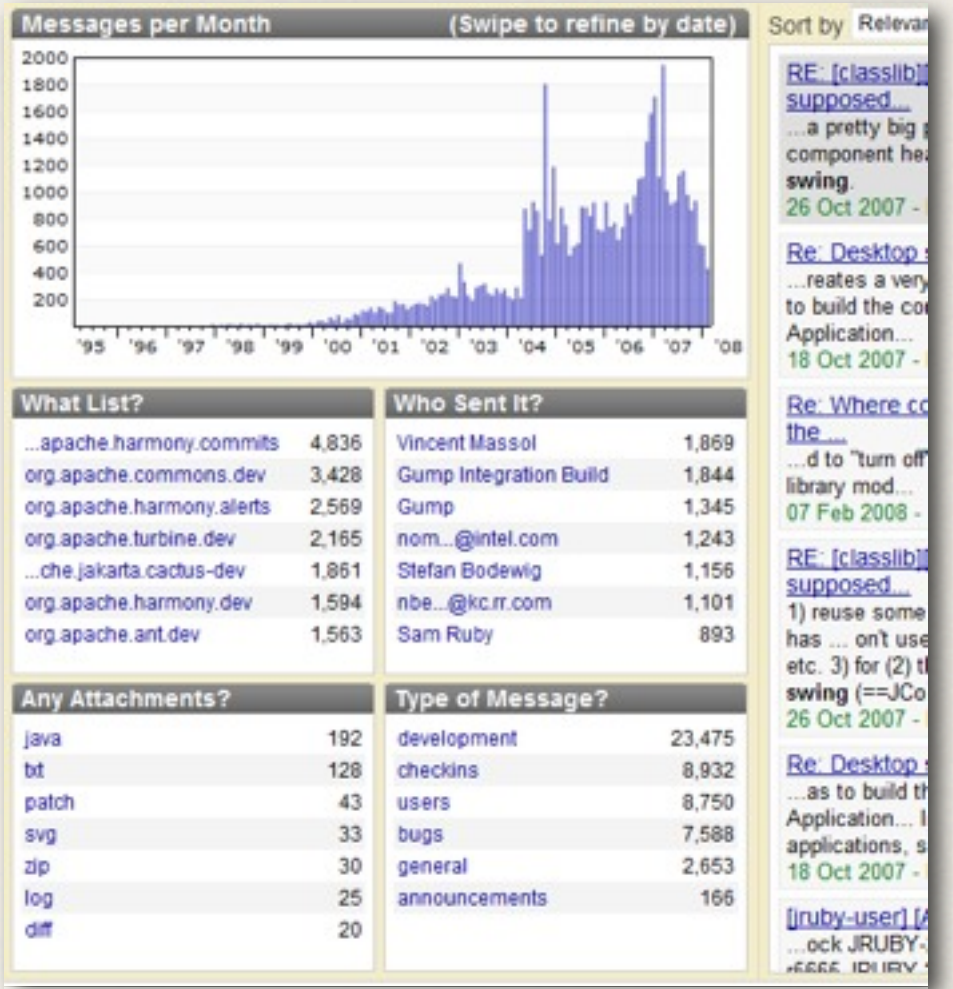
http://datamining.typepad.com/data_mining/2008/02/cifoo-markmail.html



LIS466: Ranking and IR

Week 6: Thinking about ranking functions

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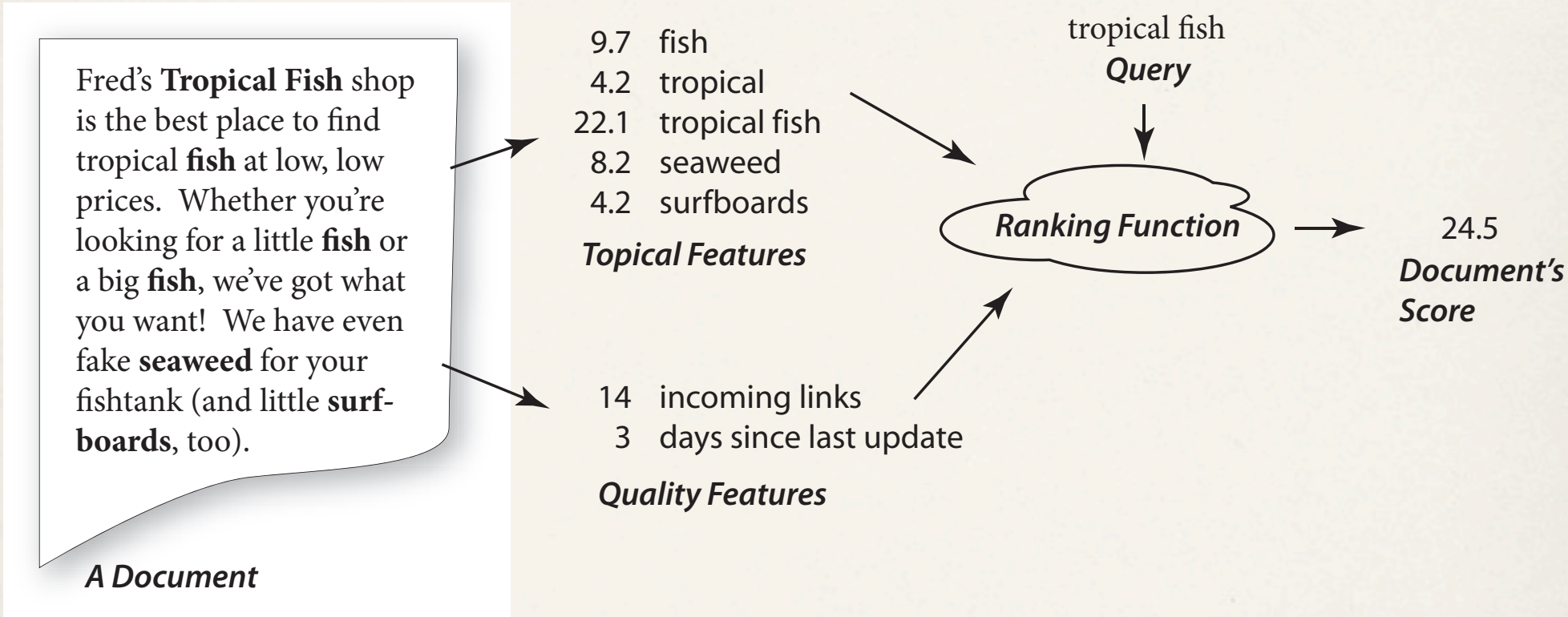
- By the end of today, you should have reflected on issues of ranking and considered how the question of ranking remains open.

Abstract model of ranking



In this example, we see how features from the document are extracted, weighted, and collectively contribute to a doc's score

file: abstractRanking1

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- In the previous example, the "ranking function" was a featureless cloud - don't worry - the point is that some score is generated. The closer numerically that document score is to the query score, the argument goes, the two are closely related.
  - Of course, this begs the question of whether the designers' choice of features *and* the semantic power of terms really are useful.

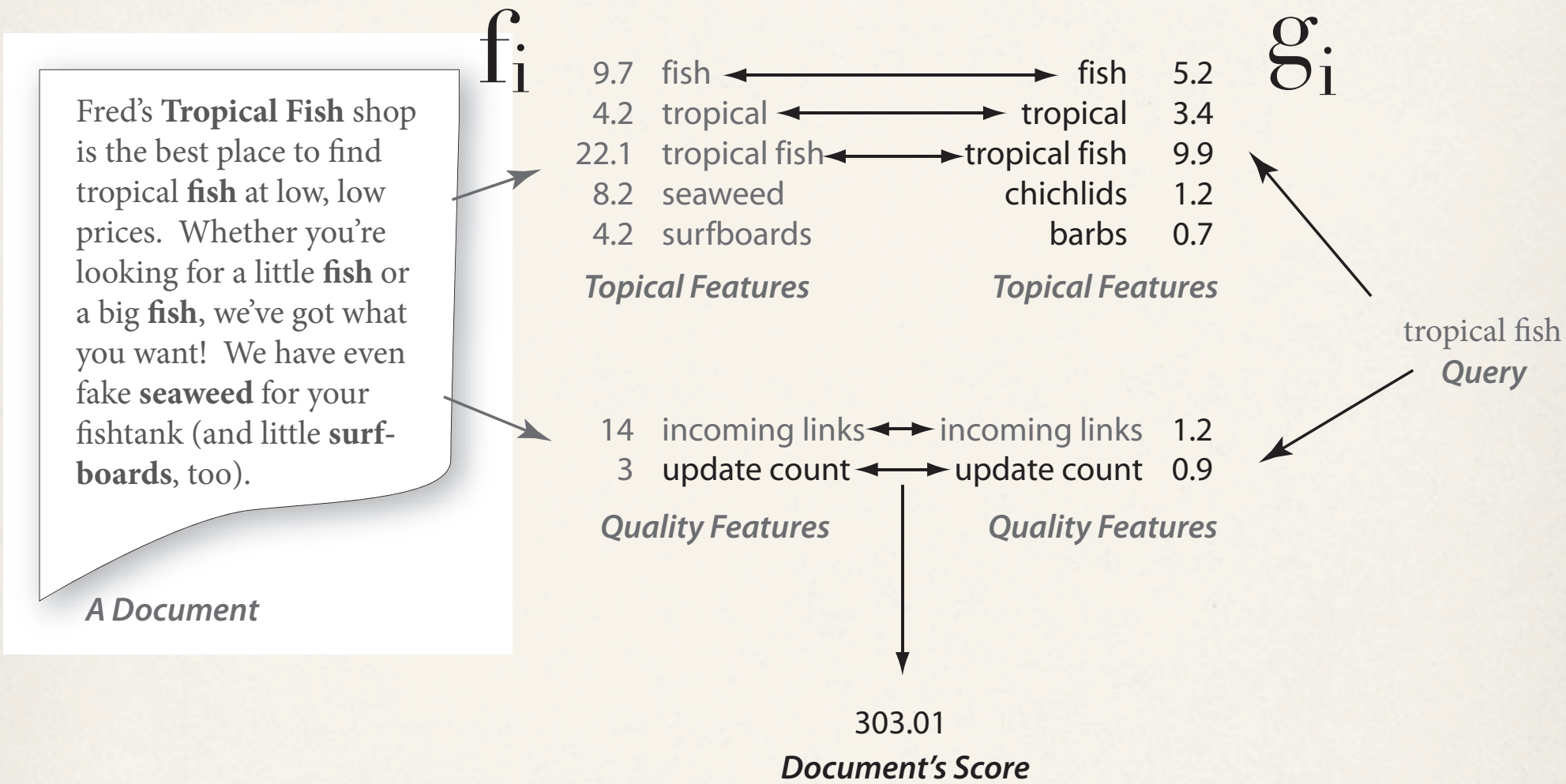
A more concrete example

- Typically a ranking function's ability to match with discrimination the query to the document representation is the measure also of its effectiveness. Different search engines are often compared using the same test collection to see which algorithm is more efficient.
- Here's a typical model of a ranking function R:

$$R(Q,D)=\sum_i g_i(Q)f_i(D)$$

- Here, f_i is some feature function that extracts a number from the document text. g_i is a similar feature function that extracts a value from a query. These two functions form a pair of feature functions. Each pair is multiplied together, and the results from all pairs are added to create a final document.

Model using query & document features



Both query & document have feature functions

file: abstractRanking2

Notes about the concrete model

- Notice that $f_i(D)$ can be replaced with the terms to help clarify things:
- $f_i(D)$ becomes $f_{tropical}(Fred's Ad)$ or $f_{fish}(D)$
- The Query aspect represented by $g_{tropical}(Q)$ evaluates a large value because "tropical" is in the query. However, $g_{barbs}(Q)$ also has a small non-zero value because it is *related* to other terms in the query.
- The values are all summarized to form a score for the document.
- BTW: If the query were "today's weather in Boston" we would prefer documents that are updated frequently, since a document about the weather changes a lot; compare this to "full text of Moby Dick" probably doesn't get updated so update feature would make a low value for the novel but higher value for weather-related documents.

Inverted files (aka indexes aka indices)

- As you know, an index is *n* number of characters of the terms along with a document pointer all combined with some technique for fast examination of the index.
- For instance, let's say we have the terms "cat fish documentary chowder" all in Document #1 and our index is a bi-gram:

```
ca  1
fi  1
do  1
ch  1
```

Example (Three Sentences S_1, S_2, S_3)

S_1 Tropical fish include bright fish found in tropical environments around the world, including both freshwater and salt water species.
S2 Fishkeepers often use the term tropical fish to refer only those requiring fresh water; with saltwater tropical fish referred to as marine fish.
S3 Tropical fish are popular aquarium fish, due to their often bright coloration.

and	1
aquarium	3
are	3
around	1
as	2
both	1
bright	1,3
coloration	3
due	3
environments	1
fish	1,2,3,4
fishkeepers	2

On the left is an inverted index for documents (sentences). In this case the "document" is a sentence long.

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  - We could do anything, but let's try recording the number of times a term appears in a document, so we must record both document # and term frequency.
  - We could also record the *position* of the term in the document. The position could be some known part of the document (such as the title, abstract) *or* it could be the position of term follows the position of another term, say "fish" following a section about "seawater".

Example of document & position table

and	1:1
aquarium	3:1
are	3:1
around	1:1
as	2:1
both	1:1
bright	1:1,3:1
coloration	3:1
due	3:1
environments	1:1
fish	1:1,2:1,3:1,4:1
fishkeepers	2:1

Here, the document number is first followed by a colon : and then the term count.

document:count

Example with word positions

and	1,15
aquarium	3,5
are	3,3; 4,14
around	1,9
as	2,21
both	1,13
bright	1,4; 3,11
coloration	3,12
due	3,7
environments	1,8
fish	1,2; 1,4; 2,7; 2,18; 2,23; 3,2; 3,6
fishkeepers	2:1

Here the term counts are limited to one posting but we record the document number first, followed by a word position.

term document:position

Notice how much more data we have to work with about the terms!

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- Depending on implementation, we might have a system that looks for related terms (find "marine fish") that looks for concepts related to marine (e.g., "seawater") and then looks for terms related to, and the query itself, ("fish"). The idea is that if you find fish *following* a section about *seawater* (a related term), that document or that part of a document is *more relevant to the query* than a document where "fish", "marine", and related terms appear anywhere.

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- Rank document D higher when term t_1 appears in the context of related term r_1, r_2, … r_n. Sum them to create a rank for that document. Compare that rank value to the query's own rank.
- Ranking a query sounds odd, doesn't it? But it is just a numeric value created by some algorithm extracting terms and weighting them, too, just as we do for documents. Then $Dt \approx Qt$ [document terms values are close to the query terms value.]

Aligning the phrase

tropical	1,1			2,6	2,17		3,1		
fish	1,2	1,4	1,7	2,7	2,18	2,33	3,2	3,6	and so on...

Aligning the postings lists for "tropic" and "fish" to find the phrase "tropical fish"

Applying this ...

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<author>Aaron Burr</author>
<title>Chez les malécites</title>

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- In this example, searching for "aaron burr" might be treated as "aaron" + "burr". But we want the concept "aaron burr" - so want the terms next to each other ("aaron burr") to be treated differently. This is called an *extent*.

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- An *extent* or *extent list* is a contiguous region of a document.
- So imagine would could parse the document, skipping the XML tags, and record something like author: (1,2), (3,4) that would mean "the author concept is stored in the first word (1) and goes to word #2 (1 = "Rhéaume", 2 = "Barrette"); the (3,4) means start at word 3 (Aaron) and continue to word 4 (Burr).

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  - There are pros and cons to this approach. Calculating weights in response to a query is computationally intensive and probably requires calculating relevancy ranks only from documents that have at least one related term.
  - There are models that work on this principle, so let's do it, too!

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  - Social issues? Peer-pressure to search certain sites other than others.
  - Technical? The way Microsoft "offers" to save passwords, or perform functions for users, who just get beaten down by confusing settings and preference files and yield.

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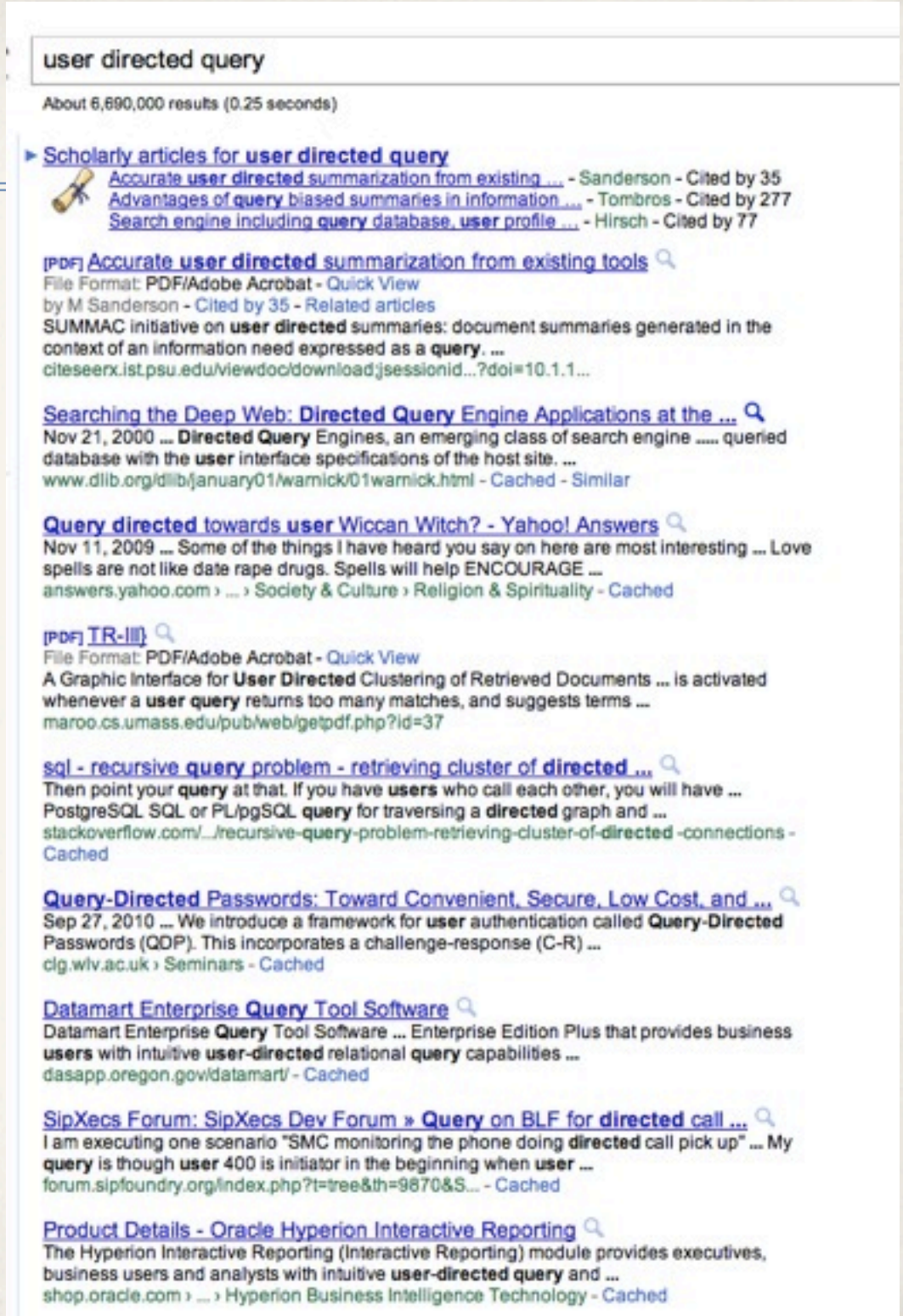
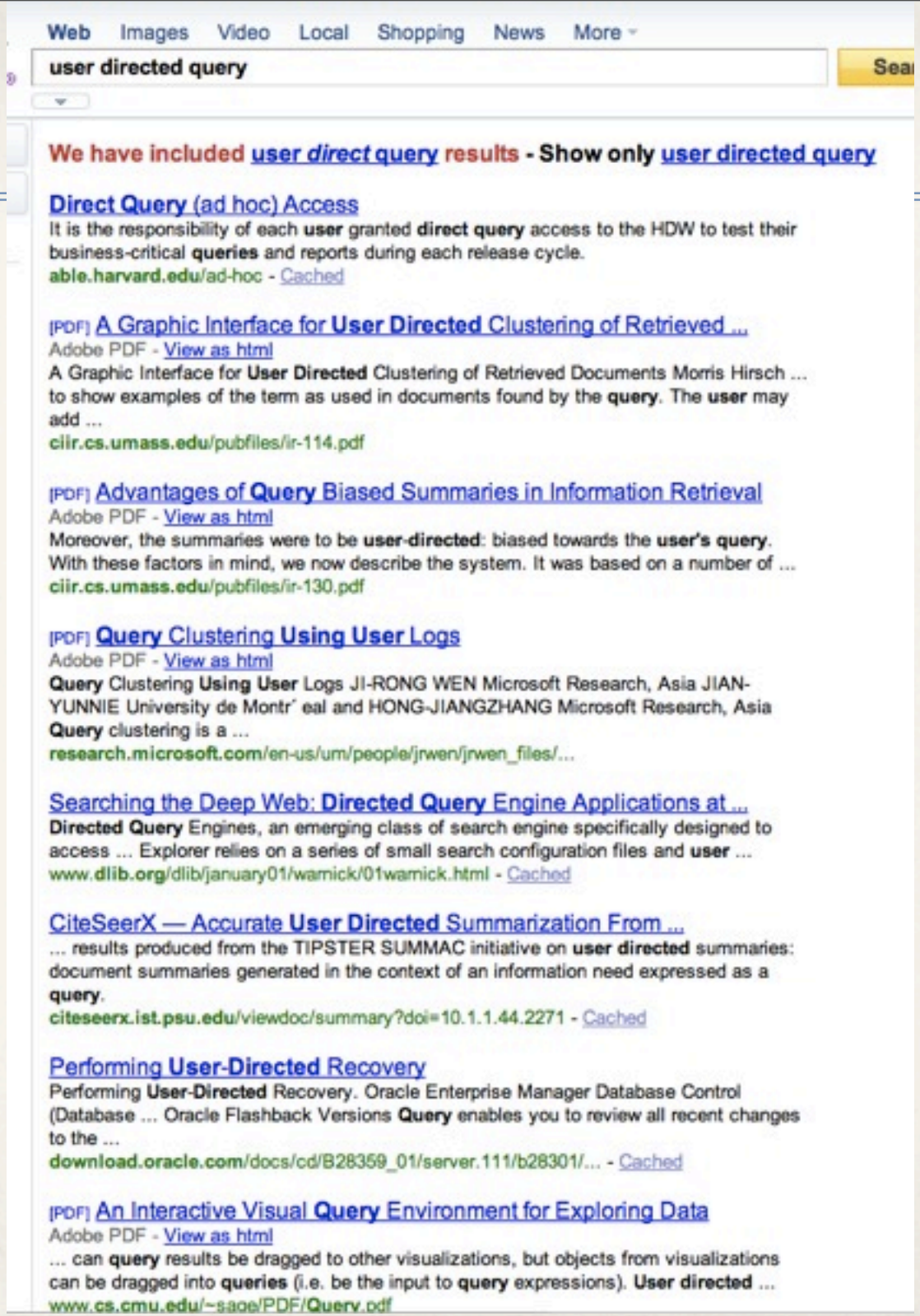
- For discussion's sake, compare your search output to the ones that appear on the next screens. Do the same documents appear? In the same order?
- Try searching with quote marks; or try forcing boolean "AND" using the +

Output from Google

A comparison chart appears after the screen shots.



Yahoo


Web Images Video Local Shopping News More
user directed query
We have included user direct query results - Show only user directed query
Direct Query (ad hoc) Access
It is the responsibility of each user granted direct query access to the HDW to test their business-critical queries and reports during each release cycle.
able.harvard.edu/ad-hoc - Cached
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Searching the Deep Web: Directed Query Engine Applications at ...
Directed Query Engines, an emerging class of search engine specifically designed to access ... Explorer relies on a series of small search configuration files and user ...
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CiteSeerX — Accurate User Directed Summarization From ...
... results produced from the TIPSTER SUMMAC initiative on user directed summaries: document summaries generated in the context of an information need expressed as a query.
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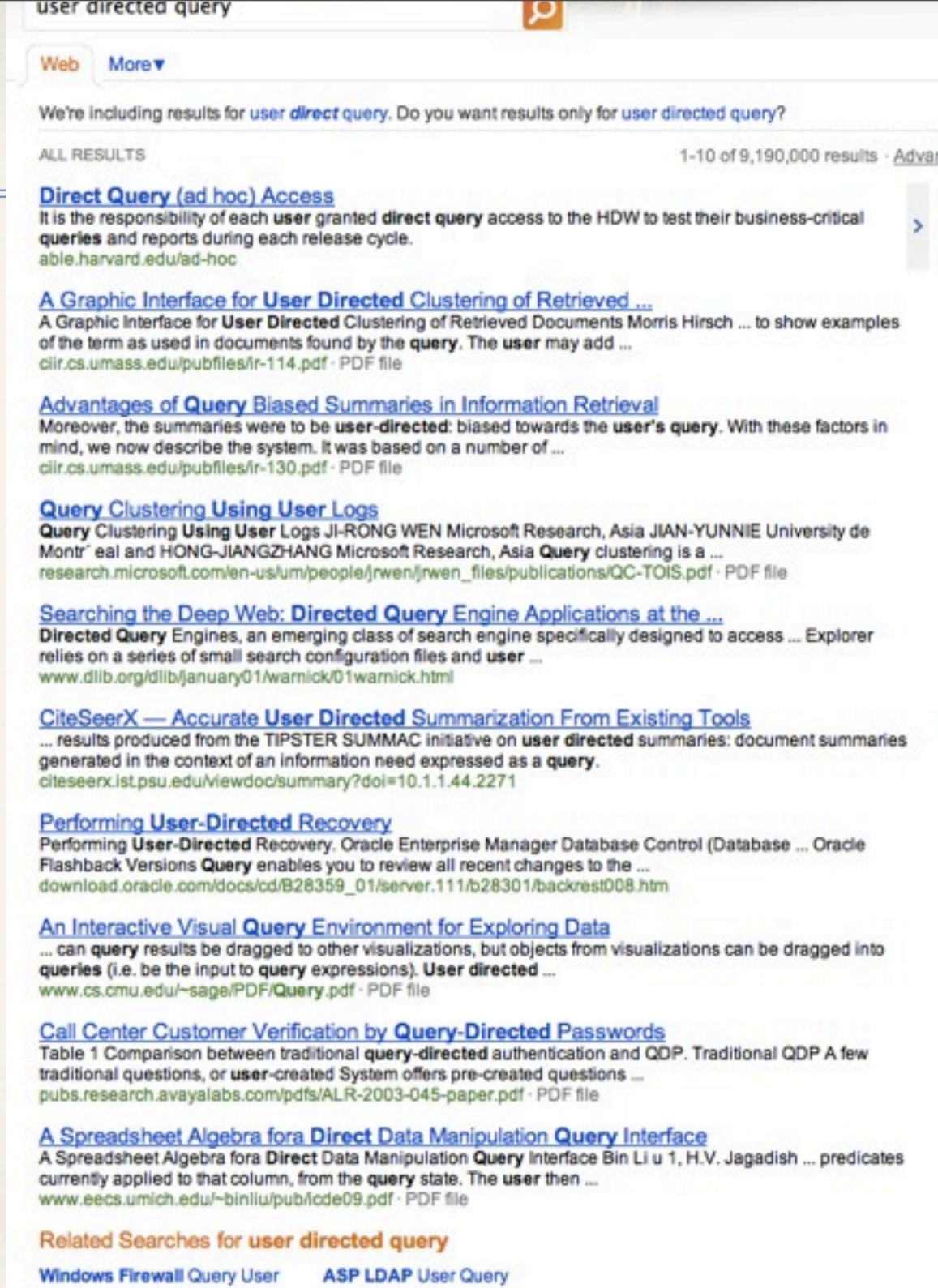
... can query results be dragged to other visualizations, but objects from visualizations can be dragged into queries (i.e. be the input to query expressions). User directed ...
www.cs.cmu.edu/~sage/PDF/Query.pdf

Bing


user directed query
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ALL RESULTS
1-10 of 9,190,000 results · Advar
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www.cs.cmu.edu/~sage/PDF/Query.pdf · PDF file
Call Center Customer Verification by Query-Directed Passwords
Table 1 Comparison between traditional query-directed authentication and QDP. Traditional QDP A few traditional questions, or user-created System offers pre-created questions ...
pubs.research.avayalabs.com/pdfs/ALR-2003-045-paper.pdf · PDF file
A Spreadsheet Algebra fora Direct Data Manipulation Query Interface
A Spreadsheet Algebra fora Direct Data Manipulation Query Interface Bin Li u 1, H.V. Jagadish ... predicates currently applied to that column, from the query state. The user then ...
www.eecs.umich.edu/~binliu/pub/icde09.pdf · PDF file
Related Searches for user directed query
Windows Firewall Query User
ASP LDAP User Query

Google	Yahoo	Bing
Scholarly articles Sanderson "Accurate user directed . . ." Tombros "Advantages of query based su" Hirsch "Search engine including query. . ."		
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Searching the Dept Web: directed query eng	[PDF] Graphic Interface for User Directed . . .	A Graphic Interface for User Directed
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Query-Directed Passwords	CiteSeerX - Accurate User Directed Summarization	CiteSeerX-Accurate User
Datamart Enterprise Query Tool Software	Performing User-Directed Recovery	Performing User-Directed
SipXecs Forum: SipXecs Dev Forum	[PDF] An Interactive Visual Query Environment	An Interactive Visual Query Env
Product Details - Oracle Hyperion		Call Center Customer Verification
		A Spreadsheet Algebra for a Direct Data

After Google's Scholarly Articles links, notice the ranking...

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- Now we can consider how we'd associate terms. Sketch out some ideas for our next session about relevancy ranking.

Special note: a real parser.

- Parsing MARC records:
  - here's a link to the source code of a parser I wrote that looks at the tags and processes them into one of 15 elements.
  - This code could be (and shall be) updated to match our class's concept of weighting based on tags and full-texts.
  - Are you thinking of interfaces for displaying the data?
  - The code is at http://web.simmons.edu/~benoit/LIS466/tagtest4.java

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  - search the research literature for research about our kind of project
  - What articles do you think are useful in explaining and/or evaluating icon or image-driven user-guided or user-directed interfaces for IR?
  - If possible, find some links or articles and send 'em to all the class (for example, save the .pdf on your website and send us the link)

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- *As always, I hope you're enjoying and learning from our examinations of IR. If you have questions, ideas, concerns, exciting discoveries, send 'em along! Bye - GB*