

# **Game Theory and Auction Design in Online Advertising:**

**Past, present, and conjectures about the future**

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**Stanford Graduate School of Business**

**New Economic School, December 9, 2021**

## The first online ad (October 27, 1994)



- Not directly relevant to the user's current activity/request/search
- Similar to newspaper ads, TV ads, billboards, etc.
- "Display ad"

# Sponsored listings – GoTo.com (1997)

The screenshot shows a Netscape browser window with the following elements:

- Browser Interface:** Netscape Communicator 4.05. Address bar: <http://www.go.to/d/search/p/befree/?Promo=befree003125820134891576256&Promo=befree&Keywords=lactose+intolerance>. Navigation buttons: Back, Forward, Reload, Home, Search, Netscape, Print, Security, Shop, Stop.
- Search Bar:** GoTo logo, search input field containing "lactose intolerera", and a search button.
- Advertisements:** Capital One advertisement for a 0% intro + 9.9% fixed APR Visa card with 60-sec responses.
- Search Results:** "You searched for **lactose intolerance**." Search Tips link.
- Sponsored Listings:**
  - No More Lactose Intolerance!**  
Try Sammi's best whey and rice. For anyone with lactose intolerance this is it! 75% less lactose, with Acidophilus and bifidus bacteria. Buy factory direct with free shipping.  
[www.bestlifeint.com](http://www.bestlifeint.com) (Cost to advertiser: \$0.30)
  - Lactose Intolerance: Whey Drinks**  
Lactose intolerance: Swiss Whey Powder. Delicious, natural, refreshing and easy to mix. Low in lactose. Great for beverages, cooking. 5 year shelf life. Money back guarantee. Mix to taste.  
[www.galavymail.com](http://www.galavymail.com) (Cost to advertiser: \$0.07)
  - Hocks.com Lactose Intolerance Products**  
Hock's online discount pharmacy is your source for lactose intolerance products and smoking aids and more! Hock's pharmacy is quality and service at competitive prices!  
[www.hocks.com](http://www.hocks.com) (Cost to advertiser: \$0.06)
  - Sport Drink for Lactose Intolerant**  
The GPush Web site provides information on nutrition in endurance sports. GPush sports drinks are scientifically formulated with galactose which is fine for lactose intolerance.  
[www.gpush.com](http://www.gpush.com) (Cost to advertiser: \$0.02)
  - Gluten Solutions Foods**  
If you have lactose intolerance, then you may also have other food intolerances that make you ill -- find out once and for all!  
[www.glutensolutions.com](http://www.glutensolutions.com) (Cost to advertiser: \$0.04)
- Sidebar (Left):** Navigation links: Computing, Education & Career, Entertainment, Finance, Health, Homelife, Reference, Shopping, Travel. Promotion: "Access 75% of all users now! Premium Listings reach 75% of all Internet users. Sign up for Premium Listings today!"

# Sponsored listings before the Internet: Yellow Pages



To advertise call 800-851-REAR (800-851-7272)

**P 106 PLUMBING CONTRACTORS**

### DISCOUNT PLUMBING & ROOPER CO.

**Clean Quality Service At Reasonable Prices**  
All Work Guaranteed In Writing

#### COMPLETE SEWER & DRAIN REPLACEMENT

- Apartments / Commercial • Disposal • Faucets & Toilets
- Water Heaters • Main Water Lines
- Video Pipe Inspection • Water Jetting
- Copper Repipes • Senior Discount
- Trenchless Sewer Line Replacement
- Management Company Specialists

**Free Video Inspection With Repair**  
"We find problems before they happen, and fix problems others couldn't find."  
**Call & Compare Our Low Rates**  
**650-549-1258**  
www.discountplumbingandrooper.com  
Atherton • Palo Alto • Redwood City • San Mateo • ML View  
Los Altos • Belmont • Foster City • Sunnyvale  
Surrounding Areas

### ECONOMY PLUMBING

SEWER & DRAIN CLEANING  
**WATER HEATERS**

ASK ABOUT  
**\$48.88**  
SENIOR SPECIAL  
Free Estimate

- KITCHEN SINK BACK-UPS CLEARED • SEWER BACK-UPS ROOTER & CLEANED
- UNDERGROUND WATER PIPES - Meter to house, minimal lawn damage, FULLED IN PLACE OF OLD
- SEWERS REPAIRED OR REPLACED (Trenchless) • 24/7 - Night & Weekends - NO EXTRA CHARGE
- FAST SERVICE - Quality on the job while you're in.
- WATER DETECTOR - Pipe locating using high pressure water
- TV VIDEO INSIDE PIPE INSPECTION - Same as televising, except for camera

**650 756-5100**

### B G Plumbing

Serving San Mateo County

Backflow Services • Drain Installation  
Emergency Services • Faucet Repair • Gas Line Services  
Electric Water Heater Repair • Gas Water Heater Repair  
Hot Water Recirculation Pump Repair  
Sump Pump Repair • Tankless Water Heater Repair  
Pipe Installation • Sewer Services  
Sink Repair • Toilet Repair • Water Heater Installation  
Bathroom & Shower Repair • Drain Cleaning

Free Estimates  
Family Owned And Operated  
License #1567590  
**650-481-8052**

Plumbing Contractors  
**ARS/RESCUE ROOPER**

Making it work. Making it right.

- 24/7 Emergency Service Available
- Plumbing, Pipes & Fixtures
- Sewer & Drain Clearing
- Water Heaters

\*Additional Charges May Apply  
License # Rescue Rooter 780133, ARS 70133  
Call 800 298-8082

Please See Ads on Pages 92 and 93

**B G Plumbing**  
2110 Tammini Court Tracy ..... 650 481-8052  
Please See Advertisement This Page

**Bay Area Plumbing & Heating**  
861 Caricos Plumbing ..... 650 701-1560  
924 Fremont Wy S C ..... 650 366-9056  
Boudreau Plumbing & Heating Inc.  
868 Warrenton Ave R ..... 650 368-3338  
Boudreau Plumbing and Heating Inc.  
868 Warrenton Ave C ..... 650 366-3391  
Boudreau Plumbing & Heating Inc.  
From Palo Alto Telephones Call ..... 650 327-4529  
From Redwood City Telephones Call ..... 650 369-4053

**Buckley Patrick Plumbing**  
2277 National Ave Bay ..... 650 363-2461  
Buckley Patrick Plumbing ..... 650 363-2471  
2277 National Ave Bay ..... 650 369-0294  
**Courtsil Mike Plumbing Inc**  
1777 Diotale Vi S ..... 650 926-9400

**County Consumer Plumbing Service & Repair Group** ..... 650 434-3749  
Please See Advertisement Page 104

**DISCOUNT PLUMBING & ROOPER COMPANY**

COMPLETE SEWER  
DRAIN  
REPLACEMENT  
WATER DAMAGE  
**CALL & COMPARE OUR LOW RATES**  
MANAGEMENT COMPANY SPECIALISTS  
CLEAN QUALITY SERVICE  
AT REASONABLE PRICES  
ALL WORK GUARANTEED IN WRITING  
• VIDEO PIPE INSPECTION  
• WATER JETTING  
COMPLETE PLUMBING REPAIRS!  
**650 549-1258**  
www.discountplumbingandrooper.com  
CA State Lic # 651367 C36, B, A  
**650 549-1258**

**Discount Plumbing & Rooter Company**  
1330 Valera Rd Redwood City ..... 650 369-8400  
Please See Ads on Pages 96, 97 and 106

The Real Yellow Pages®

**DITTMANN PLUMBING INC.**

Backflow Testing & Repair  
Water Heater Replacement  
Find & Repair Gas Leaks  
Sewer & Drain Cleaning  
**650-980-9741**  
www.dittmanplumbing.com  
941 S Claremont St San Mateo

Drain Busters Plumbing ..... 650 344-6880  
Drain Busters Plumbing ..... 650 344-6881  
Drain Doctor ..... 650 369-0790

Please See Ads on Pages 100 and 101

**Economy Rooter** ..... 650 330-0049  
Please See Ad on Previous Page

**Economy Rooter Dollar Rooter Sewer & Drain**  
164 Grand Ave ..... 650 365-1515

**GoGo Rooter** ..... 408 282-7027  
San Jose

Please See Advertisement Page 102

**Guy Plumbing & Heating**  
1245 E Camino Real Milpitas ..... 650 854-4221  
**Hansen A G Plumbing** ..... 650 323-4138  
**J & R Plumbing Inc** ..... 650 322-3001

**Larry's Plumbing**  
119 Montgomery Ave S B ..... 650 249-1200  
**Main Line Plumbing California** ..... 650 572-7434  
**Mr Rooter Plumbing of Palo Alto**  
..... 650 366-4255

**Parlat Plumbing**  
P O Box 138 Piedra ..... 650 879-1526  
**Pro Plumbing** ..... 650 369-9015  
**Pro-Plumbing** ..... 650 494-1872  
**Pro Plumbing**  
1121 Jefferson Ave R C ..... 650 494-1664  
650 328-2290  
**Quality Plumbers** ..... 888 929-4376

**Rooter Hero** ..... 650 325-3806  
Please See Ads on Pages 94, 95 and 100

**Roto Rooter 321 Hamilton P A** ..... 650 325-3806  
**Roto Rooter 321 Hamilton P A** ..... 650 325-3806  
**Roto Rooter 321 Hamilton P A** ..... 650 325-3816  
**Roto Rooter 1198 Jefferson Ave R** ..... 650 365-3302

**ROTO-ROOPER PLUMBING**  
DRAINS & WATER CLEANUP

COMPLETE PLUMBING & DRAIN CLEANING SERVICE  
24 HOURS/7 DAYS A WEEK  
650 391-2481  
Please See Ads on Pages 90, 91 and 104

**Rountree Plumbing & Heating Inc**  
801 Industrial Rd S ..... 650 298-0300  
**Shore Way Plumbing** ..... 650 322-9019  
**Shoreway Plumbing Inc**  
639 Bayshore Rd Ste 512 E ..... 650 257-3153  
**Superior Design Plumbing**  
431 Redwood Blvd R C ..... 650 779-4433  
**THOMAS PLUMBING** ..... 650 321-1247  
www.SargeesPlumberContractors.com

**Triple A Plumbing Services**  
408 727-0107  
Please See Ads on Pages 98 and 99

**24/7 Rooter & Plumbing**  
..... 415 586-6851  
Please See Advertisement Page 105

**Wide Plumbing And Heating Inc**  
..... 650 367-7388

**Plumbing Drain & Sewer Consultants**  
**Discount Plumbing And Rooter Co**  
1330 Valera Rd R C ..... 650 364-6334



# Sponsored listings before the Internet: Slotting Fees/Endcaps



# Sponsored Search

Automated system introduced by GoTo in 1997:

- Advertisers bid on specific keywords
- Bids remain in the system, can be changed at any time
- When a user searches for a particular term, ads for that keyword are shown to him/her next to “organic” results

GoTo/Overture/Yahoo! auction design (until ~2003)

“Generalized First-Price Auction”:

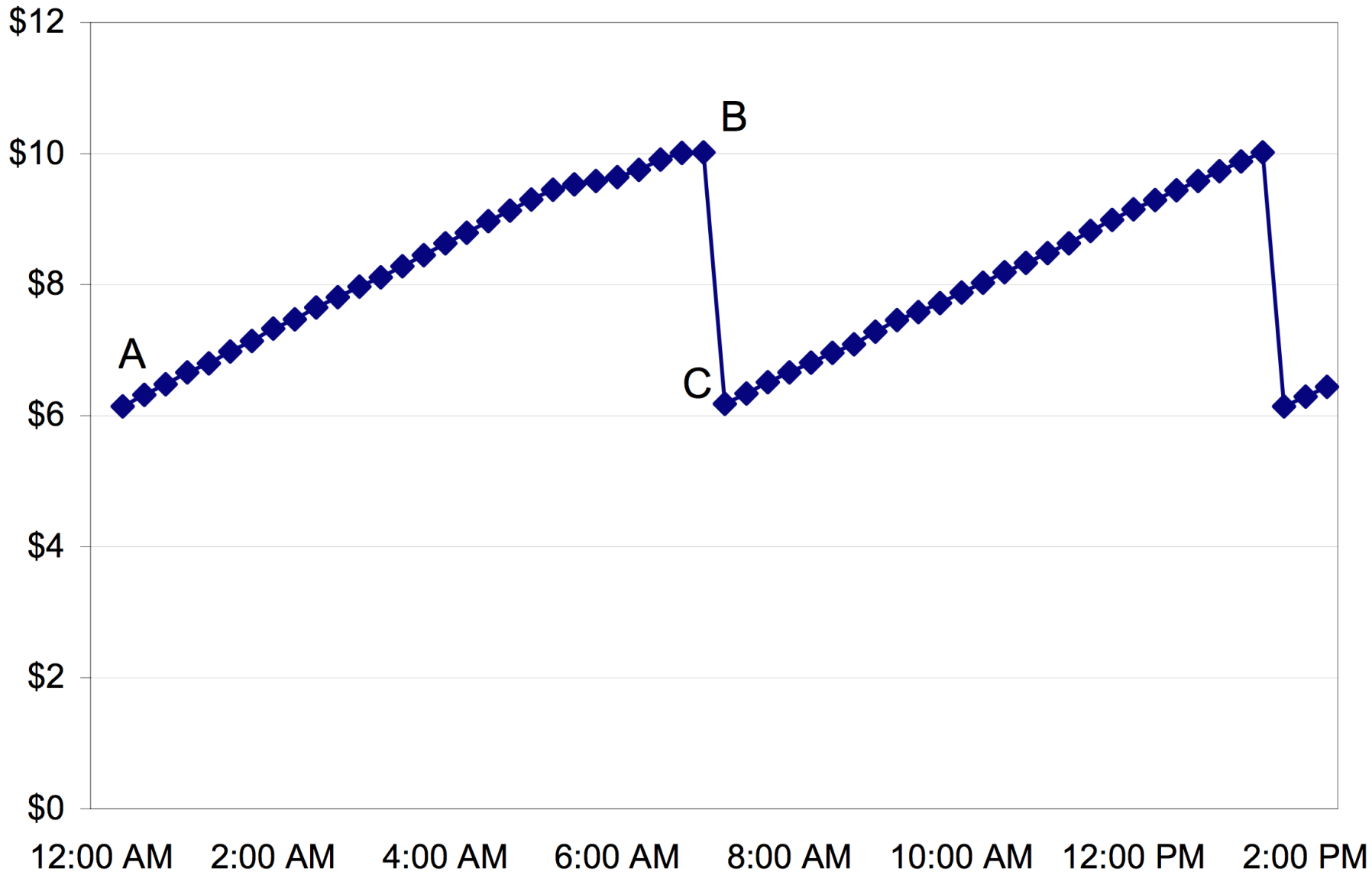
- Ads are shown in the descending order of the bids
- Pay-per-click: if an ad is clicked, the advertiser pays his or her bid
- Current bids are publicly observable

## Problem

In the Generalized First-Price Auction, a pure strategy equilibrium generally does not exist.

### Example

- Two bidders, each has value \$10 per click.
- Two positions. Top position gets 20 clicks per hour, bottom one gets 10
- Best response (for bidder 1):
  - If  $b_2 < \$5.00$ ,  $BR(b_2) = b_2 + \$0.01$
  - If  $b_2 \geq \$5.00$ ,  $BR(b_2) = \$0.01$







# Generalized Second-Price Auction

Introduced by Google in 2002, later adopted widely, currently most common format

- Per-click bids are multiplied by the estimated probability of a click (pCTR), ranked accordingly
- Pay the smallest amount needed to win the slot (e.g., if all advertisers' pCTRs are the same, pay the bid of the *next* highest bidder)

## Generalized Second-Price Auction – intuition

Suppose there is only one advertising slot on the page, and it receives 10 clicks per hour.

Suppose you are an advertiser, and you value each click at \$7.00. How much should you bid in this auction?

**Answer:** the optimal bid is \$7.00, regardless of what others are bidding.

(With one slot, GSP is truthful, aka incentive compatible)

# Generalized Second-Price Auction with multiple slots

## Example

- Two positions. Top position gets 20 clicks per hour, bottom one gets 10
- Three bidders. Their values per click are \$10, \$8, and \$1.

Question: Is it an equilibrium for each bidder to bid his or her true value?

Answer: No! For bidders 2 and 3, it is indeed optimal to bid truthfully (given the bids of others). However, that is not the case for bidder 1:

- If he bids truthfully, his profit is  $20 * (\$10 - \$8) = \$40$  per hour.
- If instead he bids, say, \$5, his profit will be  $10 * (\$10 - \$1) = \$90$  per hour

# Generalized Second-Price Auction with multiple slots

## Example

- Two positions. Top position gets 20 clicks per hour, bottom one gets 10
- Three bidders. Their values per click are \$10, \$8, and \$1.

Question: Is there a stable equilibrium?

Answer: Yes! E.g., the following profile of bids is an equilibrium:

- Bidder 3 bids \$1
- Bidder 2 bids \$4.50
- Bidder 1 bids anything greater than \$4.50



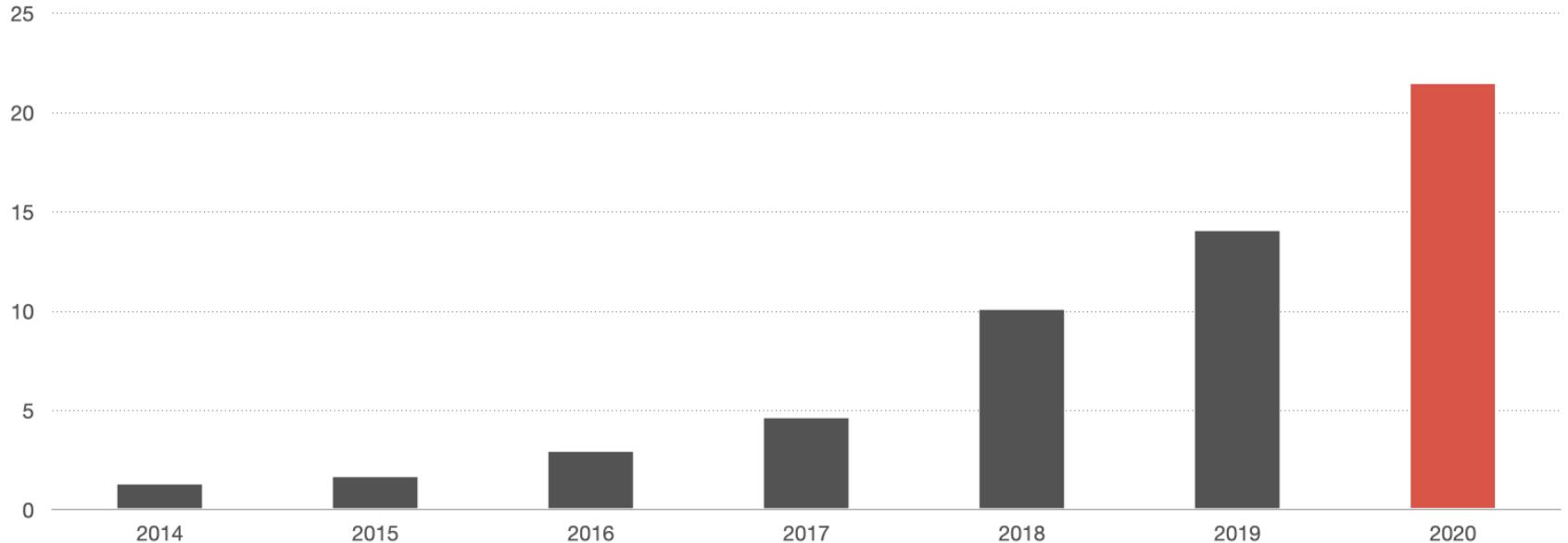
# Sponsored Search with Generalized Second-Price Auction

- Wildly successful, often substantially outperforming initial expectations.
- Initially, Google reserved the most valuable real estate (top of the results) to “Google Premium Sponsorships,” with auction-based AdWords relegated to the much less desirable right side of the page.
- Message to Premium advertisers just a few months after AdWords launched: “In 2002 we introduced our cost-per-click (CPC) ad program, Google AdWords. Because of market response, we believe this CPC model is the one that yields the best results for advertisers. [...] You can expect to make this transition to Google AdWords with informed and responsive customer service.”
- Adopted by search engines worldwide

# Beyond sponsored search: promoted listings in E-Commerce

- Amazon started experimenting with advertising in 2003.
- Struck gold after about a decade and many experiments and detours.
- Digital “slotting fees” and “endcaps”!

Amazon ‘Advertising & other’ revenue (\$bn)



## Beyond sponsored search: promoted listings in E-Commerce

- “Many investors likely recognize **Alibaba** as the largest e-commerce and cloud company in China. However, it also leads China's digital advertising market with a 33% share of revenue in the first half of 2019. A large percentage of Alimama's ad revenue comes from Taobao and Tmall, which let merchants promote their product listings via CPC (cost-per-click) bidding platforms.”
- “On [Jan 3, 2020], **Walmart** Media Group (WMG), the retail giant’s advertising arm, released a self-serve portal so advertisers can directly buy on-site search and sponsored product ads on walmart.com.”
- Feb 4, 2019: “Online furniture retailer Wayfair is opening up sponsored products to all [...] Brands can bid to promote certain SKUs within certain categories. The pay-for-performance set up means they pay for clicks. The tool is self-service.”

# Beyond sponsored search: promoted listings in E-Commerce

- **Target**
- **Kroger**
- **Albertson's/Safeway**
- May 27, 2020: “Online grocery company **Instacart** launched a self-serve advertising platform that lets marketers promote products in search results. Brands can choose the products they want to promote, set a budget and pay when users engage with those products.”
- Aug 31, 2020: “**Uber Eats** today announced its first in-app advertising format, giving restaurants a way to promote their menu offerings. [...] With Uber Eats' cost-per-click pricing model, restaurants only pay when an app user clicks on the sponsored listing. The self-serve ad platform lets restaurants target their ads based on the location, order history and dietary preferences of Uber Eats customers.”

## Observation: strategic considerations (more game theory!)

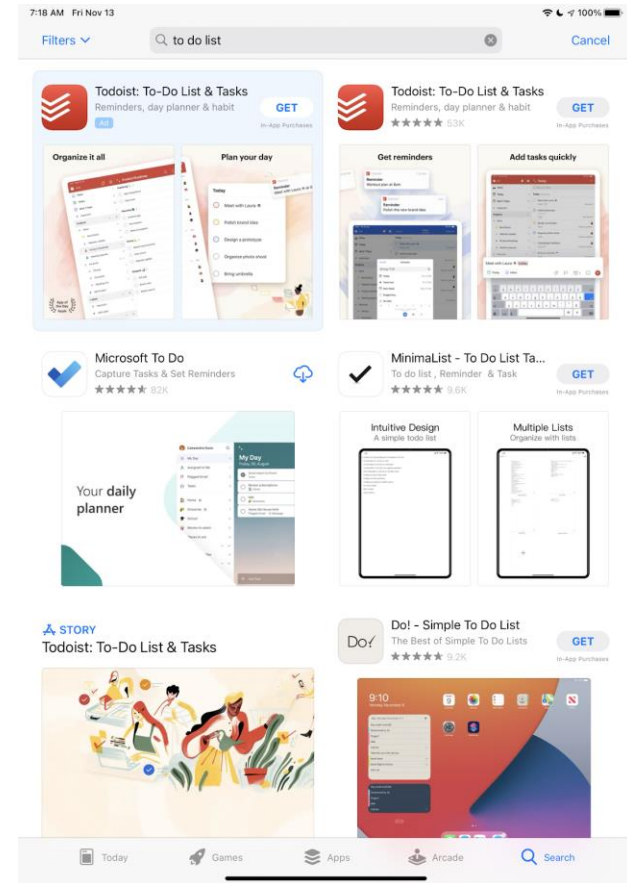
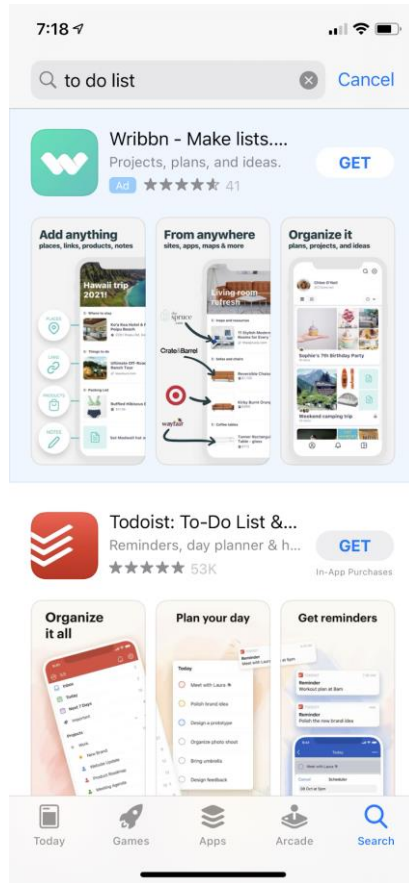
- Making substantial profits from a sponsored listings platform allows a retailer a greater flexibility in dealing with suppliers, and also allows them to charge lower prices to customers (either uniformly across all products, or for strategically chosen products and verticals).
- In particular, if retailer A has a successful sponsored listings platform, while retailer B does not, retailer A can undercut retailer B's prices - and retailer B cannot respond unless they have their own sponsored listings platform.
- Which means ...



# Applicability

- Sponsored search (Google, Bing, etc.)  $\approx$  Yellow Pages
- Sponsored products (E-commerce)  $\approx$  Endcaps and slotting fees
- .....
- The idea of sponsored listings is applicable to **any website or app** with a **search box** (or **search through categories, taxonomy, or navigation**; or another type of **ordered list**) and “results” of that search that are interested in being shown to the end user and are thus willing to pay to be shown more prominently.

# App Stores



## Job search sites

- **Indeed.com** Sponsored Jobs
- **ZipRecruiter** TrafficBoost
- .....
- **Works in both directions!** -> **Fiverr** Promoted Gigs

# Travel

**Search**

Destination/property name:

Check-in date

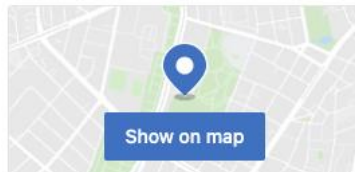
Check-out date

1-week stay

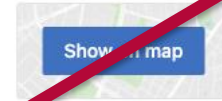
I'm traveling for work

Stay flexible with free cancellation. [Read more.](#)

Only show properties with free cancellation

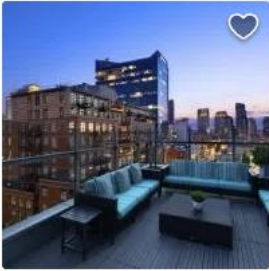


## San Diego: 296 properties found



- Top picks for long stays
- Entire homes & apartments
- Price (lowest first)
- Review Score & Price
- Genius
- ...

Prices shown are for your 7-night stay

 **Hotel Indigo San Diego Gaslamp Quarter, an IHG Hotel** Promoted

**Very Good 8.5**  
1,323 reviews  
**Comfort 8.9**

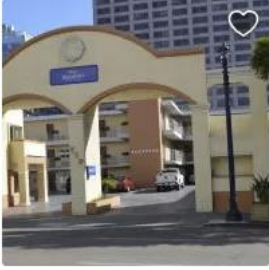
[Downtown San Diego, San Diego](#) · [Show on map](#) · 1,650 feet from center

Booked 2 times for your dates in the last 6 hours

**King Room** – 2 people  
1 king bed

**FREE cancellation • No prepayment needed**  
You can cancel later, so lock in this great price today!

1 week, 2 adults  
**\$1,028**

 **Baymont by Wyndham San Diego Downtown** Genius

**Good 7.6**  
2,246 reviews

[Downtown San Diego, San Diego](#) · [Show on map](#) · 2,950 feet from center

Booked 2 times for your dates in the last 24 hours

**Queen Room with Two Queen Beds - Non-Smoking** – 2 people  
2 queen beds

**FREE cancellation • No prepayment needed**  
You can cancel later, so lock in this great price today!

1 week, 2 adults  
~~\$718~~ **\$640**

## Many other examples

- Yelp, OpenTable, TripAdvisor
- Gartner Digital Markets (Capterra, GetApp, SoftwareAdvice)
- eBay Promoted Listings
- Etsy (arts and crafts)
- Shopify App Store Ads (launched in 2020)
- Zocdoc
  
- ..... and this is just in the US!



# What makes sponsored listings so successful?

Main reason:

*In Sponsored Listings, ads are for items that a user is actively looking for, so relevance is greatly improved and the performance of ads is high.*

Benefits to all three groups of constituents:

- The marketplace running sponsored listings
- Vendors
- Customers

## Benefits to the marketplace

Flexible, profitable, self-equilibrating monetization lever

Gives freedom to adjust other monetization levers – lower prices (sometimes to zero), eliminate or reduce listing fees, commissions, etc.

Strategic benefit

Attracting more vendors

Users remain on the platform after clicking on the ad (in many cases)

## Benefits to the vendors

Allows to drive demand in a controlled manner

Allows new providers to increase the speed of growth on the platform via “costly signaling”

Allows existing providers to quickly ramp up demand for new products

## Benefits to the customers

Crucially, fundamentally different from mostly irrelevant display ads

Research shows that customers are **more** likely to click on top listings when they are marked as sponsored, promoted, etc.

- Milgrom and Roberts (JPE 1986), “Price and Advertising Signals of Product Quality”
- Sahni and Nair (REStud 2020), “Does Advertising Serve as a Signal? Evidence from Field Experiments in Mobile Search”

Benefits to the marketplace and vendors translate into better experience for the customers (lower commissions and prices, better variety)

**So, what about the future?**

## Privacy considerations

Sponsored listings are *much* better adapted to the upcoming privacy-first world than display ads, because so much information is contained in user intent.

So advertising budgets may shift from the latter to the former.

## Auction format

Increasing adoption of *autobidding*: an advertiser specifies the overall budget and high-level goals, and the platform takes care of the rest.

Ideal for many advertisers, especially *small ones*.

Fascinating use case: Etsy – “How We Built A Context-Specific Bidding System for Etsy Ads” (2021), <https://codeascraft.com/2021/03/23/how-we-built-a-context-specific-bidding-system-for-etsy-ads/>

## Auction format – alternatives to GSP?

- Incentive-compatible alternative to GSP – the Vickrey-Clarke-Groves mechanism:

[yandex.com/support/direct/technologies-and-services/vcg-auction.html](http://yandex.com/support/direct/technologies-and-services/vcg-auction.html)

<https://www.wired.com/2015/09/facebook-doesnt-make-much-money-couldon-purpose/>

- ***Whole page optimization***: the best combination (and layout) of ads vs. organic results, taking various tradeoffs into account.



# Ad listing format

**P 106 PLUMBING CONTRACTORS**

**DISCOUNT PLUMBING & ROOPER CO.**  
**Clean Quality Service At Reasonable Prices**  
 All Work Guaranteed In Writing

**COMPLETE SEWER & DRAIN REPLACEMENT**

- Apartments / Commercial • Disposal • Faucets & Toilets
- Water Heaters • Main Water Lines
- Video Pipe Inspection • Water Jetting
- Copper Re-pipes • Senior Discount
- Trenchless Sewer Line Replacement
- Management Company Specialists

**Free Video Inspection With Repair**

*"We find problems before they happen, and fix problems others couldn't find."*

**Call & Compare Our Low Rates**  
**650-549-1258**

www.discountplumbingandrooper.com  
 Atherton • Palo Alto • Redwood City • San Mateo • Mt. View  
 Los Altos • Belmont • Foster City • Sunnyvale  
 Surrounding Areas

CA State Lic # 651367 C36, B, A

**ECONOMY PLUMBING**  
**SEWER & DRAIN CLEANING**  
**WATER HEATERS**

**45% OFF** **\$48.88**  
 Senior Special  
 Free Estimate

- KITCHEN SINK BACK UPS CLEANED • SEWER BACK UPS NOTED & CLEANED
- SODIUM HYPOCHLORITE WASH PIPES - Water is heated, neutralizer added, PULSED IN PLACE O.D.O.
- SEWERS REPAIRED OR REPLACED (Overseas) • 24 Hr. Nights & Weekends - NO EXTRA CHARGE
- FREE SERVICE - Quality job in 90 minutes • NOBB AFTER - Free money saving high pressure water
- LEAK VIDEO INSIDE PIPE INSPECTION - Soak & solvent, repair the camera

**650 756-5100**

CA State Lic # 651367 C36, B, A

**B G Plumbing**  
 Serving San Mateo County

Backflow Services • Drain Installation  
 Emergency Services • Faucet Repair • Gas Line Services  
 Electric Water Heater Repair • Gas Water Heater Repair  
 Hot Water Recirculation Pump Repair

Sump Pump Repair • Tankless Water Heater Repair  
 Pipe Installation • Sewer Services  
 Sinks Repair • Toilet Repair • Water Heater Installation  
 Bathbath & Shower Repair • Drain Cleaning

Free Estimates  
 Family Owned And Operated  
 License #10073407

**650-481-8052**

Ad · <https://www.geico.com/> ▾

## GEICO Car Insurance - Get a Free Rate Quote

In just 15 minutes, you could save \$500 or more on car insurance. Get a quote!

### Get a Quote

Looking For Low Cost Car Insurance?  
 Try GEICO. Get a Free Quote Now!

### Changes in Your Life

Marriage? Move? Big things in your  
 life could also mean big savings

### 75 Years of Savings

What does a company with that  
 history offer? Dependability

### Why Customers Love GEICO®

See What Our Customers  
 Have to Say

Ad · <https://www.progressive.com/> ▾

## Progressive® Auto Insurance - Switch & Save \$700+ on Avg/Yr

4 out of 5 New Customers Recommend Progressive®. Switch & Start Saving Today. Save an  
 Average of 12% When Bundling a Home & Auto Policy with Progressive®. Online Quoting.

To advertise call 800-867-8644  
 1-800-451-7528

**The Real Yellow Pages®**

**Plumbing Contractors**

**ARS/RESCUE ROOPER**

**ARS RESCUE ROOPER**  
 Making it work. Making it right.

- 24/7 Emergency Service Available
- Plumbing, Pipes & Fixtures
- Sewer & Drain Cleaning
- Water Heaters

\*Additional Charge May Apply  
 License # 651367 C36, B, A

Please See Ads on Pages 92 and 93

**B G Plumbing**  
 2110 Tannis Court Tracy 650 481-8052  
 Please See Advertisement Plus Page  
 Bar Area Plumbing & Heating 650 701-1548  
 Bel Caries Plumbing 650 344-9000  
 924 Vermont Wy 650 344-9000  
 Boulevard Plumbing & Heating Inc 650 348-3338  
 80 Warrington Ave E 650 348-5190  
 Boulevard Plumbing & Heating Inc 650 327-4242  
 From Palo Alto To Tracy Call 650 344-9000  
 Buckley Patrick Plumbing 650 343-2443  
 2077 Inwood Ave 650 343-2443  
 2077 Inwood Ave 650 343-2443  
 Call West Plumbing 650 349-4294  
 Council Mike Plumbing Inc 650 926-9400  
 County Consumer Plumbing Service & Repair Group 650 434-3749

Please See Advertisement Page 104

**DISCOUNT PLUMBING & ROOPER COMPANY**

COMPLETE SEWER & DRAIN REPLACEMENT  
 WATER DAMAGE  
**CALL & COMPARE OUR LOW RATES**  
 MANAGEMENT COMPANY SPECIALISTS  
 CLEAN QUALITY SERVICE  
 AT REASONABLE PRICES  
 ALL WORK GUARANTEED IN WRITING

- VIDEO PIPE INSPECTION
- WATER JETTING

COMPLETE PLUMBING REPAIRS!  
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 www.discountplumbingandrooper.com  
 CA State Lic # 651367 C36, B, A  
**650 549-1258**

**Discount Plumbing & Rooper Company**  
 1330 Valcott Rd Rived City 650 369-9400  
 Please See Ads on Pages 96, 97 and 100

**OTTIMANN PLUMBING INC.**

Backflow Testing & Repair  
 Water Heater Replacement  
 Find & Repair Gas Leaks  
 Sewer & Drain Cleaning  
**650-980-9741**  
 www.ottimannplumbing.com  
 941 S. Claremont St San Mateo

**Drain Doctors Plumbing** 650 344-6880  
**Drain Doctor** 650 344-6881  
 Please See Ads on Pages 92 and 93

**Economy Plumbing** 650 756-5100  
**Economy Rooter** 650 330-0049  
**Drain Doctor Rooter Sewer S.** 650 345-1515  
**GoDo Rooter** 408 282-7027

**City Plumbing & Heating** 650 854-4221  
**City Plumbing & Heating** 650 321-4138  
**H R Plumbing Inc** 650 323-2601

**Larry's Plumbing** 650 249-1200  
**McMenemy Gas & Main Line Plumbing** 650 575-7434  
**McRooter Plumbing of Palo Alto** 650 344-4555

**Private Plumbing** 650 879-1236  
**Pro Plumbing** 650 348-9015  
**Pro Plumbing** 650 494-1572  
**Pro Plumbing** 650 494-1644  
**Quality Plumbing** 650 338-2290

**Rooter Hero** 808 929-4378  
 Please See Ads on Pages 96, 97 and 100

**Rooter** 650 325-3806  
**Rooter** 311 Hamilton P.A. 650 325-3806  
**Rooter** 311 Hamilton P.A. 650 325-3806  
**Rooter** 311 Hamilton P.A. 650 325-3816  
**Rooter** 118 Alameda Ave E 650 365-3302

**ROTO-ROOPER PLUMBING DRAINS & WATER CLEANUP**

**ROTO-ROOPER**  
 Complete Plumbing & Drain Cleaning Service  
 24 HOURS DAILY 6 A.M. 650 391-2481

Please See Ads on Pages 90, 91 and 104

**Roottree Plumbing & Heating Inc** 650 298-0100  
**Shore Way Plumbing** 650 322-9019  
**Shoreway Plumbing Inc** 650 257-3153  
**Shoreway Plumbing Inc** 650 257-3153  
**Shoreway Plumbing Inc** 650 257-3153  
**THOMAS PLUMBING** 650 779-4433  
**THOMAS PLUMBING** 650 321-1247

www.shorewayplumbing.com

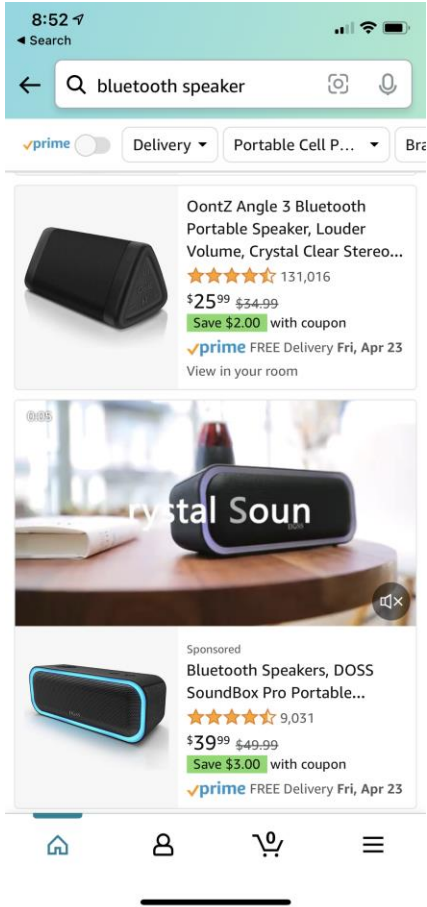
**Triple A Plumbing Services** 408 727-0107  
 Please See Ads on Pages 86 and 89

**24/7 Rooter & Plumbing** 415 586-6851  
 Please See Advertisement Page 100

**Wise Plumbing And Heating** 650 367-7388

**Plumbing Drain & Sewer Consultants**  
 Discount Plumbing And Rooter Co  
 1330 VALCOTT RD R.C. 650 364-4334

# Video ads



# Interactive ads



## Conclusion

Sponsored listings are a really powerful tool – profitable, relevant to users, not irritating or distracting, and giving voice to good vendors.

Origins go to times well before the Internet.

Took off on search engines, spread to ecommerce and beyond, exploding now in more and more domains, not clear where the limit is – anything with a search box or categories or list of items is a potential application.

Exciting developments going forward.

# Thank you!

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