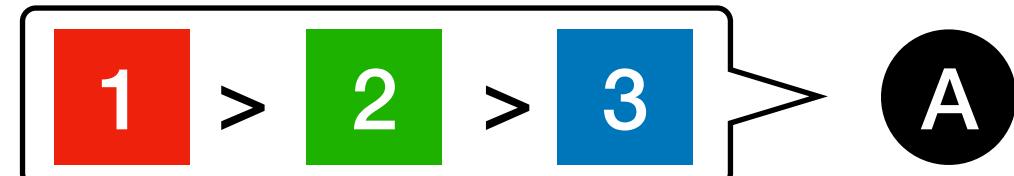
Strategy-proofness and the *Abridged Serial Dictatorship*

Femi Alayesanmi

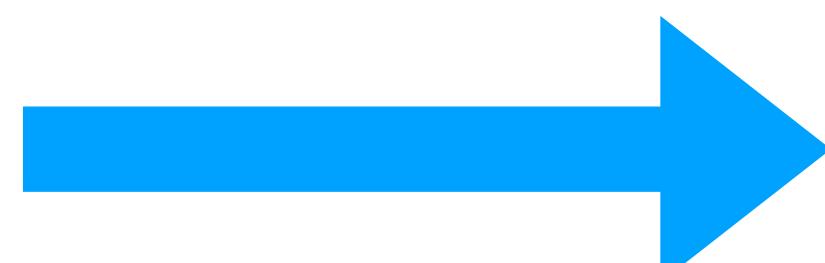
The Abridged Serial Dictatorship

Abridged Serial Dictatorship

1. Have each participant submit their preferences over their **top K** books.
2. Randomly order attendees.
3. In that order, give each attendee their favorite book amongst those remaining, according to their reported preferences. **If all their favorite books are gone, give them nothing.**



Serial dictatorship: full list

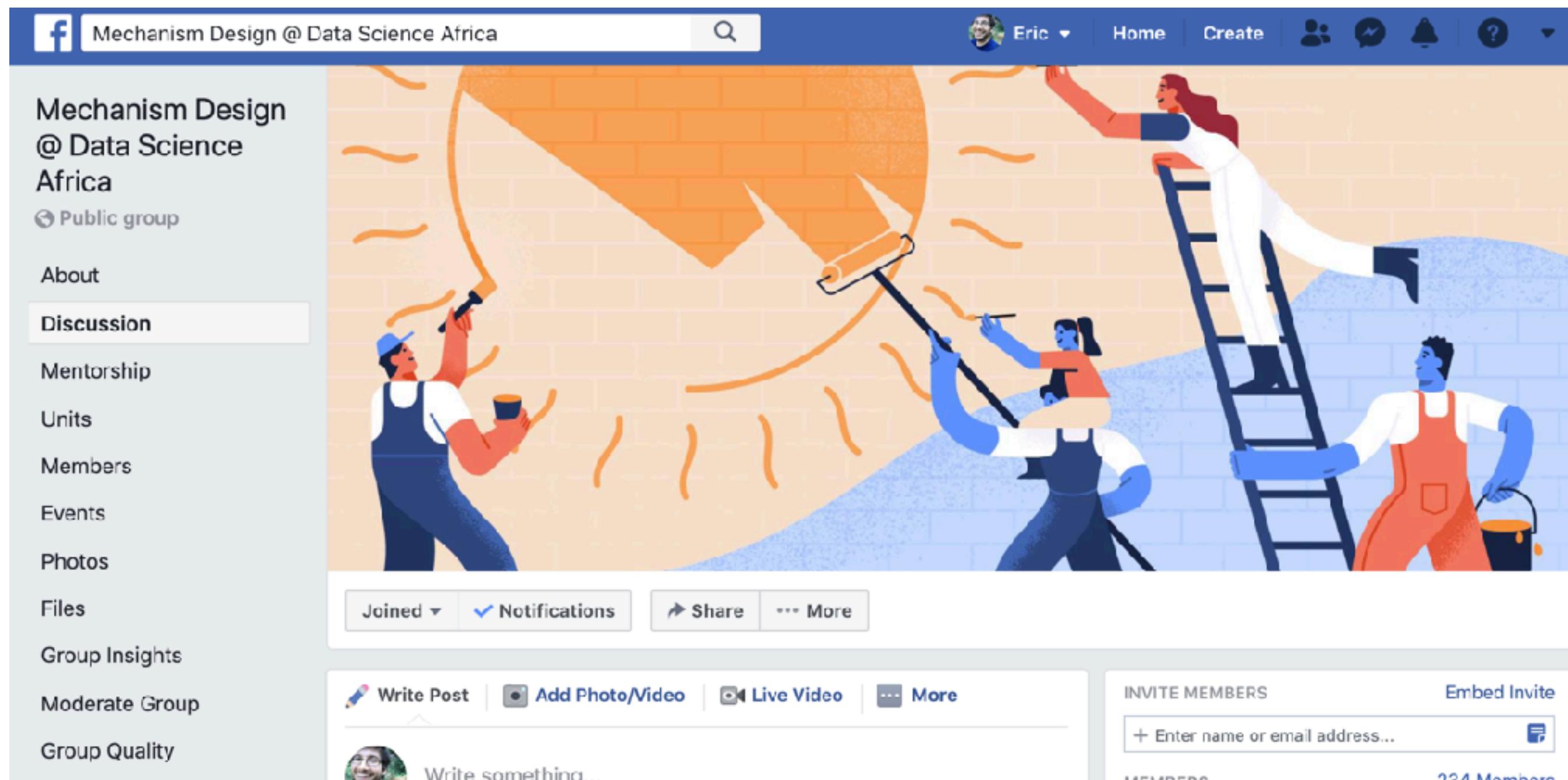


Abridged Serial dictatorship: truncated list

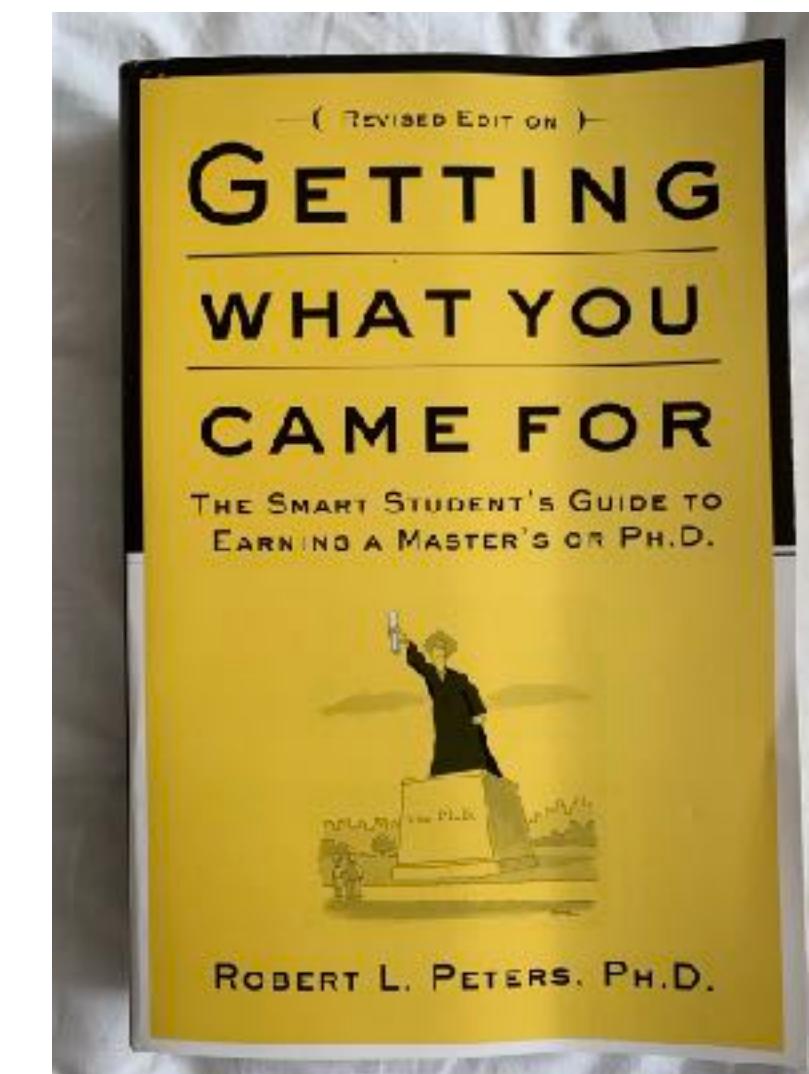
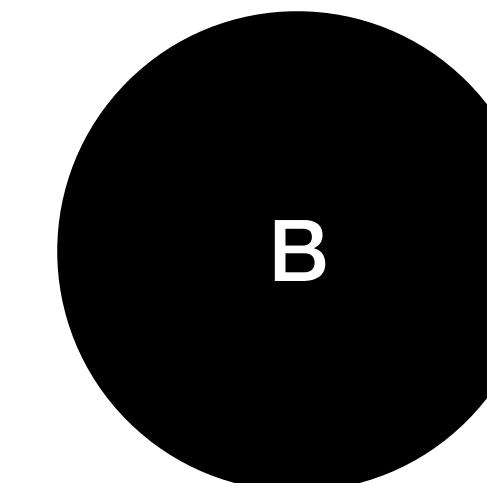
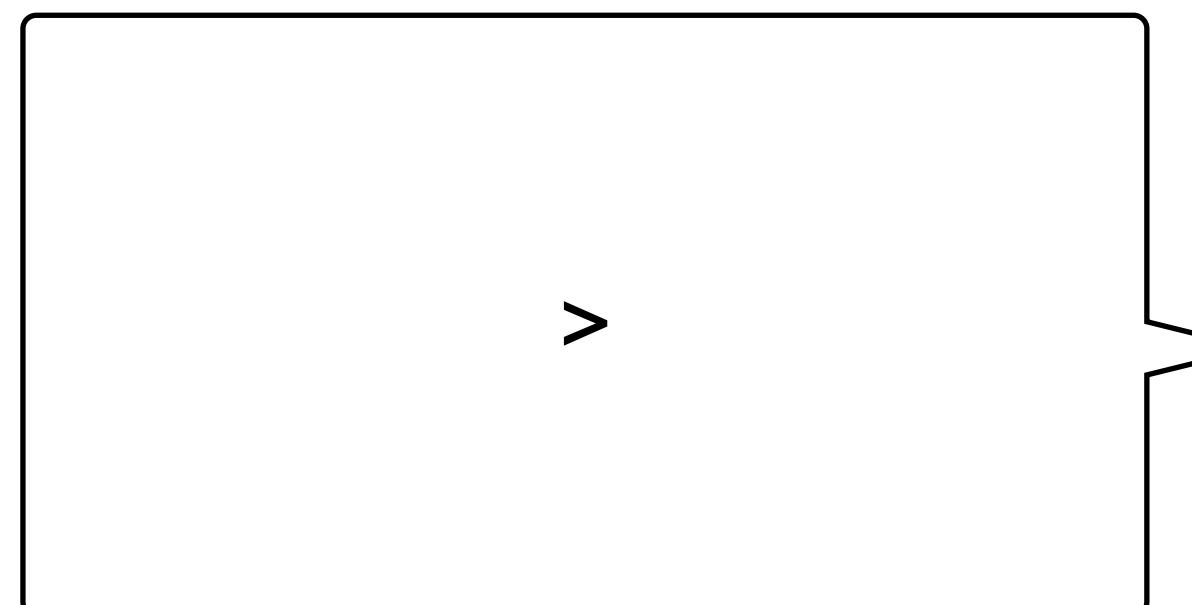
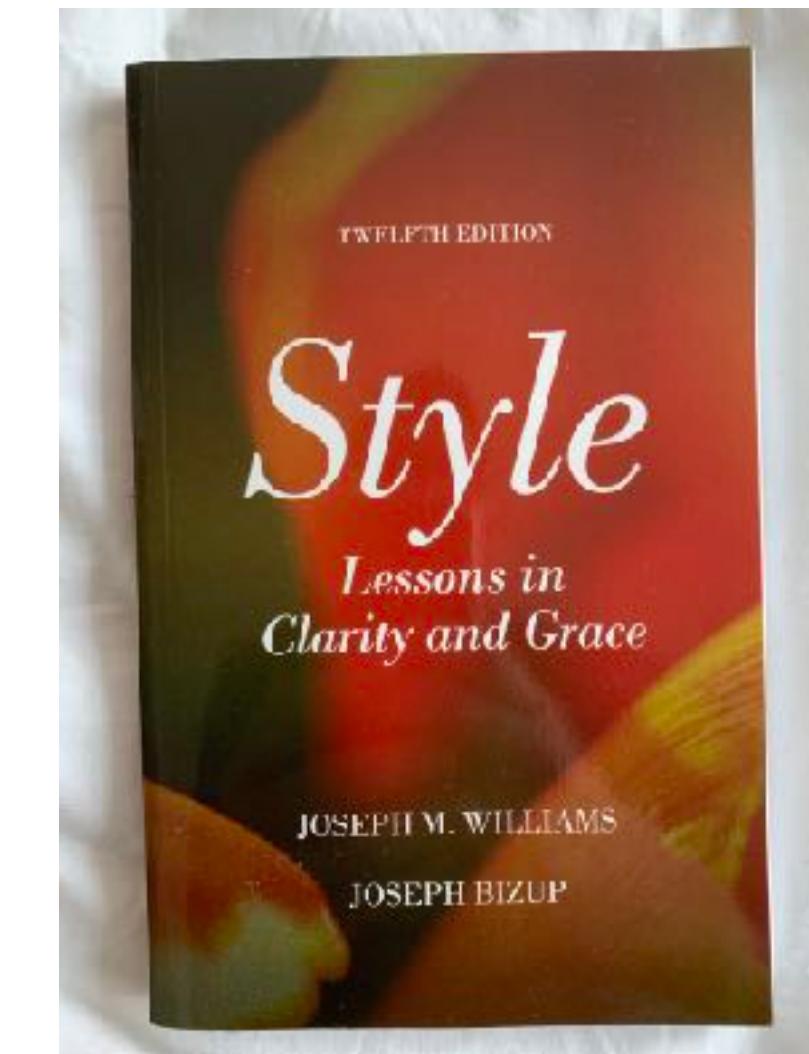
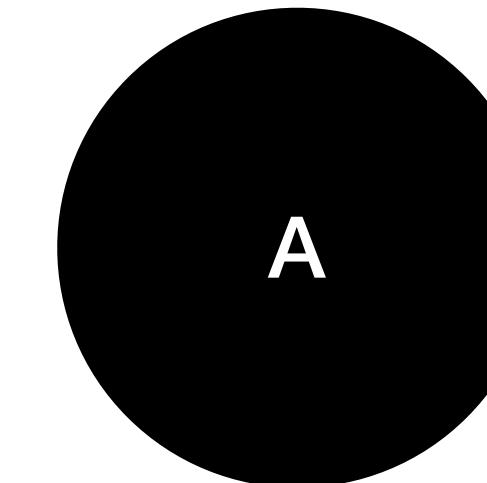
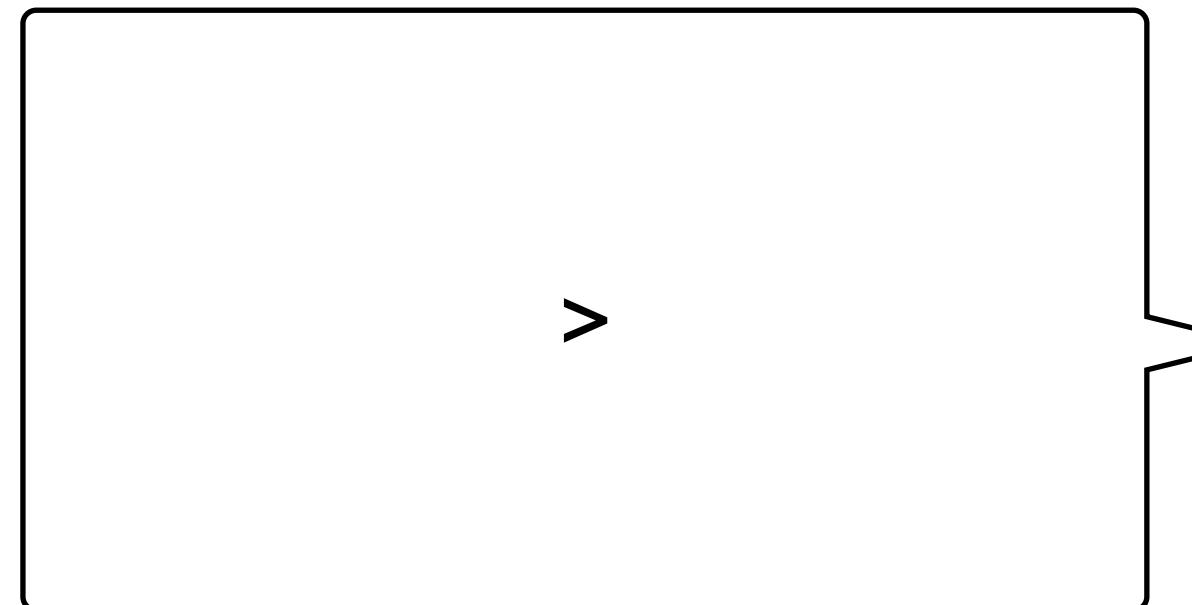
**Is the Abridged Serial Dictatorship strategyproof?
(examples)**

Last chance to join the group to be eligible for contest:

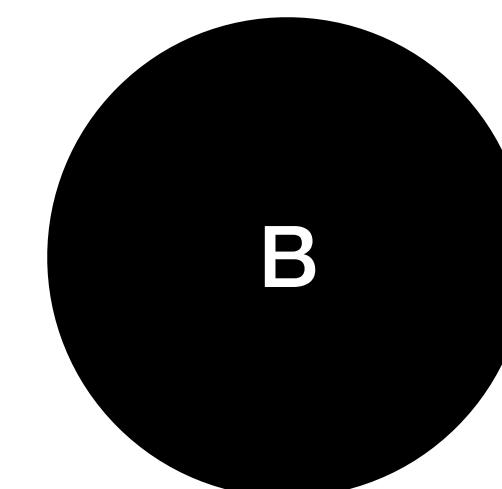
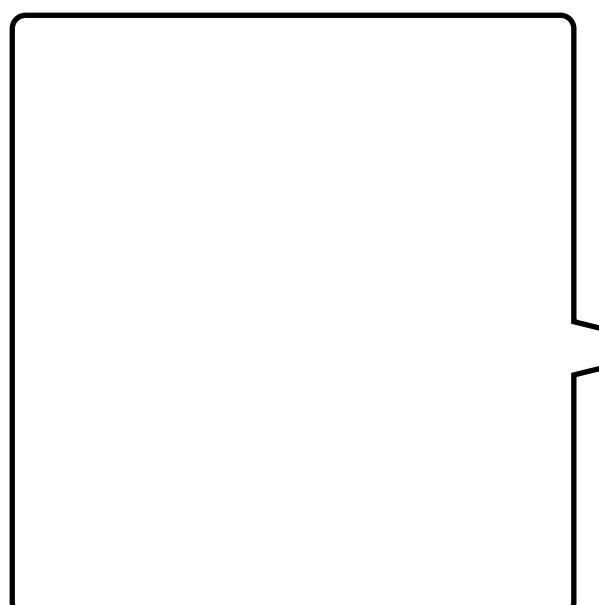
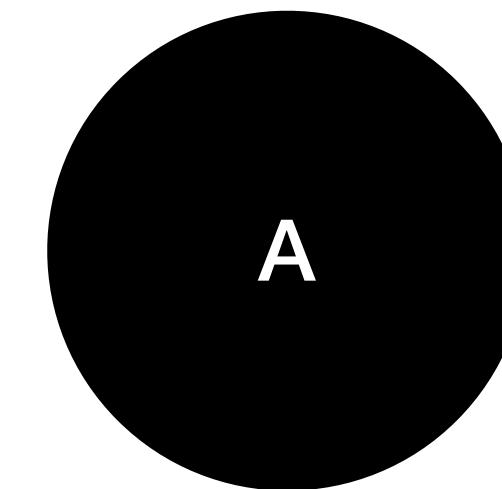
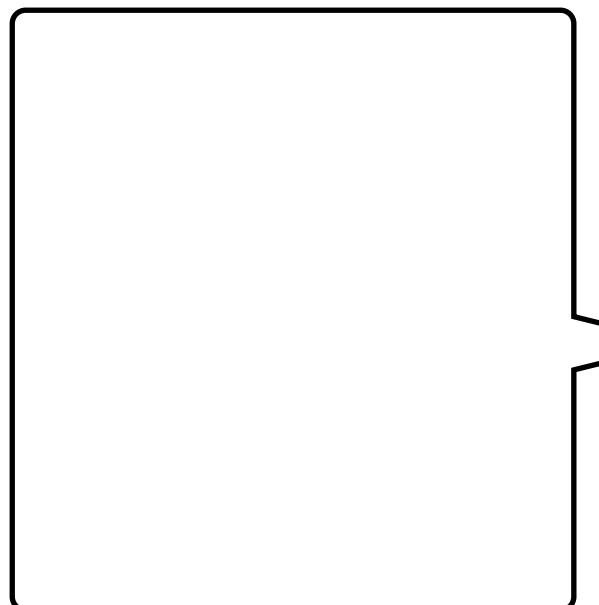
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Example 1: Serial Dictatorship



Example 2: Abridged Serial Dictatorship



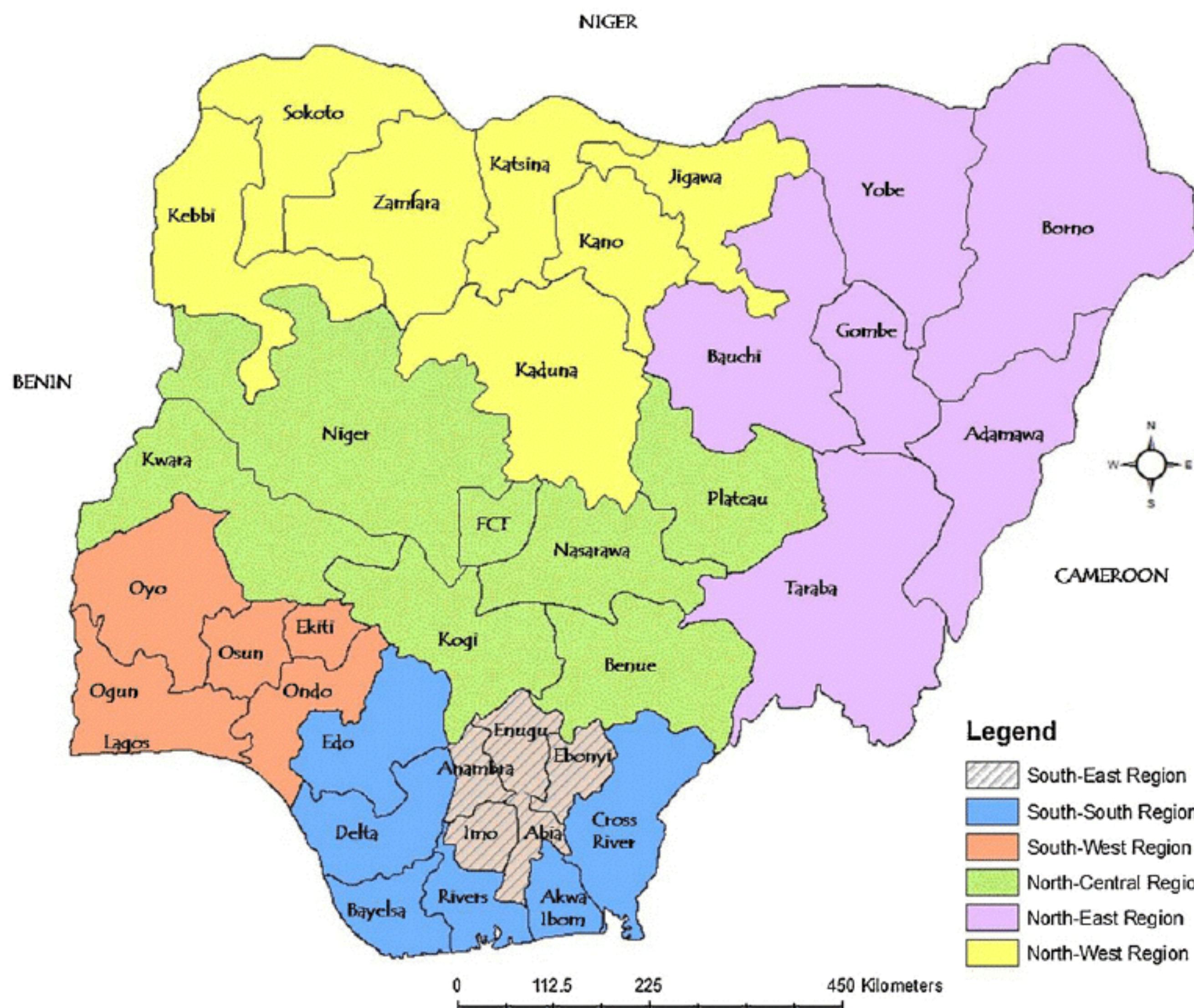
Things to remember

- The rules of the game matter
- Small changes to the rules can make a big difference

Mechanism Design in the Wild

Emmanuel Adeiza Ozi-yusuf





State	Zone	Region	Country
Sokoto	North West		
Zamfara			
Katsina			
Kebbi			
Jigawa			
Kaduna			
Kano	North Central		
Benue			
FCT			
Kogi			
Kwara			
Nasarawa			
Plateau	North East		
Niger			
Adamawa			
Bauchi			
Borno			
Gombe			
Taraba	South West		
Yobe			
Ekiti			
Lagos			
Ondo			
Ogun			
Osun	South South		
Oyo			
Akwa Ibom			
Bayelsa			
Cross River			
Edo			
Delta	South East		
Rivers			
Abia			
Imo			
Anambra			
Enugu			
Ebonyi			
Akwa Ibom			

Choosing state of preference

State of Deployment

Note: If you choose any of the following states: BORNO, YOBE, AND ADAMAWA, you will be allowed to relocate to any other state apart from your State of origin during the orientation course. Please note that the orientation will take place in the states mentioned above here

Please carefully select your desired state of deployment from the available options. This is a Pilot/Survey/Trial; you may NOT be deployed to any of the selected states. NYSC reserves the authority to deploy you to any state, geographical region apart from states you selected.

First state of deployment:

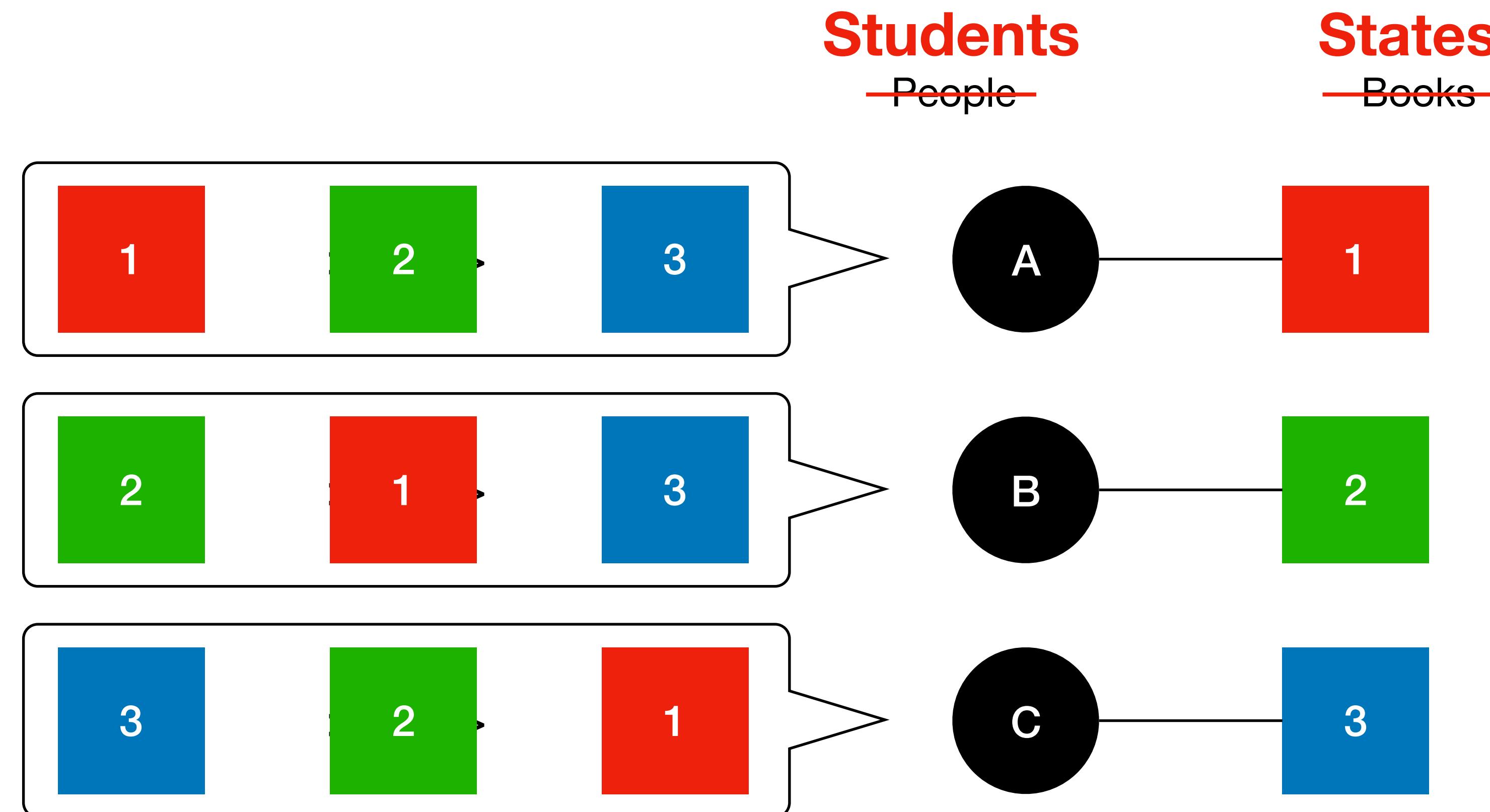
Second state of deployment:

Third state of deployment:

Fourth state of deployment:

I, Ohimai Micheal Okhamuafen confirm that all the information supplied herewith are valid. I agree that the Scheme should

NYSC Matching



Discussion

- Can you think of other systems that you regularly participate in that are clearly not strategyproof, or that do not produce Pareto optimal outcomes?
- What are some problems that feel similar to “book giving” problems? What’s the general version of the problem?
- (Discuss for 2-5 minutes)

Next Steps

Eric Sodomka

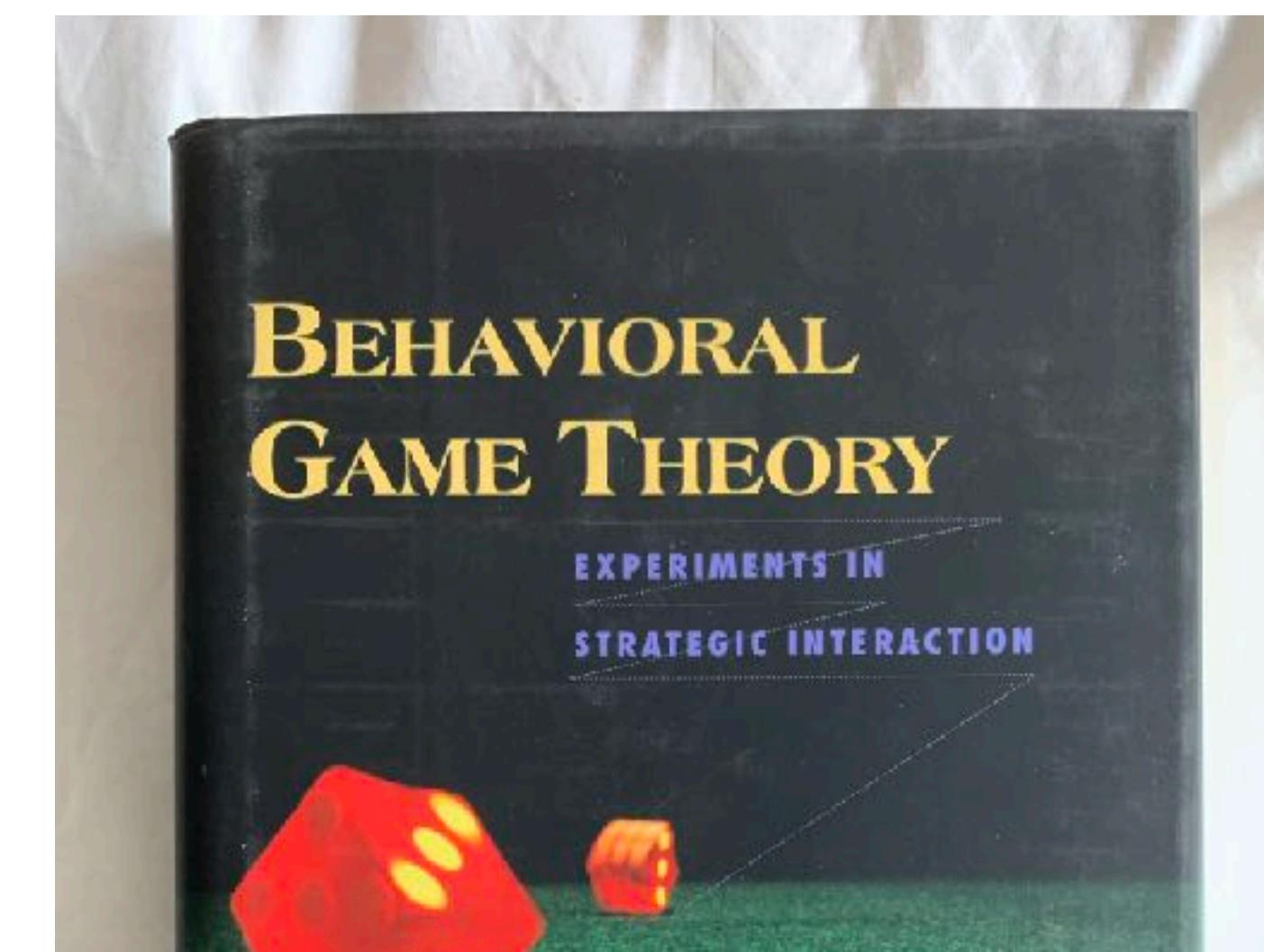
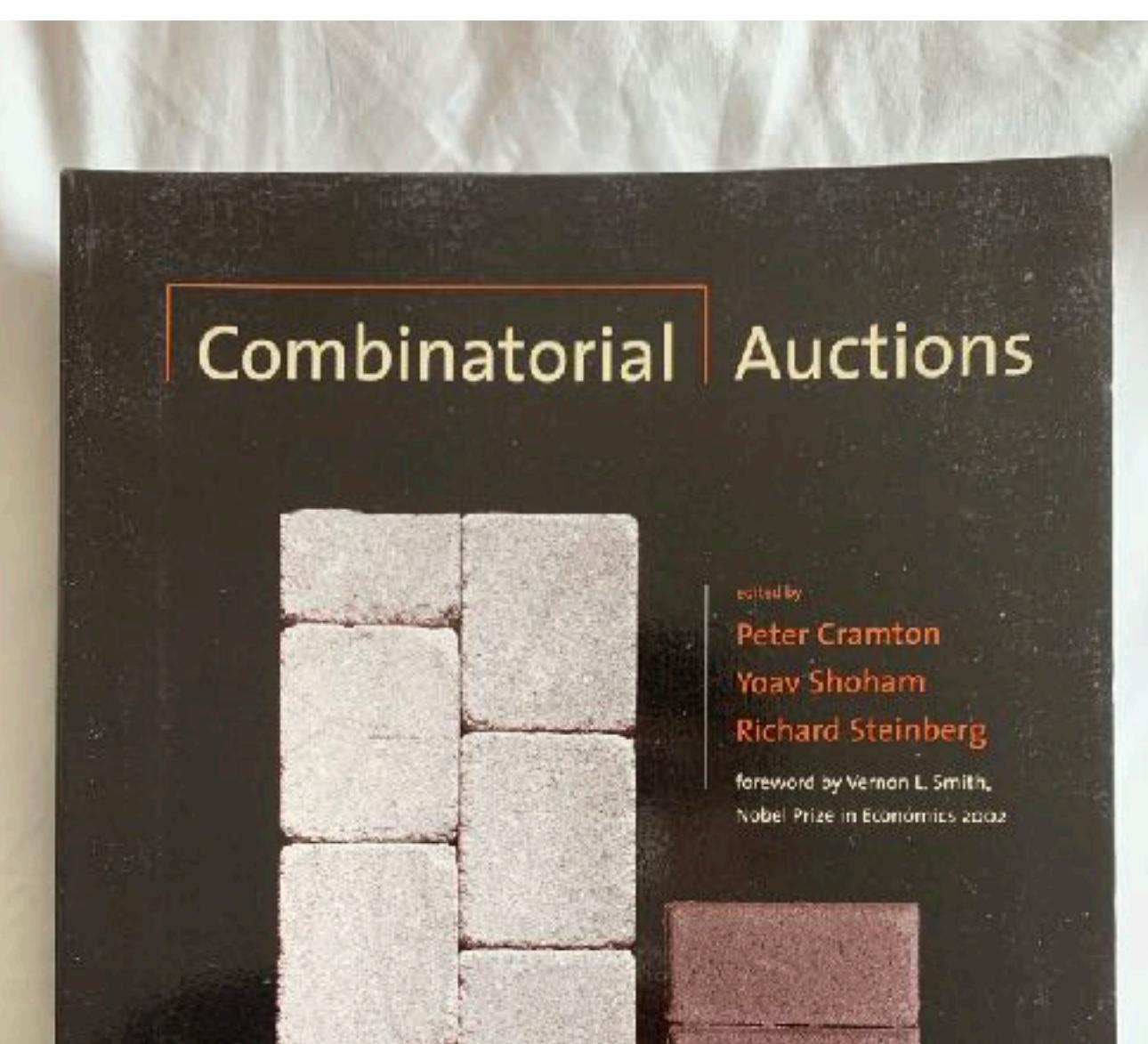
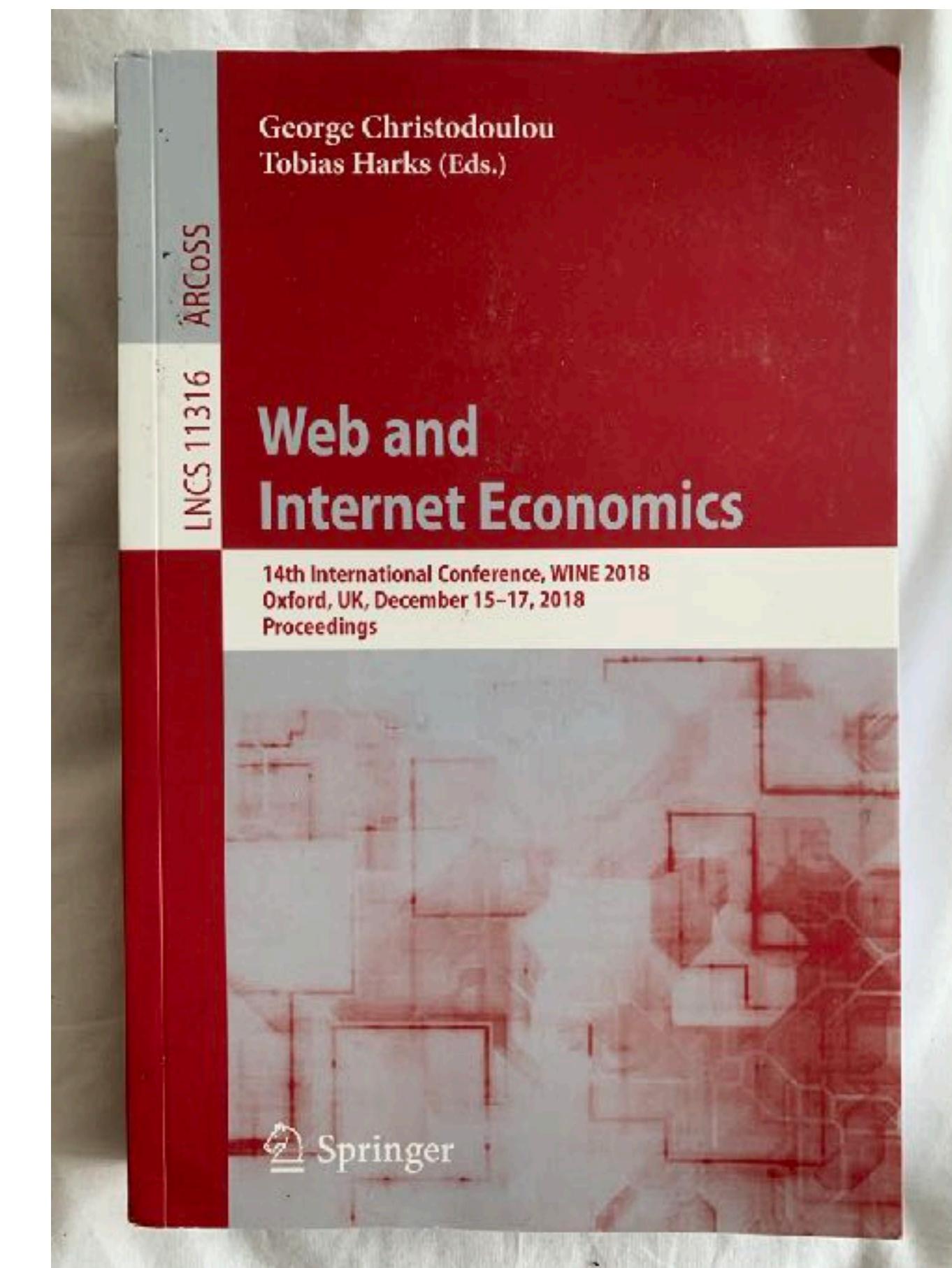
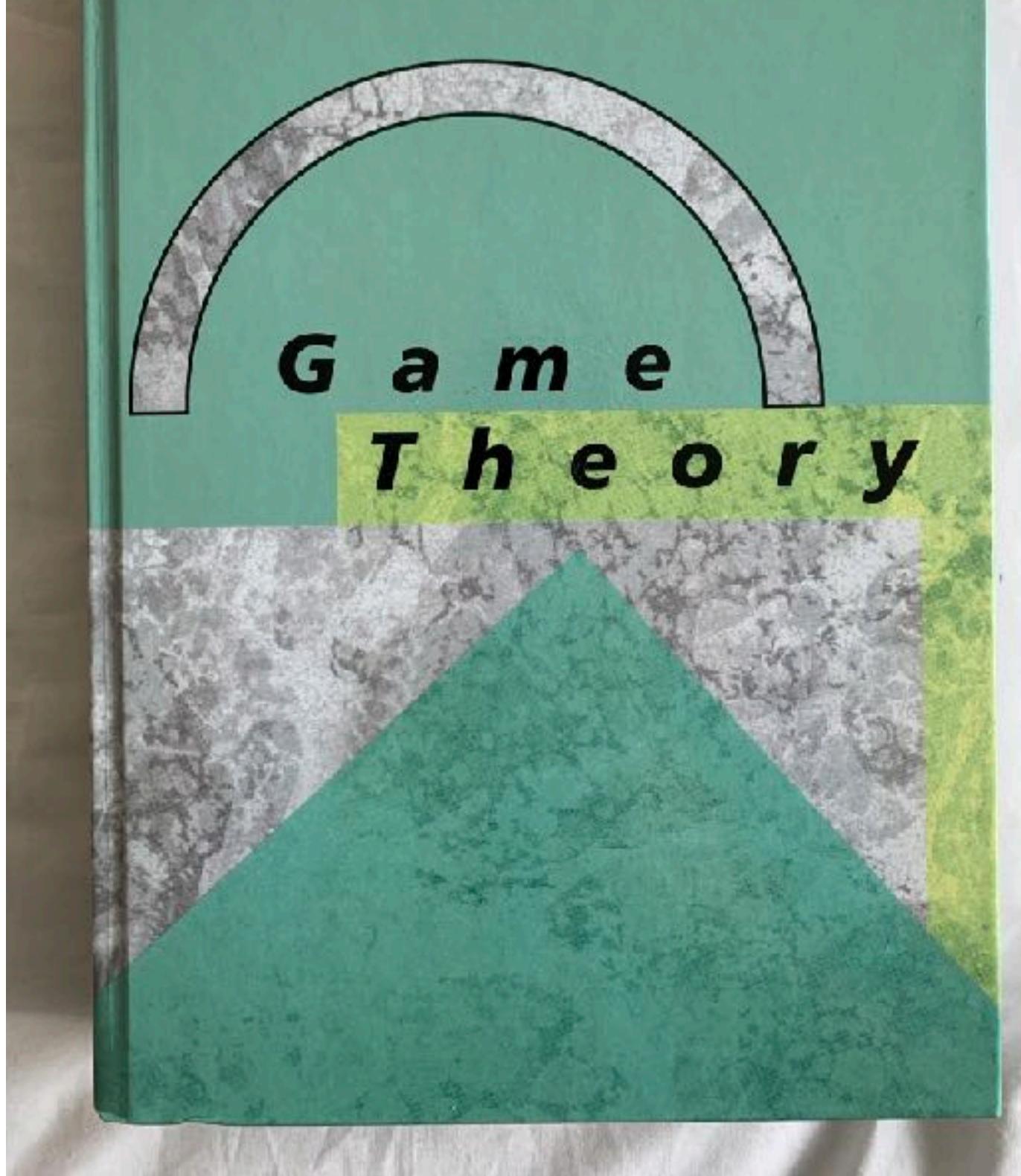
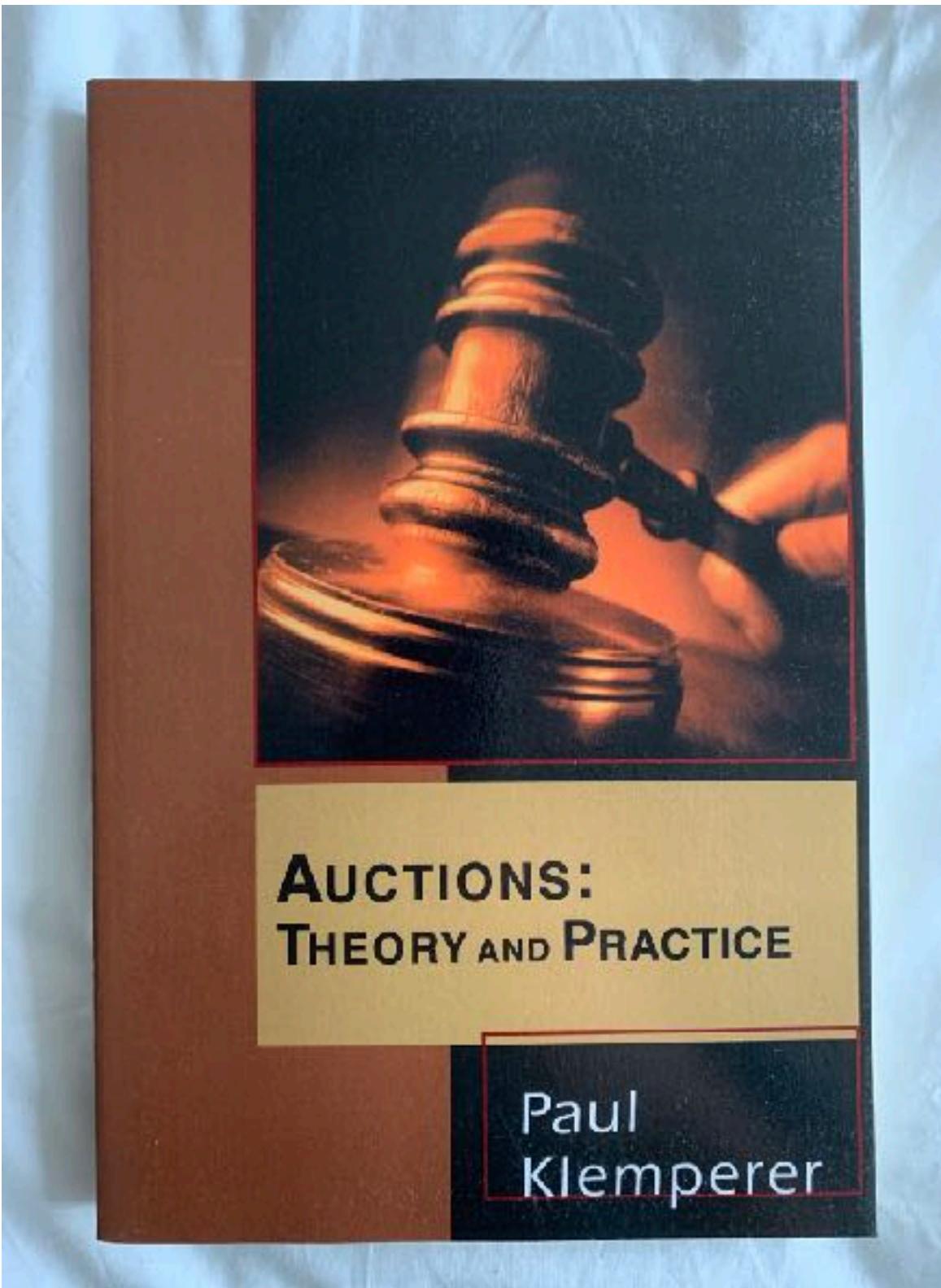
What did you learn?

What did you learn?

- Mechanism design
- Serial dictatorship
- Pareto optimal
- Strategy proof
- “Abridged serial dictatorship”

Contest: Local Challenges in Mechanism Design

- **Identify a real-world problem in your region that could benefit from the tools of mechanism design.**
- Prize: (1) Mechanism design book of your choice; (2) If exceptional submission: Funding to attend mechanism design conference.
- Submission deadline: Thursday 9:00 AM
- Submit early for feedback. You can edit your submission.
- Winner(s) announced at DSA talk on Thursday



Contest: Local Challenges in Mechanism Design

- Brainstorming form: tinyurl.com/dsa-accra-brainstorm
- Submission form: tinyurl.com/dsa-accra-contest
- Facebook group: tinyurl.com/dsa-fb-group

Next Step: Join Facebook Group
Mechanism Design @ Data Science Africa tinyurl.com/dsa-fb-group

- This talk based on first lecture of course by Tim Roughgarden: *Incentives in Computer Science*. Available online!
- Resources for learning more about mechanism design
- Resources for getting involved in the mechanism design community
- Contest announcements

What I want...

- Winners of upcoming Mechanism Design **research grants** are attendees of Data Science Africa (DSA) 2019 Accra.
- **Top-tier publications** between mechanism design researchers and DSA attendees.
- Top **academic and industry positions** for DSA attendees in mechanism design.

Contest: Local Challenges in Mechanism Design

- Brainstorming form: tinyurl.com/dsa-accra-brainstorm
- Submission form: tinyurl.com/dsa-accra-contest
- Facebook group: tinyurl.com/dsa-fb-group