

# I 202: INFORMATION ORGANIZATION & RETRIEVAL FALL 2025

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Class 19: LLM Search Behavior, Foraging, Sensemaking

## LAST TIME

- Information Needs
- Search Tactics and Strategies
- Information Seeking Models

# Today's Outline

LLMs and Changing Search Behavior

Emotions and Search

Sensemaking

Foraging Theory

# Natural language interfaces have long been a goal

## Early Natural Language Database (1973)

```
38**WHAT IS THE AVERAGE CONCENTRATION OF ALUMINUM IN HIGH ALKALI ROCKS)
***  
PARSING  
1331 CONSES  
4.987 SECONDS  
INTERPRETING  
2427 CONSES  
11.025 SECONDS  
INTERPRETATIONS:  
(FOR THE X13 / (SEQL (AVERAGE X14 / (SSUNION X15 / (SEQ TYPEAS) :T ; (DATALINE (WHQFILE X15)  
X15 (NPR* X16 / (QUOTE OVERALL)) (NPR* X17 / (QUOTE AL203)))) :T)) :T ; (PRINTOUT X13))  
BBN LISP-10 03-09-72 ...  
EXECUTING  
(8.134996 . PCT)
```

# Natural language interfaces have long been a goal

Keyword search was never the goal, but NL did not work



People loved Ask Jeeves even though it didn't work!

# Computer scientists have long pursued natural language interfaces

But the obstacles were overwhelming  
Notice the subtle differences of these two NL queries

Find drinkers who frequent some bar  
that serves only beers they like.

```
SELECT F.drinker
FROM Frequent F
WHERE NOT EXISTS
  (SELECT *
   FROM Serves S
   WHERE S.bar = F.bar
   AND NOT EXISTS
     (SELECT L.beer
      FROM Likes L
      WHERE L.drinker = F.drinker
      AND S.beer = L.beer))
```

Find drinkers who frequent only bars  
that serve some beer they like.

```
SELECT F1.drinker
FROM Frequent F1
WHERE NOT EXISTS
  (SELECT F2.bar
   FROM Frequent F2
   WHERE F2.drinker = F1.drinker
   AND NOT EXISTS
     (SELECT S3.drink
      FROM Serves S3, Likes L4
      WHERE S3.beer = L4.beer
      AND S3.bar = F2.bar
      AND L4.drinker = F2.drinker))
```

# NLP has to work really well to be useful

Studies showed that people on average experimented with Alexa for about a week and then settled on a small fixed set of commands

This was due to its limited NLP abilities



# AI: First New UI Paradigm in 60 Years



Jakob Nielsen

June 18, 2023

 Share

AI is introducing the third user-interface paradigm in computing history, shifting to a new interaction mechanism where users tell the computer what they want, not how to do it

# Language-based Chat is the New User Interface

But only because it works very well

what is a 'natural' user interface? Answer in 300 characters or fewer.



A "natural" user interface (NUI) enables intuitive interaction with systems using touch, gestures, voice, or other human inputs, mimicking real-world interactions to make technology more accessible and user-friendly. Examples include touchscreens, motion sensors, and voice-controlled virtual assistants.



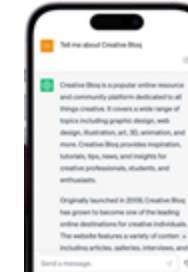
Message ChatGPT



Many problems are now solved, but new ones arise!

# Language-based Chat is the New User Interface

Pro: Can allow for great flexibility in expression

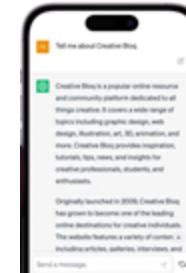


Easier to write with language than code

“Write code in python for jupyter notebook to extract paper titles from the enclosed pdf.”

# Language-based Chat is the New User Interface!

Pro: Can allow for great flexibility in expression



Con: it often requires (lots of) iteration

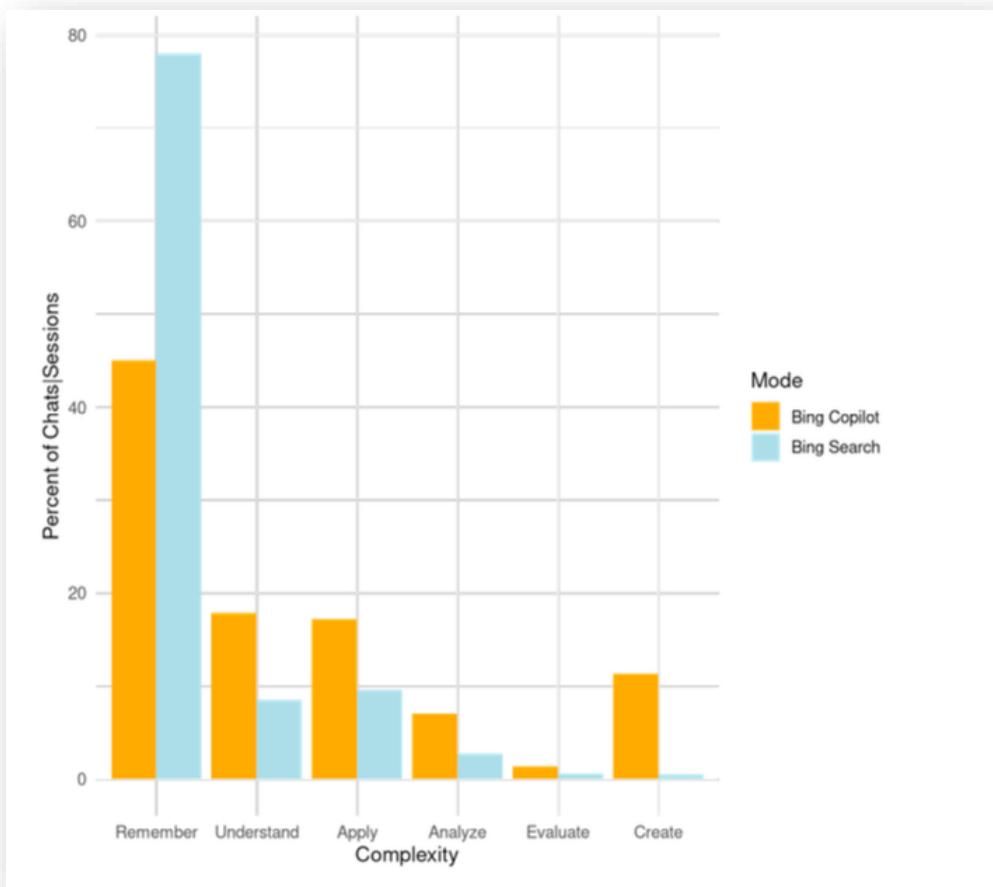
“Write code in python for jupyter notebook to extract paper titles from the enclosed pdf. Paper titles are in boldface, author names and affiliations are in normal text. Extract only the titles even if they wrap to a second line, convert unicode to ascii, and output to a csv. Assume the files are in the same directory as the code.”

# HOW ARE LLMs CHANGING SEARCH BEHAVIOR?

A summary of some recent research papers

# STUDY: COMPARE BING SEARCH TO Co-PILOT

- Used real query logs
- 80,000 conversations using Co-Pilot (an LLM), 80,000 using Bing Search
- Used GPT-4 to classify the main task in each conversation and session according to Anderson and Krathwohl's Taxonomy:
  - *From lowest complexity to highest:*
  - *Remember, Understand, Apply, Analyze, Evaluate, and Create.*
- Question: what percent of sessions fall into the 4 more complex types?
  - *Bing: 13.4%*
  - *Copilot: 37.0%*



A much higher percentage (37%) of Bing Copilot conversations were categorized into the higher complexity tasks compared to only 13.4% for Bing Search queries.

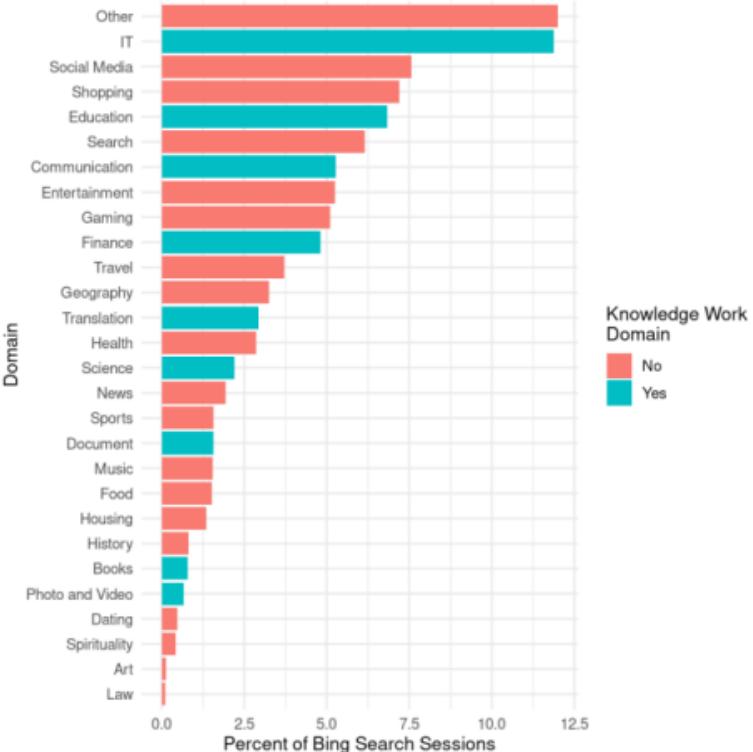
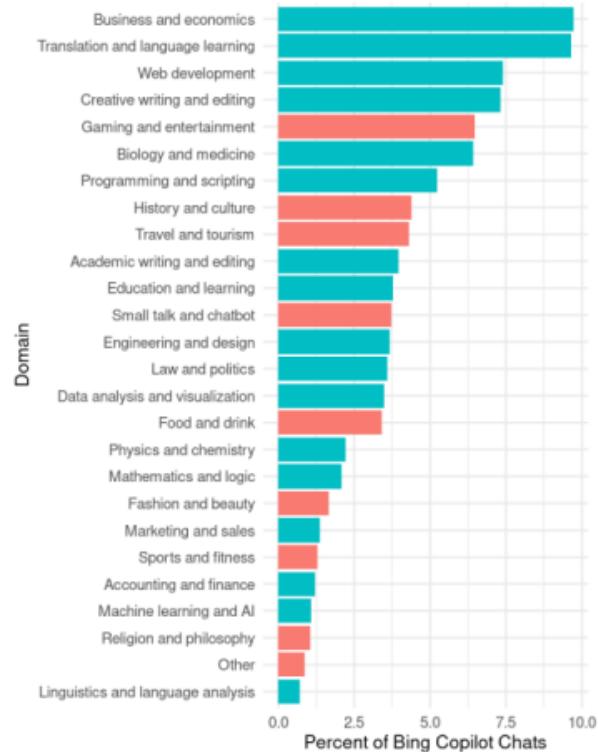
For both partial and fully completed tasks, user satisfaction increased more as the level of task complexity increases.

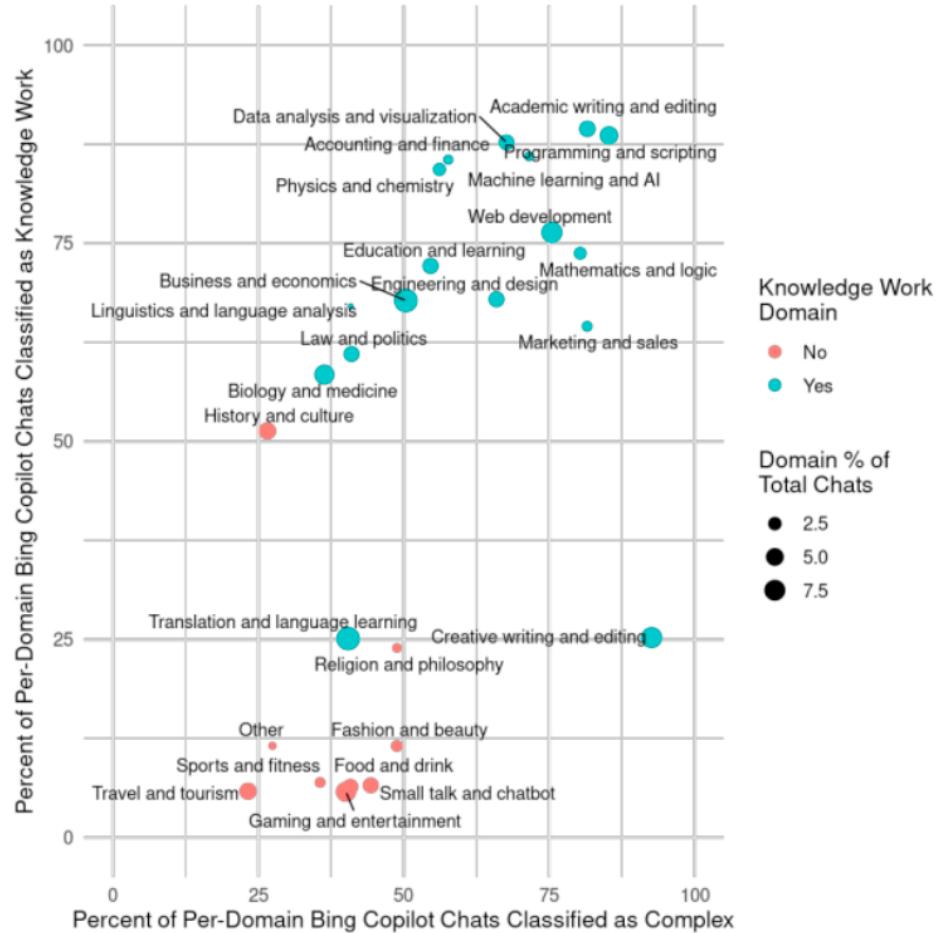
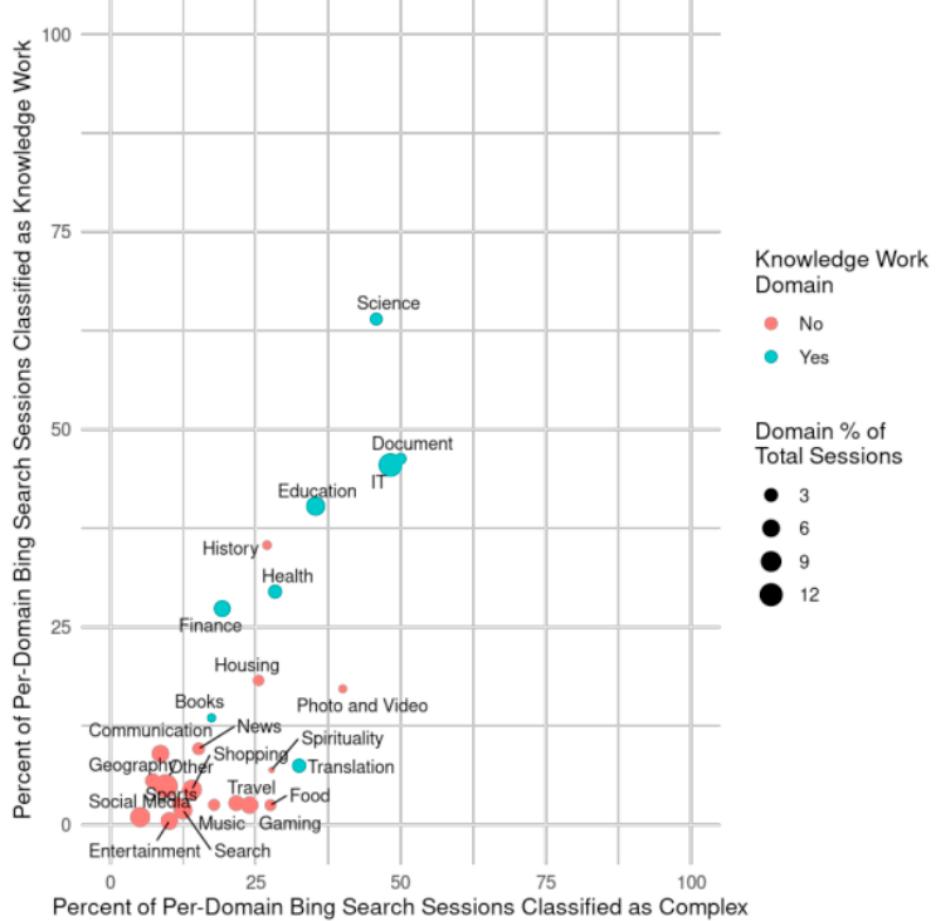
# STUDY: COMPARE BING SEARCH TO Co-PILOT

- Classified conversations / sessions into 25 topical domains
- Also classified conversations as consisting of **knowledge work**

“Work that concerns the creation, handling, and distribution of information and knowledge products, and that involved non-routine tasks and uses creative and analytical thinking in convergent and divergent ways”
- Search sessions in Bing Copilot contain user tasks that skew more towards knowledge work than Bing Search.

# Knowledge Work Comparison





# STUDY: COMPARED GPT-3.5 (LLM) TO STANDARD SEARCH (BING)

Controlled experiment to facilitate direct comparisons

Focused on car product comparison tasks

This figure displays two side-by-side search tool interfaces. Both interfaces feature a header with back and forward navigation arrows, a text input field containing placeholder text, and a blue 'SUBMIT' button.

**Left Interface (AI-powered search bot):**

- Text input placeholder: "This is an AI-powered search bot for you to use. ..."
- Text input field: "Queries left for this task: 9"
- Text area:
  - You:** Which has the larger total cargo space to total length ratio, the 2020 Kia Sportage (LX FWD) or the 2020 Toyota RAV4 (LE FWD)?
  - Bot:** The 2020 Kia Sportage (LX FWD) has a total cargo space of 60.1 cubic feet and a total length of 176.4 inches, giving it a cargo space to length ratio of 0.34. The 2020 Toyota RAV4 (LE FWD) has a total cargo space of 69.8 cubic feet and a total length of 180.9 inches, giving it a cargo space to length ratio of 0.39. Therefore, the 2020 Toyota RAV4 (LE FWD) has a larger total cargo space to total length ratio than the 2020 Kia Sportage (LX FWD).

**Right Interface (experimental search engine):**

- Text input placeholder: "This is a search engine for you to use. Charact..."
- Text input field: "Queries left for this task: 9"
- Text area:

Your Query: Which has the larger total cargo space to total length ratio, the 2020 Kia Sportage (LX FWD) or the 2020 Toyota RAV4 (LE FWD)?

**2020 Kia Sportage Specifications** [VISIT](#)  
[www.kiamedia.com](http://www.kiamedia.com)

2020 Kia Sportage Specifications. Excel (.xlsx) My Computer Google Drive Dropbox PDF (.pdf) ... Final gear ratio 3.064:1 (FWD)/ 3.195:1 (AWD) 3.064:1 (FWD)/ 3.195:1 (AWD) 3.064:1 (FWD)/ 3.195:1 (AWD) ... Cargo volume, total interior volume (SAE cu. ft.)

**Kia Sportage Features and Specs - Car and Driver** [VISIT](#)  
[www.caranddriver.com](http://www.caranddriver.com)

Cargo Space/Area Behind Front Row (cubic feet) 74.1 Cargo Space/Area Behind Second Row (cubic feet) 39.6 Cargo Space/Area Behind Third Row (cubic feet) 39.6 Steering Steering Type...

**2020 Kia Sportage Interior, Cargo Space & Seating | U.S. News** [VISIT](#)  
[cars.usnews.com](http://cars.usnews.com)

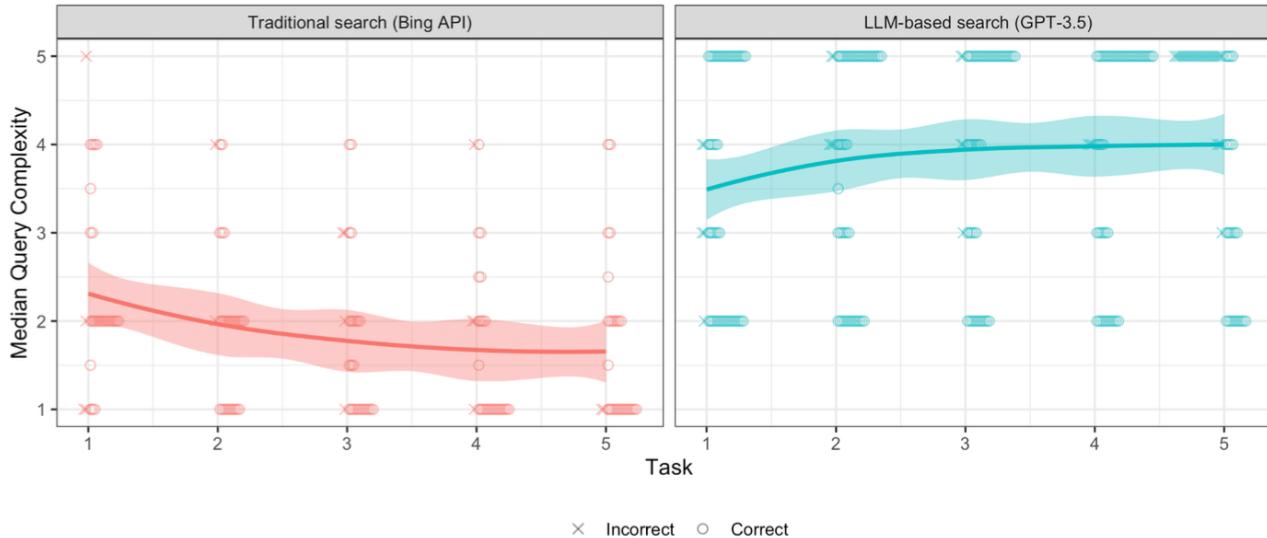
With 30.7 cubic feet of space behind the rear seats and a total of 60.1 cubic

**Figure 3:** Search tool response interface for both conditions in this experiment: the experimental AI-powered search tool (left) and the experimental search engine (right).

# STUDY: COMPARED COPILOT (LLM) TO STANDARD SEARCH (BING)

- **First study:** participants using the LLM-based tool were able to complete their tasks more quickly, using fewer but more complex queries than those who used traditional search
- Comparable results between search and LLM on “routine” tasks
- However, an overreliance on incorrect information when the LLM erred; certain tasks were more likely to generate LLM errors

# Complexity of Queries



**Figure 6:** Complexity of queries issued by condition and task. Each point represents an average of the complexity of all of the queries issued by a given participant in a given task.

# STUDY: COMPARED GPT 3.5 TO STANDARD SEARCH (BING)

- **First study:** participants using the LLM-based tool were able to complete their tasks more quickly, using fewer but more complex queries than those who used traditional search
- However, an overreliance on incorrect information when the LLM erred
- **Second study:** some users see a color-coded highlighting scheme to alert them to potentially incorrect or misleading information in the LLM responses.
- This substantially increases the rate at which users spot incorrect information, improving the accuracy of their overall decisions while leaving most other measures unaffected

# Highlighting High and Low-Confidence Info

<>This is an AI-powered search bot for you to use. Characters left: 1000SUBMIT

Queries left for this task: 9

**You:** Which has the larger total cargo space to total length ratio, the 2020 Toyota 4Runner (SR5 2WD) or the 2020 GMC Terrain (FWD SLE)?

---

**Bot:** The 2020 Toyota 4Runner (SR5 2WD) has a total cargo space of 47.2 cubic feet and a total length of 189.8 inches. The 2020 GMC Terrain (FWD SLE) has a total cargo space of 63.3 cubic feet and a total length of 183.1 inches.

The 2020 Toyota 4Runner (SR5 2WD) has a total cargo space to total length ratio of 0.248. The 2020 GMC Terrain (FWD SLE) has a total cargo space to total length ratio of 0.346.

Therefore, the 2020 GMC Terrain (FWD SLE) has the larger total cargo space to total length ratio.



High  
Confidence

Low  
Confidence

# IMAGE GEOLOCATION COMPARISON

- Task: determine the location where an image was captured

# IMAGE GEOLOCATION COMPARISON



**Figure 1: Initial viewpoints (with the location indicated) of the six rounds in the experiment.**

# IMAGE GEOLOCATION COMPARISON

- Task: determine the location where an image was captured
- 60 Participants using traditional search (Bing) more accurately predicted the location of the image compared to those using the LLM-based search (Bing Chat).
- Participants using the LLM-based search issued longer, more natural language queries, but had shorter search sessions.
- When reformulating their search queries, traditional search participants tended to add more terms to their initial queries, whereas participants using the LLM-based search rephrased their initial queries.

# IMAGE GEOLOCATION COMPARISON

The screenshot shows a search engine interface with the query "Stockland building" in the search bar. Below the search bar, there are several navigation tabs: SEARCH (which is selected), CHAT, SCHOOL, IMAGES, VIDEOS, MAPS, NEWS, and SHOPPING. The search results indicate "About 8,900,000 results". The first result is from "The Skyscraper Center" with a link to https://www.skyscrapercenter.com/building/building/19700. This result includes the building's name, height (123 m / 404 ft), floors (31), and official name (The current legal building name). It also lists other names under "Other Names". The second result is from "Financial Review" with a link to https://www.afr.com/property/commercial/stockland... This result is about "Stockland's tallest tower proposed" and includes the author's name (Larry Schlesinger) and a "EXPLORE FURTHER" section with a link to architectureau.com. To the right of the search results, there is a blue-bordered box containing a question from an LLM: "Where in the world would a big building with 'Stockland' on it be?". Below the question, the LLM's response states: "I searched the web for 'Stockland building location' and found several results. However, I could not find any information about a building with the name 'Stockland' on it. Could you please provide me with more information about the building? For example, is it a commercial or residential building? Is it located in a specific country or city? Any additional information you can provide will help me to better assist you." At the bottom of the LLM box, there is a "Learn more:" section with four links: 1. bbc.com, 2. stockland.com.au, 3. en.wikipedia.org, and 4. theurbandeveloper.com. A small green dot at the end of the fourth link indicates it is the last item in a sequence.

Stockland building

SEARCH CHAT SCHOOL IMAGES VIDEOS MAPS NEWS SHOPPING

About 8,900,000 results

**The Skyscraper Center**  
https://www.skyscrapercenter.com/building/building/19700

**Stockland Centre - The Skyscraper Center**  
Web Height 123 m / 404 ft Floors 31 Official Name The current legal building name. Stockland Centre Other Names Other names the building has commonly been known as, including ...

**Financial Review**  
https://www.afr.com/property/commercial/stockland...

**'Workplace of the future': Stockland plans \$1.3b tower**  
Web Jan 28, 2021 · Stockland has submitted plans for a \$1.3 billion office tower in North Sydney that it hopes will be the model for the post-COVID-19 "workplace of the future". The ...  
Author: Larry Schlesinger  
EXPLORE FURTHER  
A North Sydney's tallest tower proposed | ArchitectureAU architectureau.com

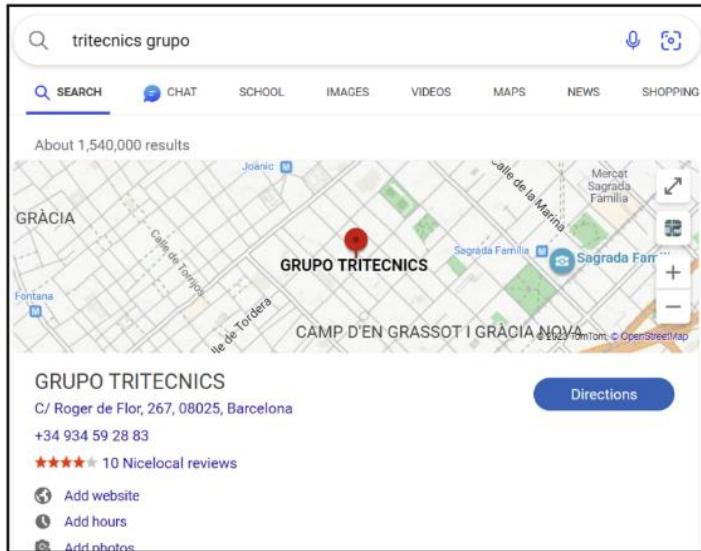
Where in the world would a big building with "Stockland" on it be?

I searched the web for "Stockland building location" and found several results. However, I could not find any information about a building with the name "Stockland" on it. Could you please provide me with more information about the building? For example, is it a commercial or residential building? Is it located in a specific country or city? Any additional information you can provide will help me to better assist you.

Learn more: 1. bbc.com 2. stockland.com.au 3. en.wikipedia.org 4. theurbandeveloper.com

1 of 30

# IMAGE GEOLOCATION COMPARISON



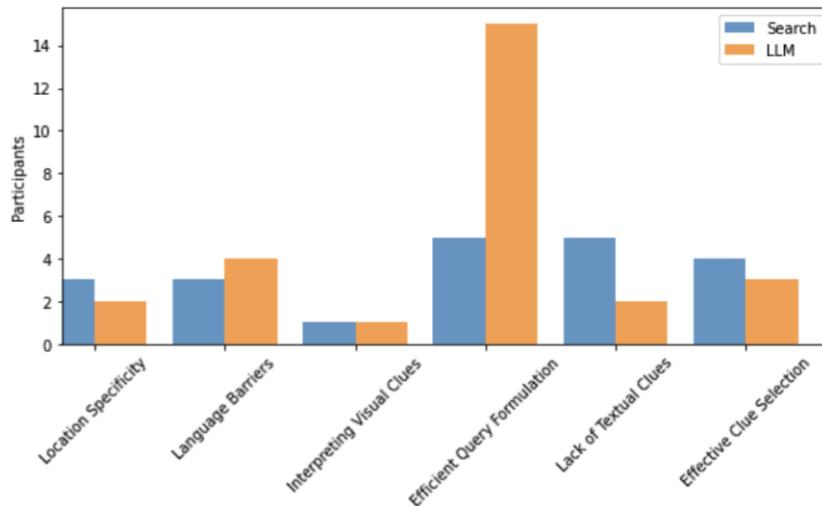
what language is tritecnics a word in

I'm sorry, but I couldn't find any information about the word "tritecnics" in my search results. However, if you could provide me with more context or information about the word, I might be able to help you better. If you have any other questions, feel free to ask!

Learn more: 1. [tritecnics.com](https://tritecnics.com) | 2. [asha.org](https://asha.org) | 3. [armypubs.army.mil](https://armypubs.army.mil)

1 of 30

# IMAGE GEOLOCATION COMPARISON



**Figure 10: Comparison of challenges faced by our participants in both the Search and LLM conditions**

# EXAMPLE USE OF GROUNDED CODING

Qualitative Code	Description	Example Response
Location Specificity	Precisely specifying and differentiating streets within a city	P1(Search): I did have a hard time. There were many First and Second streets I was on, and it is difficult to distinguish those between the first and second streets of other cities
Language Barriers	Identifying Foreign Words with Non-English alphabets	P13(LLM): My strategy of finding word clues failed if the words I saw were in a language that does not use the English alphabet
Interpreting Visual Clues	Translating visual clues into effective questions or searches	P58(Search): It is hard to try to search the architecture of a building without using an image search
Efficient Query Formulation	Crafting efficient search queries that would yield precise results	P38(LLM): It was challenging to find the correct wording to get the desired result
Lack of Textual Clues	Locations with limited textual clues, for example remote locations	P53(LLM): Sometimes it's very hard to find street names or shop names from the image, especially if the images are from remote locations
Effective Clue Selection	Finding clues that can be described or will generate effective results when searched	P50(LLM): Figuring out what clue to look up, for example, local places were useful, meanwhile large chains are not as useful

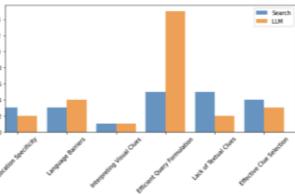


Table 3: Qualitative codes resultant from the coding of challenges described by participants. and example quotes

# EMOTIONS AND SEARCH

# EMOTIONS AND SEARCH

Kuhlthau 1991 on informational and emotional stages in search

Initiation

Uncertainty and apprehension

Selection

Confusion, uncertainty, doubt, frustration

Exploration

Optimism (after deciding)

Formulation

Confidence dawning \*

Collection

Confidence growing

Presentation

Relief and satisfaction (or disappointment)

(Assuming novice researchers engaged in challenging tasks)

# EMOTIONS: THE IMPORTANCE OF AESTHETICS

With an aesthetically pleasing design:

- *People will enjoy working with it more*
- *People will persist searching longer*
- *People will (sometimes) choose it even if it is less efficient*

# EMOTIONS: THE IMPORTANCE OF AESTHETICS

Small details matter

*Example:*

*A lefthand side line vs. a box for ads*

The line integrates the results into the page

*Balancing white space with content*

*Balancing font color, shape, and weight*

Sponsored links

[Aesthetics Schoo](#)

Comprehensive Aest  
Directory with full scho  
[www.beautyschoolsdirectory.com](http://www.beautyschoolsdirectory.com)

[Aesthetic Career](#)

Find an **Aesthetics Schoo**  
start training for your ca  
[www.EstheticsSchool.com](http://www.EstheticsSchool.com)

[See your ad here »](#)

A close-up photograph of a small, vibrant green plant with four leaves sprouting from a narrow crevice in a light-colored, textured concrete surface. The plant is positioned in the lower-left quadrant of the frame, with its leaves pointing upwards and to the right. The background is a soft-focus view of the same concrete surface.

# FORAGING THEORY

# Information Foraging Theory

A theory that tries to quantify people's decision-making processes during information seeking.

Tries to answer questions like: How do people decide to click on a link? When do they leave a webpage? When do they prefer to search and when do they browse?

When users have an information goal, they try to maximize:

**Information value / Cost associated with obtaining that information**

# Foraging Theory

## ANIMAL FORAGING

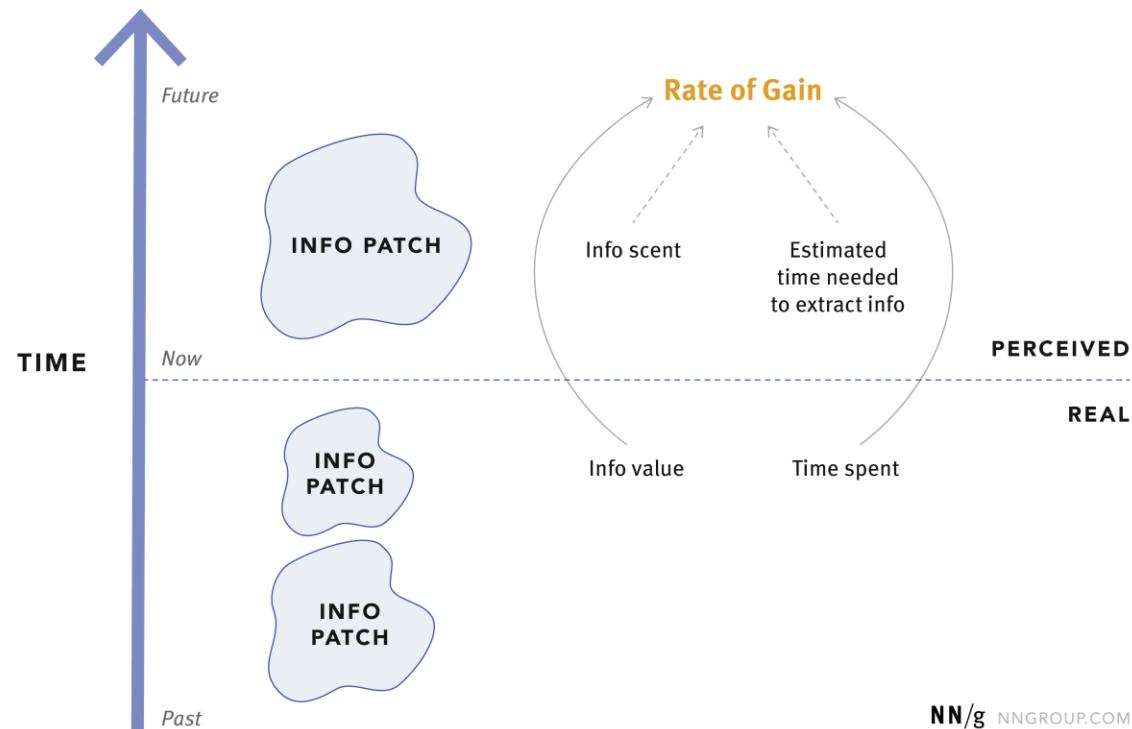
	Food	Goal
	A site containing one or more potential sources of food	Patch
	Search for food	Forage
	The animal's assessment of how likely it is that a given patch will provide food	Scent
	The totality of food types that an animal may consider in order to satisfy hunger	Diet

# Foraging Theory

## INFORMATION FORAGING

Goal	Information	
Patch	A website (or other source of information)	
Forage	Search for information	
Scent	How promising a potential source of information appears to the user	
Diet	The totality of the information sources that a user may consider in order to satisfy an information need	

## Information Foraging: Choosing a New Info Patch



# Information Foraging Theory: Essentially, A Cost/Benefit Analysis

## **Information Value:**

Do you want a varied diet, or fill up on one thing?

## **Information “Scent” and Structure:**

How to find a good direction to travel to a new info “patch”?

## **Want to Maximize**

Rate of gain = Information value / Cost of obtaining that information

# An Example of “Information Scent”



The image shows a grand, classical-style library or study hall. The ceiling is high and decorated with intricate moldings and a series of arched recesses. Large, multi-paned windows line one side of the room, allowing natural light to illuminate the space. Bookshelves filled with books are visible along the walls. In the foreground, there are rows of wooden tables and chairs, suggesting a quiet study or reading area.

## Degree Programs

**[Master of Information Management and Systems \(MIMS\)](#)**

Educating information professionals to provide leadership for an information-driven world.

**[Ph.D. in Information Management and Systems](#)**

A research program for next-generation scholars of the information age.

**[Master of Information and Data Science \(MIDS\)](#)**

Online degree preparing data science professionals to solve real-world problems.

**[5th Year Master of Information and Data Science \(MIDS\)](#)**

Online degree training UC Berkeley undergraduates for data science careers.

**[Master of Information and Cybersecurity \(MICS\)](#)**

Online degree preparing cybersecurity leaders for complex cybersecurity challenges.

**[COVID-19 Coronavirus Response](#)**

- **[School of Information updates:](#)**

- Most staff will be working on campus by late August 2021.
- South Hall remains closed to the public.
- Face masks are required in South Hall and all UC Berkeley buildings.
- Most Fall 2021 classes will be held in person.

- **[UC Berkeley news and updates](#)**

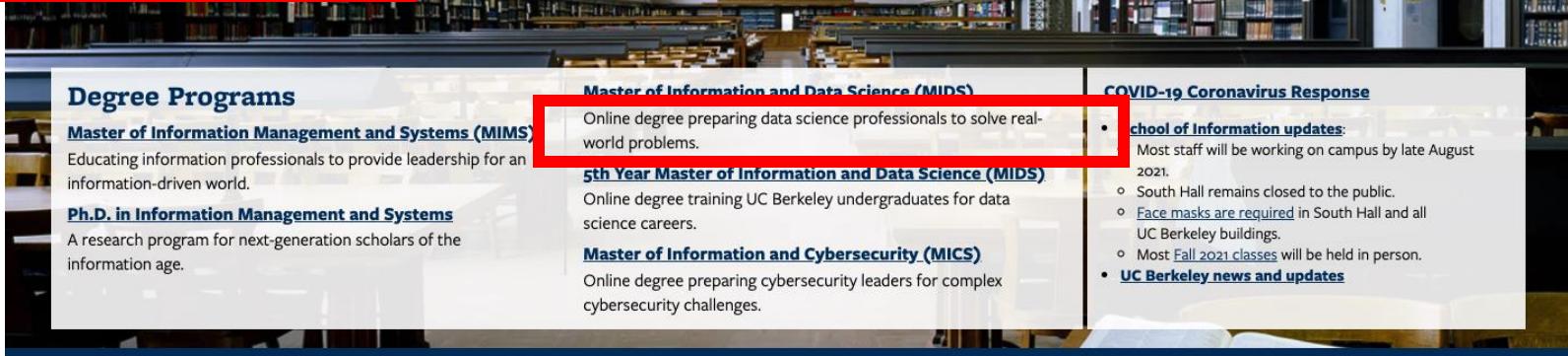
# An Example of “Information Scent”

Berkeley

SCHOOL OF  
INFORMATION

ABOUT PROGRAMS COURSES PEOPLE RESEARCH CAREERS NEWS EVENTS

The text beneath the link provides a concise summary of what can be found there.



The screenshot shows the Berkeley School of Information website. A red box highlights the text "The text beneath the link provides a concise summary of what can be found there." which is located in a white box on the left side of the page. Below this, there are three main sections: "Degree Programs", "Master of Information and Data Science (MIDS)", and "COVID-19 Coronavirus Response". The "Master of Information and Data Science (MIDS)" section is also highlighted with a red box. It includes a brief description and links to "5th Year Master of Information and Data Science (MIDS)" and "Master of Information and Cybersecurity (MICS)". The "COVID-19 Coronavirus Response" section contains a bulleted list of updates.

**Degree Programs**

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# **SENSEMAKING**

# INFORMATION SEEKING BEHAVIOR IS PART OF SENSEMAKING

Two parts of a process:

search and retrieval

analysis and synthesis  
of search results



The whole process is called  
SenseMaking

# The Sensemaking Model

“The process of searching for a representation and encoding data in that representation to answer task-specific questions.” – Russell et al. CHI 1993

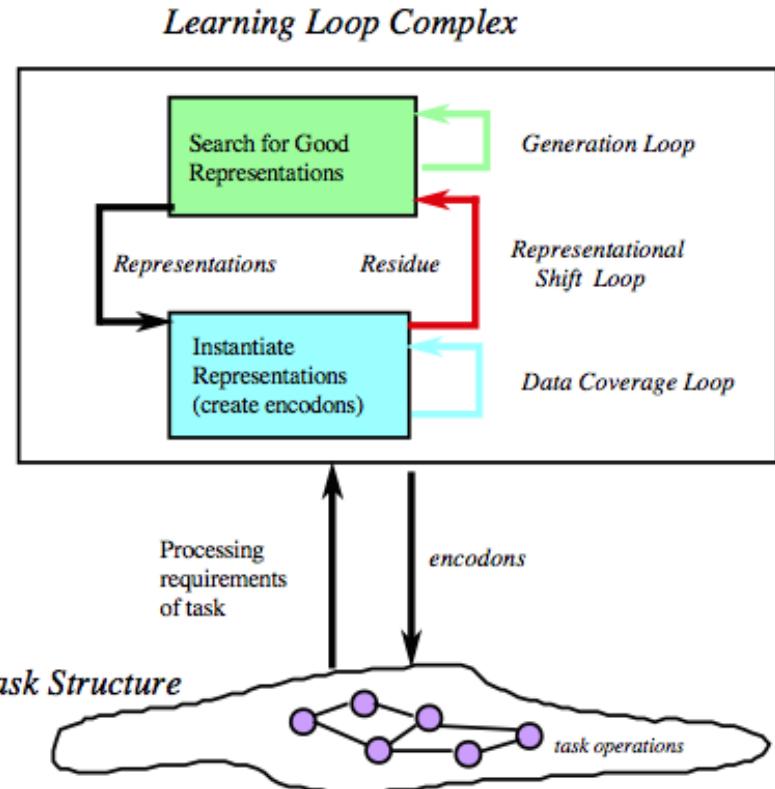
Search

Encoding

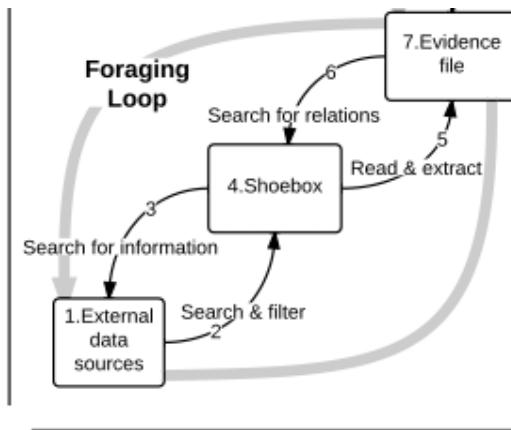
- Search      Follow Links
- Triage      Ask Colleagues
- Navigate Resources
- Read Overviews
- Take Notes
- Categorize Notes
- Write Summaries
- Create Spreadsheets
- Make Database Entries
- Talk with Collaborators

# The Encoding Portion

## Encoding

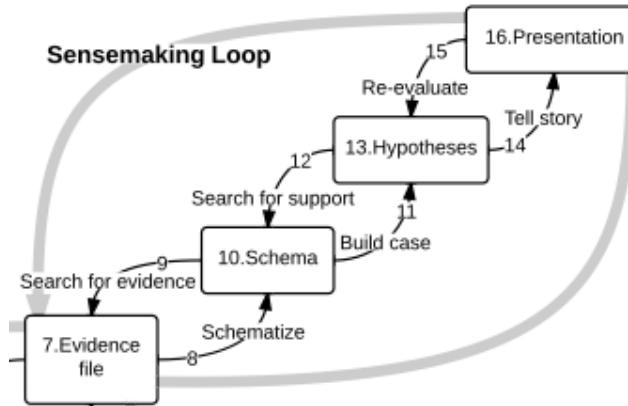


# Intelligence Analysts' SenseMaking Loop



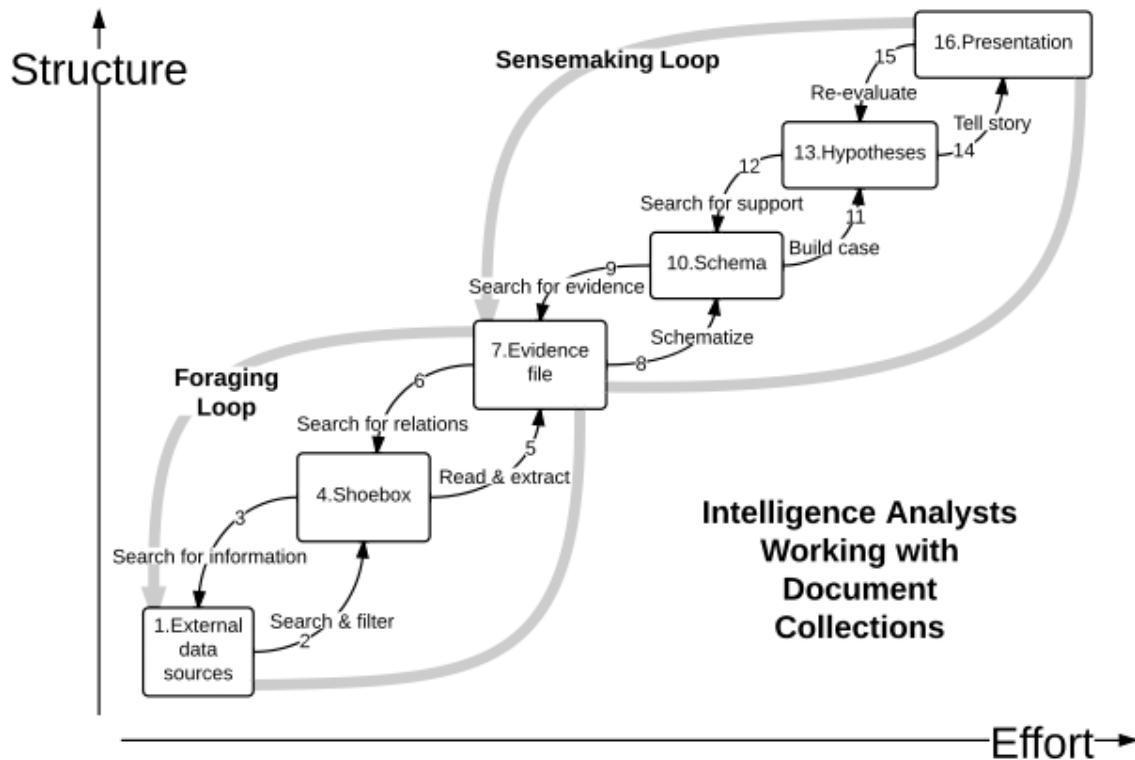
Pirolli & Card, The Sensemaking Process and Leverage Points for Analyst Technology as Identified Through Cognitive Task Analysis ,PICIA, 2005

# Intelligence Analysts' SenseMaking Loop



Pirolli & Card, The Sensemaking Process and Leverage Points for Analyst Technology as Identified Through Cognitive Task Analysis ,PICIA, 2005

# Intelligence Analysts' SenseMaking Loop



Pirolli & Card, The Sensemaking Process and Leverage Points for Analyst Technology as Identified Through Cognitive Task Analysis ,PICIA, 2005

U

## User

what has been published about how information seeking / search has changed with the use of LLMs in search results



### Understanding your request

Re-formulated query: "How information seeking and search has changed with the use of LLMs in search results."

Keyword search query: "information seeking search LLMs search results"

Search filters applied: fieldsOfStudy: Computer Science

### Searching scientific literature at scale

Retrieving relevant passages from a corpus of 8M+ open access papers

Retrieved 252 highly relevant passages

Retrieved 16 more papers from Semantic Scholar abstracts using keyword search

Further re-rank and aggregate passages to focus on up to top 50 papers

Found 36 highly relevant papers after re-ranking and aggregating

Extracting salient key statements from papers

### Synthesizing a structured answer

Synthesizing an answer outline based on extracted quotes

Start generating each section in the answer outline:

- Background and Context
- Search Interface and Interaction Changes
- User Behavior and Search Pattern Changes
- Information Processing and Presentation Changes
- Bias and Information Quality Concerns
- Technical Integration Approaches
- Domain-Specific Applications
- Future Implications and Research Directions

Iteratively generating section: 1 of 8 - Background and Context



Asta > Summarize literature

# Search Portion of the Sensemaking Loop

## ⌚ Searching scientific literature at scale

Retrieving relevant passages from a corpus of 8M+ open access papers

Retrieved 252 highly relevant passages

Retrieved 16 more papers from Semantic Scholar abstracts using keyword search

Further re-rank and aggregate passages to focus on up to top 50 papers

Found 36 highly relevant papers after re-ranking and aggregating

Extracting salient key statements from papers

# Encoding Portion of the Sensemaking Loop

## ⌚ Synthesizing a structured answer

Synthesizing an answer outline based on extracted quotes

Start generating each section in the answer outline:

- Background and Context
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- User Behavior and Search Pattern Changes
- Information Processing and Presentation Changes
- Bias and Information Quality Concerns
- Technical Integration Approaches
- Domain-Specific Applications
- Future Implications and Research Directions

Iteratively generating section: 1 of 8 - Background and Context

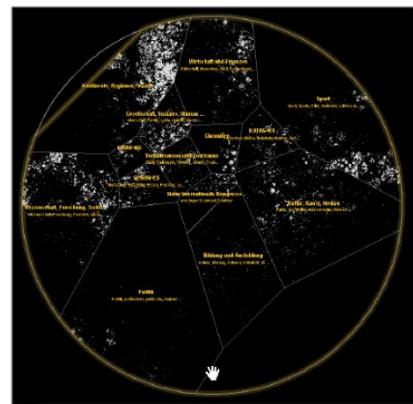
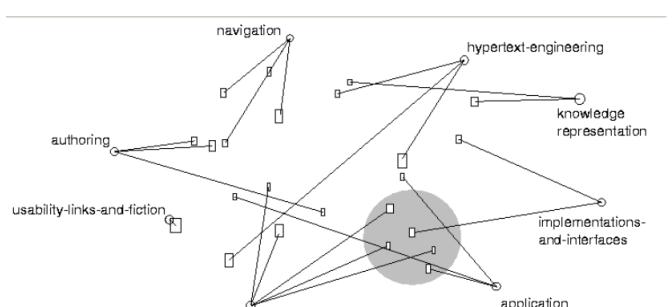
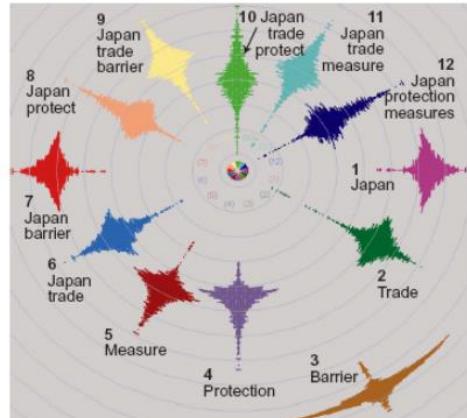
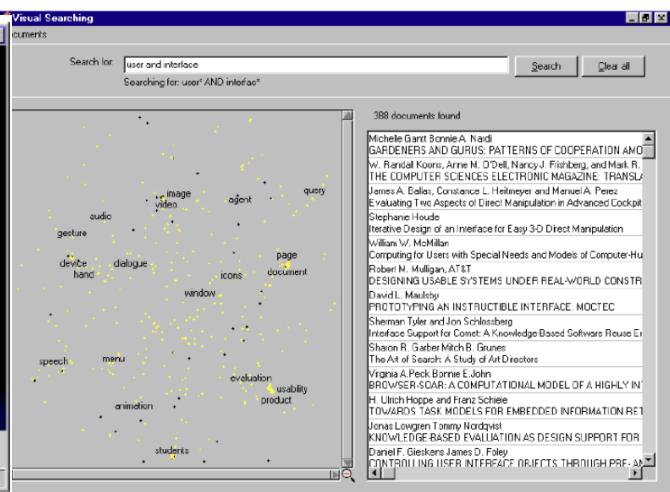
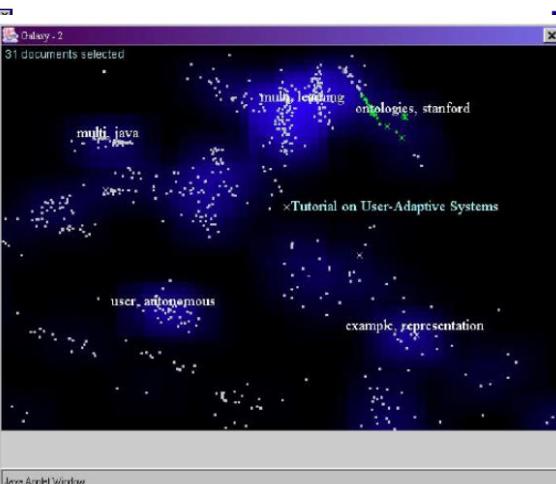
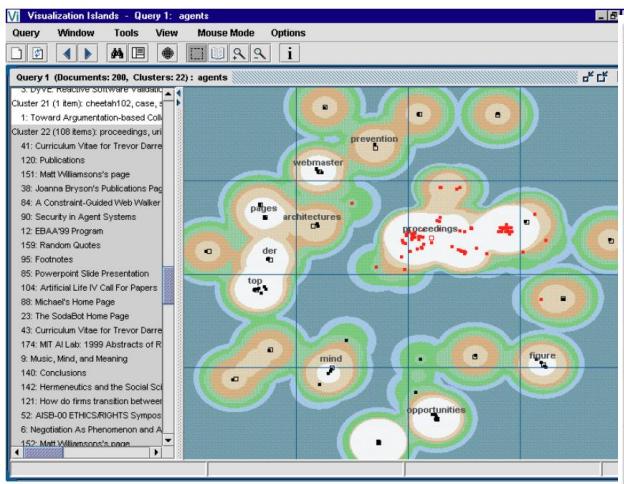
# Spatial Organizations of Search Results

There have been many attempts

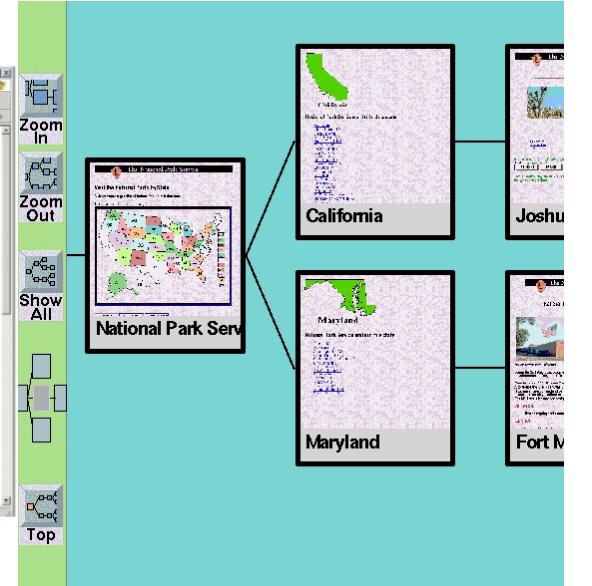
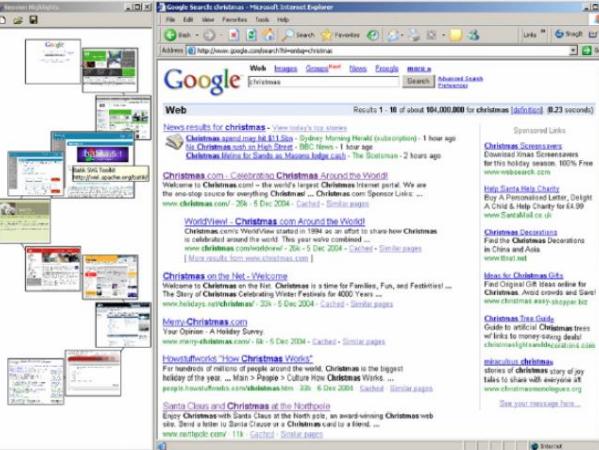
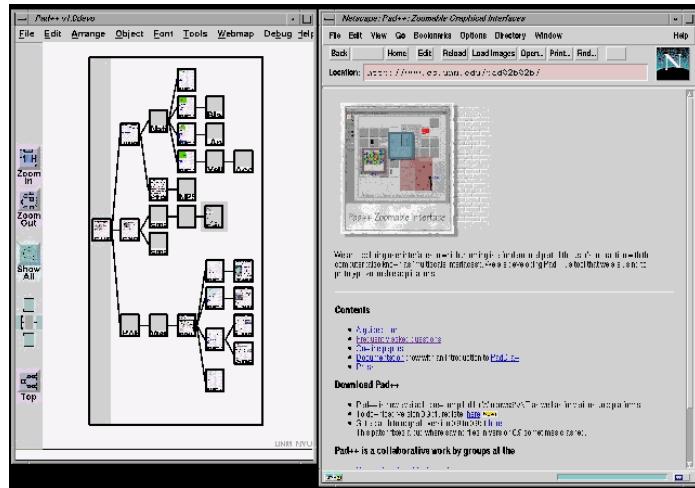
They haven't caught on except for citation graphs

Organizing with tags / facets seems to work better

# Many, Many Spatial Search Results Layout Attempts



# Many Visual Browsing History Attempts



# The Data Mountain



Robertson et al. "Data mountain: using spatial memory for document management." *UIST* 1998.  
<https://uist.acm.org/archive/html/videos.html#1998>

# Data Mountain: Using Spatial Memory for Document Management

G. Robertson, M. Czerwinski,  
K. Larson, D. Robbins, D. Thiel,  
M. van Dantzich, Microsoft Research.

Contact: [ggr@microsoft.com](mailto:ggr@microsoft.com)

# Research Rabbit

**Recent Work**

Relevance

Comments

Select All

Filter these items

2010  
Harvard speech in private  
ly Law Bulletin

2011  
zial elections are doomed  
ly Law Bulletin

2010  
ook at original intent in 1787  
ly Law Bulletin

2009  
e in springfield  
ly Law Bulletin

2009  
in the wrong direction  
ly Law Bulletin

2017  
ago illinois took step to  
ly Law Bulletin

2010  
for legislative redistricting  
ad ideas  
ly Law Bulletin

Connections between your collection and 42 papers

Graph Type

Labels

Network Timeline

First Author Last Author

43 Selected Papers

Add to: war of 1812

Add to Other Collection

EXPLORE PAPERS

Similar Work

Earlier Work

Later Work

EXPLORE PEOPLE

These Authors 3

Suggested Authors 3

EXPLORE OTHER CONTENT

Linked Content

EXPORT PAPERS

BibTeX RIS CSV

**Suggested Authors**

Filter Relevance

Abstracts  Comments

Select None Select All

**Ann M Lousin**  
43 publications 0 citations

**Joseph A. Kearney**  
1 publications 0 citations

**Philip Hablitzel**  
1 publications 0 citations

Load More

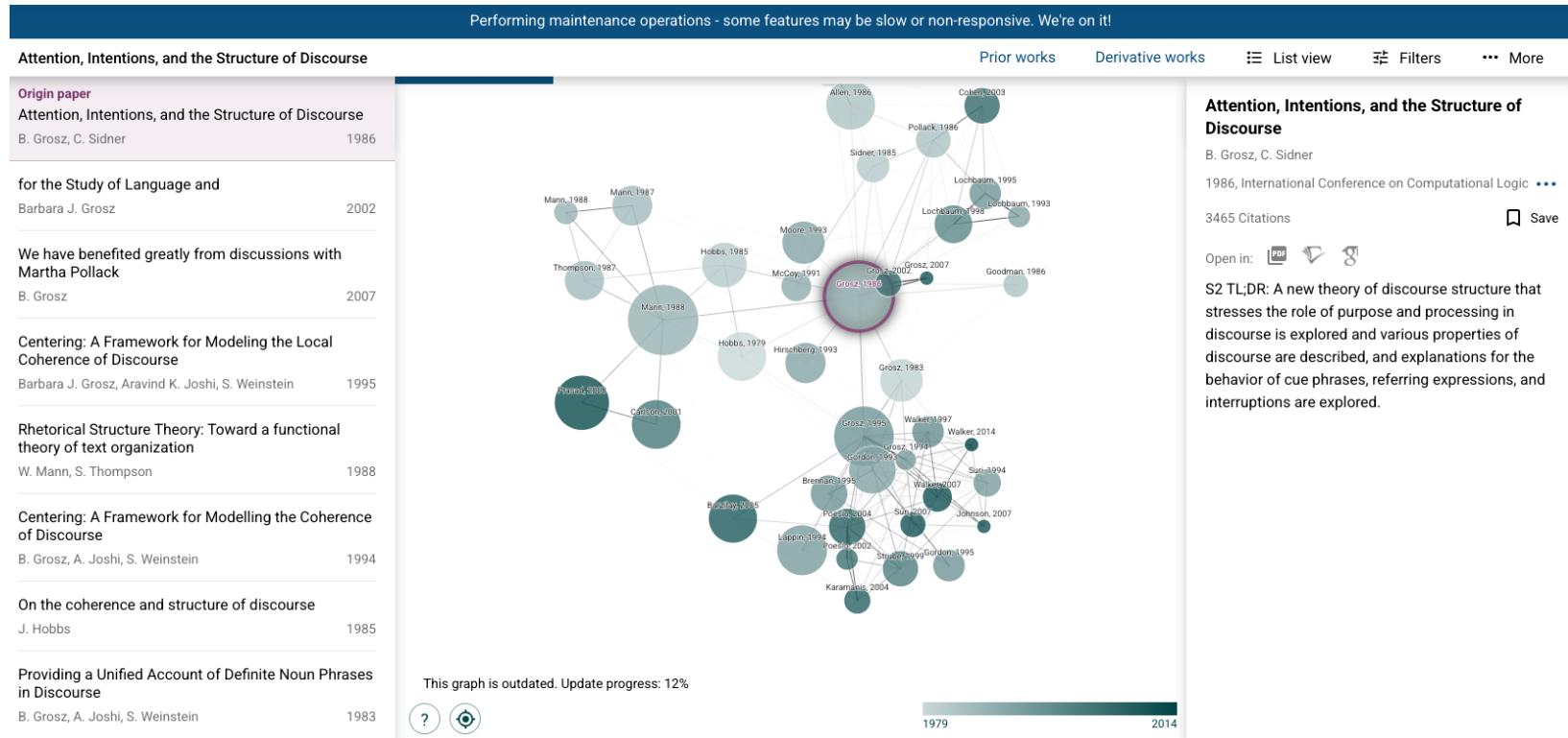
Connections between 3 authors

Filter these items

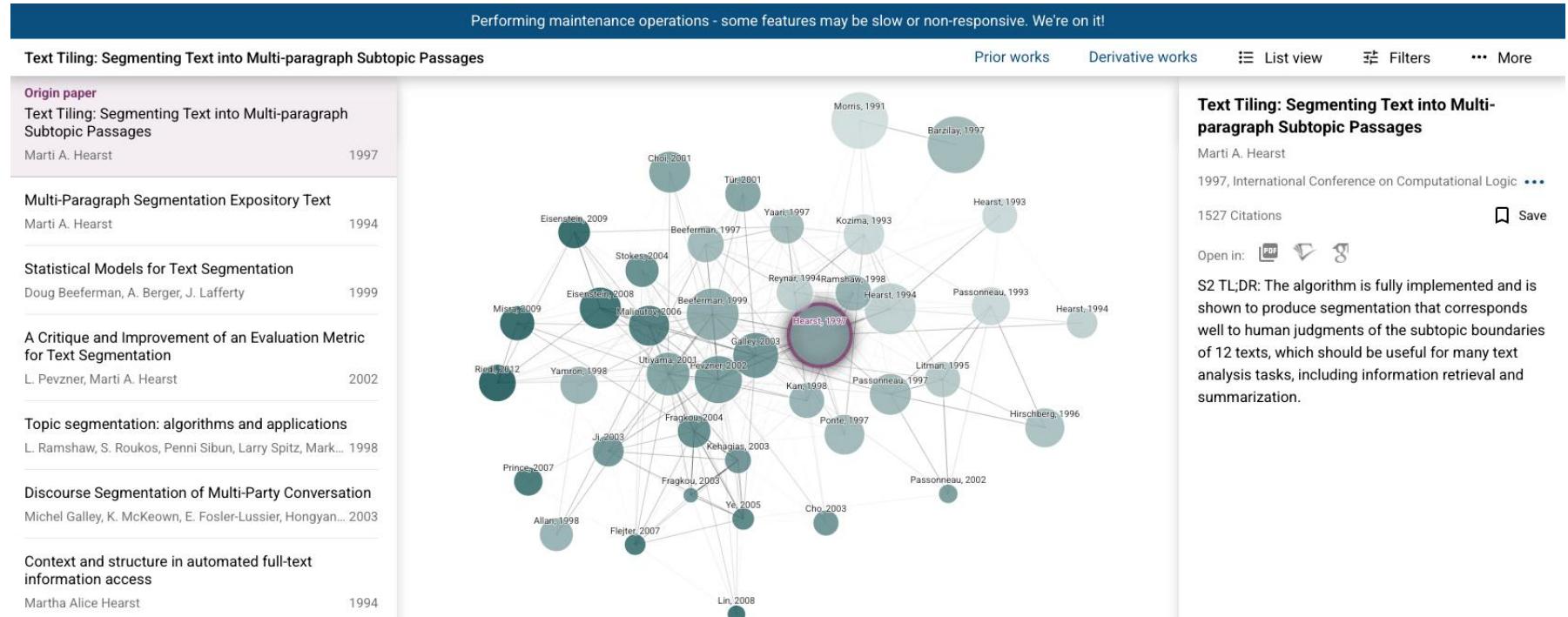
1 selected person

**Joseph A. Kearney**  
1 publications 0 citations

# Research paper citation graphs are an exception. Recent example: Connected Papers



Research paper citation graphs are an exception. Recent example: Connected Papers



# Spatial Organizations of Search Results

There have been many attempts

They haven't caught on except for citation graphs

Organizing with tags / facets seems to work better

# Our Research: The Problem



**Time-constrained analysts**



**Millions of documents**



**Want to:**

*Search quickly, triage best docs*

*Organize quickly as they go*

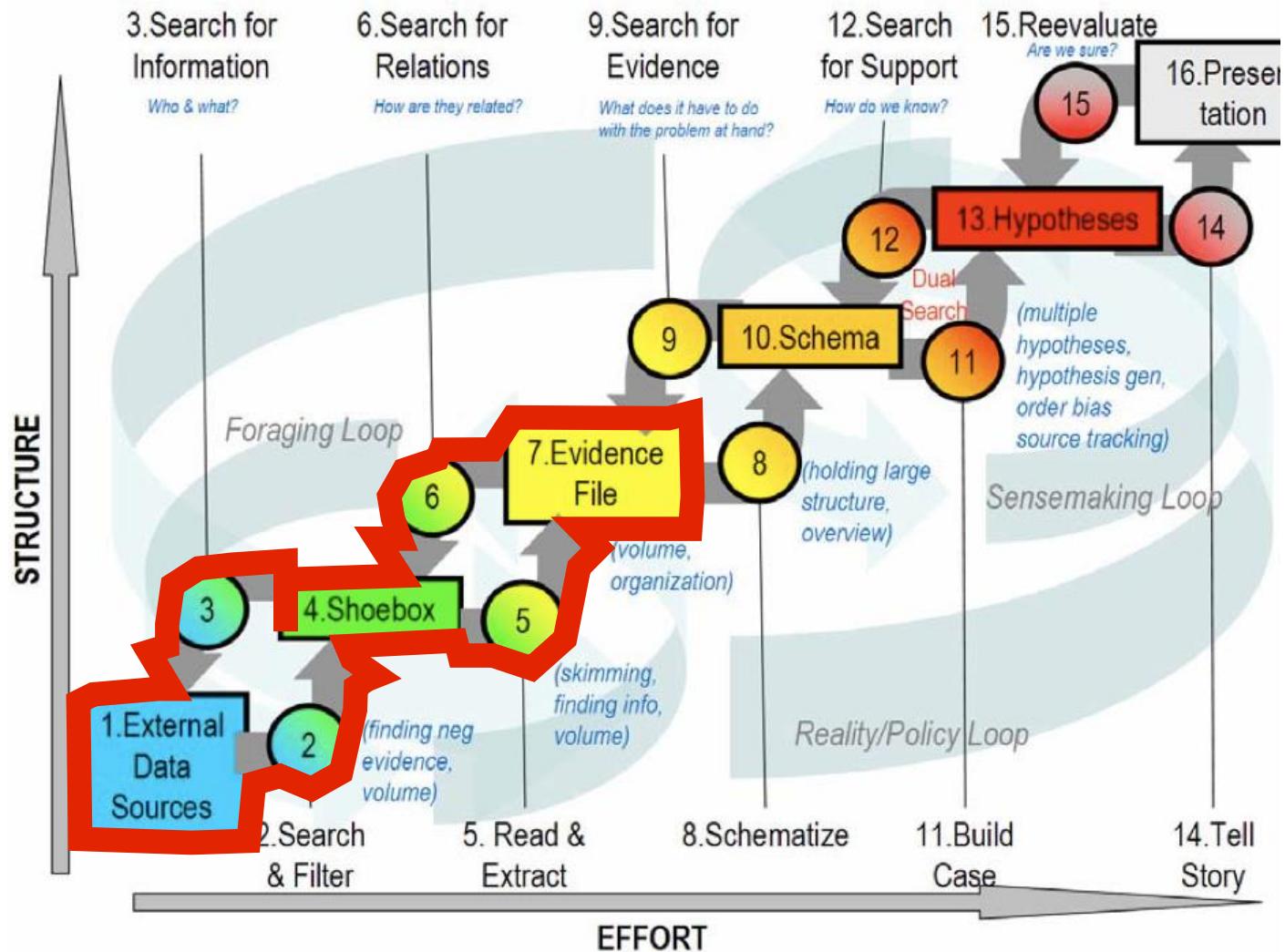
*Later, organize in more detail*

# The Solution: Focus on Triage

Triage: “The practice of quickly determining the usefulness and relevance of documents in a collection of documents.”

Badi et al., IUI’06

- Keyboard Letter Commands Create Groups
- Groups Are Immediately Visible, Editable
- Groups Tightly Coupled to Search
- Spatial Organizing Available, but with Automated Arranging



# Search Triage User Interface

The screenshot displays the Search Triage User Interface. On the left, a search bar contains the query "touch screen". Below it, the search results panel shows 11994 results found, with the first result being a patent titled "Touch screen image setting frame" by Tremaine, L. et al., published on 2009-08-17. The patent description mentions a monitor with a touch screen overlay. To the right of the search results is a "Tagged Documents" panel. It features five sections labeled a through e, each containing a list of documents related to touch screens:

- a | focus 1**: graphical user interface (GUI) element by Uller, A. et al.
- b | configuration**: multi-level GUI by M. N., K. et al.
- c | for next week**: visibility of GUI components by Krebs, A. et al.
- d | touch screen**:
  - graphical user interface (GUI) by Balkman, W. et al.
  - improved touch screen assembly by Rasmussen, J. et al.
  - Touch screen image setting frame by Tremaine, L. et al.
- e | configuration**: Binding a GUI element to live measurement data by Wells, E. et al.

PEZE - Case Prep

lon.dir.o19s.com/webapp/#

Case Prep 27 -

Layout: Current Case Number: demo 20

1.1.0-SNAPSHOT \$231

Hello, Dave Robertson Feedback Help Switch User

**Search**

Id Search Clear Search

Search Results Document Details Syntax and Commands

# Snippets: 2 Sort by: relevance Per page: 50 Options

Abstract Description Claims Image

Highlights: user interface GUI

10922 results found. Currently displaying results 1 - 50. Page 1 of 219

Pat. No.... application's user interface. A Web application exhibits a back-end state (e.g., stored data, runtime data, and logic). The HTML definitions that are used primarily for the application's user interface must be dynamic to reflect the changing back-end state. The back-end state must be able to be bound to the

**Graphical cursor navigation methods**

NUMBER	DATE PUBLISHED	CLASS	INVENTOR	TYPE
07484184	2009-01-26	715/856	Wroblewski, F. et al.	Patent

Description: using a GUI (on a computer for example) include the use of an input device such as a mouse or a track ball. A movement of the mouse or the track ball results in a corresponding graphical cursor (sometimes called a cursor or a pointer) moving on the graphical user interface. The graphical cursor (or pointer)... graphical user interface (GUI) includes navigating a graphical cursor corresponding to an input device onto the button, activating a fence around a border of the button if the navigation occurs via a pre-defined portion of the border and navigating the graphical cursor away from the button via a pre-defined

**Multiple-mode window presentation system and process**

NUMBER	DATE PUBLISHED	CLASS	INVENTOR	TYPE
07199802	2007-04-02	345/589	Gusmorino, P. et al.	Patent

Tagged Documents

View: Group View Table View Version: Previous Next Add a Group Settings

# SUMMARY

- Search is part of a larger sensemaking process
  - *Consists of a cycle of searching, assimilating info, and creating knowledge*
- Models of the search process help us design novel search user interfaces
  - *Information foraging theory*
  - *Berry picking model*
  - *Orienteering*
  - *Natural language dialogue*
- LLM-based dialog interfaces are automating big chunks of what used to be manual steps in search and encoding