

Using Context to Support Searchers in Searching

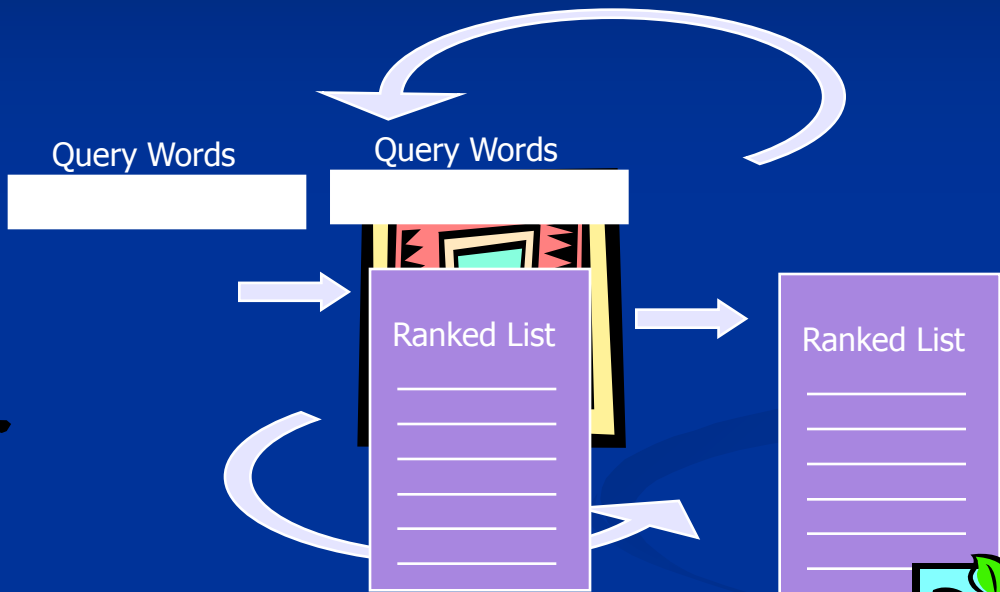
Susan Dumais

Microsoft Research

<http://research.microsoft.com/~sdumais>

Using **Context** Search Support Searchers

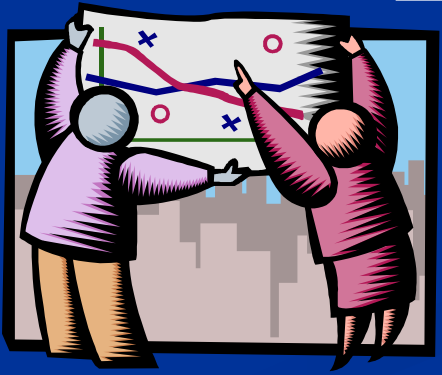
User Context



Document Context



Task/Use Context



Web Info through the Years

What's available

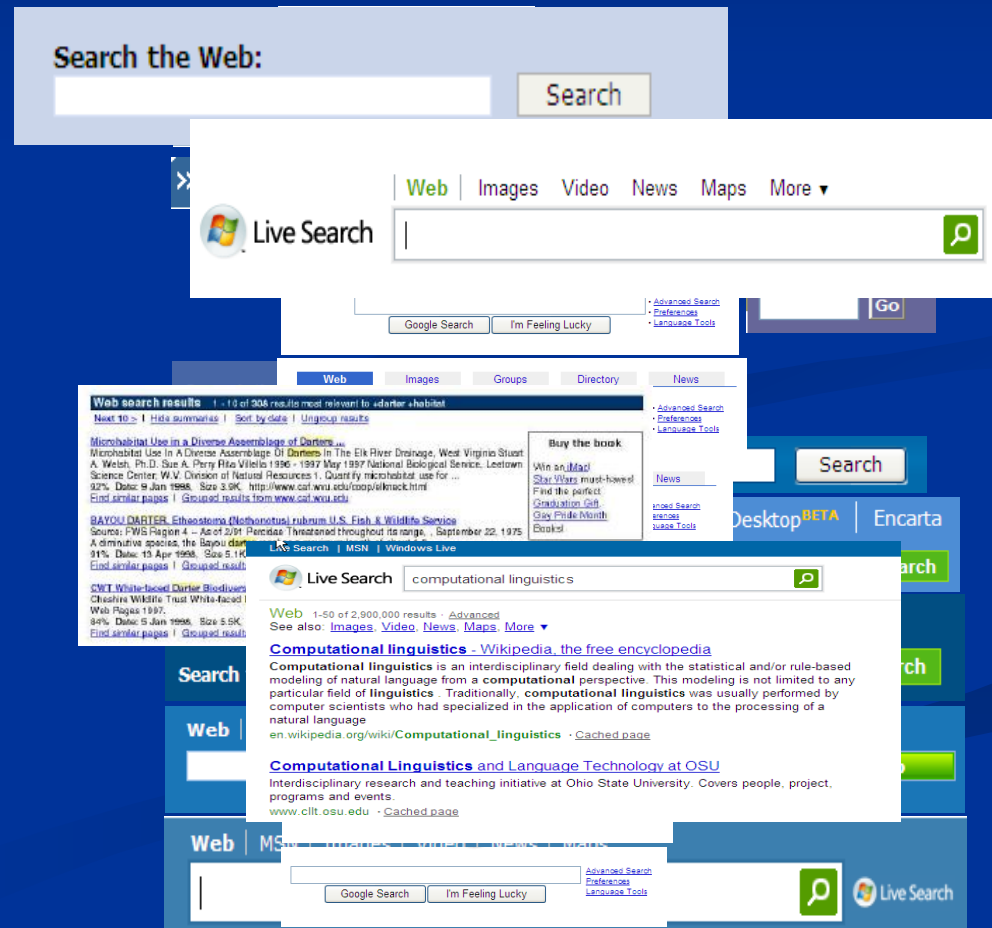
■ Number of pages indexed

- 7/94 Lycos -
- 95 - 10^6 millions
- 97 - 10^7
- 98 - 10^8
- 01 - 10^9 billions
- 05 - 10^{10} ...

■ Types of content

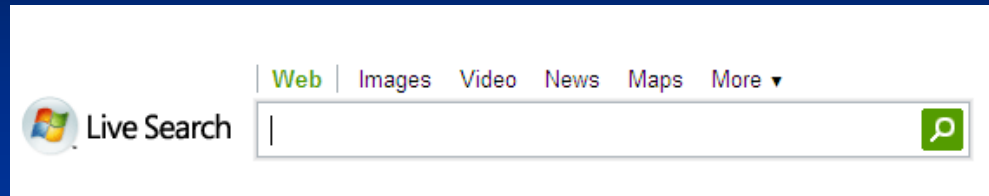
- Web pages, newsgroups
- Images, videos, maps
- News, blogs, spaces
- Shopping, local, desktop
- Books, papers
- Health, finance, travel ...

How it's accessed



Some Support for Searchers

- The search box
- Spelling suggestions
- Query suggestions
- Advanced search operators and options (e.g., “”, +/-, site:, filetype:, intitle:)
- Richer snippets
- But, we can do better using context



A screenshot of a Live Search results page. The search term 'suzan dumais' is entered in the search box. The page shows a navigation bar with 'Live Search | MSN | Windows Live', a status bar with 'United States | Options | cashback | Sign in', and a list of search results. A red circle highlights the 'Related searches' section on the right, which includes links for 'House Windows', 'Windows XP', 'Windows Update', 'Windows Media Player', 'Replacement Windows', 'Windows Vista', 'Anderson Windows', and 'Microsoft Windows'. The main results area includes sponsored links for 'Replacement Windows' and 'Microsoft Windows Support', and organic results for 'Internet Explorer: Get It Now' and 'Windows XP: Home Page'.

Key Contexts

- Users:
 - Individual, group (topic, time, location, etc.)
 - Short-term or long-term models
 - Explicit or implicit capture
- Documents/Domains:
 - Document-level metadata, usage/change patterns
 - Relations among documents
- Tasks/Uses:
 - Information goal - Navigational, fact-finding, informational, monitoring, research, learning, social, etc.
 - Physical setting - Device, location, time, etc.

Using Contexts

- Identify:
 - What context(s) are of interest?
- Accommodate:
 - What do we do differently for different contexts?
 - Outcome (Q|context) >> Outcome (Q)
- Influence points within the search process
 - Articulating the information need
 - Initial query, subsequent interaction/dialog
 - Selecting and/or ranking content
 - Presenting results
 - Using and sharing results

Context in Action

Research prototypes: provide insights about algorithmic, user experience, and policy challenges

■ User Contexts:

- Finding and Re-Finding (Stuff I've Seen)
- Personalized Search (PSearch)
- Novelty in News (NewsJunkie)

■ Document/Domain Contexts:

- Metadata and search (Phlat)
- Visualizing patterns in results (GridViz)

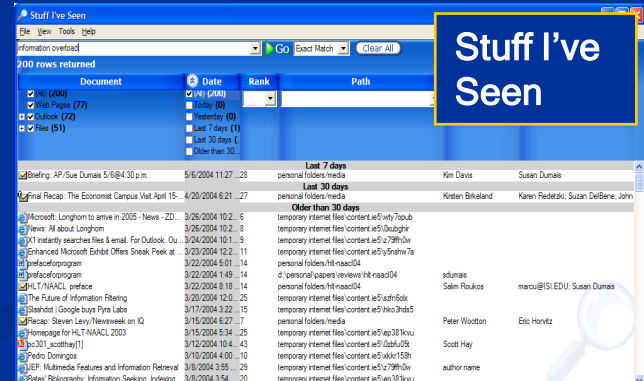
■ Task/Use Contexts:

- Pages as context (Community Bar, IQ)
- Richer collections as context (NewsJunkie, PSearch)
- Working, understanding, sharing (SearchTogether, InkSeine)

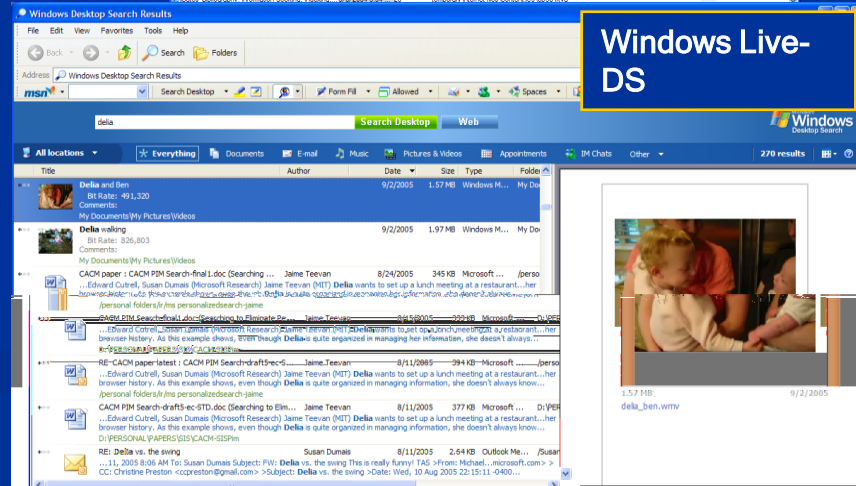
SIS: Stuff I've Seen

- Unified index of *stuff you've seen*

- Many info silos (e.g., files, email, calendar, contacts, web pages, rss, im)
- Unified index, not storage
- Index of content and metadata (e.g., time, author, title, size, access)
- Re-finding vs. finding



Stuff I've Seen



Windows Live-DS

➔ Vista Desktop Search (and Live Toolbar)

Also, Spotlight, GDS, X1, ...

SIS Demo

Stuff I've Seen

File View Tools Help

information overload | Go Exact Match Clear All

200 rows returned

Document	Date	Rank	Path	Author	Mail To
<input checked="" type="checkbox"/> (All) (200) <input checked="" type="checkbox"/> Web Pages (77) <input checked="" type="checkbox"/> Outlook (72) <input checked="" type="checkbox"/> Files (51)					
<input checked="" type="checkbox"/> Today (0) <input type="checkbox"/> Yesterday (0) <input type="checkbox"/> Last 7 days (1) <input type="checkbox"/> Last 30 days (. <input type="checkbox"/> Older than 30...					
Last 7 days					
<input checked="" type="checkbox"/> Briefing: AP/Sue Dumais 5/6@4:30 p.m.	5/6/2004 11:27 ...28		personal folders/media	Kim Davis	Susan Dumais
Last 30 days					
<input checked="" type="checkbox"/> Final Recap: The Economist Campus Visit April 15-...	4/20/2004 6:21 ...27		personal folders/media	Kirsten Birkeland	Karen Redetzki; Suzan DelBene; John
Older than 30 days					
<input type="checkbox"/> Microsoft: Longhom to arrive in 2005 - News - ZD...	3/26/2004 10:2... 6		temporary internet files\content.ie5\wty7opub		
<input type="checkbox"/> News: All about Longhom	3/26/2004 10:2... 8		temporary internet files\content.ie5\0xubghir		
<input type="checkbox"/> X1 instantly searches files & email. For Outlook, Ou...	3/24/2004 10:1... 9		temporary internet files\content.ie5\z79ffh0w		
<input type="checkbox"/> Enhanced Microsoft Exhibit Offers Sneak Peek at ...	3/23/2004 12:2... 11		temporary internet files\content.ie5\y5nshw7a		
<input type="checkbox"/> prefaceforprogram	3/22/2004 5:01 ...14		personal folders/hlt-naacl04		
<input type="checkbox"/> prefaceforprogram	3/22/2004 1:49 ...14		d:\personal\papers\reviews\hlt-naacl04	sdumais	
<input checked="" type="checkbox"/> HLT/NAACL preface	3/22/2004 8:18 ...14		personal folders/hlt-naacl04	Salim Roukos	marcu@ISI.EDU; Susan Dumais
<input type="checkbox"/> The Future of Information Filtering	3/20/2004 12:0... 25		temporary internet files\content.ie5\szfn6ox		
<input type="checkbox"/> Slashdot Google buys Pyra Labs	3/17/2004 3:22 ...15		temporary internet files\content.ie5\hko3hds5		
<input checked="" type="checkbox"/> Recap: Steven Levy/Newsweek on IQ	3/15/2004 6:27 ...7		personal folders/media	Peter Wootton	Eric Horvitz
<input type="checkbox"/> Homepage for HLT-NAACL 2003	3/15/2004 5:34 ...25		temporary internet files\content.ie5\vp381kvu		
<input type="checkbox"/> pc301_scothay[1]	3/12/2004 10:4... 43		temporary internet files\content.ie5\0zbfu05t	Scott Hay	
<input type="checkbox"/> Pedro Domingos	3/10/2004 4:00 ...10		temporary internet files\content.ie5\dkkr158h		
<input type="checkbox"/> JEP: Multimedia Features and Information Retrieval	3/8/2004 3:55 ... 29		temporary internet files\content.ie5\z79ffh0w	author name	
<input type="checkbox"/> Bates' Bibliography: Information Seeking, Indexing,...	3/8/2004 3:54 ... 20		temporary internet files\content.ie5\vp381kvu		

SIS Usage Experiences

Internal deployment

- ~3000 internal Microsoft users
- Analyzed: Free-form feedback, Questionnaires, Structured interviews, Log analysis (characteristics of interaction), UI expts, Lab expts

Personal store characteristics

- 5k - 500k items

Query characteristics

- Short queries (1.6 words)
- Few advanced operators or fielded search in query box (~7%)
- Many advanced operators and query iteration in UI (48%)
 - Filters (type, date); modify query; re-sort results

Susan's (Laptop) World		
Type	N	Size
Web	3k	0.2 Gb
Files	28k	23.0 GB
Mail	60k	2.2 Gb
Total	91k items	25.4 Gb
Index		190 Mb
		+1.5 Mb/week

SIS Usage Data, cont'd

Importance of people, time, and memory

■ People

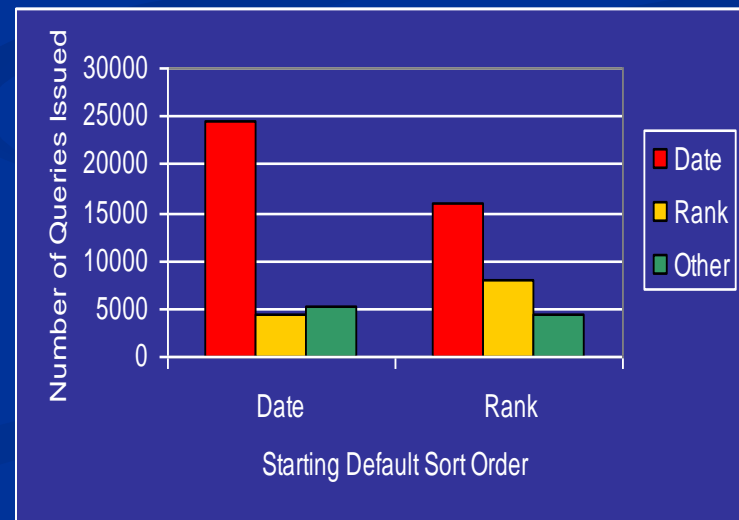
- 25% of queries contained names
- People in roles (to:, from:) vs. people as entities in text

■ Time

- Age of items opened
 - 5% today; 21% last week
 - 50% of the cases in 36 days
Web (11); Mail (36); Files (55)
- **Date** most common sort field, even when Rank was the default
 - Support for episodic memory

■ Few searches for “best” topical match ... many other criteria

$$\text{Log}(\text{Freq}) = -0.68 * \text{log}(\text{DaysSinceSeen}) + 2.0$$

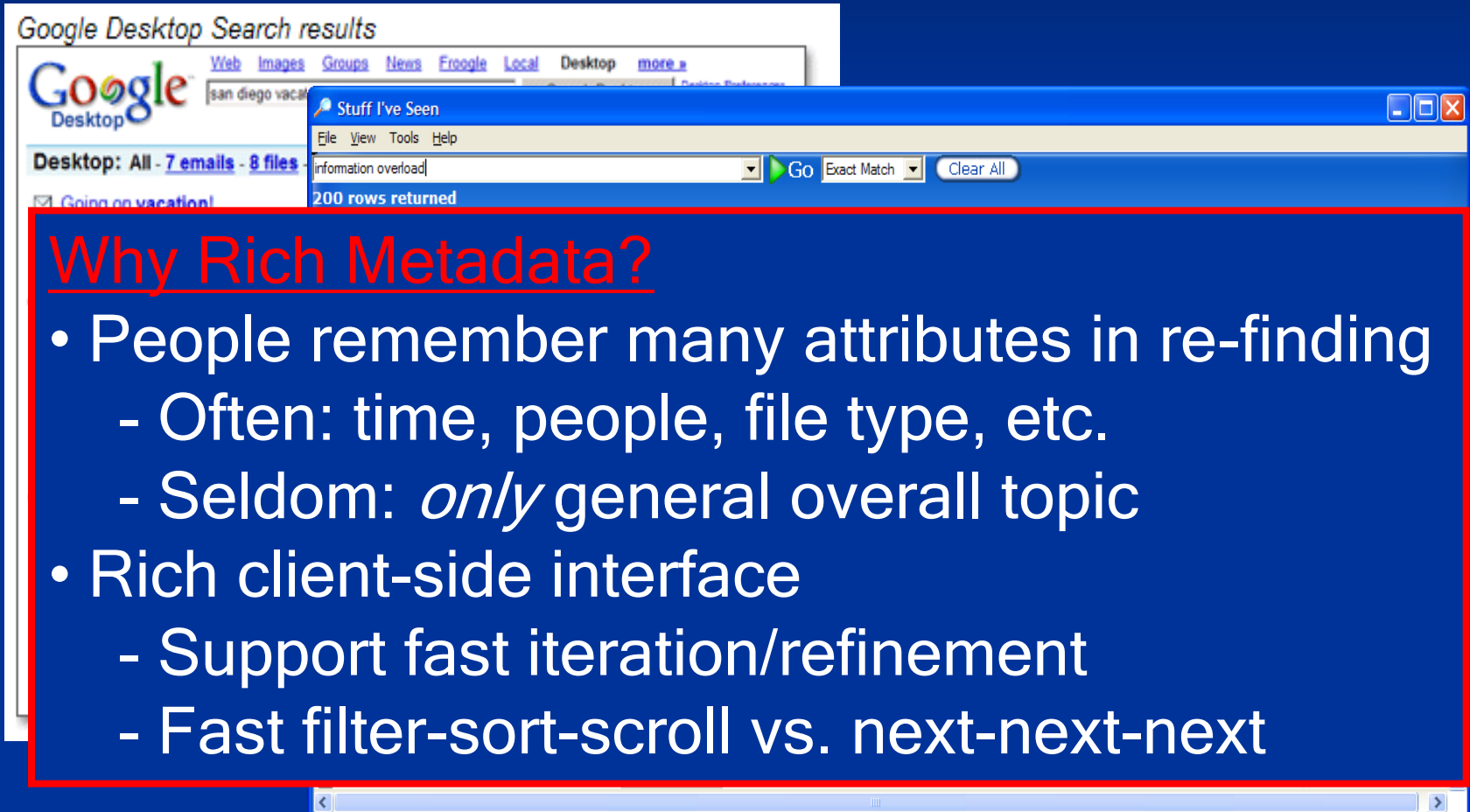


SIS Usage Data, cont'd

Observations about unified access

- Metadata quality is variable
 - Email: rich, pretty clean
 - Web: little, available to application
 - Files: some, but often wrong
- Memory depends on abstractions
 - “Useful date” is dependent on the object !
 - Appointment, when it happens
 - File, when it is changed
 - Email and Web, when it is seen
 - “People” attribute vs. contains
 - To, From, Cc, Attendee, Author, Artist

Ranked list vs. Metadata (for personal content)

A screenshot of the Google Desktop Search interface. The window title is "Google Desktop Search results". The search bar contains "san diego vaca". Below the search bar, there are tabs for "Web", "Images", "Groups", "News", "Errogle", "Local", "Desktop", and "more...". The "Desktop" tab is selected. Below the search bar, there is a "Go" button and a "Clear All" button. The search results show "200 rows returned". A red box highlights a section of the interface containing the text "Why Rich Metadata?" and a list of bullet points.

Google Desktop Search results

Google Desktop

Web Images Groups News Errogle Local Desktop more...

Desktop: All - 7 emails - 8 files

Going on vacation!

Stuff I've Seen

File View Tools Help

information overload

Go Exact Match Clear All

200 rows returned

Why Rich Metadata?

- People remember many attributes in re-finding
 - Often: time, people, file type, etc.
 - Seldom: *only* general overall topic
- Rich client-side interface
 - Support fast iteration/refinement
 - Fast filter-sort-scroll vs. next-next-next

Re-finding on the Web

- 50-80% URL visits are revisits
- 30-40% of queries are re-finding queries

Table 1. A classification of different query types.

All queries: 13,060 queries (100%)	Overlapping Click Queries – 5072 queries (39%)			
	Equal Click Queries – 3777 (29%)		Some Common Clicks 1295 (10%)	No Common Clicks 7988 (61%)
	Single Identical Click 3737 (29%)	Multiple Identical Clicks 40 (< 1%)		
Equal Query Queries 4256 (33%)	Navigational Queries 3100 (24%)		635 (5%)	485 (4%)
Different Query 8804 (67%)	637 (5%)	4 (< 1%)	660 (5%)	7503 (57%)

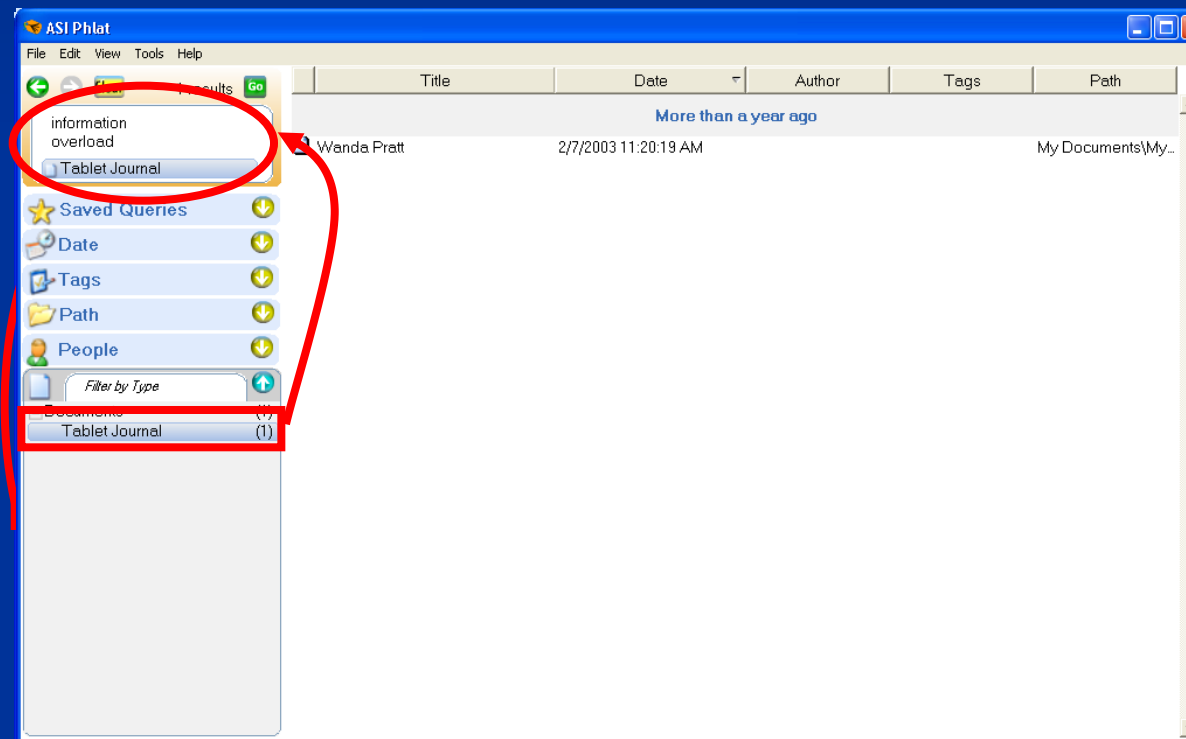
Phlat: Search and Metadata

- Shell for WDS; publically available
- Features:
 - Search / Browse (faceted metadata)
 - Unified Tagging
 - In-Context Search

The screenshot displays the Phlat search interface. On the left, the **Query Area** (pink callout) contains a search bar with the text "bike", a "Clear" button, and a "Go" button. Below the search bar are filters for "Personal" and "Mail/Calendar". The **Filter Area** (cyan callout) shows a "Filter by Tag" section with a tree view of tags: Personal (123), Family (1), Gaming, Bikes (89), Images (1), Maps (1), Book Clubs (1), Beer, Friends (16), Cats, Art, and New Friends. Below this are sections for "Path", "People", and "Type". On the right, the **Results Area** (orange callout) displays a table of search results. The table has columns for "Title", "Date", "Author", and "To". The results are grouped by date ranges: "Within the last year" and "More than a year ago". Each result entry includes a checkbox, a title, a date, an author, and a recipient. The first result is "Pedal the Pinchot July 16ht" by Cal Tjader to Willie Bobo. The second result is "Pedal the Pinchot July 16ht" by Willie Bobo to Cal Tjader. The third result is "Pedal the Pinchot July 16ht" by Cal Tjader to Willie Bobo. The fourth result is "Moran State Park Spetember Ride" by Hugh Masekela to Willie Bobo. The fifth result is "Bye..." by Jimmy Smith to Willie Bobo.

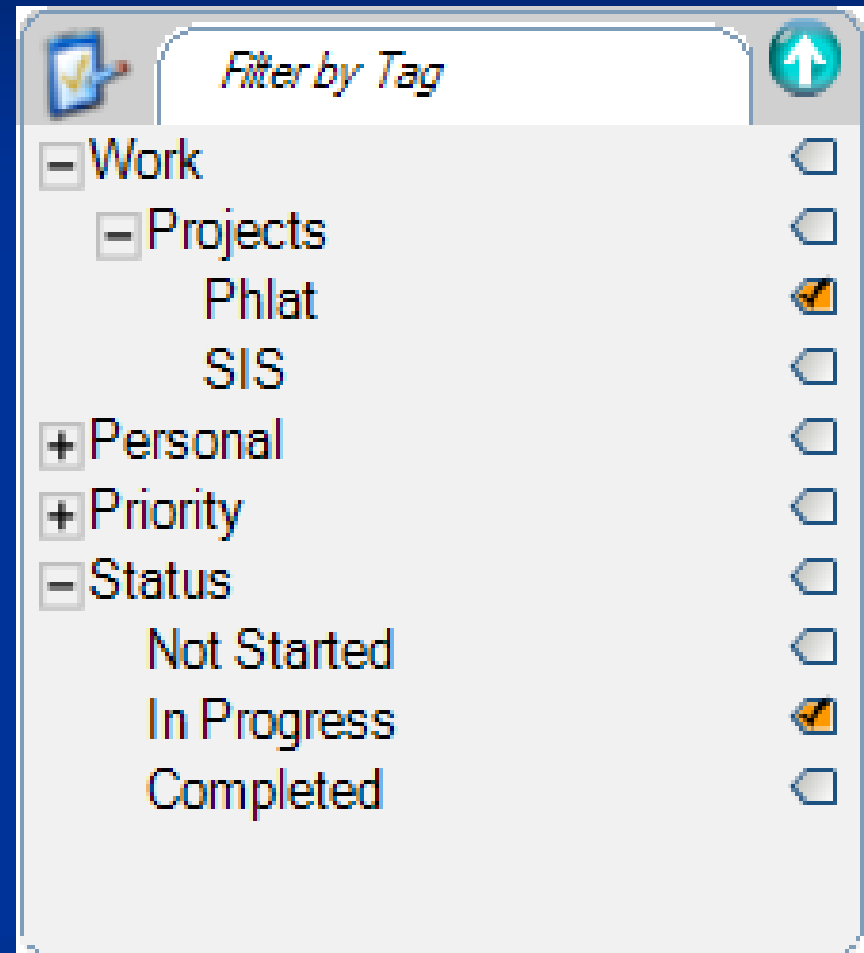
Phlat: Faceted metadata

- Tight coupling of search and browse
- Q → Results &
 - Associated metadata w/ query previews
 - 5 default properties to filter on (extensible)
 - Includes tags
- Property filters integrated with query
 - Query = words and/or properties
 - No stuck filters
- Search == Browse



Phlat: Tagging

- Apply a **single set** of user-generated tags to **all content** (e.g., files, email, web, rss, etc.)
- Tagging interaction
 - Tag widget or drag-to-tag
- Tag structure
 - *Allow* but do not *require* hierarchy
- Tag implementation
 - Tags directly associated with files as NTFS or MAPI properties



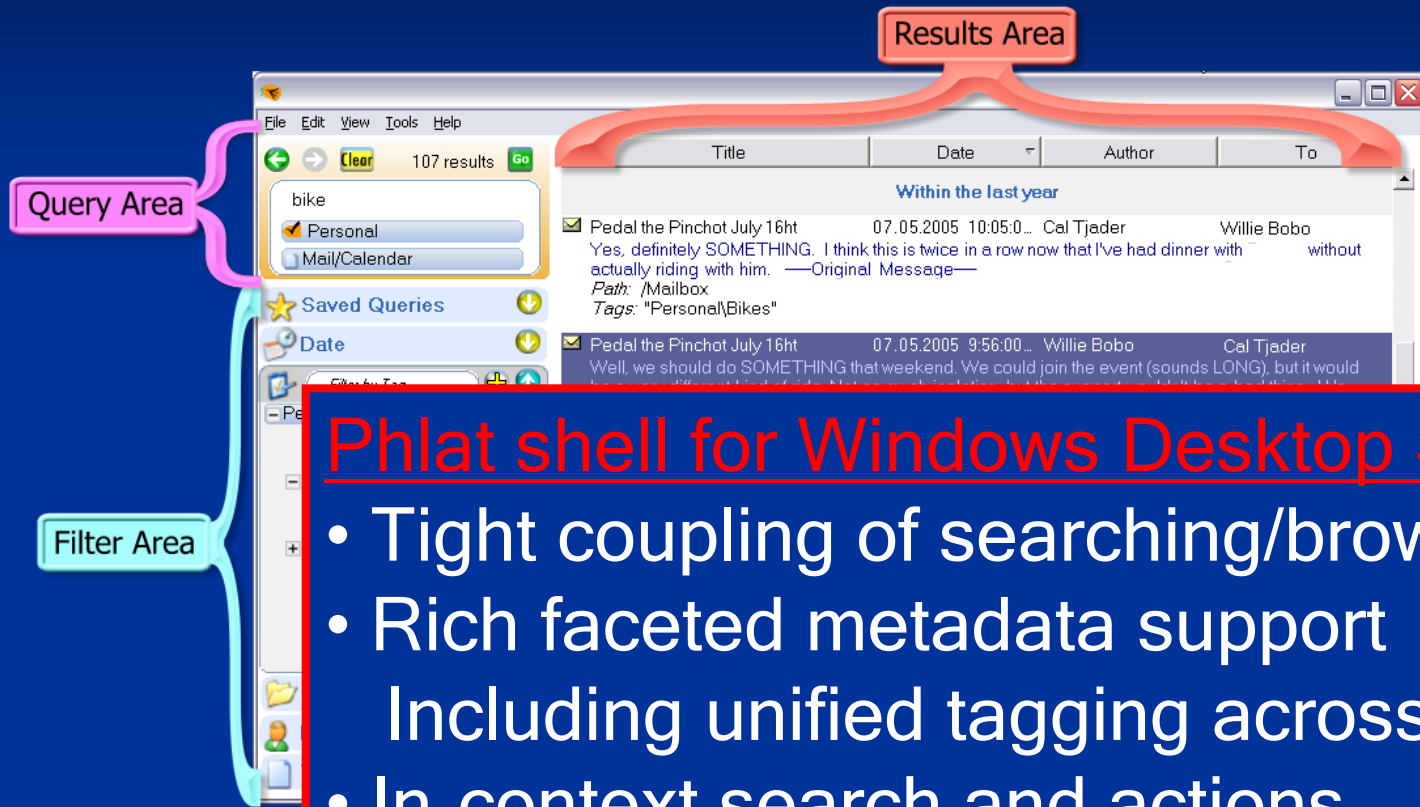
Phat: In-Context Search

- Selecting a result ...
- Linked view to show associated tags
- Rich actions
 - Open, drag-drop, etc.
- Pivot on metadata
 - “Sideways search”
 - Refine or replace query

The screenshot displays the ASI Phlat search interface. The search bar contains the query "Isa" and shows 673 results. The results are displayed in a table with columns for Title, Date, Author, Tags, and Path. The interface includes several filters on the left side, such as Date, Filter by Tag, Filter by Type, and People. A red circle highlights the "Status" filter, which is currently set to "In Progress". The search results include various documents, such as "Susan Dumais Homepage", "Finkelstein-TOIS2001.pdf", "kct-proposal", "ActionLetter-HCI752-R1.pdf", "Dumais-CV.pdf", "vita-current.pdf", "ISE chapter proofs due now.m...", "lender16.pdf", "TOP 10 questions from Lenda...", "Shell triage 8/22", "vita-current-patents", "RECAP: Sue Dumais/MaryJo...", "Briefing: Sue Dumais/MaryJo...", "How To compare 2 documents", "MSR/LL @ SIGIR", "MSR/LL @ SIGIR", "IOstress Resolutions for 07/...", "IOstress Resolutions for 07/...", "Acknowledgment", "unigram-frequencies.csv", "ActionLetter-HCI752-R1.pdf", "ActionLetter-HCI752-R1", "ActionLetter-R1", and "Encrypted files/folders (RE...)".

Title	Date	Author	Tags	Path
Susan Dumais Homepage	11/24/2006 12:46:45...			\\SDUMAISLAPTOP...
Susan Dumais Homepage	11/21/2006 5:07:54 P...			\\SDUMAISLAPTOP...
Finkelstein-TOIS2001.pdf	11/2/2006 6:48:51 PM			My Documents\paper...
kct-proposal	10/17/2006 7:03:42 A...	School of Computer...		My Documents\paper...
kct-proposal.pdf	9/21/2006 8:21:34 PM			My Documents\paper...
...	9/3/2006 10:52:03 AM	Peter Pirolli		/Personal Folders/SP...
ActionLetter-HCI752-R1.pdf (...)	9/2/2006 10:58:51 AM			My Documents\paper...
ActionLetter-HCI752-R1	9/2/2006 10:56:14 AM	sdumais		My Documents\paper...
Dumais-CV.pdf (Microsoft Wo...	8/31/2006 9:01:27 AM			My Documents\paper...
vita-current.pdf (Microsoft Wo...	8/31/2006 9:01:27 AM			My Documents\paper...
vita-current	8/31/2006 8:47:42 AM	sdumais		My Documents\paper...
ISE chapter proofs due now.m...	8/28/2006 3:31:54 PM			My Documents\paper...
lender16.pdf (untitled)	8/25/2006 2:02:16 PM			My Documents\paper...
TOP 10 questions from Lenda...	8/23/2006 9:35:04 AM	Tom Landauer	:"Status\In Progress"	/Personal Folders/IR/...
Dear Jaakko Väyrynen, The webmaster of the LSA@colorado.edu site, Pratul Mangelath, will send you a form with the conditions for sharing the TOEFL items. I am compelled to add that Dumais and I intended this small multiple choice test for...				
Path: /Personal Folders/IR/Isi				
Tags: "Status\In Progress"				
Shell triage 8/22	8/22/2006 5:28:38 P...	Joe Sheman		/personal folders/fir/...
vita-current-patents	8/12/2006 8:09:52 AM	sdumais		My Documents\paper...
RECAP: Sue Dumais/MaryJo...	8/3/2006 9:40:45 AM	Doreen O'Skea		/Personal Folders/Me...
Briefing: Sue Dumais/MaryJo...	7/31/2006 7:14:56 PM	Kim Davis		/Personal Folders/Me...
How To compare 2 documents	7/31/2006 2:43:36 AM	ongkir		/Personal Folders/IR/...
MSR/LL @ SIGIR	7/30/2006 8:37:11 PM	Julie Woodbury		/Personal Folders/Me...
MSR/LL @ SIGIR	7/29/2006 4:10:20 PM	Susan Dumais		/personal folders/fir/m...
IOstress Resolutions for 07/...	7/25/2006 3:58:40 P...	David Shockley (Volt)		/personal folders/fir/...
IOstress Resolutions for 07/...	7/24/2006 4:19:35 P...	David Shockley (Volt)		/personal folders/fir/...
Acknowledgment	6/21/2006 6:47:57 AM	Eduardo Mizraji		/Mailbox - Susan Du...
unigram-frequencies.csv	6/9/2006 1:05:57 PM			My Documents\Pers...
ActionLetter-HCI752-R1.pdf (...)	6/3/2006 11:12:39 AM			My Documents\paper...
ActionLetter-HCI752-R1	6/3/2006 11:11:21 AM	sdumais		My Documents\paper...
ActionLetter-R1	6/3/2006 9:16:50 AM	sdumais		My Documents\paper...
Encrypted files/folders (RE...	5/26/2006 9:42:58 A...	Mike Smith-Lonerqa...		/personal folders/fir/...

Phlat



Phlat shell for Windows Desktop Search

- Tight coupling of searching/browsing
- Rich faceted metadata support
 - Including unified tagging across data types
- In-context search and actions

Download: <http://research.microsoft.com/adapt/phlat>

Web Search using Metadata

See all results that mention **Digital Cameras** New Nikon D700 On Sale

Search for **cold soup**

Home Recipes & Cooking Holidays & Parties Quick & Easy Healthy Eating TV Shop Videos

Showing 1 - 15 of 317 Sort by: Relevance

Your Selections:

To narrow your search results
Select filters from the left.

Narrow Your Results By:

- Vegetables (169)
- Chicken (49)
- Eggs (4)
- Meat (43)
- More Ingredients (39) ▶
- Dishes
- Soup (229)
- Sauce (40)
- Brunch (6)
- Gumbo (4)

Cold Tomato Soup ★★★★★
Recipe courtesy Emeril Lagasse, 2004
Ingredients: Vegetables, Fruit
Prep Time: 50 mins | Cook Time: N/A | Difficulty: Easy

Cold Avocado Soup ★★★★★
Recipe courtesy Emeril Lagasse, 2001
Ingredients: Vegetables, Cucumber, Dairy
Prep Time: 10 mins | Cook Time: N/A | Difficulty: Easy

Cold Heirloom Tomato Soup with Tropical Lobster Relish ★★★☆☆
Recipe courtesy Emeril Lagasse, 2004
Ingredients: Vegetables, Tomato, Shellfish
Prep Time: 3 hrs 30 mins | Cook Time: 40 mins | Difficulty: N/A

Advertisement: WAL*MART
Save money. Live better.™
Roll over for all your sundae ingredients.
Build something delicious for a great low price.
Love ice cream?

In the Food Network Store
Oval Stockpot (8-qt.)
Hard Anodized by Rational
Price: \$79.95

Nikon D80 - digital camera
by Nikon
From \$924.99

\$780 - \$16,496 to \$

Many queries include implicit metadata

portrait of barak obama

recent news about midwest floods

good painters near redmond

starbucks near me

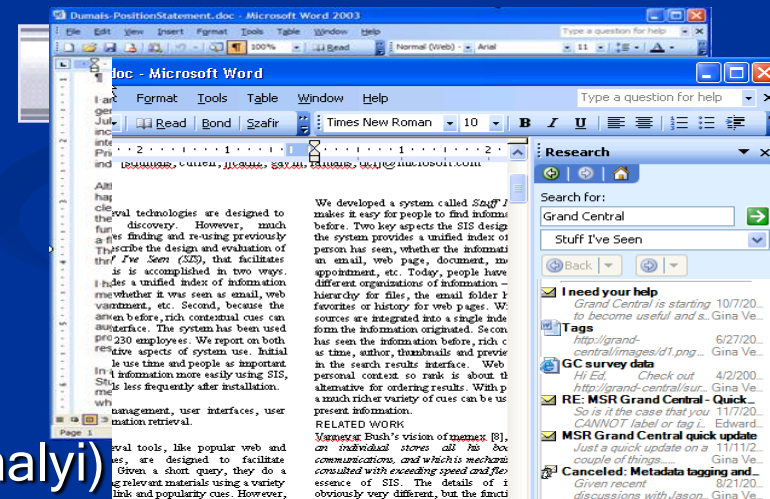
overview of high blood pressure

Limited support for users to articulate this

Search in Context

- Search is not the end goal ...
- Support information access in the context of ongoing activities (e.g., writing talk, finding out about, planning trip, buying, monitoring, etc.)

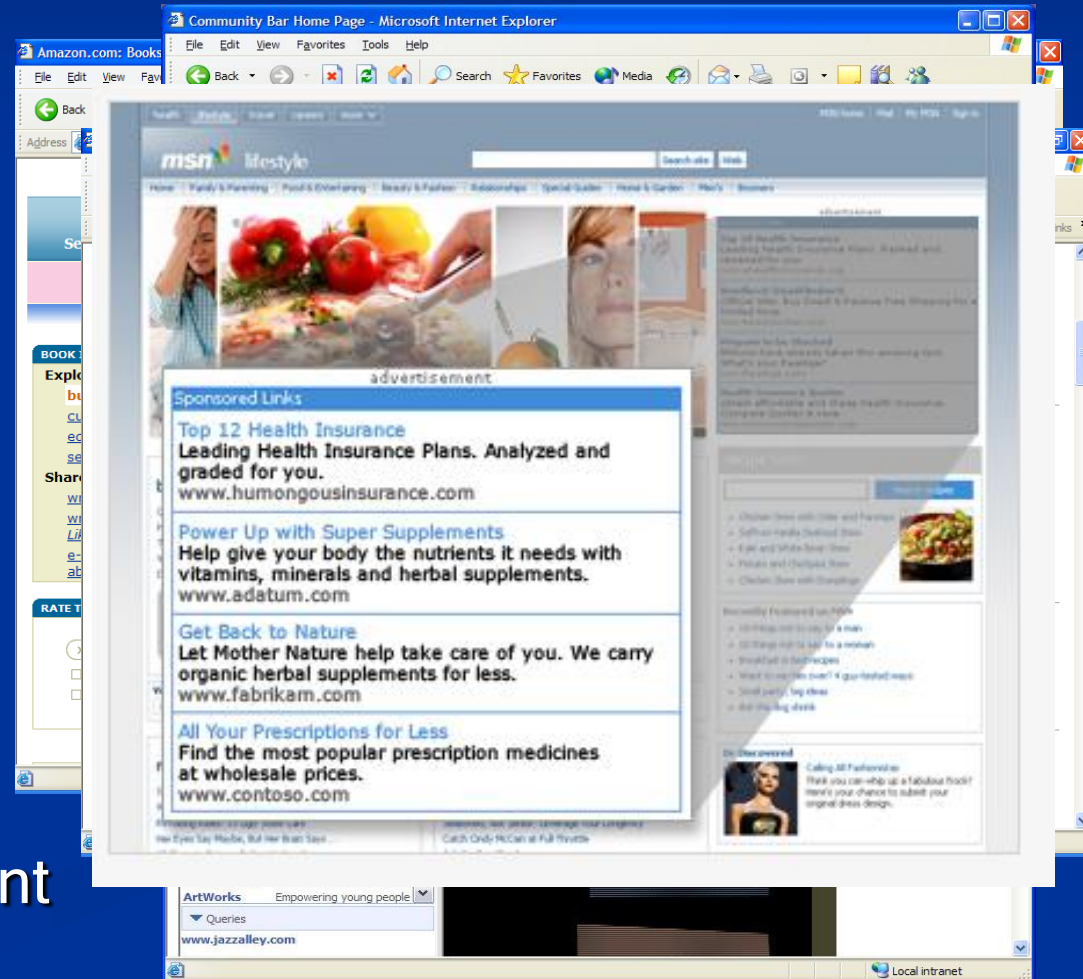
- Search always available
- Search from within apps (keywords, regions, full doc)
- Show results within app
- Maintains “flow” (Csikszentmihalyi)
- Can improve relevance



Documents as (a simple) Context

Proactive “query” specification depending on current document content and activities

- Recommendations
 - People who bought this also bought ...
- Contextual Ads
 - Ads relevant to page
- Community Bar
 - Notes, Chat, Tags, Inlinks, Queries
- Implicit Queries (IQ)
 - Also Y!Q, Watson, Rememberance Agent



Document Contexts (Implicit Query, IQ)

- Proactively find info related to item being read/created
 - Quick links
 - Related content
- Challenges
 - Relevance, fine
 - When to show? (useful)
 - How to show? (peripheral awareness)

The screenshot shows an email client window titled "I need your help - Message (H...)" with a menu bar (File, Edit, View, Insert, Format) and a toolbar (Reply, Reply to All, Forward, etc.). The email content is as follows:

From: Gina Venolia
To: ASI and Affiliates
Cc:
Subject: I need your help

Sent: Tue 10/7/2003 10:08 AM

Grand Central is starting to become useful and stable enough to "dogfood". Yay! To make sure that it works on a variety of machine configurations, I'm hoping that I can get some volunteers to run Grand Central on their machines. Requirements and installation steps are at <http://grand-central/install.html>

Thanks,
-Gina

Gina Venolia

The IQPane sidebar on the right shows a search for "Search SIS for:" with results for "Gina Venolia" and "ASI and Affiliates", and a subject line "Subj: I need your help".

Callout 1 (top right): Quick links for People and Subject.

Callout 2 (bottom left): Background search on top k terms, based on user's index —
Score = $\text{tf}_{\text{doc}} / \log(\text{tf}_{\text{corpus}} + 1)$

Callout 3 (bottom right): Top matches for this Implicit Query (IQ).

*P*Search: Personalized Search (Even Richer Context)

- Today: People get the same results, independent of current session, previous search history, etc.
- PSearch: Uses rich client-side info to personalize results

Live Search | MSN | Windows Live

Live Search

Web 1-10 of 3,480,000 results - [Advanced](#)
See also: [Images](#), [Video](#), [News](#), [Maps](#), [More](#) ▼

Personalized [WebCache](#) [Desktop](#)

- [ACL 08: HLT - Home Page](#)
o <http://www.ling.ohio-state.edu/acl08/>
- [ACL 2008 Workshop on Mobile Language Processing](#)
o <http://www.mobilenlpworkshop.org/>
- [ACL 2008 Lineup Announced! Sonic Itch Music](#)
o <http://www.sonicitchmusic.com/?p=1883>

...show more

[Austin City Limits Music Festival : September 26-28, 2008 : Austin, TX ...](#)
and TM designate trademarks of Capital of Texas Public Telecommunications Council, Inc. All Rights Reserved.
www.aclfestival.com/default.aspx · [Cached page](#)

[Austin City Limits - Lineup](#)
and TM designate trademarks of Capital of Texas Public Telecommunications Council, Inc. All Rights Reserved.
www.aclfestival.com/lineup.aspx · [Cached page](#)
[Show more results from www.aclfestival.com](#)

[ACL Connections 2008](#)
Connections 2008 was a resounding success. Attendees learned new and innovative ways to use ACL technology and got a sneak peak at AuditExchange 2009, including live demonstrations
www.acl.com/userconference · [Cached page](#)

- Building a user profile



- Personalized ranking



- When to personalize?

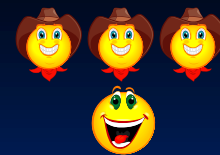


- How to personalize display?

[ACM SIGIR Special Interest Group on Information Retrieval Home Page](#)

Welcome to the ACM SIGIR Web site ... SIGIR thanks Doug Oard, Bill Hersh, David Carmel, Noriko Kando, Diane Kelly... Get ready for SIGIR 2008!

sigir.org



Building a User Profile

- Type of information: *PSearch*
 - Explicit: Judgments, categories
 - Content: Past queries, web pages, desktop
 - Behavior: Visited pages, dwell time
- Time frame: Short term, long term
- Who: Individual, group
- Where the profile resides:
 - Local: Richer profile, improved privacy
 - Server: Richer communities, portability

Personalized Ranking



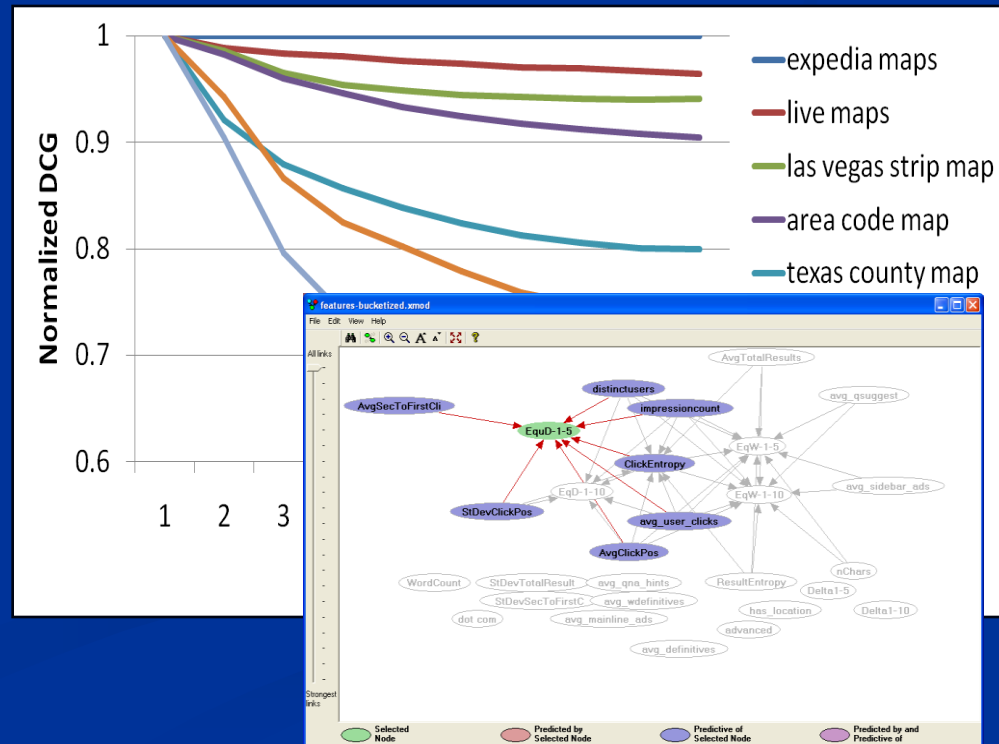
- Personal Rank = $f(\text{Cont}, \text{Beh}, \text{Web})$
- Pers_Content Match: $\text{sim}(\text{result}, \text{user_content_profile})$
- Pers_Behavior Match: visited URLs
- Web Match: web rank

When to Personalize?



- Personalization works well for some queries, ... but not for others
- Framework for understanding when to personalize

- Personal ranking
 - **Personal relevance** (explicit or implicit)
- Group ranking
 - Decreases as you add more people
- Gap is “*potential for personalization (p4p)*”

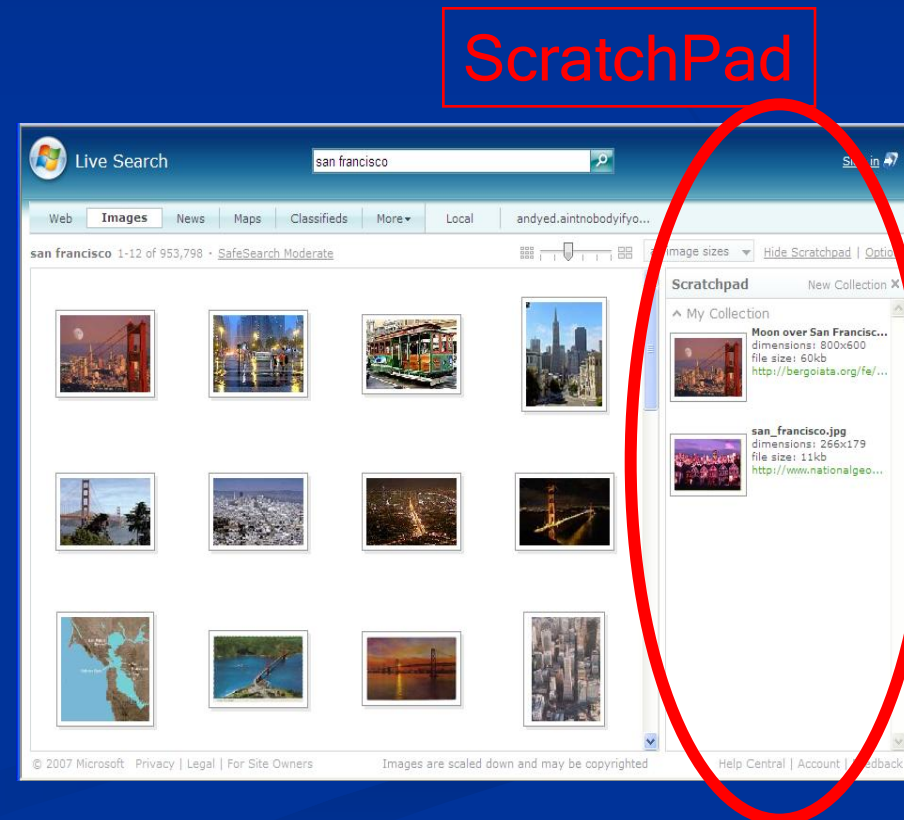


More Personalized Search

- PSearch - rich long-term context; single individual
- Short-term session/task context
 - Session analysis
 - Query: *ACL*, ambiguous in isolation
 - Natural language ... summarization ... *ACL*
 - Knee surgery ... orthopedic surgeon ... *ACL*
- Groups of similar people
 - Groups: Location, demographics, interests, behavior, etc.
 - Mei & Church (2008)
 - $H(\text{URL}) = 22.4$
 - Search: $H(\text{URL}|\text{Q}) = 2.8$
 - Personalization: $H(\text{URL}|\text{Q}, \text{IP}) = 1.2$
 - Many models ... smooth individual, group, global models

Beyond Search - Gathering Info

- Support for more than retrieving documents
 - Retrieve -> Analyze -> Use
- Lightweight scratchpad or workspace support
 - Iterative and evolving nature of search
 - Resuming at a later time or on other device
 - Sharing with others



Beyond Search – Sharing & Collaborating

■ SearchTogether

- Collaborative web search prototype
- Sync. or async. sharing w/ others or self

■ Collaborative search tasks

- E.g., Planning travel, purchases, even understanding medical info; research joint project or report

■ Today little support

- Email links, instant messaging, phone

■ SearchTogether adds support for

- Awareness (history, metadata)
- Coordination (IM, recommend, split)
- Persistence (history, summaries)

SearchTogether



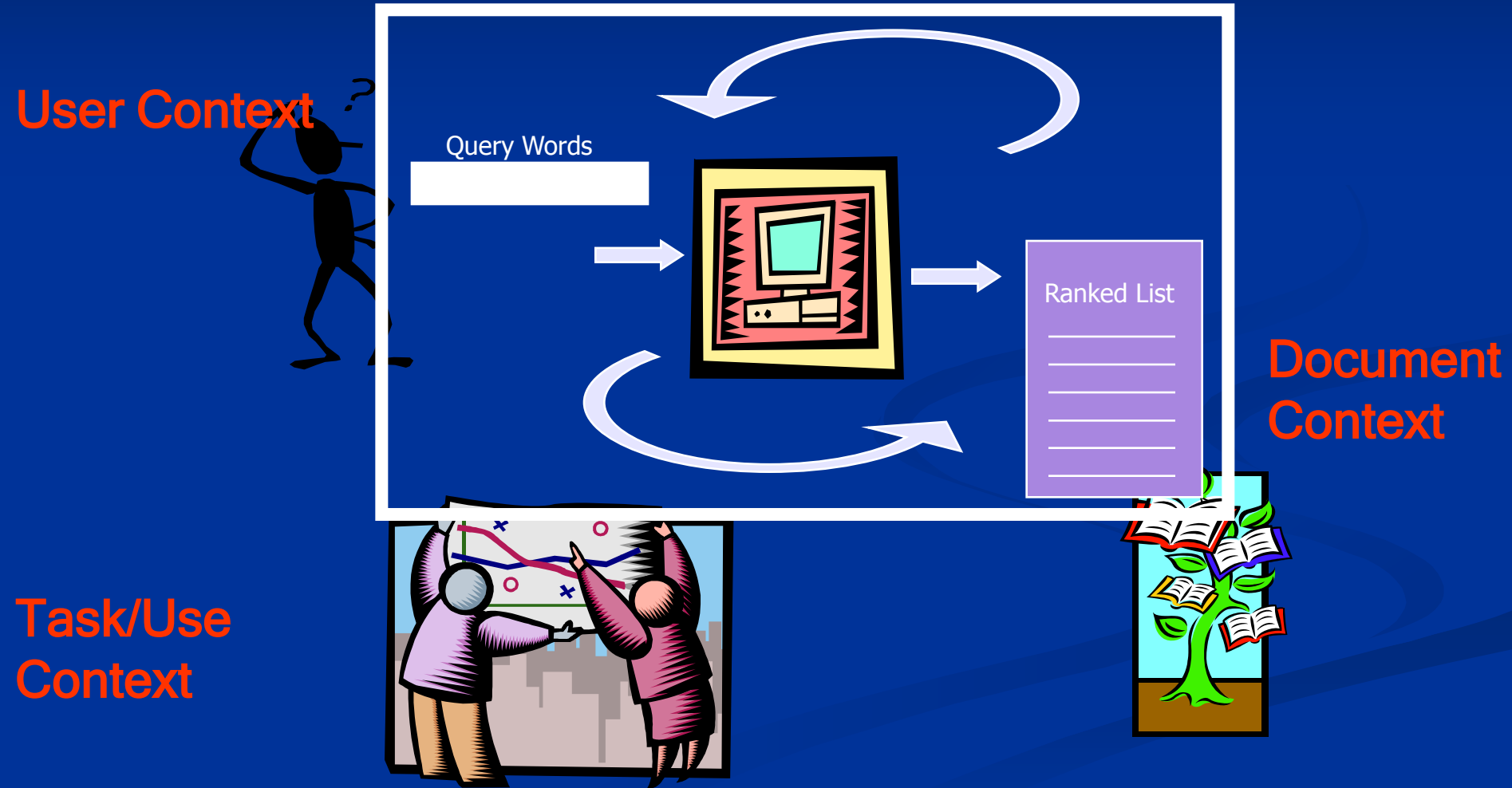
Figure 1. The SearchTogether client. (a) integrating messaging, (b) query awareness, (c) current results, (d) recommendation queue, (e)(f)(g) search buttons, (h) toolbar, (i) browser

Looking Ahead ...

- Continued advances in scale of systems, diversity of resources, ranking, etc.
- Tremendous new opportunities to support searchers by
 - Understanding user intent
 - Modeling user interests and activities over time
 - Representing non-content attributes and relations
 - Supporting the search process
 - Developing interaction and presentation techniques that allow people to better express their information needs
 - Supporting understanding, using, sharing results
 - Considering search as part of richer landscape

Using Context to Support Searchers

Think Outside the IR Box(es)



Thank You !

- Questions/Comments ...
- More info,
<http://research.microsoft.com/~sdumais>
- Windows Live Desktop Search, <http://toolbar.live.com>
- Phlat, <http://research.microsoft.com/adapt/phlat>
- Search Together, <http://research.microsoft.com/searchtogether/>

References

- **Stuff I've Seen**
 - S. T. Dumais, E. Cutrell, J. J. Cadiz, G. Jancke, R. Sarin & D. C. Robbins (2003). [Stuff I've Seen: A system for personal information retrieval and re-use](#). *SIGIR 2003*.
 - *Download: <http://toolbar.live.com> and Vista Search*
- **Phlat**
 - E. Cutrell, D. C. Robbins, S. T. Dumais & R. Sarin (2006). [Fast, flexible filtering with Phlat - Personal search and organization made easy](#). *CHI 2006*.
 - *Download: <http://research.microsoft.com/adapt/phlat>*
- **Memory Landmarks**
 - M. Ringel, E. Cutrell, S. T. Dumais & E. Horvitz (2003). [Milestones in time: The value of landmarks in retrieving information from personal stores](#). *Interact 2003*.
- **Personalized Search**
 - J. Teevan, S. T. Dumais & E. Horvitz (2005). [Personalizing search via automated analysis of interests and activities](#). *SIGIR 2005*.
- **Implicit Queries**
 - S. T. Dumais, E. Cutrell, R. Sarin & E. Horvitz (2004). [Implicit queries \(IQ\) for contextualized search](#). *SIGIR 2004*.
- **Revisitation on Web**
 - J. Teevan, E. Adar, R. Jones & M. Potts (2007). [Information re-retrieval](#). *SIGIR 2007*.
- **InkSeine**
 - K. Hinckley, S. Zhao, R. Sarin, P Baudisch, E. Cutrell & M. Shilman (2007). [InkSeine: In situ search for active note taking](#). *CHI 2007*.
 - *Download: <http://research.microsoft.com/inkseine/>*
- **Search Together**
 - M. Morris & E. Horvitz (2007). [Search Together: An interface for collaborative web search](#). *UIST 2007*.
 - *Download: <http://research.microsoft.com/searchtogether/>*