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What happens in M³AAWG stays in M³AAWG

- What occurs here cannot be shared outside the membership without the written permission of the Executive Director, unless we state the specific session is open to the press and social media.
- See the M³AAWG Meeting Policy at www.m3aawg.org/MeetingPolicy

Treat Everyone with Respect

- Treat all attendees respectfully in and out of sessions. No less will be tolerated.
- See the M³AAWG Conduct Policy at <https://www.m3aawg.org/conduct-policy>

You agreed to these policies when you registered for the meeting.
For questions, please contact Amy Cadagin at amy@m3aawg.org

This slide will be presented by Amy
Executive Director

Reminders for Our Worldwide Friends

All meeting content is confidential: No photos, no video, no recording.

Reach out to room monitor staff with questions.



 L'ensemble du contenu de la réunion est confidentiel : les photos, vidéos et enregistrements sont interdits.
Pour toute question, demandez conseil au personnel.

 Todo el contenido de la reunión es confidencial: No está permitido sacar fotografías ni grabar video o audio.
Consulte con el personal si tiene alguna pregunta.

 Der gesamte Inhalt des Meetings ist vertraulich: Keine Fotos, kein Video, keine Tonaufzeichnung. Bei Fragen wenden Sie sich an die Mitarbeiter.

 会議の内容はすべて機密扱いです。写真やビデオの撮影、録音は禁止されています。質問がある方は、スタッフまでご連絡ください。

 所有会议内容均为保密信息：禁止拍照、录像、录音。如有疑问，请咨询职员。

 회의에서 다루는 모든 내용은 기밀입니다. 사진 및 동영상 촬영과 녹음은 금지됩니다. 질문이 있으시면 직원에게 문의해 주십시오.

 Все содержимое собрания является конфиденциальным: нет фотографий, нет видео, нет записи. Смотрите сотрудники с волпросами.

**This slide will be presented by Amy,
Executive Director**



Proactive Strategies for Tackling

Algorithm -enabled Manipulation on Online Platforms

Shreyas Sekar, Professor of Operations & Analytics

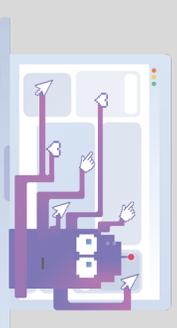
shreyas.sekar@rotman.utoronto.ca

www.sekarshre.github.io



UNIVERSITY OF
TORONTO
SCARBOROUGH

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Rotman

Too Much Fraud, Too Little Time

This Talk



1. Fake Reviews



2. Algorithmic Collusion



3. Disintermediation

Too Much Fraud, Too Little Time

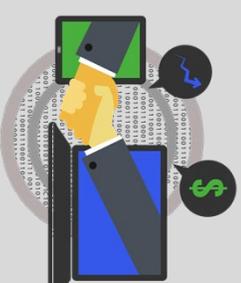
This Talk



1. Fake Reviews



2. Algorithmic Collusion



3. Disintermediation

Pop Quiz

What percentage of reviews on Amazon are Fraudulent?

The Answer is Blowing in the Wind

What percentage of reviews on Amazon are Fraudulent?

- Depends on whom you ask:
 1. According to Amazon, fewer than **1%** of reviews are fake
 2. Independent monitors like Fakespot/ReviewMeta estimate **20-40%**
- Reviews influence customer decisions
- Growing evidence that fake reviews hurt consumer welfare

Many Americans believe customer reviews and ratings improve consumer experiences

% of U.S. adults who say customer reviews and ratings help ___ to ...



Fake Reviews Harm Consumers

- **2022 Study***: 10000 participants were asked to select between five products
- Poor product inflated with fake ratings & reviews

	
JBL Charge 4 Bluetooth Wireless Speaker	Roberts Beacon 310 Bluetooth Wireless Speaker

- Inflated ratings and fake reviews make consumers 55% more likely to buy bad products
- Fake reviews reduce consumer welfare by at least 12%
- “Sophisticated shoppers” just as likely to fall victim to review fraud



* “The Impact of Fake Reviewson Demand and Welfare” – Akessonnet al. (2022)



FTC's Crusade Against Fake Reviews



What companies – and platforms – can do to help stop fake post-for-pay reviews

FTC, States Sue Rental Listing Platform Roomster and its Owners for Duping Prospective Renters with Fake Reviews and Phony Listings

Agency, States Also File Proposed Order Requiring Fake Review Seller to Pay \$100,000 and Cooperate in Case Against Roomster

FTC Proposes to Strengthen Advertising Guidelines Against Fake and Manipulated Reviews

Agency Warns Marketers on Child-Directed Stealth Advertising

FTC Puts Hundreds of Businesses on Notice about Fake Reviews and Other Misleading Endorsements

Notice of Penalty Offenses can trigger steep penalties for recipients who use endorsements to deceive consumers

FTC to Explore Rulemaking to Combat Fake Reviews and Other Deceptive Endorsements

Agency seeks comments on the harms and pervasiveness of fake and paid reviews, and other deceptive endorsement tactics

Understanding the Fake Review Ecosystem

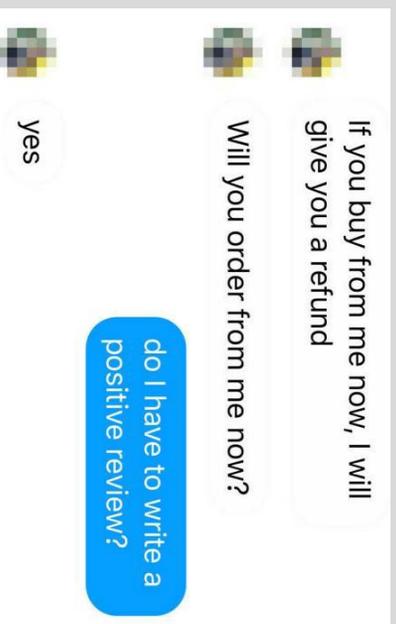
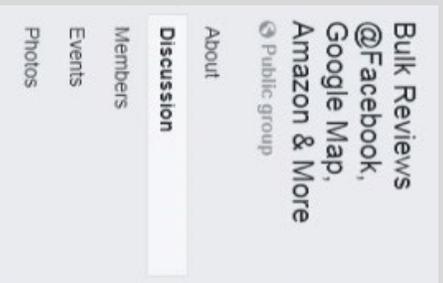
1. How are fake reviews solicited?

2. What drives sellers to hire fake reviewers?

3. What are platforms doing to combat the problem?

Marketplace* for Fake Reviews

1. How are fake reviews solicited?



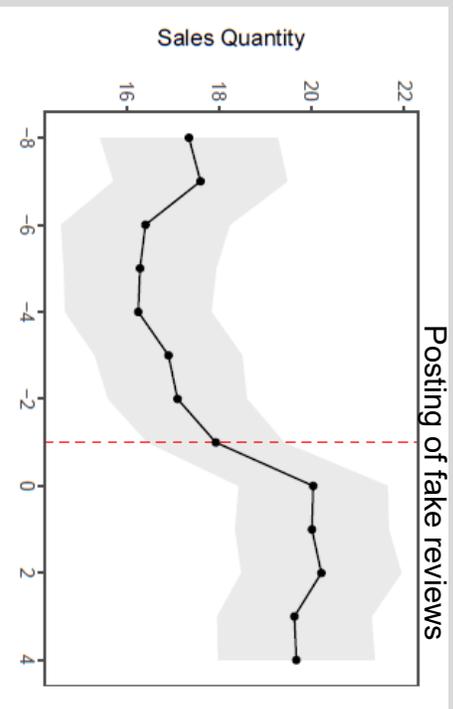
Thousands of Facebook groups where sellers “incentivize” others to purchase their product and leave **averified 5-star review**.

- Fraudsters are extremely sophisticated
- Fake reviews employed by a wide range of products and not just newcomers
- Sellers using fake reviews as promotions

*“The Market for Fake Reviews” – S. He et al. (2022)

The Benefits of Fake Reviews

2. What drives sellers to hire fake reviewers?



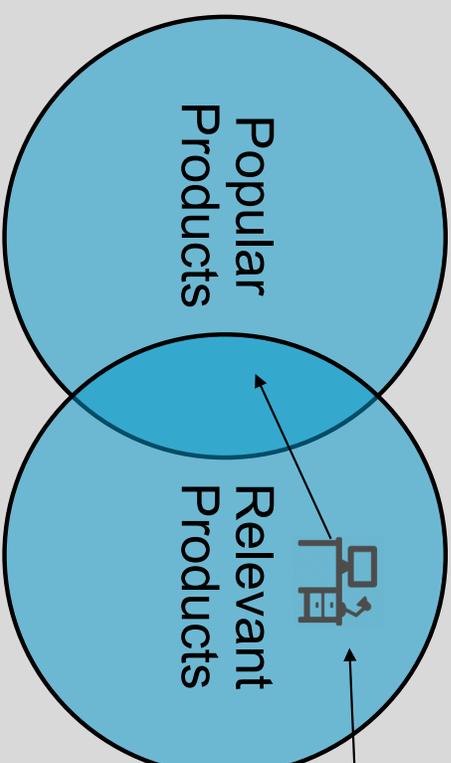
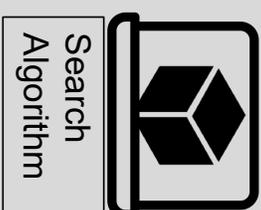
- In the long run, sales stabilizes at pre-fraud level

Fake reviews deceive consumers into purchasing poor quality products

Fake reviews trick the search algorithm into featuring bad products

Algorithms Exacerbate Fraudulent Data

The screenshot shows the Amazon Prime search results for 'workstation desk'. The top result is 'Z-Line Designs Cyrus Workstation' priced at \$194.65, with a 4.5-star rating and 1,924 reviews. Below it is 'Amazon's Choice' for 'Teraves Reversible L Shaped Desk with Shelves Round Corner Computer Desk Gaming Table...' priced at \$239.99 (discounted from \$275.99) with a 4.5-star rating and 740 reviews. The bottom result is 'On-Stage WS7500 Series Wood Studio Workstation, Black' priced at \$214.95 with a 4.5-star rating and 370 reviews. All items offer free delivery by Wednesday, Oct 14 for Prime members.



- Going up 5-10 ranks in the search results can double your visibility

Too Little, Too Late

3. What are platforms doing to combat the problem?



"In 2019, Amazon spent \$500 million and hired 8000 workers to combat abuse on its platform"

At least 200 million fake reviews have been removed from the platform

1. On average, fake reviews take 100 days to be deleted
2. Fake reviewers have gotten increasingly sophisticated over time!



How can we be proactive in addressing fake reviews?

A Simple Intervention

Improving Consumer Awareness



Please be aware that the product pages may contain untrue or misleading customer reviews.

Some tips to avoid fake reviews:

- Inspect the comments (don't rely on star ratings alone).
- Watch out for suspicious language (such as a lack of punctuation, capitals, or odd formatting).
- Be suspicious of products with an unusually large amount of reviews.
- Check the dates of the reviews (be more cautious if a lot of the reviews were posted on the same day)
- Check the one-star reviews, and in particular if they seem to directly conflict with the praise in the five-star reviews.

To learn more about spotting fake reviews, please visit [this page](#).

- This reduces the share of consumers who purchase poor products by 23%
- Customers become distrustful of reviews on the whole

Revamping Reviews

Designing Informative Review Systems

Treatment	Additional Question	Answer choices
<i>Expectation</i>	How did this freelancer compare to your expectations?	Much worse than I expected, Worse than I expected, About what I expected, Better than I expected, Far better than I expected, Beyond what I could have expected
<i>Adjectives</i>	How would you rate this freelancer overall?	Terrible, Mediocre, Good, Great, Phenomenal, Best possible freelancer!
<i>Average</i>	How does this freelancer compare to others you have hired?	Worst Freelancer I've Hired, Below Average, Average, Above Average, Well Above Average, Best Freelancer I've Hired



*Assigning “word” meanings to numeric reviews reduced number of five star reviews

* “Designing Informative Review Systems: Evidence from an Online Labor Market” – Garg and Johari (2020)

Revamping Reviews



Designing Informative Review Systems

Treatment	Additional Question	Answer choices
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<i>Adjectives</i>	How would you rate this freelancer overall?	Terrible, Mediocre, Good, Great, Phenomenal, Best possible freelancer!
<i>Average</i>	How does this freelancer compare to others you have hired?	Worst Freelancer I've Hired, Below Average, Average, Above Average, Well Above Average, Best Freelancer I've Hired

Recent advances in Natural Language Processing enable review summarization and identifying customer intent



SH

Can you summarize reviews for bose noise cancelling headphones 700?



The Bose Noise Cancelling Headphones 700 are well-reviewed for their effective noise-cancellation capabilities, comfortable fit, and clear audio quality. Some users have noted issues with the touch controls and the high cost of the headphones. However, overall, the headphones are generally considered to be a worthwhile investment for those looking for a high-quality noise-cancelling experience.



SH

Will the bose noise cancelling headphones 700 work well on an airplane?

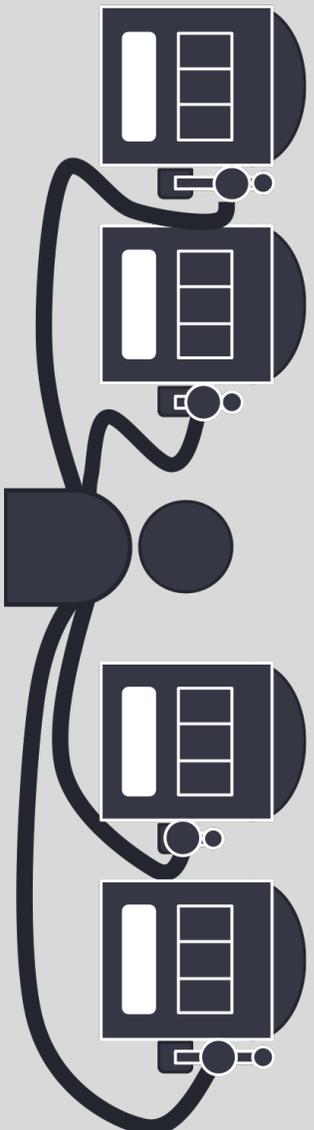


The Bose Noise Cancelling Headphones 700 are designed to effectively reduce ambient noise, making them a good choice for use on an airplane. Many users have reported that they are able to block out the majority of airplane cabin noise, allowing for a more comfortable and enjoyable travel experience. However, as the level of noise-cancellation will depend on the specific model of airplane and the level of noise inside the cabin, it is best to check reviews from users who have used the headphones on an airplane specifically to be sure.



Fake-Aware Recommendations

Make Search Algorithms Resilient to Fake Reviews



- A new machine learning approach for search and recommendations that *hedges* between multiple parallel algorithms
- Numerical experiments suggest that the Fake-Aware Learning is **10-20%** slower than conventional ML but **cannot be fooled by fake reviews** (i.e., no short-term ranking boosts)

Diversify Search Results



Popularity-Centric Search Results

Furniture / Office Furniture / Desks
Over 100,000 Results

Desks
Over 100,000 Results

- Wayfair Choice**
Alysia 47.25" Console Table by Sand & Stobben
From \$236.99 \$299.99
★★★★★ (1977)
- Sale**
Domelynn 48" Desk by House of Hampton®
\$334.99 \$399.99
★★★★★ (1319)
- Free-Start Size**
+2 Sizes
Jaler Solid Wood Console Table by Grace Oaks
From \$154.99 \$194.99
★★★★★ (144)

Diversity-Centric Search Results

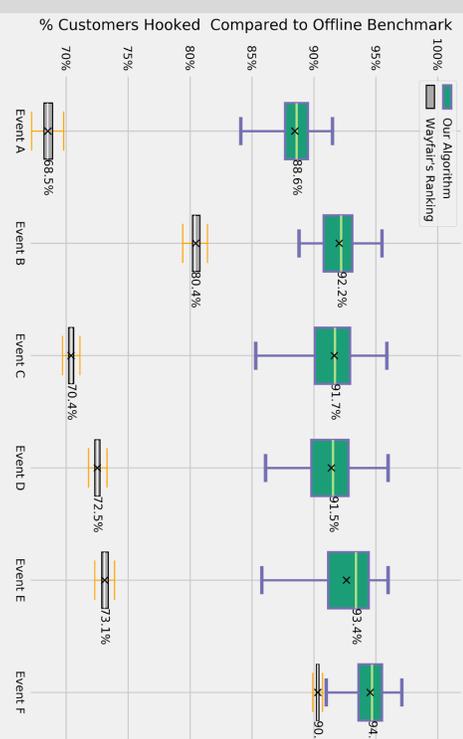
Desks
Over 100,000 Results

- Free-Start Size**
55" to 63" Electric Height Adjustable Standing Desk by Modernchomp
From \$217.49 \$249.49
★★★★★ (537)
- Free-Start Size**
Model# 42" Desk by Mercury Row®
From \$219.99 \$299.99
★★★★★ (41)
- Free-Start Size**
59.06" Desk by Inbox Zero
From \$179.99 \$199.48
★★★★★ (40)

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Collaboration with wayfair

Performance of our Algorithm in Terms of Offline Benchmark



What comes after reviews?

Open Questions: If customers stop relying on reviews for decision-making, how does this affect platforms/sellers?

The New York Times
Wirecutter

Which?



Too Much Fraud, Too Little Time

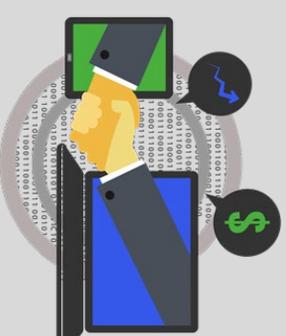
This Talk



1. Fake Reviews



2. Algorithmic Collusion

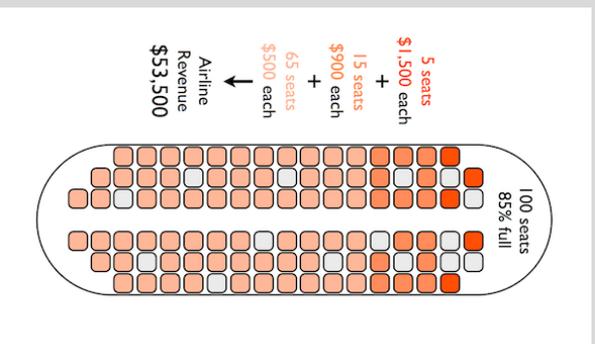


3. Disintermediation

Algorithmic Pricing is Everywhere



Demand is off the charts! Fares have increased to get more Ubers on the road.



- \$139.00**
 List: ~~\$199.00~~ (50% off)
 Save \$60 on Ring Alarm 5-Piece Kit & Free Echo Dot
 ★★★★★ 2835
- \$79.99**
 Price: ~~\$129.00~~ (38% off)
 Samsung Save Up to 30% on Home Monitoring Kit
 Ships from and sold by Amazon.com.
 ★★★★★ 2194
- \$209.00**
 List: ~~\$299.00~~ (30% off)
 Save \$90 on Ring Alarm Smoke & CO Kit + Free Echo Dot
 ★★★★★ 2835

Real-Time Bidding

AD SPOT

RTB

\$125 CPM

\$195 CPM

\$200 CPM

\$235 CPM

\$175 CPM

\$125 CPM

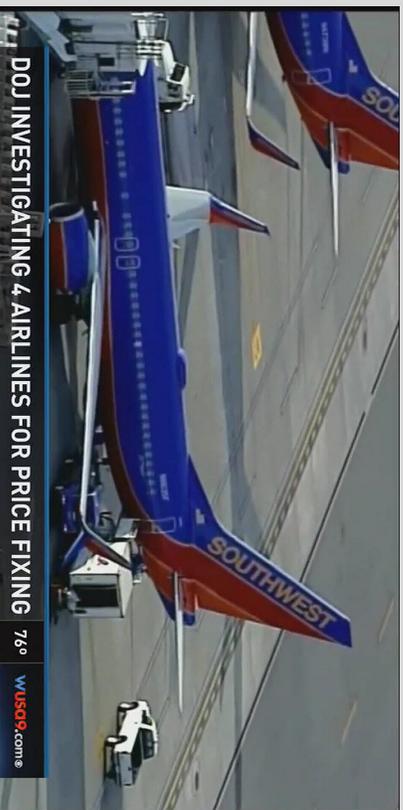
Collusion – The Old Fashioned Way



ENGAGEMENT SERIES

Department of Justice

JUSTICE DEPARTMENT SETTLES AIRLINES PRICE FIXING SUIT,
MAY SAVE CONSUMERS HUNDREDS OF MILLIONS OF DOLLARS



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Collusion – The Old Fashioned Way



ENGAGEMENT SERIES

Department of Justice

**JUSTICE DEPARTMENT SETTLES AIRLINES PRICE FIXING SUIT,
MAY SAVE CONSUMERS HUNDREDS OF MILLIONS OF DOLLARS**

THE CANADIAN JOURNAL OF
ECONOMICS AND POLITICAL SCIENCE

Volume XIII.

FEBRUARY, 1947

Number 1

THE EDICT OF DIOCLETTIAN:

A STUDY OF PRICE FIXING IN THE ROMAN EMPIRE

“Two Artificial Neural Networks and one Nash equilibrium meet in an online (pub) hub. After a few milliseconds, a unique silent friendship is formed...”

* Ariel Ezrachi and Maurice Stucke (2017)

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Algorithmic Collusion – Deus Ex Machina

The Making of a Fly: The Genetics of Animal Design (Paperback)
by Peter A. Lawrence

Return to product information
Always pay through Amazon.com's Shopping Cart or 1-Click. Learn more about [Safe Online Shopping](#) and our [Safe Buying Guarantee](#).

Price at a Glance
List Price: ~~\$79.99~~
Used: from **\$35.54**
New: from **\$1,730,045.91**
Have one to sell? [Sell yours here](#)

Used (13 from \$35.54)

Sorted by Price + Shipping

New 1-2 of 2 offers

Price + Shipping	Condition	Seller Information	Buying Options
\$1,730,045.91 + \$3.99 shipping	New	Seller: profnath Seller Rating: ★★★★★ 93% positive over the past 12 months. (6,183 total ratings) In Stock. Ships from NJ, United States. See seller's shipping rates and return policy.	Add to Cart or Add to Cart to run on 1-Click ordering.
\$2,198,177.95 + \$3.99 shipping	New	Seller: borderbook Seller Rating: ★★★★★ 93% positive over the past 12 months. (123,891 total ratings) In Stock. Ships from United States. See seller's shipping rates and return policy. New item in excellent condition. Not used. May be a publisher overstock or even slight overstock. Satisfaction guaranteed!	Add to Cart or Add to Cart to run on 1-Click ordering.

Algorithmic Pricing and Competition: Empirical Evidence from the German Retail Gasoline Market

Stephanie Assad, Robert Clark, Daniel Ershov, Lei Xu

How A Book About Flies Came To Be Priced \$24 Million On Amazon

Two booksellers using Amazon's algorithmic pricing to ensure they were generating marginally more revenue than their main competitor ended up pushing the price of a book on evolutionary biology – Peter Lawrence's *The Making of a Fly* – to \$23,698,655.93. [partner id="wireduk"]The book, which was published in 1992, is out of print but is commonly [...]

Technology Rent Going Up? One Company's Algorithm Could Be Why.

by Heather Vogell, ProPublica, with data analysis by Haru Coryne, ProPublica, and Ryan Little

Oct. 15, 2022, 5 a.m. EDT

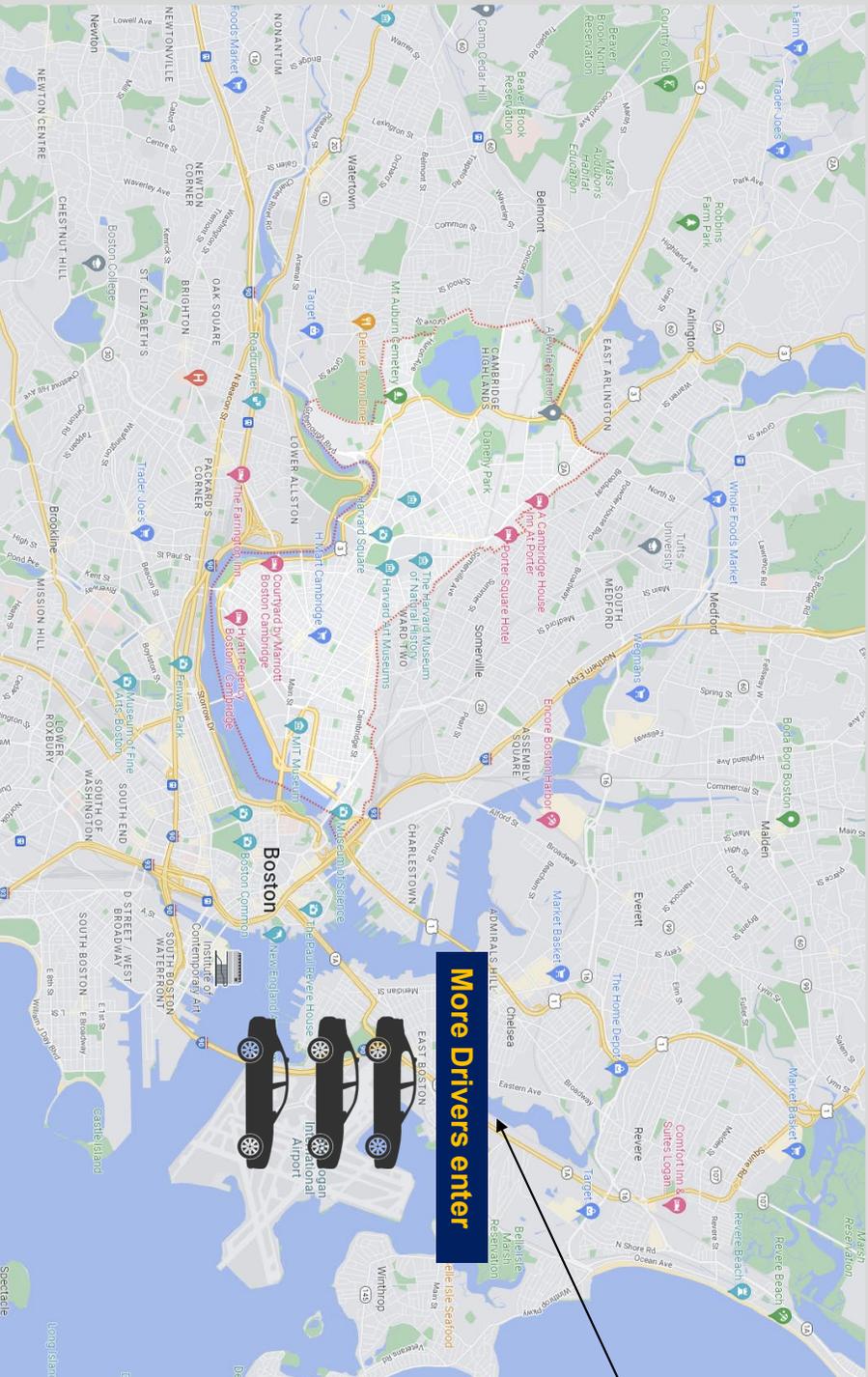
o M3AAWG Members

Learning to Collude – An Illustrative Example



Service #1

Demand drops



Service #2

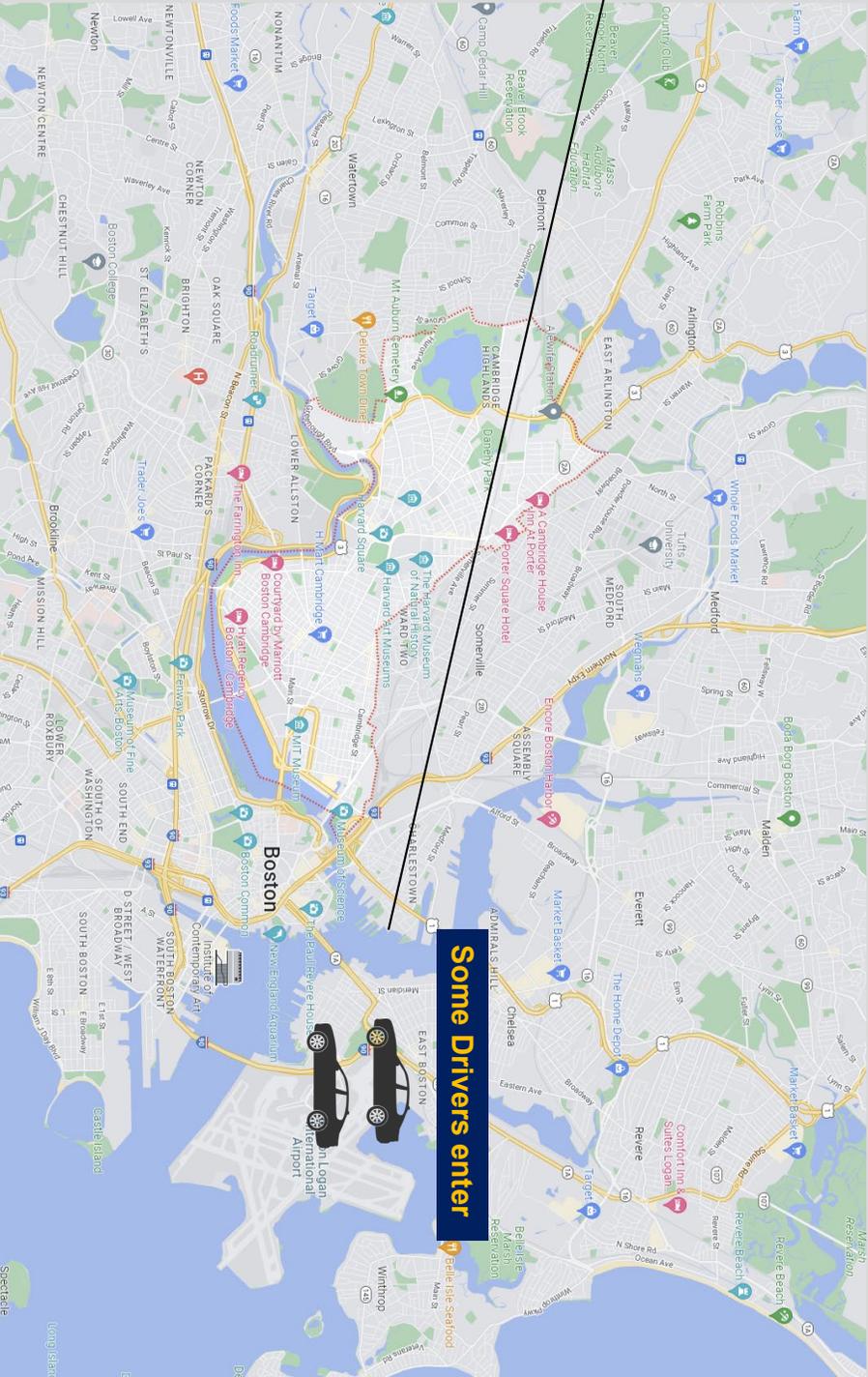
Prices go down
More Demand

Learning to Collude – An Illustrative Example



Service #1

• Price increase



Service #2

• Price Increase

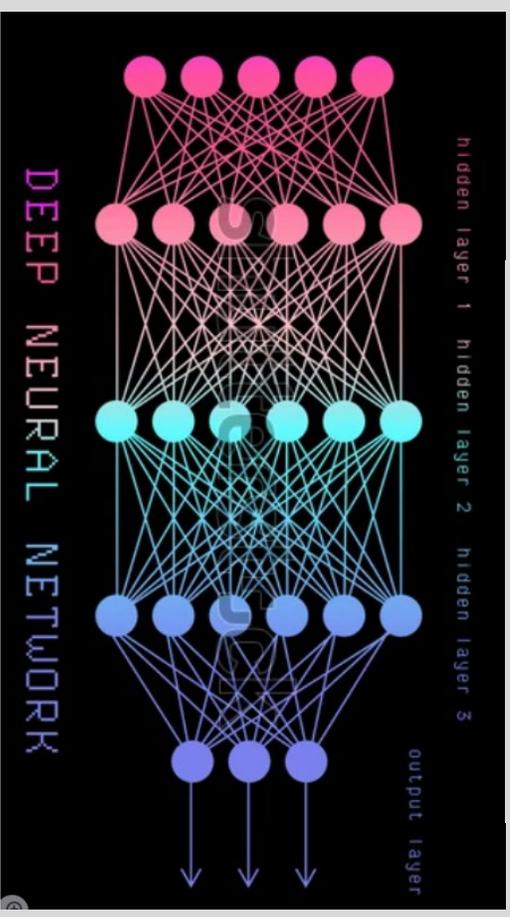


How do Machine Learning Algorithms Collude?

“Artificial Intelligence , Algorithmic Pricing and Collusion – Calvano et al. (2020)

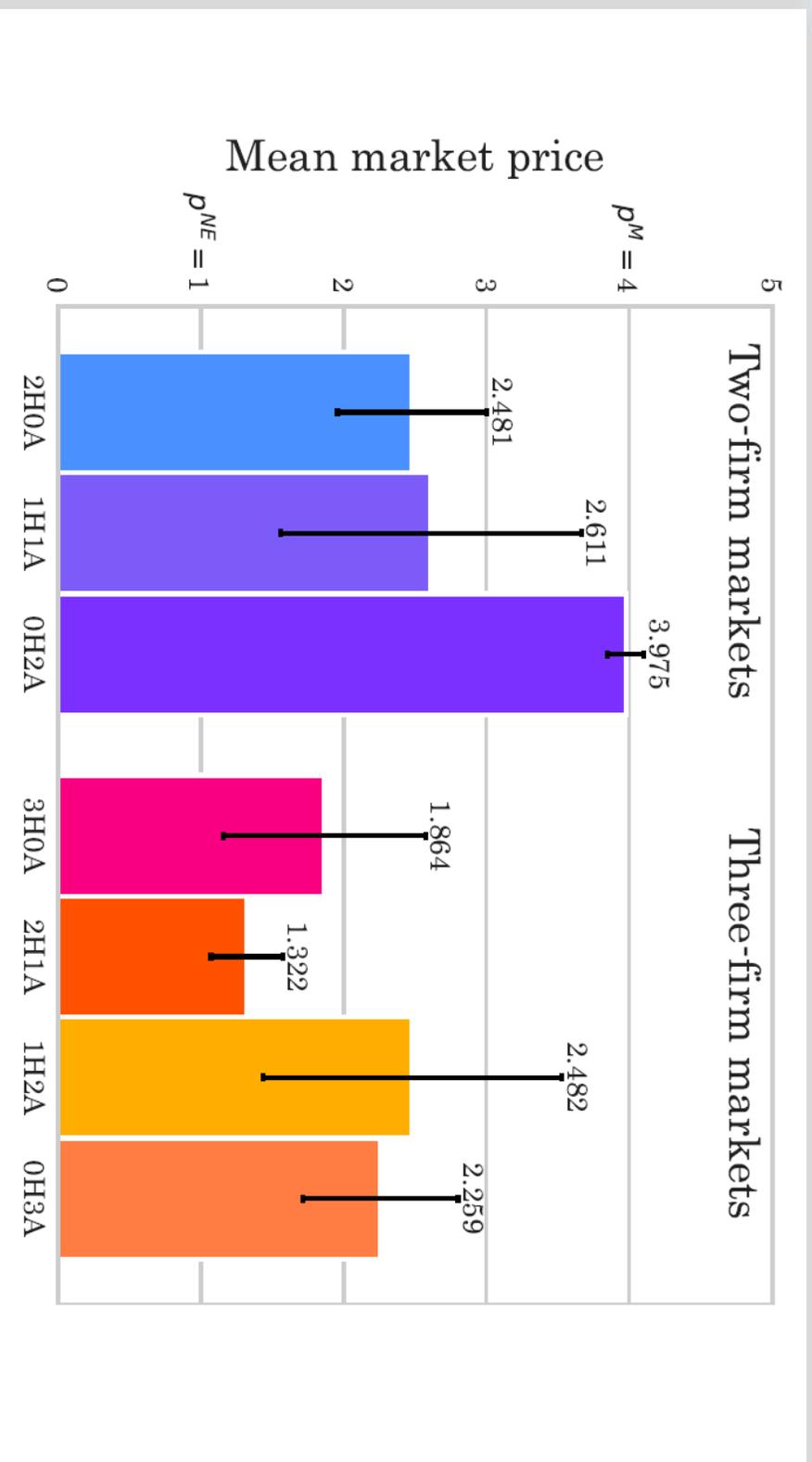
When researchers analyzed machine learning algorithms in tandem, they discovered something surprising

- **Setup:** Two neural networks that are deployed with the goal of maximizing profit and only have access to customer demand
- They unintentionally collude and raise prices
- This can happen with <1 year’s worth of data
- Extremely hard to detect if you only look at the outcome



The image shows two screenshots of an e-commerce product page for 'Urban Classics Men Hoodie Basic Tery in grey'. The price is €35.28. The first screenshot shows a red circle around the text '8 pieces sold in the last 24 hours' and an 'add to basket' button. The second screenshot shows a red circle around the text 'Currently in stock: 157' and an 'Add to Cart' button.

Learning to Collude – How Bad Does it Get?



Can we get ahead of algorithmic collusion?

The Basics:

More research on spotting collusive outcomes by comparing against counterfactuals

A New Hope

Research suggests that as the #algorithms increases beyond 2, level of collusion goes down

Localized Learning

The Amazon repricer tool **trusted** by more than 4,200 sellers across 20+

Amazon and eBay channels



UK, Germany, France, Italy, Spain, Netherlands, Sweden, Poland, Belgium | USA, Canada, Mexico, Brazil | Australia, Japan, India, Singapore, UAE, Saudi Arabia, Turkey, Egypt

Nightly price

Smart Pricing

Automatically adjust your price based on demand. Your price stays within the range you set, and you can change it at any time.



What is Smart Pricing?

Minimum price

Tip: \$125

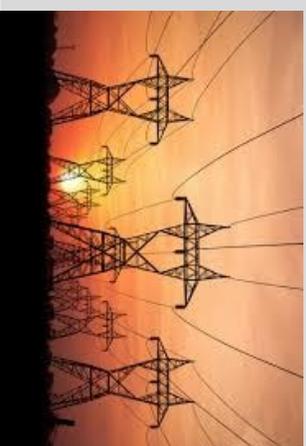
Maximum price

Tip: \$537



TESLA

Autobidder



Search Algorithms to the Rescue (yet again!)

- Redesign search algorithms to prioritize (even slightly) lower priced products

air fryer
Deliver to

RESULTS

Amazon's Choice

Sponsored

Ninja Foodi 6-in-1 8-qt. (7.6L) 2-Basket Air Fryer DualZone Technology, Match Cook & Smart...
★★★★★ 3,387
\$1,899
prime
FREE delivery Sun, Jan 22
Or fastest delivery Fri, Jan 20

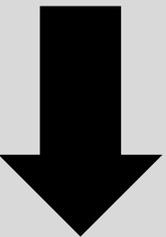
Bestseller

Sponsored

Cosori Proii Air Fryer Oven Combo, 5.8qt. Max XL Large Cooker with 12 One-touch Saveable Custom...
★★★★★ 13,042
\$1,749
prime
Save \$30.00 with coupon
FREE delivery Sun, Jan 22
Or fastest delivery Fri, Jan 20

T-Fal Air Fryer Essential, 3.2 Liter / 3.4 Quarts, 1500W, Air Fryer, Grill, Roast, Bake, Perfect Size, Oil-less...
★★★★★ 2,159
\$849
prime
FREE delivery Sun, Jan 22
Or fastest delivery Fri, Jan 20

Insuky Air Fryer XL 5.8QT. [2022 Upgraded] 11 in 1 Oilless Hot Air Fryers Oven, Easy One Touch...
★★★★★ 24,365
\$1,499
prime
Save \$30.00 with coupon
FREE delivery Sun, Jan 22
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air fryer
Deliver to

RESULTS

Amazon's Choice

Sponsored

Insuky Air Fryer XL 5.8QT. [2022 Upgraded] 11 in 1 Oilless Hot Air Fryers Oven, Easy One Touch...
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Bestseller

Sponsored

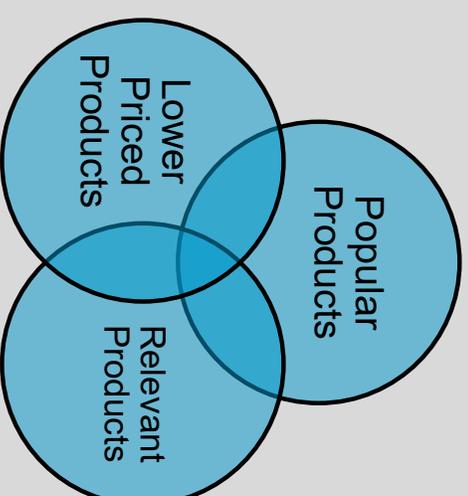
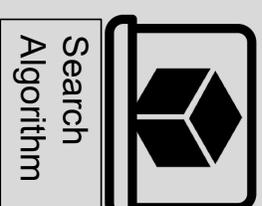
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Search Algorithms to the Rescue (yet again!)

- Redesign search algorithms to prioritize (even slightly) lower priced products

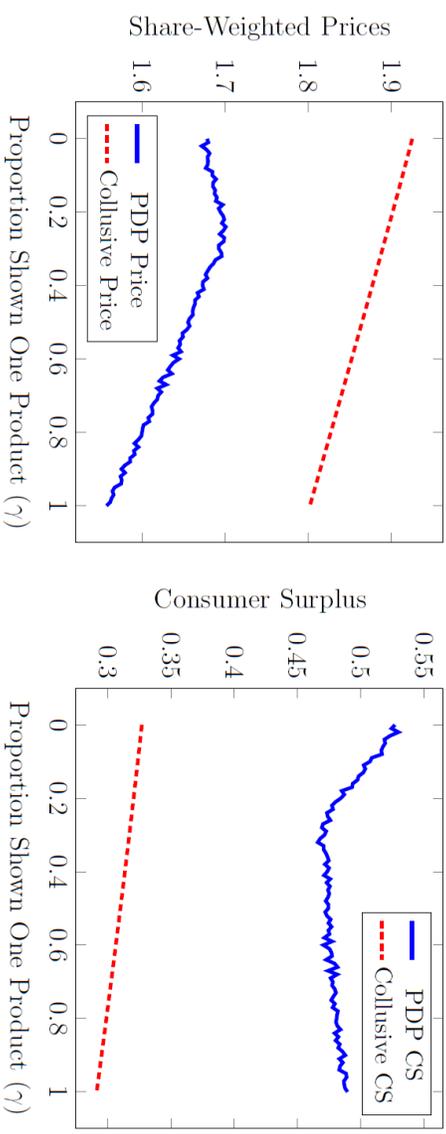
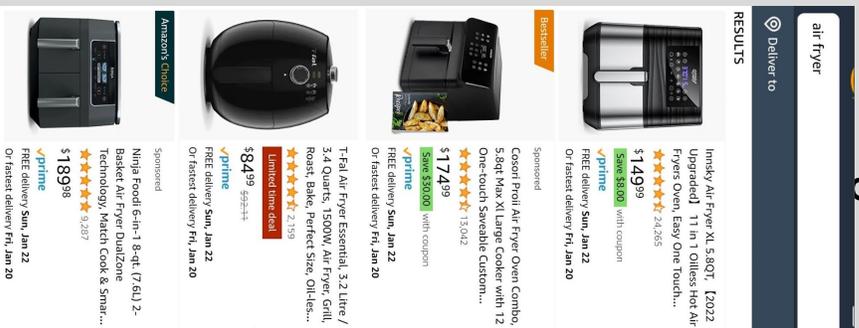


FIGURE 1. The effect of price-directed prominence on prices (left panel) and consumer surplus (right panel), with differentiation $\mu = 1/4$.

Too Much Fraud, Too Little Time

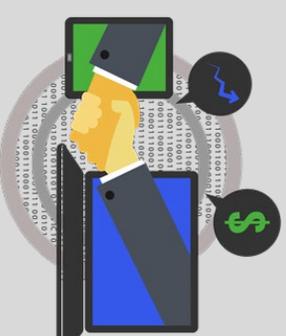
This Talk



1. Fake Reviews



2. Algorithmic Collusion



3. Disintermediation

What is Disintermediation?

- When a buyer and service provider decide to transact outside of the platform to avoid paying commission

WIRED | BACKCHANNEL | BUSINESS | CULTURE | GEAR | IDEAS | SCIENCE | SECURITY

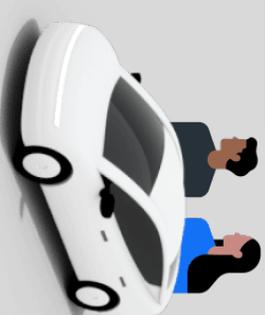
Why Homejoy Failed

Will the home-cleaning revolution be Uberified? One company tried, and spectacularly bombed.

- Empirical research* estimates that freelance platforms may be losing up to 25% of business due to disintermediation

* “Disintermediation evidence from a cleaning platform” — Karacaoglu et al. (2022)

Why don't you cancel your ride and pay me separately?

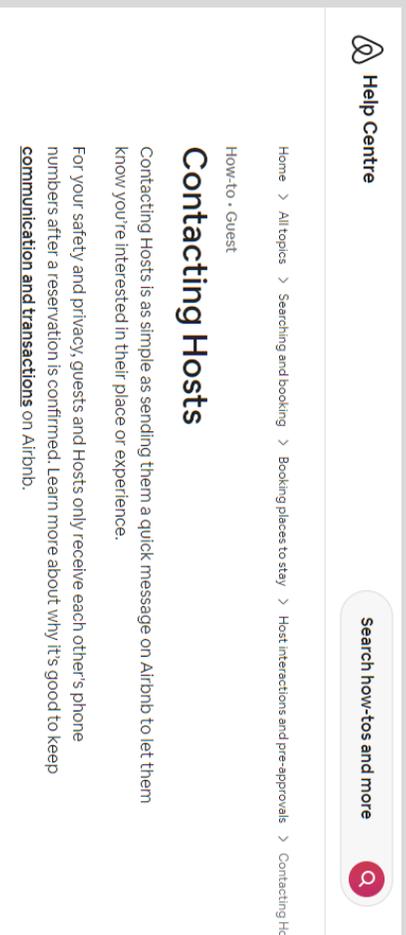


openbay

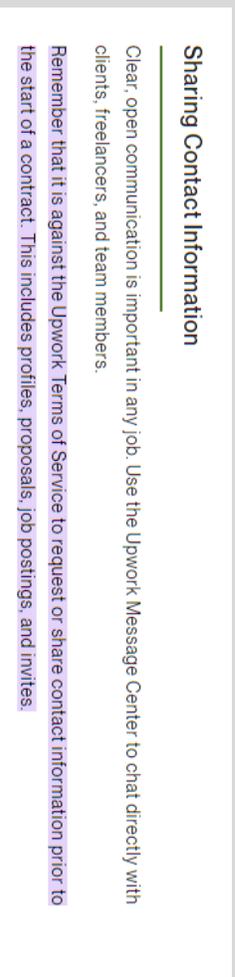
CEO Rob Infantino at
Harvard Digital Summit

“We worry about this problem every, single, day. [. . .] How do you prevent that from happening? You build value on both sides of the marketplace. But the point is, disintermediation is big; it's a big problem. And we are constantly fighting it. We are working on it . . . but that is a big, big problem for us!”

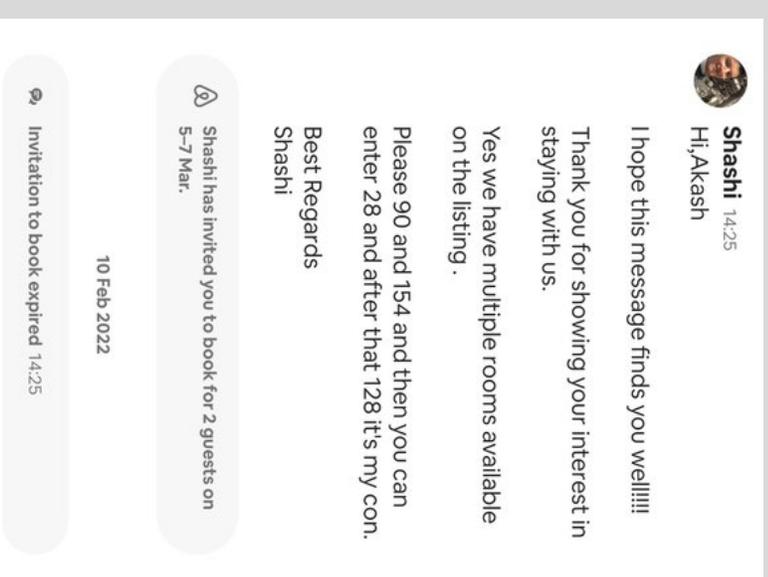
How Platforms Respond to Disintermediation?



The screenshot shows the Airbnb Help Centre page for "Contacting Hosts". The breadcrumb trail is: Home > All topics > Searching and booking > Booking places to stay > Host interactions and pre-approvals > Contacting Hosts > How-to - Guest. The article title is "Contacting Hosts". The text explains that contacting hosts is as simple as sending a quick message on Airbnb to let them know you're interested in their place or experience. It also notes that for safety and privacy, guests and hosts only receive each other's phone numbers after a reservation is confirmed. A link is provided to learn more about why it's good to keep communication and transactions on Airbnb.



The screenshot shows the Airbnb Help Centre page for "Sharing Contact Information". The article title is "Sharing Contact Information". The text states that clear communication is important in any job and that users should use the Upwork Message Center to chat directly with clients, freelancers, and team members. A key reminder is highlighted: "Remember that it is against the Upwork Terms of Service to request or share contact information prior to the start of a contract. This includes profiles, proposals, job postings, and invites."



The screenshot shows a message conversation from a user named Shashi (14:25, Hi, Akash). The message says: "I hope this message finds you well!!!!!! Thank you for showing your interest in staying with us. Yes we have multiple rooms available on the listing . Please 90 and 154 and then you can enter 28 and after that 128 it's my con. Best Regards Shashi". Below the message, a system notification states: "Shashi has invited you to book for 2 guests on 5--7 Mar." and "10 Feb 2022". At the bottom, another notification says: "Invitation to book expired 14:25".

- At least 5.4% of “potential” Airbnb transactions happen offline

The Unseen Effects of Disintermediation

Finding 1: Noisy Reviews

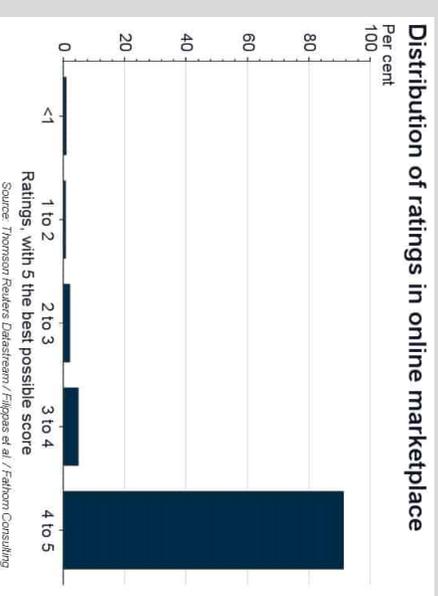
Platforms have no incentive to make their rating systems more accurate/informative.

Staying Safe on Upwork

Home / Trust & Safety / Scam Prevention and Online Safety

PRO TIPS

Never get paid or pay someone outside of Upwork. You may open yourself up to scams or fraud, and lose Upwork Payment Protection. Learn more here.



Finding 2: Risky Buyers/Sellers

Keeping buyer-seller trust low is in the best interest of the platform

Proactively Tackling Disintermediation

New Pricing Mechanisms

1. Platforms should move from commissions to charging upfront (e.g., subscriptions, access fees)
2. Our research suggests that charging upfront can cost platforms 10-20% revenue as not all service providers are willing to pay



T How much does Thumbtack cost?

Leads
You auto-pay for leads that match your targeting preferences and you can check your targeting prices page for a breakdown of what you'll pay.

Opportunities
All opportunities show prices upfront and you only pay if a customer responds after you've expressed interest in their job.



Driver products
Welcome to the 0% service fee with Uber's Go Pass. **UB**

Proactively Tackling Disintermediation

PLATFORMS ARE PUSHING INSTANT BOOKING ^x



Book your trip instantly

Refine your search to homes you can book instantly.
With Instant Book, it's easier to make a reservation
because you don't need to wait for host approval.

Show Instant Book Listings

Reduce Friction

1. The introduction of instant booking reduced disintermediation on AirBnB by at least 9%

People are willing to pay a premium for convenience!

Too Much Fraud, Too Little Time



This Talk

1. Fake Reviews

FTC Sues Owner of Online Dating Service Match.com for Using Fake Love Interest Ads To Trick Consumers into Paying for a Match.com Subscription

2. Algorithmic Collusion

**Streaming Farms:
How Big Artists and
Labels Fake Their
Streaming Numbers**

Researchers Accuse Uber Drivers Of Colluding And Gaming The System To Jack Up Fare Prices In Major Cities

3. Disintermediation

I got SCAMMED on Kickstarter...

 **Austin Evans** ✓
5.35M subscribers

[Subscribe](#)

FINIT – shreyas.sekar@rotman.utoronto.ca



Which of these two hotel reviews is deceptive opinion spam?

Date of review: Jun 9, 2006

4 people found this review helpful

I have stayed at many hotels traveling for both business and pleasure and I can honestly say that The James is tops. The service at the hotel is first class. The rooms are modern and very comfortable. The location is perfect within walking distance to all of the great sights and restaurants. Highly recommend to both business travellers and couples.

Date of review: Jun 9, 2006

4 people found this review helpful

My husband and I stayed at the James Chicago Hotel for our anniversary. This place is fantastical! We knew as soon as we arrived we made the right choice! The rooms are BEAUTIFUL and the staff very attentive and wonderful!! The area of the hotel is great, since I love to shop I couldn't ask for more!! We will definatly be back to Chicago and we will for sure be back to the James Chicago



@Gaffetheory

www.sekarshre.github.io