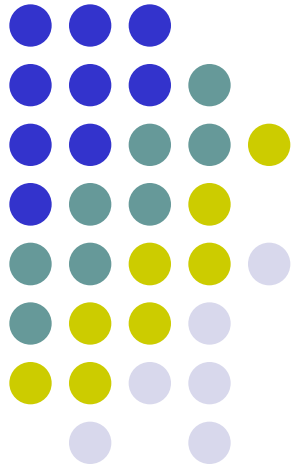
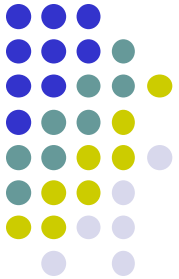
Web Algorithms – Sponsored Search

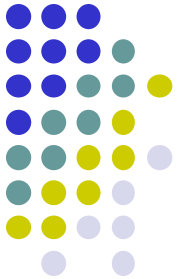
Eng. Fabio Persia, PhD



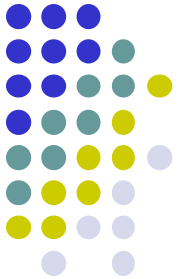


Matching Markets (Third Part)

Back to Sponsored Search



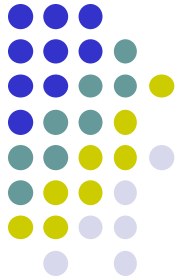
- We modelled the problem of assigning slots to advertisers as a matching market with
  - slots ≡ sellers
  - advertisers ≡ buyers
  - valuations $v_{i,j} = r_i \cdot v_j$
- Clearly, the market corresponds to a special case of restricted valuations
- As it can be easily checked, the best matching is obtained by assigning
  - first slot (with max clickthrough rate) to first advertiser (with max revenue per click),
  - second slot to the second advertiser
  - …



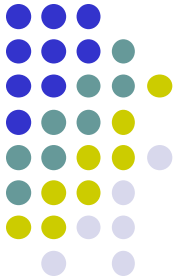
- This allows however to incorporate refinements for the definition of the $v_{i,j}$, to relax some of the simplifying assumptions:
  1. The clickthrough rate depends only on the slot and not on the (relevance or quality of the) shown ad
  2. The clickthrough rate also does not depend on the ads in the other slots
  3. The revenue per click is intrinsic to the advertiser and does not depend on the page where the user clicked on the ad
  4. Revenue per click if ad in first slot or for instance in third slot
  5. …

- Let us see an example for plugging inside a quality factor of the ads or advertisers

Ad Quality

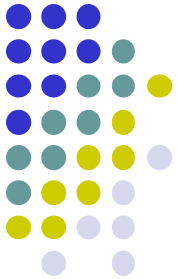


- We assumed that the clickthrough rates r_i depend only on slot i and not on the shown ad
- However, the thumbnail of the ad matters, for instance if users recognize the name of the company, affecting whether they will click on the ad or not
- But the search engine is charging per clicks, and not per ad
- Worrisome scenario:
  - Low-quality advertisers bid highly and get first slots
  - Users don't click on them (for instance they don't trust the company or the ad is not relevant for them)
  - The search engine loses money

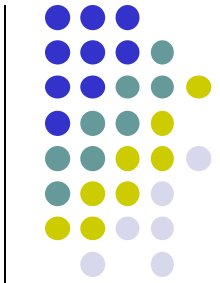


- Google addressed this problem as follows
- It estimates a *quality factor* q_j of advertiser *j*
- If advertiser *j* appears in slot *i*, the estimated clickthrough rate is $q_j \cdot r_i$
- Valuations can be defined accordingly:

$$v_{i,j} = q_j \cdot r_i \cdot v_j$$

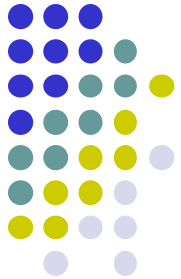


- Question: how is quality computed?
- Observing the clickthrough rate of the ad
- But also taking into account other factors, like relevance of the ad text and “landing page”
- Like unpaid results, search engines do not share these details and don’t reveal the function to advertisers

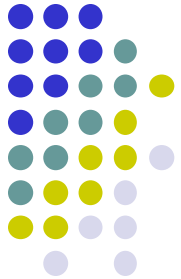


- As a consequence, ad quality factors make the keyword-based “opaque” to advertisers
- This gives the search engine unlimited power to affect the order of advertisers
- But there is a further issue to be taken into account …

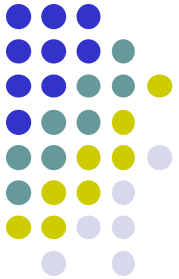
Complex Queries and Interaction with Keywords



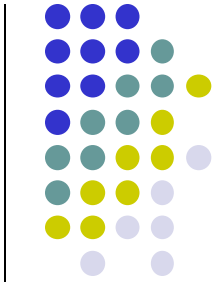
- So far we focused on a market arising from a given query
- There are however simultaneous markets going on the web for different keywords
- How should an advertiser divide her budget among the different markets?
- Challenging question subject of current research



- There are analogous problems from the search engine's perspective
- Suppose advertisers have communicated their interest in specific keywords
- There is the possibility that none or very few of them specified complex phrases of keywords, even if related to the advertisers' interests
- If market rules are defined too strictly, the search engine can show ads only on explicitly specified phrases
- Both the search engine and the advertisers lose money



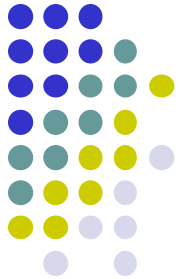
- Which ads to show is a difficult problem
- Simple rule: consider the maximum valuation for any keyword
- Bad idea (Example: “European ski vacation”)
- Even if relevant advertisers are identified, how much should they be charged per click, given that they did not specify their interest for that query?



- Search engines tend to get agreements from advertisers: they extrapolate prices on the basis of the prices they are willing to pay for the specified queries

- Best way to do this not fully understood

Final Remarks on Markets



- They can suitably model sponsored search
- They are suitably general to incorporate refinements in the estimation of the valuation functions of the buyers
- Very nice theory, but there is a problem: the search engine doesn't know the valuations of the advertisers
- Of course, like in early days, they can ask them
- But advertisers can cheat to get better payoffs, for instance declaring lower valuations
- Solution: run auctions!