# YAHOO!

"Engage moi": From retrieval effectiveness, user satisfaction to user engagement

Mounia Lalmas Yahoo London mounia@acm.org

### This talk



› Others



# Our case study:

# **Evaluation in search**

YAHOO!

### How to evaluate in search

- Coverage
- Speed
- Query language
- User interface



- Users find what they want and return to the search system
- But let us remember: In carrying out a search task, search is a means, not an end

(Manning, Raghavan & Schütze, 2008; Baeza-Yates & Ribeiro-Neto, 2011)

## **Measuring user happiness**

Most common proxy: *relevance* of retrieved results



all items

### **Evaluation measures:**

- precision, recall, R-precision; precision@n; average precision; F-measure; ...
- bpref; cumulative gains, rank-biased precision, expected reciprocal rank, Q-measure, ...

- User information need translated into a query
- Relevance assessed relative to information need not the query
- Example:
  - Information need: I am looking for tennis holiday in a country with no rain
  - > <u>Query</u>: *tennis academy good weather*



**Measuring user happiness** 

Most common proxy: *relevance* of retrieval results



Explicit signals

Test collection methodology (TREC, CLEF, NCTIR, ...) Human labeled corpora

Implicit signals

User behavior in online settings (clicks, skips, ...)

Explicit and implicit signals can be and are used together



### What is a happy user in search

- 1. The user information need is satisfied
- 2. The user has learned about a topic and even about other topics
- 3. The system was inviting and even fun to use





# How can we know whether a user is happy?

Interpreting the signals

### **Examples of implicit signals**

- Number of clicks
- SAT click
- Quick-back click
- Click at given position
- Time to first click
- Skipping
- Abandonment rate
- Number of query reformulations
- Dwell time
- Hover



The Huffington Post 4 days ago



### **Click-through rate**



## Clicks (I)





PEOPLE WHO SEARCHED FOR LEO MESSI ALSO SEARCHED FOR











Multimedia search activities often driven by entertainment needs, not by information needs



(Slaney, 2011)

## Clicks (II)



### Information-rich snippet

### No click: Abandonment (I)

YAHOO!	Angel Lane surgery Dunmow Search					
UK & IRELAND	3,110 results					
	WEB IMAGES VIDEO NEWS SHOPPING MORE -					
	Search: 💽 the Web 🔘 only in UK 🔘 only in Ireland					
FILTER BY TIME						
Anytime	Angel Lane Surgery - Essex Welcome to Angel Lane Surgery . We aim to provide you and your family with the best possible healthcare. Angel Lane Surgery Angel Lane Great Dunmow Essex CM6 1AQ					
Past day						
Past week	www.angellanesurgery.co.uk - Cached					
Past month	Useful Contacts - Angel Lane Surgery - Essex Angel Lane Surgery: Appointments/Enquines: 01371 872 122: Hospitals Registrar of Births, Deaths and Marriages (Dunmow) www.angellanesurgery.co.uk/useful.asp - Cached					
	Overview - Angel Lane Surgery - NHS Choices Angel Lane Surgery. Telephone: 01371 872122 Address: Angel Lane, Great Dunmow, Dunmow, Essex, CM6 1AQ Website: Website address not added					

More results from nhs.uk »

I just wanted the phone number  $\dots$  I am totally happy  $\odot$ 



### No click: Abandonment (II)

- Abandonment is when there is no click on the search result page
  - User is dissatisfied (bad abandonment)
  - User found result(s) on the search result page (good abandonment)
- 858 queries (21% good vs. 79% abandonment manually examined)
- Cursor trail length
  - > Total distance (pixel) traveled by cursor on SERP
  - > Shorter for good abandonment
- Movement time
  - > Total time (second) cursor moved on SERP
  - Longer when answers in snippet (good abandonment)
- Cursor speed
  - Average cursor speed (pixel/second)
  - Slower when answers in snippet (good abandonment)



YAHOO



### **Dwell time (I)**





(a) relevant (dwell time: 30s)

(b) non-relevant (dwell time: 30s)

"reading" cursor heatmap of relevant document vs "scanning" cursor heatmap of non-relevant document (both dwell time of 30s)



### **Dwell time (II)**



(a) relevant (dwell time: 70s)

(b) non-relevant (dwell time: 80s)

"reading" a relevant long document vs "scanning" a long non-relevant document



(Lalmas etal, 2015)

dwelTime

notOptimized optimized

YAHOO!

### Mobile advertising: Dwell time (III)



Dwell time on non-optimized landing pages comparable and even higher than on mobileoptimized ones

... when mobile optimized, users realize quickly whether they "like" the ad or not?

# User happiness User engagement

"User engagement is a quality of the user experience that emphasizes the phenomena associated with wanting to use a technological resource longer and frequently" (Attfield et al, 2011)





## happy users come back

What you want to optimize for each task, session, query



What you want to optimize longterm



## Happy users come back

# From intra- to intersession evaluation

### From intra- to inter-session evaluation





### User engagement metrics for search (Proxy: relevance of search results)

### intra-session search metrics

- Dwell time
- Number of clicks
- Time to 1<sup>st</sup> lick
- Skipping
- Click through rate
- Abandonment rate
- Number of query reformulations

• . . .

Dwell time as a proxy of user interest Dwell time as a proxy of relevance



YAHOO!

### Search result page for "asparagus" (I)



en.wikipedia.org/wiki/Spargel - Cached More results from en.wikipedia.org »

#### Asparagus - Food.com Kitchen Dictionary www.food.com



broccoli

spinach

Anvtime

Past day

Past week

Past month

Asparagus (from the Persian word asparag, meaning a sprout), are slim green spears, often tinged with a bit of purple at the tip. ...



Everything About Asparagus... and More!

We are dedicated to spreading the good word about the virtues of asparagus, one of nature's most perfect foods. www.asparagus.org - Cached

Asparagus - Recipe Search recipes.search.yahoo.com

#### Baked Asparagus with Balsamic Butter Sauce

allrecipes.com  $\star$ Total time: 25 mins

Ingredients (6): fresh asparagus, cooking spray, salt, butter, soy sauce, more ...



#### Pan-Fried Asparagus

allrecipes.com +++Total time: 25 mins

Ingredients (6): butter, olive oil, coarse salt, ground black pepper, garlic, more,

Asparagus Supplements Buy 1 Get 2 Free 450mg 90ct 10.99 www.doctorvitaminstore.com

#### Cooking Fresh Asparagus

Find Cooking Fresh Asparagus at Great Prices. www.Pronto.com

#### Asparagus Roots

Asparagus Roots Info. Research now on About.com. About.com/Asparagus Roots

#### Asparagus plants for less

Buy asparagus plants for less money. Free shipping!!! www.asparagus4you.com

#### How To Grow Asparagus

Get Answers & References On Ask.com. Try Asking Now! Ask.com

#### Discount Asparagus Plant

Top Asparagus Plant - top prices! Save up to 75% on Asparagus Plant www.Asparagus-Plant.BEST-PRICE.com

#### Asparagus Seed

Huge Selection of Asparagus Seeds. Superior Quality, Great Prices www.ParkSeed.com

More Sponsors: asparagus cook asparaqus grilled

See your message here...



### Search result page for "asparagus" (II)

#### Asparagus - Wikipedia, the free encyclopedia

#### en.wikipedia.org/wiki/Spargel

Biology · History · Uses · Cultivation · Commercial production Asparagus officinalis is a spring vegetable, a flowering perennial plant species in the genus Asparagus. It was once classified in the lily family, like its Allium ...

#### Everything About Asparagus... and More!

#### www.asparagus.org

We are dedicated to spreading the good word about the virtues of asparagus, one of nature's most perfect foods.

#### Videos of asparadus

bina.com/videos



How to Take Care How to Make of Asparagus Pla... Asparagus Bundl... eHow eHow

How To Cook Asparagus Bing Video

Reheating Cooked Asparagus eHow

#### Asparagus Recipes: Roasting and Grilling ...

www.foodnetwork.com > Topics > Seasonal

Find new ways to cook with asparagus, including grilling and roasting asparagus, as well as an amazing asparagus soup recipe from ...

#### Growing Asparagus In The Home Garden, HYG-1603-94 - Ohioline

#### ohioline.osu.edu/hyg-fact/1000/1603.html

Asparagus is a long-lived perennial vegetable crop that is enjoyed by many gardeners. Soil requirements Asparagus grows in most any soil as

#### Images of asparagus



#### WHFoods: Asparagus

www.whfoods.com/genpage.php?tname=foodspice&dbid=12

Asparagus. The fleshy green spears of asparagus are both succulent and tender and have been considered a delicacy since ancient times. This highly prized vegetable ...

#### Asparagus - Simply Recipes Food and Cooking Blog

www.simplyrecipes.com/recipes/asparagus

Quick and easy asparagus recipe. How to cook asparagus spears perfectly, dress with olive oil, Parmesan, and lemon zest.

#### Asparagus



Asparagus officinalis is a spring vegetable. a flowering perennial plant species in the genus Asparagus. It was once classi... en.wikipedia.org

en.wikipedia.org

Scientific Name: Asparagus officinalis Biological Classification: Species Belongs to: Asparagus

People also search for







Spinach

Broccoli Celerv

Data from: wikipedia · freebase

Report a problem

#### Ads

Top recipes >

#### Cooking Fresh Asparagus

www.Pronto.com Find Cooking Fresh Asparagus at Great Prices.

#### Asparagus Supplements www.doctorvitaminstore.com

Buy 1 Get 2 Free 450mg 90ct 10.99

See your message here



### **Absence time and survival analysis**



DIE = RETURN TO SITE → ABSENCE TIME → Hazard Rate

YAHOO!

### **Absence time applied to search**

### **Ranking functions on Yahoo Answer Japan**

知恵袋検索結果 - Q&A	best sushi で検索した結果1~10件目 / 約594
Y! <b>社員の皆様:</b> 検索結果に対する <u>フィードバック</u> をお願いします。   <u>登録方法</u>	限じる     スポンサードサーチ       すしランキング
Q&A 知恵ノート	知りたい事を簡単検索。ASKならすぐわか
すべての質問 回答受付中の質問 投票受付中の質問 解決済みの質問	るを探す! jp.ask.com/
表示順序: 関連度順   ○ What's your <b>best sushi</b> experience?	病司     方     方     方     方     方     方     方     う     シ      シ     シ     シ
er had. 解決済み - 更新日時:2012/02/14 12:44:48 - 回答数:3 - 閲覧数:45 <u>教養と学問、サイエンス &gt; 言葉、語学 &gt; 英語</u> 【日本語訳希望】CNIN 「The <b>best sushi</b> restaurants in Tokyo」より http://eato http://eatocracy.cnn.com/2012/01/30/he- <b>best-sushi</b> -restaurants-in-tokyo/ 以下の文で、引用符 現しているのかが分かりません。詳しい方、ご解説をお願いします。Ask five Tokyoites to na S	日本楠で寿司なら《鰤門》へ 《スマホ対応》メディア注目の本格江戸前 館店。一流の味覚を味わう! www.seamon-nihonbashi.jp/ で何を表 ame the be <u>《業務用》ペスト通販 納期2日</u> 見積3分納期2日。電話注文・サンプル即 配送 品数書家 実績15万計

Two-weeks click data on Yahoo Answer Japan: search One millions users

Six ranking functions



Session boundary:

30 minutes of inactivity

# Absence time and number of clicks on search result page

survival analysis: high hazard rate (die quickly) = short absence



- No click means a bad user experience
- Clicking between 3-5 results leads to same user experience
- Clicking on more than 5 results reflects poorer user experience; users cannot find what they are looking for
  YAHOO!

(Dupret & Lalmas, 2013)

# Using DCG versus absence time to evaluate five ranking funct YAHOO!

DCG@1	DCG@5		Absence time	
Ranking Alg 1	Ranking Alg 1		Ranking Alg 1	
Ranking Alg 2	Ranking Alg 3		Ranking Alg 2 Ranking Alg 5	
Ranking Alg 3	Ranking Alg 2	L.	Ranking Alg 3	3
Ranking Alg 4	Ranking Alg 4			
Ranking Alg 5	Ranking Alg 5		Ranking Alg 4	



### **Absence time and search experience**

search session metrics  $\rightarrow$  absence time



From 21 experiments carried out through A/B testing, using absence time agrees with 14 of them (which one is better)

### **Positive signals**

- One more query in session
- One more click in session
- SAT clicks
- Query reformulation

### **Negative signals**

- Abandoned session
- Quick-back clicks



The complete methodology?

### Large-scale online measurement



# Happy users come back

**Other examples** 

### Dwell time and absence time for landing page quality

### **Absence time:**

- return to publisher
- click on an ad

### Dwell time $\rightarrow$ ad click

Positive post-click experience ("long" clicks) has an effect on users clicking on ads again





(mobile)



(Lalmas etal, 2015)

# Off-site links and absence time in focused news reading



### Off-site link $\rightarrow$ absence time

Providing links to related off-site content has a positive long-term effect (for 70% of news sites, probability that users return within 12 hours increases by 76%)

Ukrainian troops are trying to defend the key transport hub of Debaltseve

At least 40 people have been reported killed as fighting between Ukrainian troops and pro-Russian rebels rages on in the east of the country.

Ukrainian officials say 15 soldiers and 12 civilians died in the past 24 hours. The rebels report 13 casualties.

The separatists also claim to have seized the town of Vuhlehirsk and surrounded the key hub of Debaltseve, but the Ukrainian military denies this.

Meanwhile, urgent truce talks ended in Belarus, but no deal was signed.

Representatives of Ukraine and Russia, as well as rebel envoys and members the Organization for Security and Co-operation (OSCE), took



#### Related off-site content



### **Final words**

### happy users come back

&

we need to properly identify that a user is happy

