Competing for users' attention:
On the interplay between organic and sponsored search results

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04-29-2010   WWW 2010

Sponsored search

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Sponsored search - Why bother?

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- Even though ads and organics coexist on the search results page, until now they have been largely studied in isolation.

Ads and organics studied in isolation

Interplay between ads and organics

High level question:

What is the interplay between the ads and the organics?

1. Is there competition for clicks between ads and organics?
2. Are users more attracted by ads that are similar to the organic results or do they prefer diversity?

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High level answer:

Well, it depends: the nature of the interplay is determined by the type of query.

Data

64,000 queries

- All ads and organics shown during a month on Yahoo! Search for these queries
- For each query:
  - One representative organic.
  - One representative (north) ad.
- **64,000 (query, organic, ad) tuples**

Data

Example tuple:

(**query:** "dog", **organic:** wiki_dog, **ad:** Purina_ad)

- title, text (snippet) and URL of the ad and organic
- aggregated click information for the ad and organic (click-through rate):
    - $CTR\_org = 730$ clicks/1400 views
    - $CTR\_ad = 30$ clicks/900 views

A poverty of attention

"... a wealth of information creates a poverty of attention"

Herbert Simon, 1971

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Question:
- Does this poverty lead to competition for attention between ads and organics?

Nature of interplay: Competition?

Relation between the CTR of ads and the CTR of organics

- Negative correlation (competition)
    - Users are willing to spend limited time and effort for each query.

- Positive correlation
    - Based on the quality of the results:
        - Easy query: "Online radio"
          → decent ads and organics → clicks for both
        - Hard query: "Who is giving this talk?"
          → poor ads and organics → no clicks for either

- Independence (null hypothesis)
    - Users consider ads and organics independent sources of information

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Nature of interplay: Competition?

Overall trend

Nature of interplay: Competition?

Each point = Bin of tuples
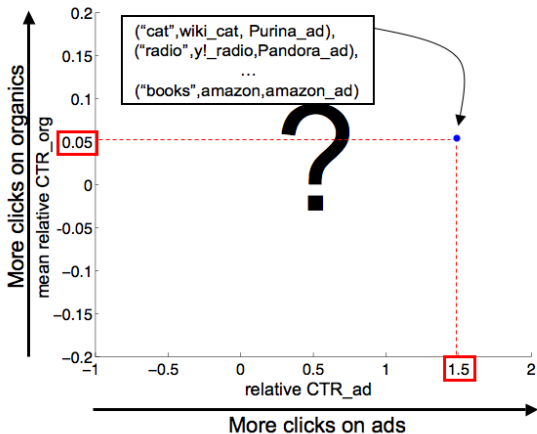
Nature of interplay: Competition?

Competition and positive correlation
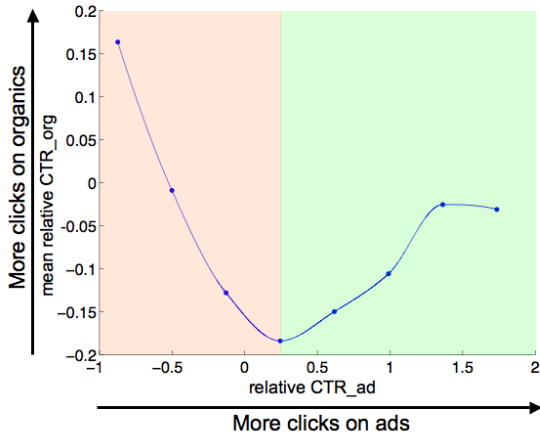
Decoupling the forces

Separating out the effect of competition

- Competition $\Leftarrow$ Users are willing to spend limited effort for each query

- In order to separate out the competition effect, we try to account for the amount of effort a user is willing to spend.

The effort a user is willing to spend on a query

Low effort investment

"Pandora radio"
"Bank of America"
"Cornell University"

High effort investment

"Meaning of life?"
"Make advisor happy"
"Academia vs industry"

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Navigational
(27% of all queries)
[Broder, 2002]

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navigationality score
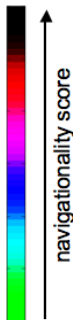
Decoupling the forces

Navigational queries only
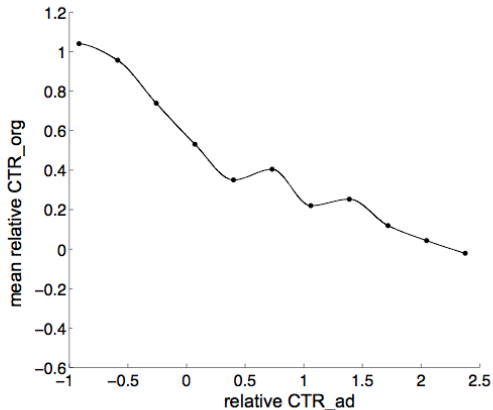
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Navigational queries only → Competition
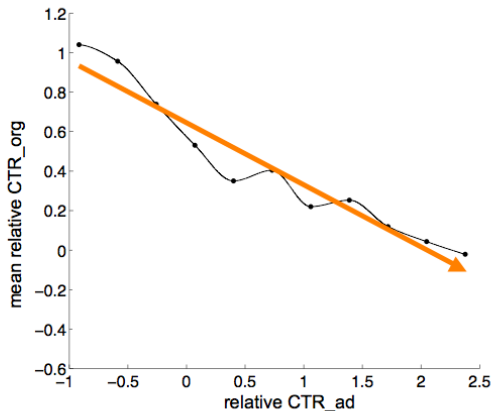
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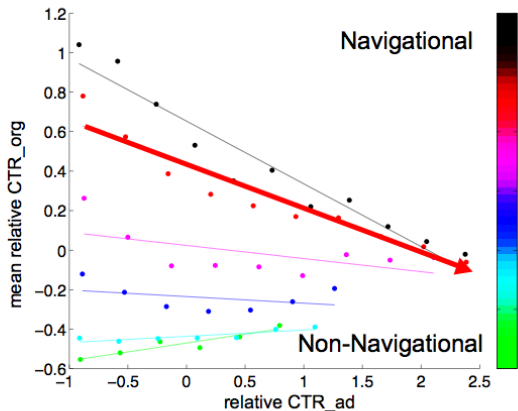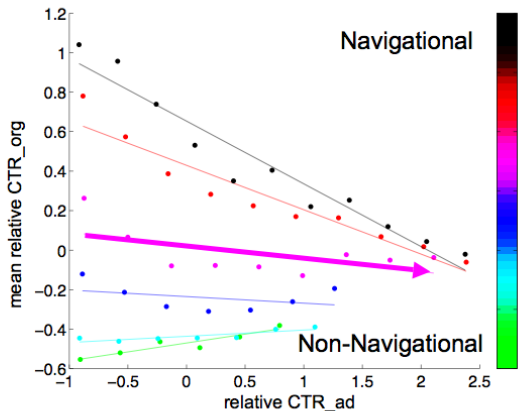
Degrees of "navigationality" → Smooth transition

Decoupling the forces
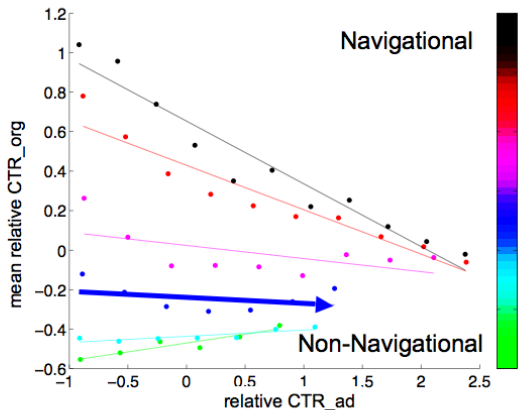
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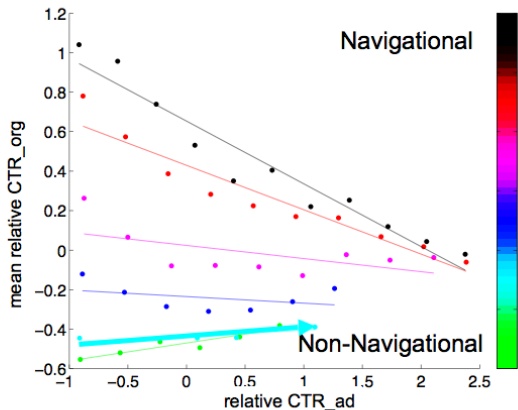
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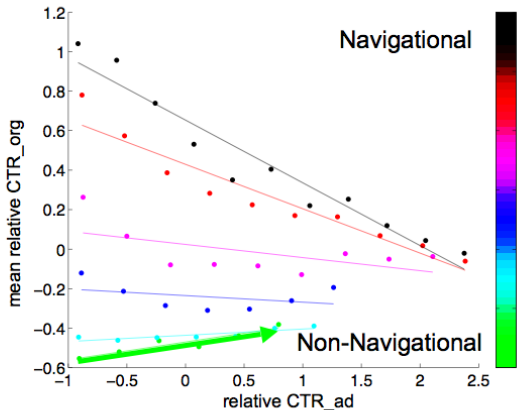
Nature of interplay: Competition?

Question:

- Does this poverty lead to competition for attention between ads and organics?

Answer:

- Yes, but the amount of competition is mediated by the navigational property of the query.

Diversity vs. Similarity

Question

- Do users prefer ads that are more similar to the organic results or ads that provide diversity?

Preference for similarity

- More likely to be relevant to the query.
- This assumption made in query augmentation systems: [Broder et al., 2008]

Preference for diversity

- Diversity among organic results was shown to be desirable: Diversity session today at WWW 2010, [Chen and Krager, 2006], [Gollapudi and Sharma, 2009]

Diversity vs. Similarity

Measure of similarity

Jaccard similarity coefficient between titles:

$$overlap = \frac{|B_{Ad} \cap B_{Org}|}{|B_{Ad} \cup B_{Org}|}$$

Diversity vs. Similarity

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Overall trend
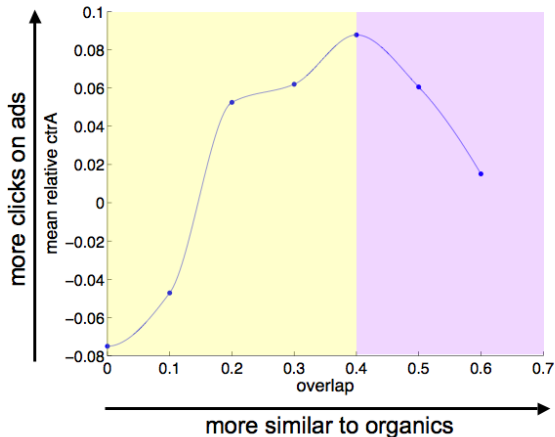
Diversity vs. Similarity
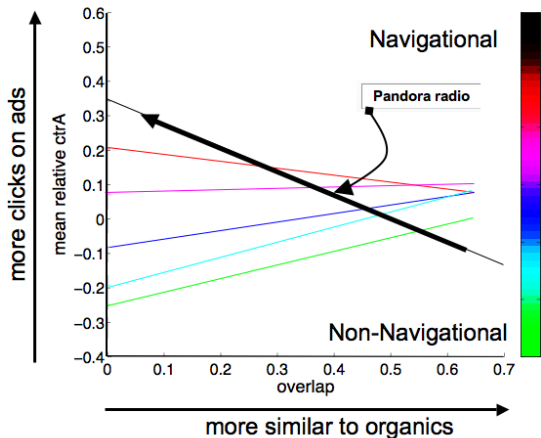
Breakdown by navigationality

Diversity vs. Similarity

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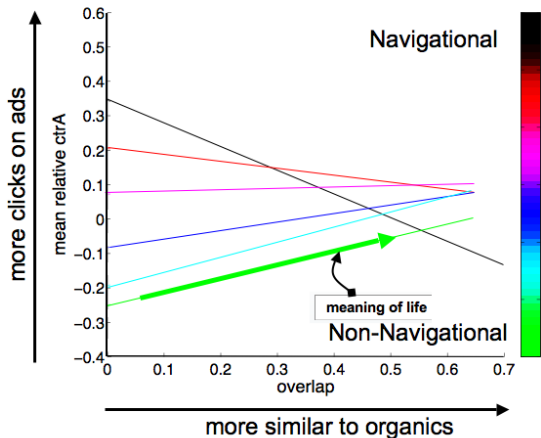
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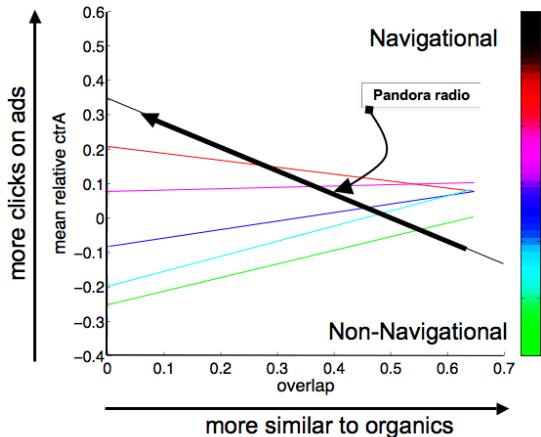
Responsive and Incidental Ads

Responsive ads

Ads that directly address the user's information need.

Incidental ads

Ads only loosely related to the user's information need.

Example:

For the query "`free internet radio`":

- Responsive ad: *"Pandora Internet Radio"*
- Incidental ad: *"Discounted Bose Computer Speakers"*

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Not reasonable organic results

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Responsive and Incidental Ads

Responsive ads

→ more likely to be similar to the organics

Incidental ads

→ more likely to be different from the organics

Example:

For the query "`free internet radio`":
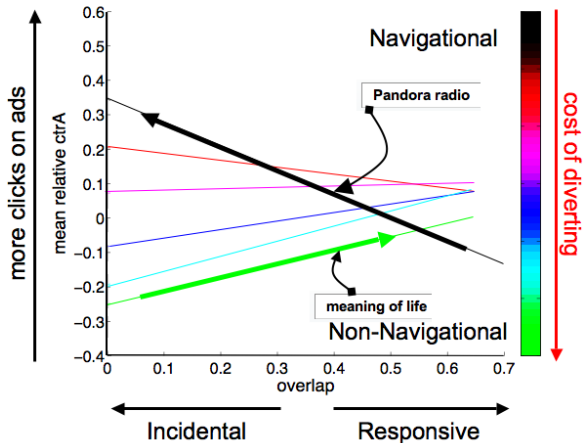
- Responsive ad: *"Pandora Internet Radio"*
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Diversity vs. Similarity

Now it makes sense...

Only correlations? Yes, but usefull...

Mathematical model

Simple mathematical model that formalizes and explains our observations.

Prediction

- Task: given a pair of ads, which of them will get more clicks?
- Features inspired by our observations perform better and are complementary to traditional features:

Features	Accuracy
traditional features	59.55
interplay features	61.45
traditional + interplay	62.82

Conclusions

- We are the first to study the interplay between ads and organics.

- We explore in detail two facets of this interplay:
  - Dependency between the CTR of ads and organics
  - Influence of similarity with organics on the CTR of ads.

- We discover the role of the navigational property of the query as an intermediator of this interplay.

- We propose a simple mathematical model that formalizes and explains the observed correlations.

- Our observations can be transformed into prediction features.

Thank you!