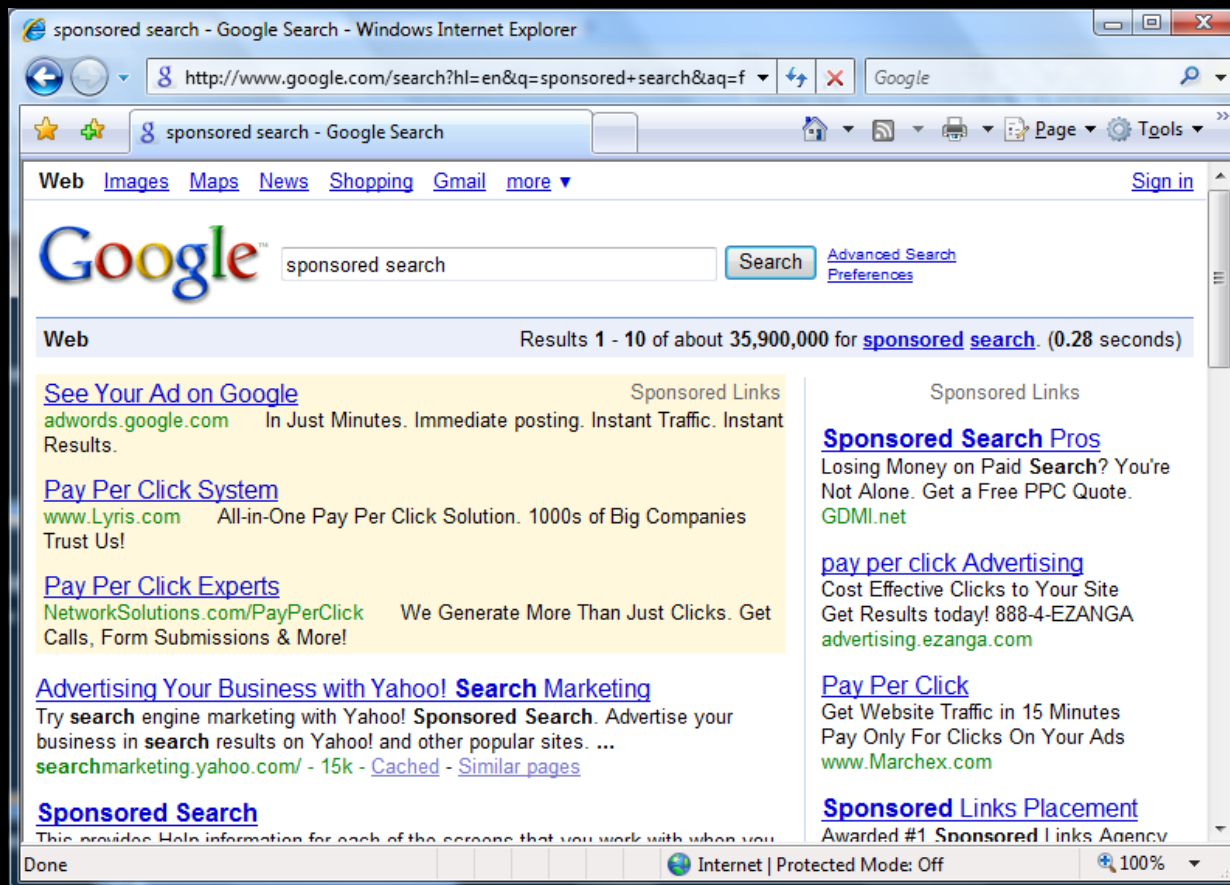


15-396

Science of teh Interwebs

Sponsored Search

Lecture 12 (October 13, 2011)



The screenshot shows a Windows Internet Explorer browser window displaying a Google search for "sponsored search". The search results page includes the Google logo, a search bar with the text "sponsored search", and a "Search" button. Below the search bar, the results are categorized as "Web" and show "Results 1 - 10 of about 35,900,000 for sponsored search. (0.28 seconds)".

The search results are divided into two columns of sponsored links:

- Left Column:**
 - See Your Ad on Google** (Sponsored Links): adwords.google.com In Just Minutes. Immediate posting. Instant Traffic. Instant Results.
 - Pay Per Click System** (Sponsored Links): www.Lyris.com All-in-One Pay Per Click Solution. 1000s of Big Companies Trust Us!
 - Pay Per Click Experts** (Sponsored Links): NetworkSolutions.com/PayPerClick We Generate More Than Just Clicks. Get Calls, Form Submissions & More!
 - Advertising Your Business with Yahoo! Search Marketing** (Sponsored Links): Try **search** engine marketing with Yahoo! **Sponsored Search**. Advertise your business in **search** results on Yahoo! and other popular sites. ... searchmarketing.yahoo.com/ - 15k - [Cached](#) - [Similar pages](#)
 - Sponsored Search** (Sponsored Links): This provides Help information for each of the screens that you work with when you
- Right Column:**
 - Sponsored Search Pros** (Sponsored Links): Losing Money on Paid **Search**? You're Not Alone. Get a Free PPC Quote. GDML.net
 - pay per click Advertising** (Sponsored Links): Cost Effective Clicks to Your Site Get Results today! 888-4-EZANGA advertising.ezanga.com
 - Pay Per Click** (Sponsored Links): Get Website Traffic in 15 Minutes Pay Only For Clicks On Your Ads www.Marchex.com
 - Sponsored Links Placement** (Sponsored Links): Awarded #1 **Sponsored Links Agency**

The browser's status bar at the bottom shows "Done", "Internet | Protected Mode: Off", and "100%" zoom level.

Web 1.0 Advertising

Vox is brought to you by our sponsors

Find Your Graduating Class



I graduated in:

1997	▲
1987	▬
1977	▼

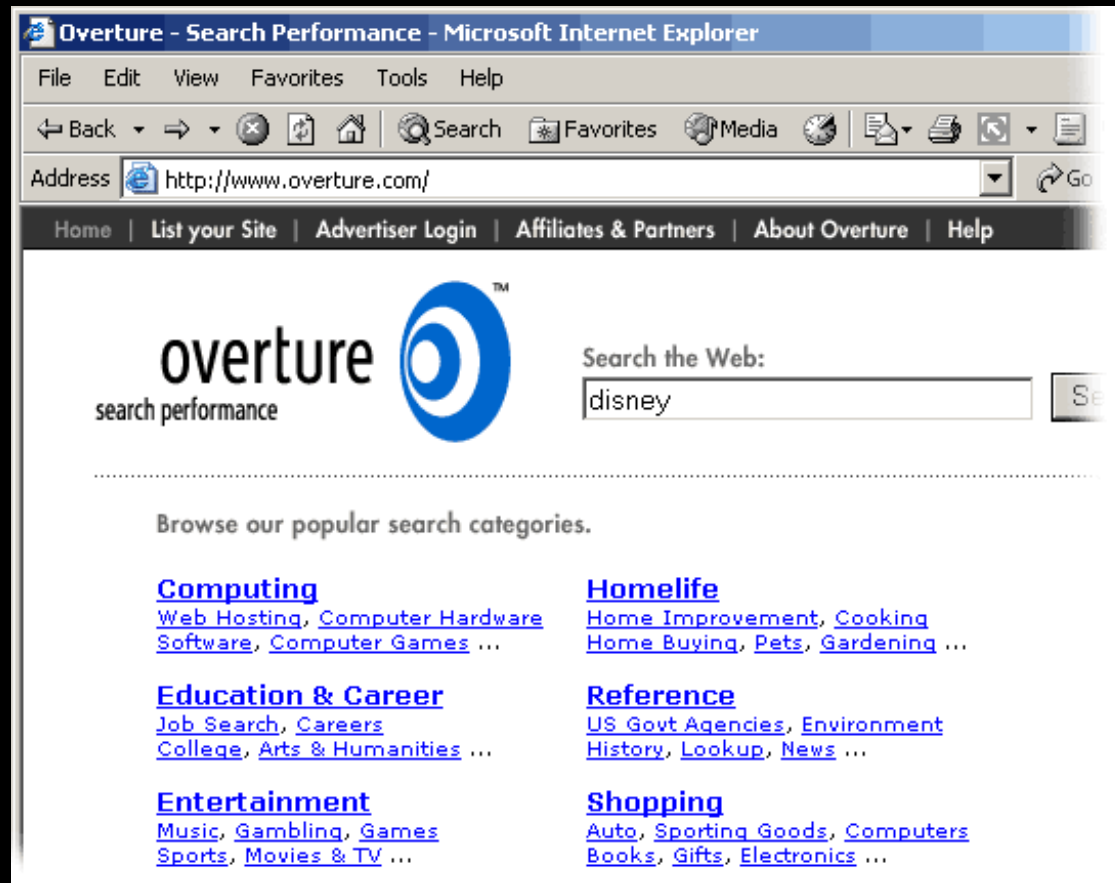
FIND

 classmates.com

The image shows a web advertisement for 'classmates.com'. At the top, it says 'Vox is brought to you by our sponsors'. The main heading is 'Find Your Graduating Class'. Below this are three black and white portraits of young women. Underneath the portraits is a form with the text 'I graduated in:' followed by a dropdown menu showing the years 1997, 1987, and 1977. To the right of the dropdown are up and down arrow buttons. Below the dropdown is a 'FIND' button. In the bottom left corner, there is a logo for 'classmates.com'.

Advertisers paid per “impression” and ads were not targeted

In 1998...



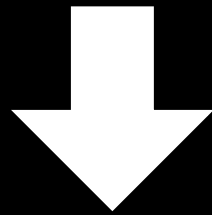
...Ads became targeted

The Charging Model Has Also Changed

Typically very low

Past:

CPI (Cost Per Impression)



Now:

Much higher: CPC
for “ca lemon law”
is \$60

CPC (Cost Per Click)

How should Google decide how much to charge?

The screenshot shows a Windows Internet Explorer browser window displaying a Google search for "sponsored search". The address bar shows the URL: <http://www.google.com/search?hl=en&q=sponsored+search&aq=f>. The search results page features the Google logo, a search bar with the text "sponsored search", and a "Search" button. Below the search bar, the results are categorized under "Web" and show "Results 1 - 10 of about 35,900,000 for sponsored search. (0.28 seconds)".

The search results include several sponsored links:

- See Your Ad on Google** (Sponsored Links): adwords.google.com In Just Minutes. Immediate posting. Instant Traffic. Instant Results.
- Pay Per Click System** (Sponsored Links): www.Lyris.com All-in-One Pay Per Click Solution. 1000s of Big Companies Trust Us!
- Pay Per Click Experts** (Sponsored Links): NetworkSolutions.com/PayPerClick We Generate More Than Just Clicks. Get Calls, Form Submissions & More!
- Advertising Your Business with Yahoo! Search Marketing**: Try search engine marketing with Yahoo! Sponsored Search. Advertise your business in search results on Yahoo! and other popular sites. ... searchmarketing.yahoo.com/ - 15k - [Cached](#) - [Similar pages](#)
- Sponsored Search**: This provides Help information for each of the screens that you work with when you
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- Pay Per Click** (Sponsored Links): Get Website Traffic in 15 Minutes Pay Only For Clicks On Your Ads www.Marchex.com
- Sponsored Links Placement** (Sponsored Links): Awarded #1 Sponsored Links Agency

The browser status bar at the bottom shows "Done", "Internet | Protected Mode: Off", and "100%".

Here's Exactly How Much Google Charges:

http://services.google.com/awp/en_us/breeze/3004832/index.html

Generalized Second Price Auction

Each advertiser j announces a bid b_j

Slot i is assigned to the i^{th} highest bidder at a price per click equal to the $(i+1)^{\text{st}}$ highest bidder's bid

Truthful Bidding is Not Necessarily an Equilibrium!

(and therefore also not a dominant strategy)

	True Revenue Per Click		Click-Through Rate
Bidder A	7	Slot 1	10
Bidder B	6	Slot 2	4
Bidder C	1	Slot 3	0

If each bidder bids their true valuation, then A gets Slot 1 and their payoff is $7 \cdot 10 - 6 \cdot 10 = 10$

Truthful Bidding is Not Necessarily an Equilibrium!

(and therefore also not a dominant strategy)

	True Revenue Per Click		Click-Through Rate
Bidder A	7	Slot 1	10
Bidder B	6	Slot 2	4
Bidder C	1	Slot 3	0

If A were to bid 4, then its payoff would be
 $7*4 - 1*4 = 24$, which is higher than 10

	True Revenue Per Click		Click-Through Rate
Bidder A	7	Slot 1	10
Bidder B	6	Slot 2	4
Bidder C	1	Slot 3	0

Bidder A bids 5, B bids 4 and C bids 1 is an equilibrium

Bidder A bids 3, B bids 5 and C bids 1 is also an equilibrium (and it's not socially optimal, since it assigns B the highest Slot)

**Is There a Way to Encourage
Truthful Bidding?**

Second Price Sealed Bid Auctions Revisited

If bidders values in decreasing order were $v_1, v_2, v_3, \dots, v_n$

Then bidder 1 would win

If bidder 1 were not present, the object would go to bidder 2, who values it at v_2

Bidders 2, 3, ..., n collectively experience a **harm** of v_2 because bidder 1 is there

Vickrey-Clarcke-Groves Mechanism

Each individual is charged the harm
they cause to the rest of the world

Assumptions

We have a set of buyers and a set of sellers, with an equal number of each

Buyer j has valuation of v_{ij} for item of seller i

Each buyer will only get one item, they know their own valuation but not the valuation of others

The sellers do not know anybody's valuations

Buyers only care about the item they get, not about how the goods are allocated to others

Vickrey-Clarcke-Groves Mechanism

Each individual is charged the harm
they cause to the rest of the world

Valuations

Bidder A	30,15,16	—————	Slot 1
Bidder B	20,10,4	—————	Slot 2
Bidder C	10,5,2	—————	Slot 3

First assign items to buyers so as to maximize total valuation

What is the harm caused by bidder A's existence?

If bidder A was not there, B would make 10 and C would make 5, which improves their combined valuation by 13. **So A has to pay 13.**

Valuations

Bidder A	30,15,16	—————	Slot 1
Bidder B	20,10,4	—————	Slot 2
Bidder C	10,5,2	—————	Slot 3

What is the harm caused by bidder B's existence? **3**

What is the harm caused by bidder C's existence? **0**

VCG Mechanism

M = set of sellers

N = set of buyers

V^M_N = maximum total valuation over all possible matchings of sellers and buyers

$M-i$ = set of sellers with seller i removed

$N-j$ = set of buyers with buyer j removed

If we give item i to seller j , then the best total valuation the rest of the buyers could get is V^{M-i}_{N-j}

So they should pay: $V^M_{N-j} - V^{M-i}_{N-j}$

If items are assigned and prices computed according to the VCG procedure, then truthfully announcing valuations is a dominant strategy for each buyer, and the resulting assignment maximizes the total valuation of any perfect matching of slots and advertisers

g2g

ttyl