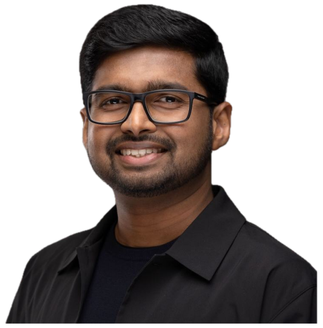
Characterizing the Evolving Landscape of Modern Information Seeking

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ESSIR - FDIA 2026


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Flavour of This Presentation

- A presentation about a PhD project outline by a second-year PhD student (two years away from submitting thesis).
- I position myself as an interactive IR researcher who will do interdisciplinary research using knowledge from HCI, information system and cognitive science research. I also do LLM ranker evaluations against ranking manipulations (SEOs).
- My PhD works use different methodologies and instruments, including: crowdsourcing, neurophysiological signals (e.g., EEG), also potentially in-the-wild or diary studies.
- I would love your criticizing, please don’t hesitate. All suggestions will be appreciated.

Information Retrieval History

Pre-1950s

Pre-IR Systems: Mechanical and manual cataloging for library science

1950s–1980s

Early IR Systems built based on basic word indexing and boolean logic

1990s–2000s

Keyword Search and web search engine rises, such as Google and Yahoo!

2010s - 2020s

Search expands to social media platforms (e.g., Facebook, Twitter) and mobile devices. Personalisation and contextualisation became popular

2020s - present

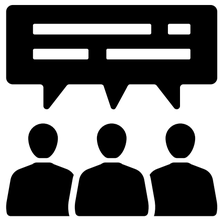
Generative AI emerges and be integrated into products

Modern Information Environments

Sanderson, Mark, and W. Bruce Croft. (2012) "The history of information retrieval research." Proceedings of the IEEE 100.Special Centennial Issue.

Modern Information Seeking






ChatGPT

Google

YouTube

reddit

facebook



The modern information environment (MIE) has been evolved!

What Do I Do in PhD

Characterizing Evolving Landscape?

RQ 1: Do theoretical information seeking frameworks are still sufficient to characterise MIE? Or how one looks like?

RQ 2: What is the current picture regarding people's preferences of using diversified search user interfaces (SUIs)?

RQ 3 - RQ 4: What and why are the driven changes on human cognition introduced by emerging interaction paradigms (specifically generative chatbot)?

Do Existing Behaviour Models Capture MIEs?

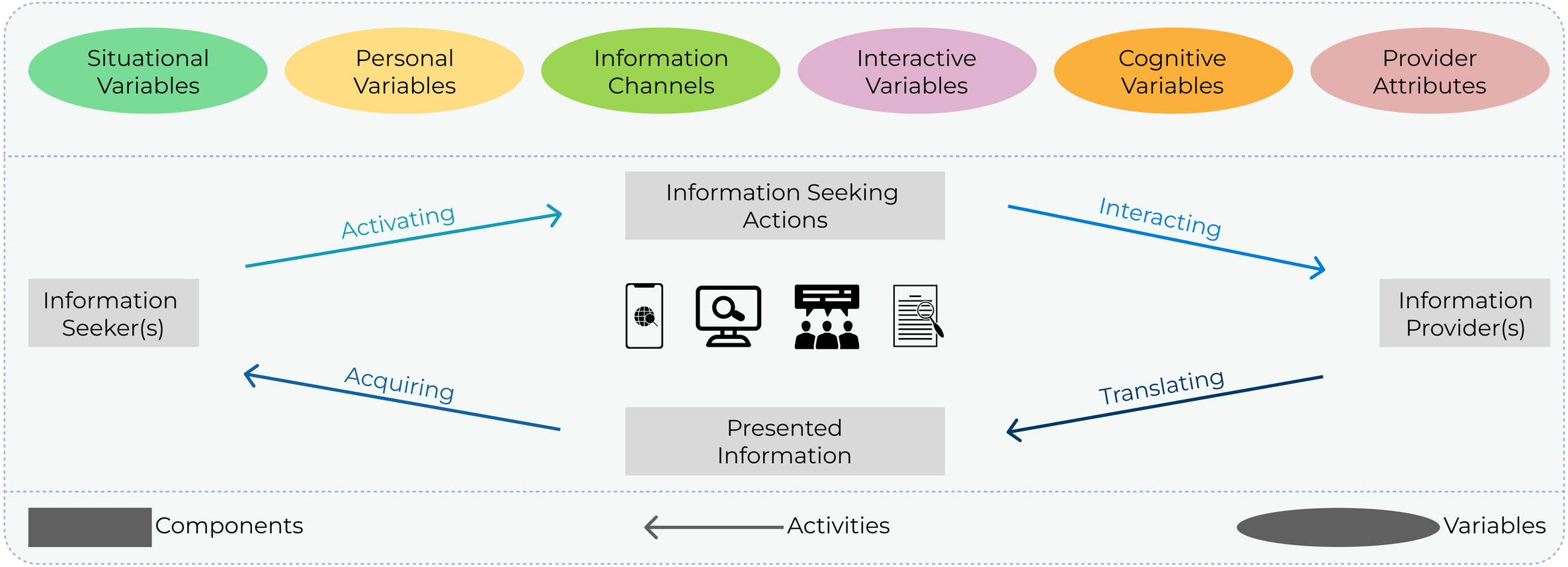
Part of literature review:

Prior models	Gap
Saracevic, 1997	more focusing on the situations that drive the knowledge gap, less on contextual situation
Wilson, 1997	less focusing on the intent of systems
Ingwersen & Järvelin, 2005	less focusing on various devices

Saracevic, T. (1997). The stratified model of information retrieval interaction: Extension and applications.
Wilson, T. D. (1997). Information behaviour: an interdisciplinary perspective.
Ingwersen, P., & Järvelin, K. (2005). The turn: Integration of information seeking and retrieval in context.

ISMIE Framework

Information Seeking in Modern Information Environment (ISMIE)



Sun, Shuoqi, Danula Hettiachchi, and Damiano Spina (2025). "ISMIE: A Framework to Characterize Information Seeking in Modern Information Environments." SIGIR-AP'25.

Research Question (2)

RQ 2: What is the current picture regarding people's preferences of using diversified search user interfaces (SUIs)?

Motivations

A Comparative Study of Users' Information-Seeking Practices Across Search Engines and Generative AI Chatbots

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To Search or To Gen? Design Dimensions Integrating Web Search and Generative AI in Programmers' Information-Seeking Process

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From To-Do to Ta-Da: Transforming Task-Focused IR with Generativ

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A New Era of Online Search? A Large-Scale Study of User Behavior and Personal Preferences during Practical Search Tasks with Generative AI versus Traditional Search Engines

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Methodology

Characterize Search Scenario

Information Need Categories;
Situational Location; Urgency .....

Crowdsourcing Survey

Manual review; Quality control; Templify

Phase 1: Collecting Search Scenarios

Structured Search Scenarios
as Context Variables

Crowdsourcing Survey
with Attributed SUIs as
Alternative Options

Quantitative Models

Phase 2: Desecrate Choice Experiments

We Expect Large Use of Chatbots

1. Chatbots cause greater cognitive declines than search engines.

> As we stand at this technological crossroads, it becomes crucial to understand the full spectrum of cognitive consequences associated with LLM integration in educational and informational contexts. While these tools offer unprecedented opportunities for enhancing learning and information access, their potential impact on cognitive development, critical thinking, and intellectual independence demands a very careful consideration and continued research.

> The LLM undeniably reduced the friction involved in answering participants' questions compared to the Search Engine. However, this convenience came at a cognitive cost, diminishing users' inclination to critically evaluate the LLM's output or 'opinions' (probabilistic answers based on

2. Information presentation is one of the driven factors.

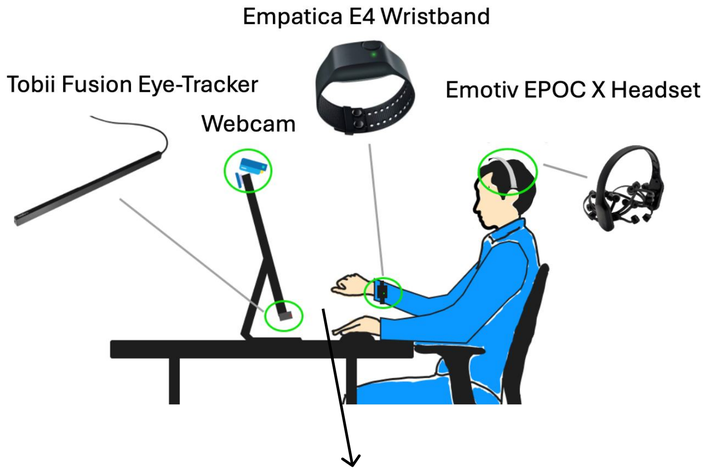
> 3]. Unlike participants who saw the AI suggestions, participants who saw the static text suggestions did not report attitudes that were significantly different than those of participants in the Control after Tukey adjustment for multiple comparisons [difference in means = 0.20, 95% CI (−0.02, 0.43), $t(1474) = 2.098$, $P = 0.091$, Cohen's $d = 0.11$]. This

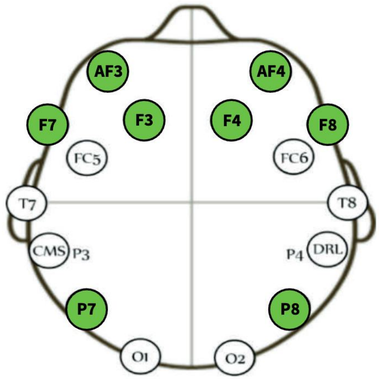
Kosmyna, N., et. al., (2025). Your brain on ChatGPT: Accumulation of cognitive debt when using an AI assistant for essay writing task. arXiv.
Williams-Ceci, S., et. al., (2025). Biased AI writing assistants shift users' attitudes on societal issues. Science Advances.

Research Question (3)

RQ 3: If information itself is the same, what attributes of information presentation drives differences in cognition when people interact with search engine and generative chatbot?

Methodology





Search tasks that require them to produce search outcomes (e.g., writing a short answer)

Participants see task topic and later a piece of relevant information (hard-coded, highly control)

Controlling the information coverage

Varying presentation attributes

↓

1. Top-1 search engine result (baseline)
2. AI-generated answer (AI baseline)
3. Structural AI-generated answer (e.g., bullet points)

↓

1. Neuro Correlates
   a. Cognitive load (theta/alpha ratio)
   b. Attention (relative pupil dilation)
2. Search outcomes
   a. Summary quality/creativity
   b. Accuracy to quote material
   c. Satisfaction/Preference

Ji, K., Hettiachchi, D., Salim, F. D., Scholer, F., & Spina, D. (2024). Characterizing information seeking processes with multiple physiological signals. SIGIR '24

Research Question (4)

RQ 4? Possibly follow-up studies with a mixed methodology

If you have any idea about how to extend, I would love to hear.

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Personal Website

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