



Information is Nothing without Retrieval

Martin Potthast

1945

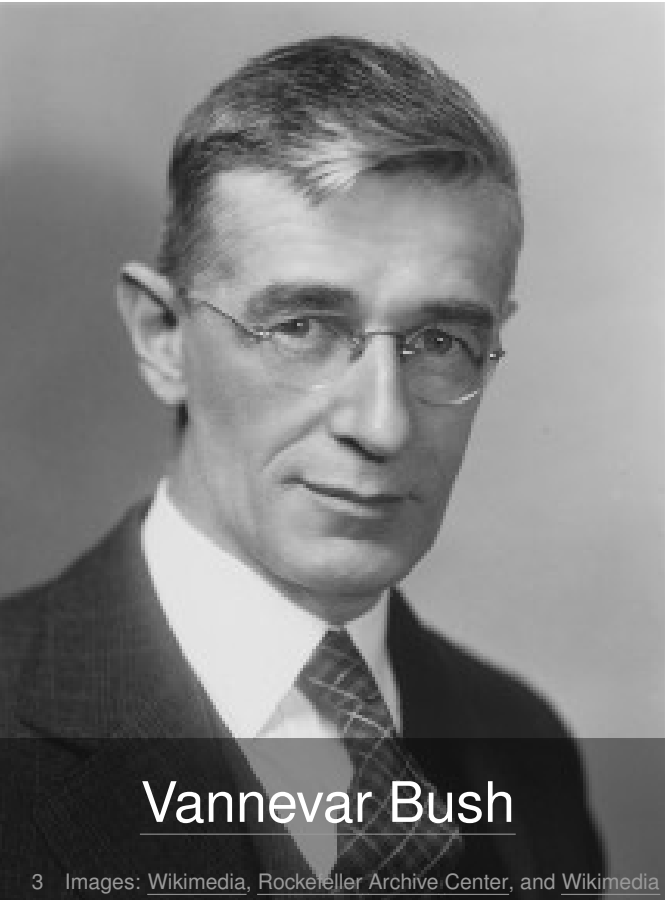
Can machines search?



Vannevar Bush

1945

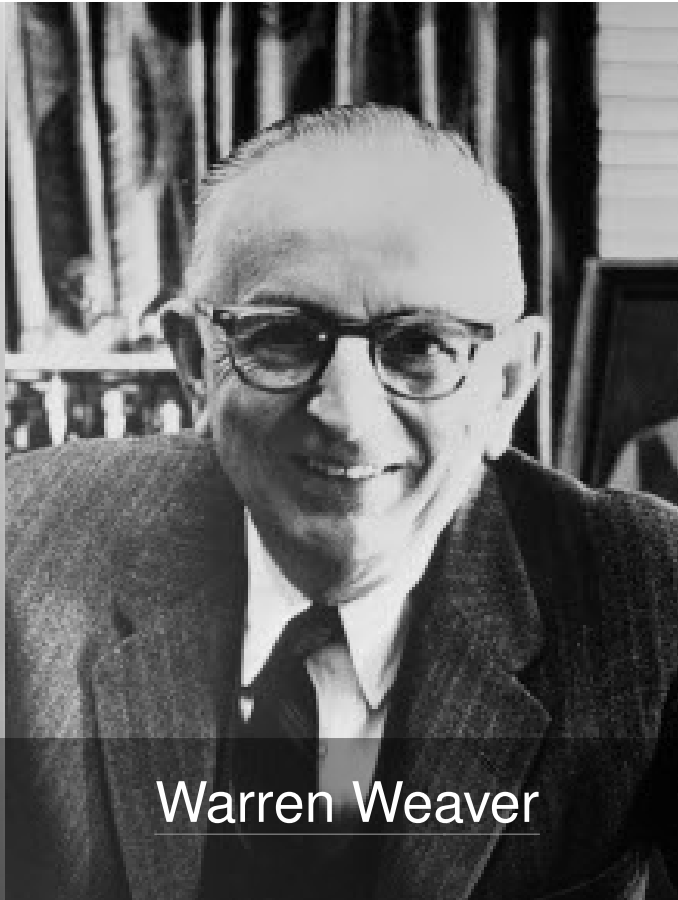
Can machines search?



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Can machines translate?



Warren Weaver

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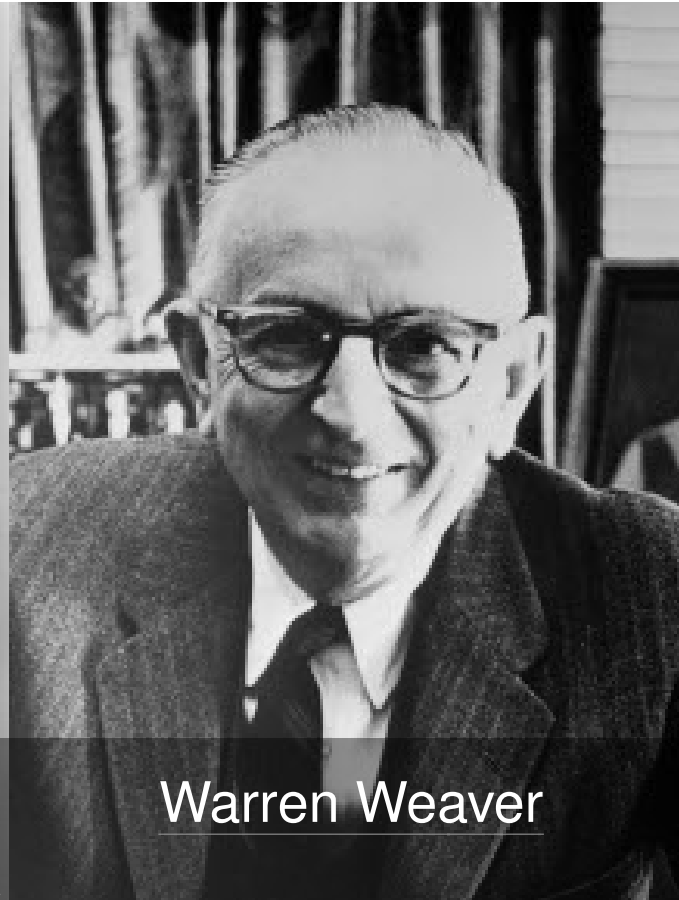
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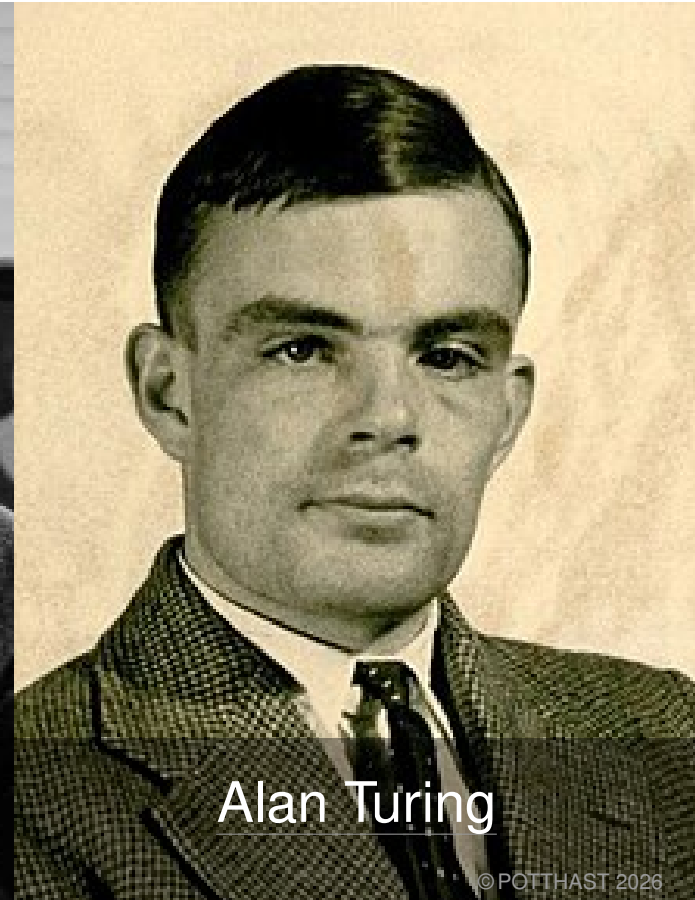
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Warren Weaver

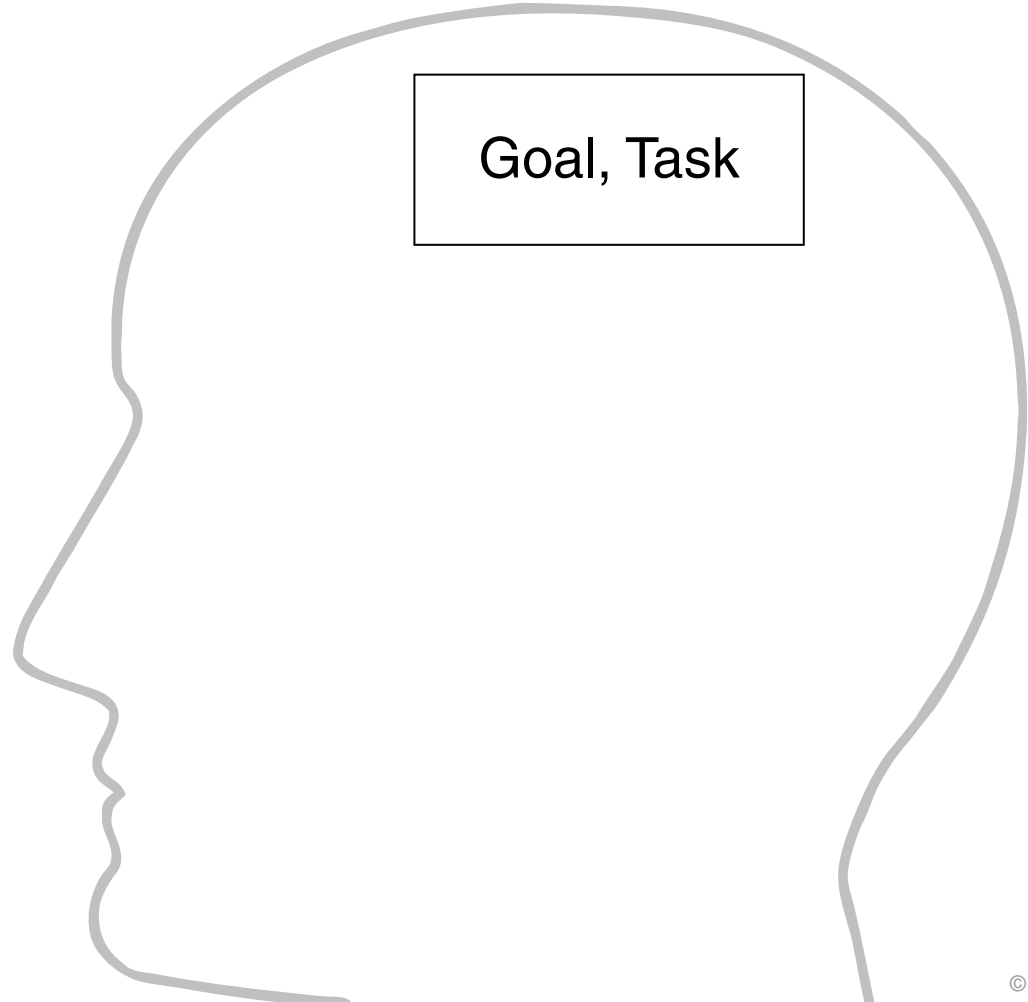
1950

Can machines think?

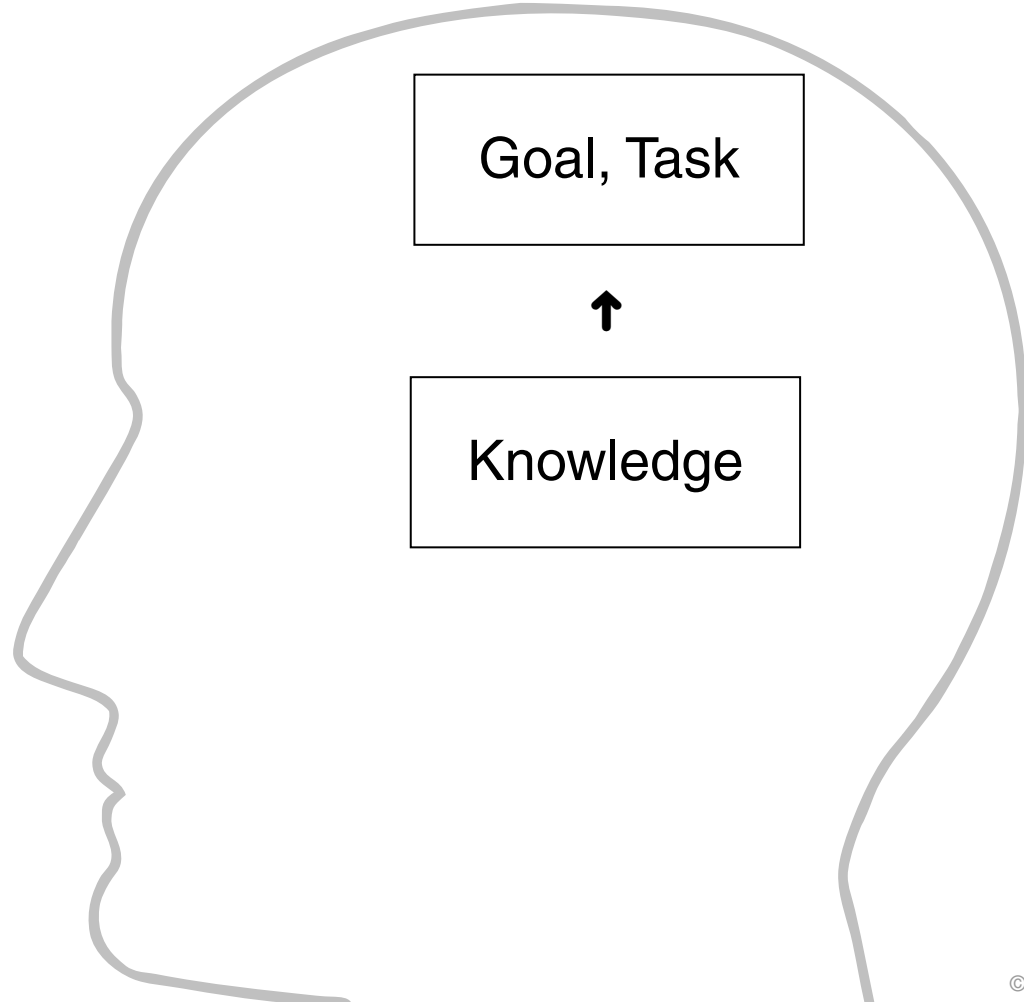


Alan Turing

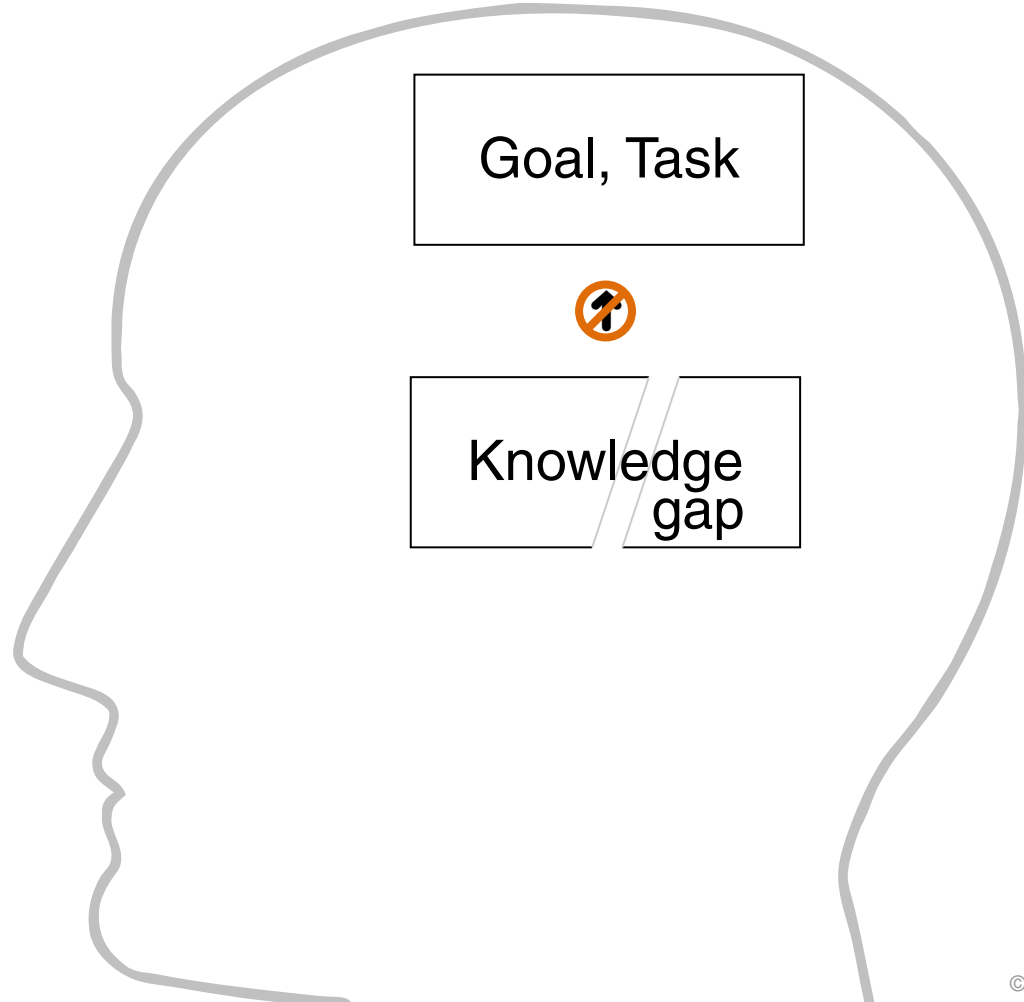
Information Systems



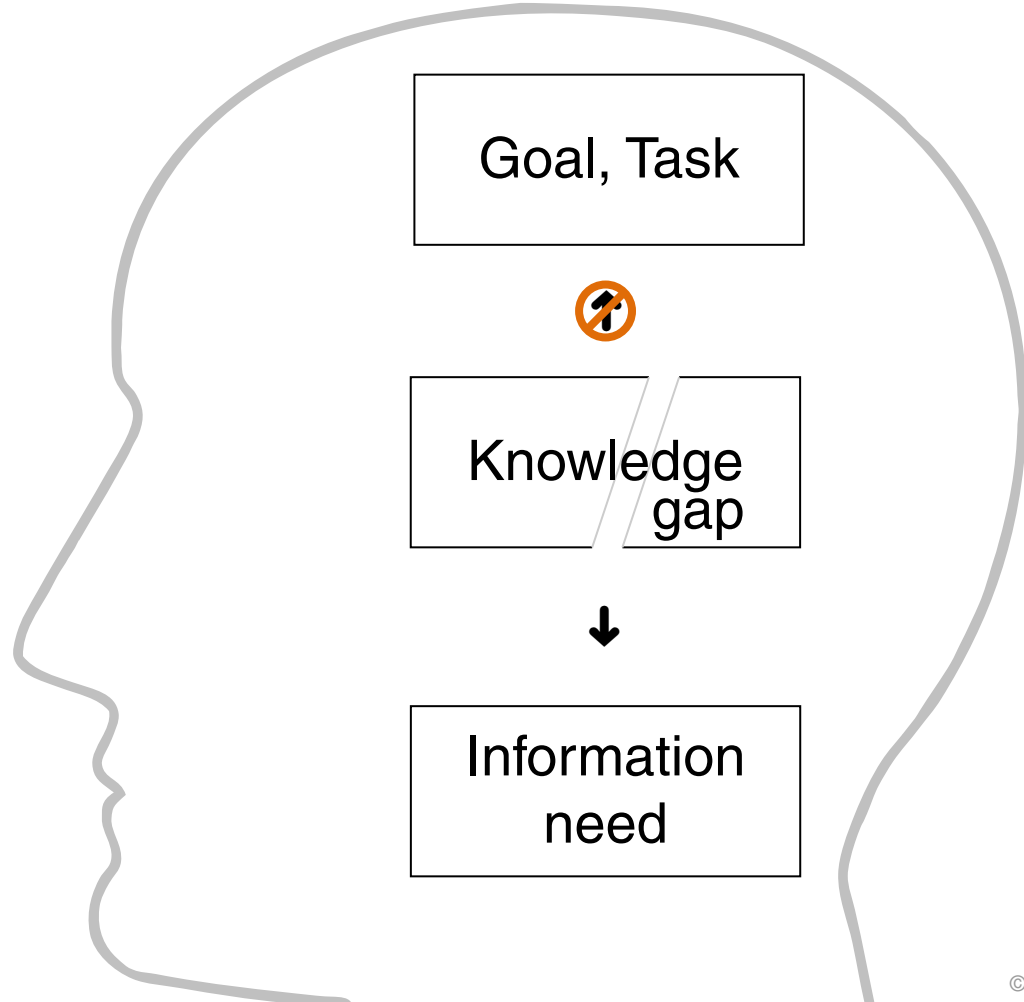
Information Systems



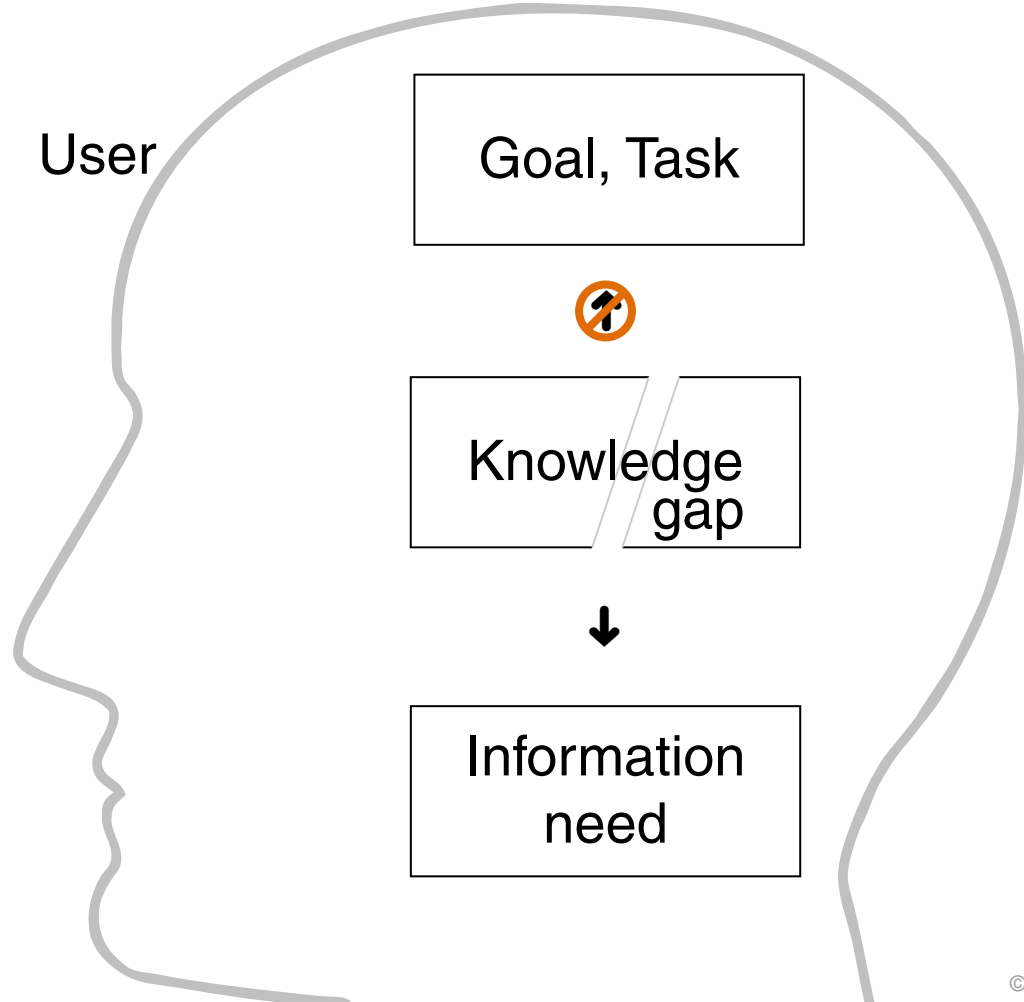
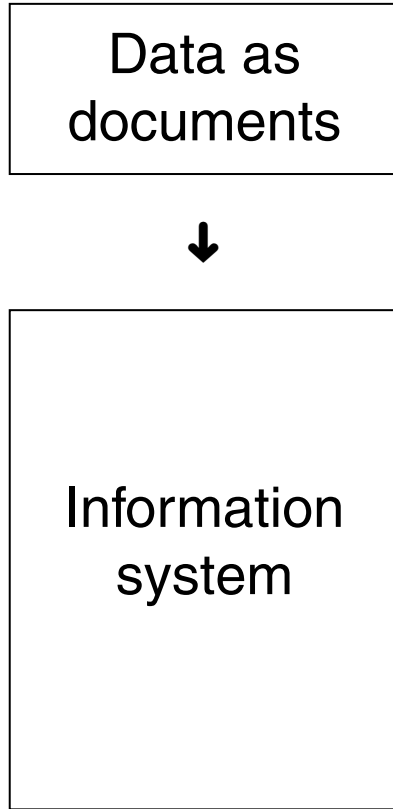
Information Systems



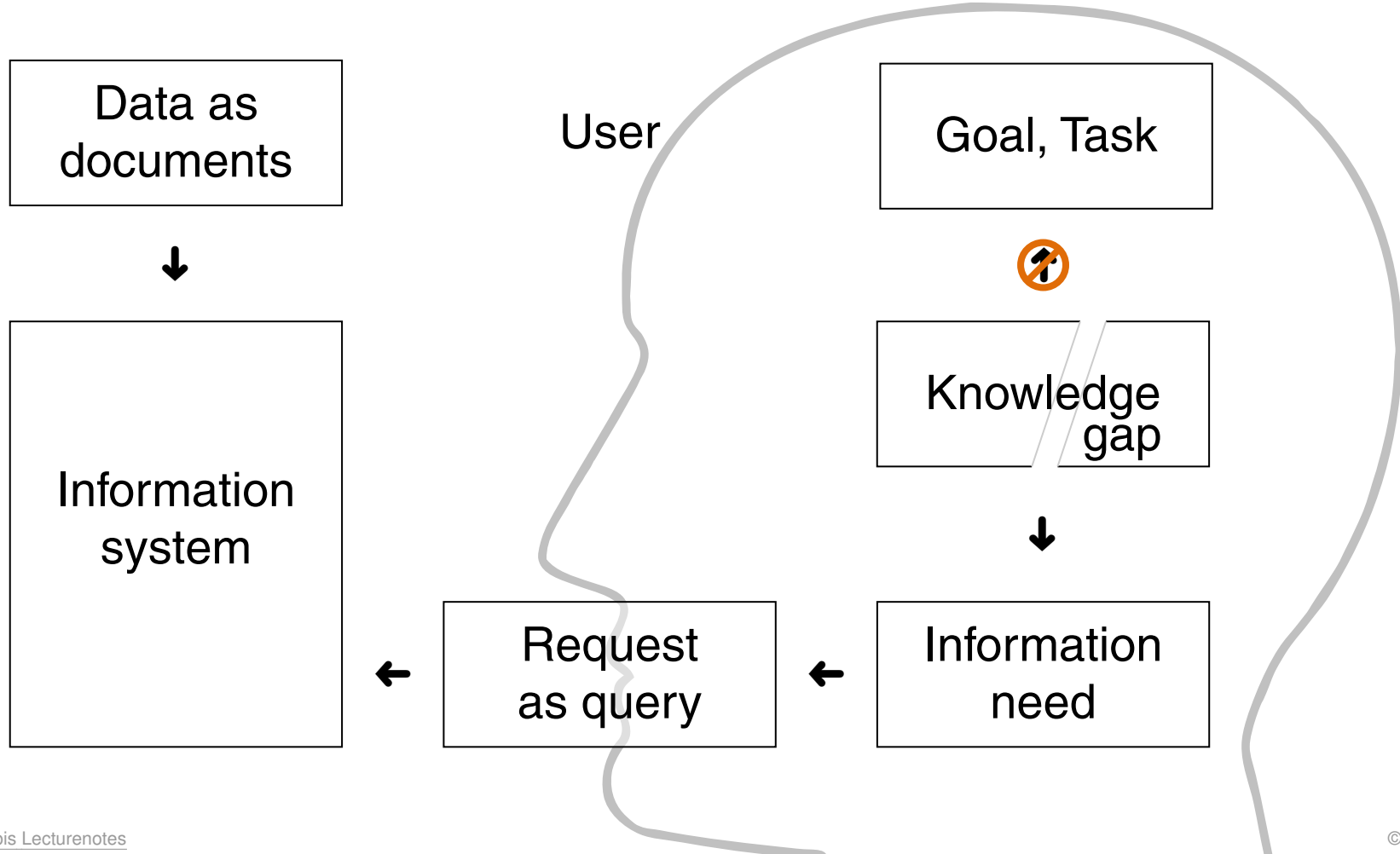
Information Systems



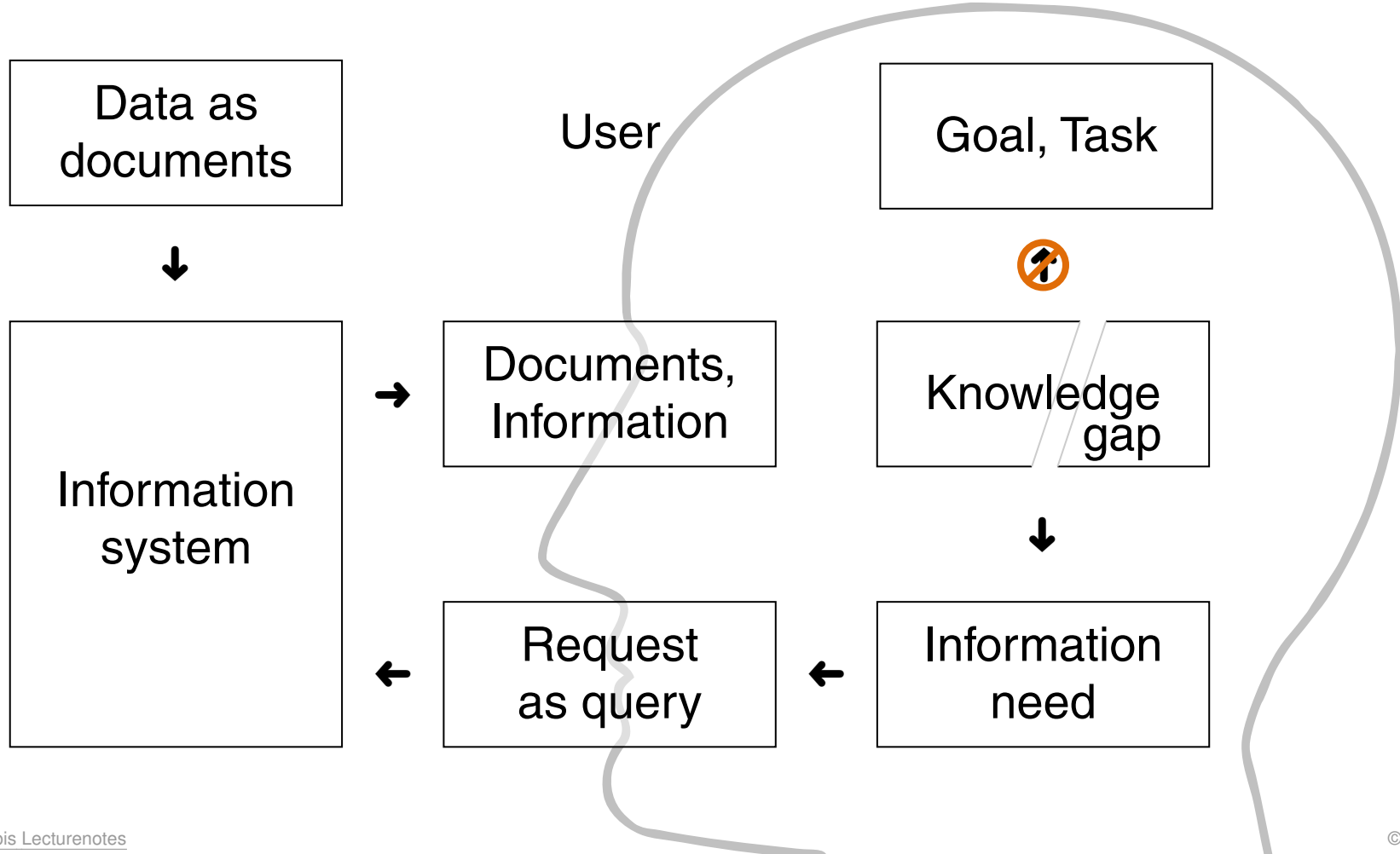
Information Systems



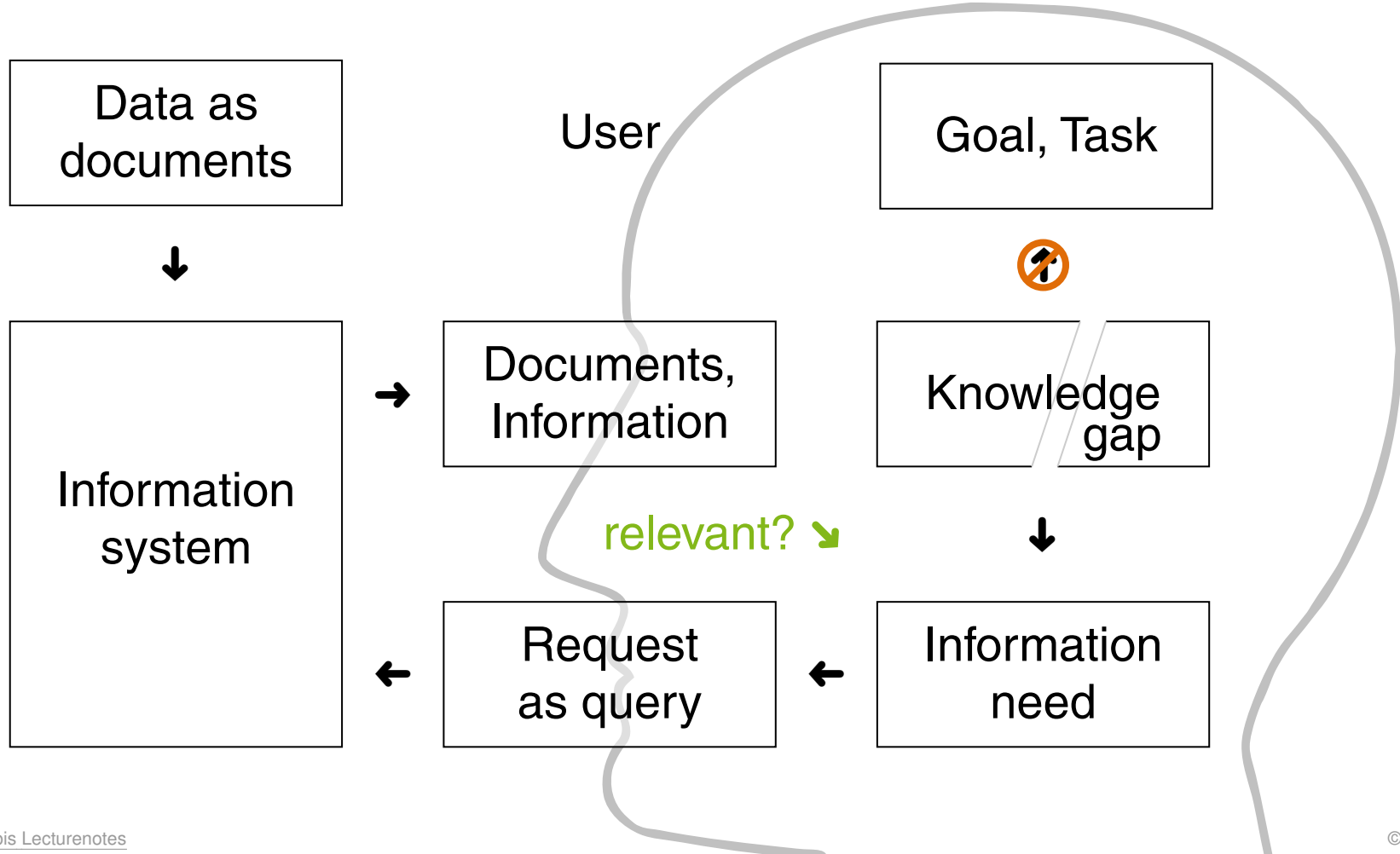
Information Systems



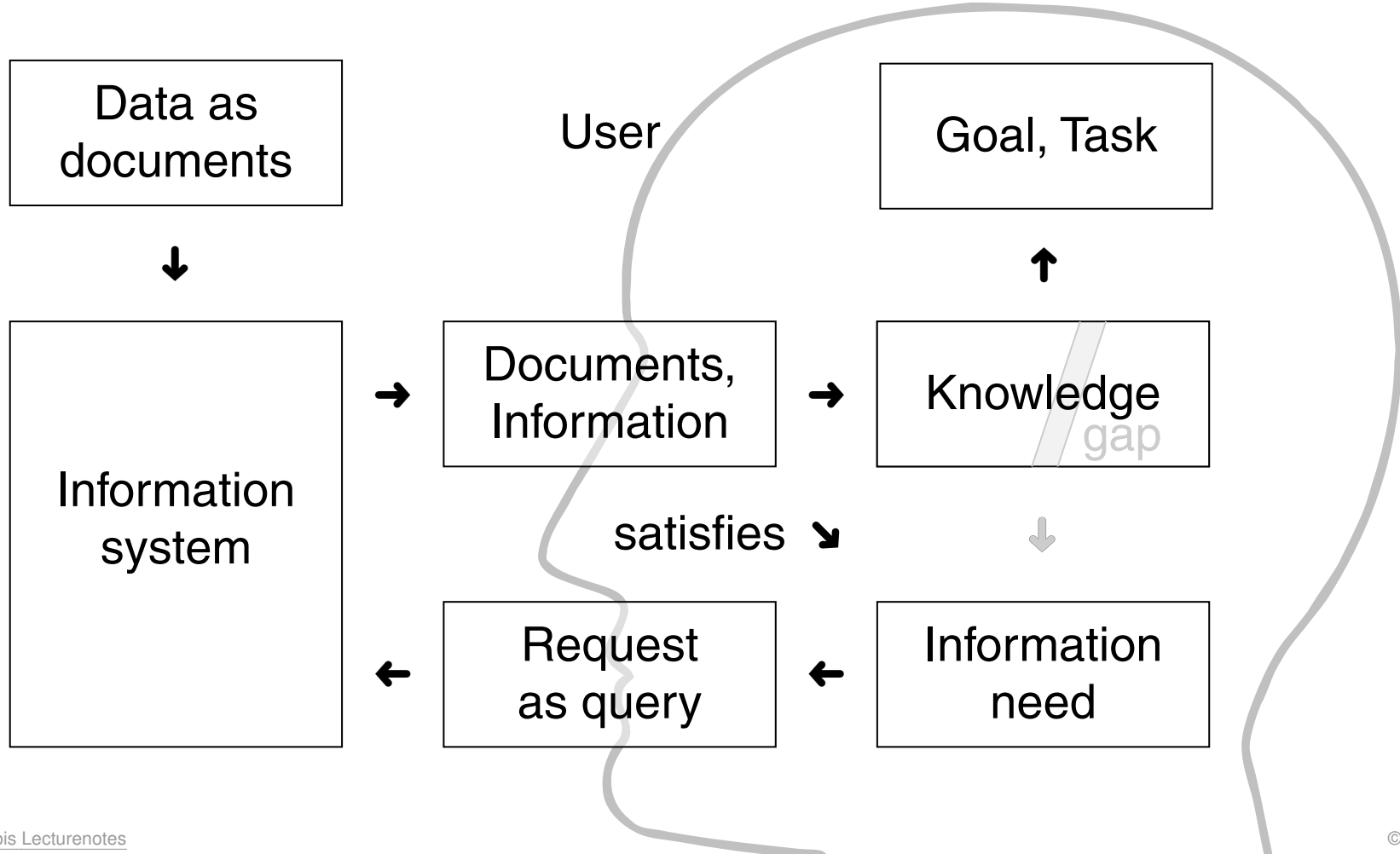
Information Systems



Information Systems



Information Systems



Information Systems

1. Humans

Expert, family, friends, coworkers, ...

2. Curated collections (offline and online)

Library, private collection, book shop, ...

3. Broadcast Media

TV, Radio, newspapers, magazines, ...

4. Open collections (online)

Web, Wikipedia, social media, YouTube, ...

5. Generative AI

Chatbot, RAG, deep research agent, ...

Can I exercise with mild muscle soreness?

Is this medicine supposed to be taken with food?

Do I need a tetanus shot after a small cut?

What's a normal resting heart rate for adults?

How much water should a child drink per day?

How do you treat diaper rash at home?

What causes tooth sensitivity to cold?

How long should you wait to eat after a filling?

Is it normal for cats to sleep 16 hours a day?

How often should I walk a dog?

Why is my stomach rising?

How long can I keep food in the fridge?

How do I get rid of fabric?

What causes a bathroom?

What drill bit is best for tile vs wood?

Can I paint over old paint without sanding?

How much do you tip in Greece?

What's the best way to pack a suit?

What's a good way to give constructive feedback?

Why do my brakes squeak only in the morning?

What does this dashboard light mean?

What's a normal tire pressure range?

How do I run a meeting with a clear agenda?

How do I tell if an email is phishing?

How do I backup my photos safely?



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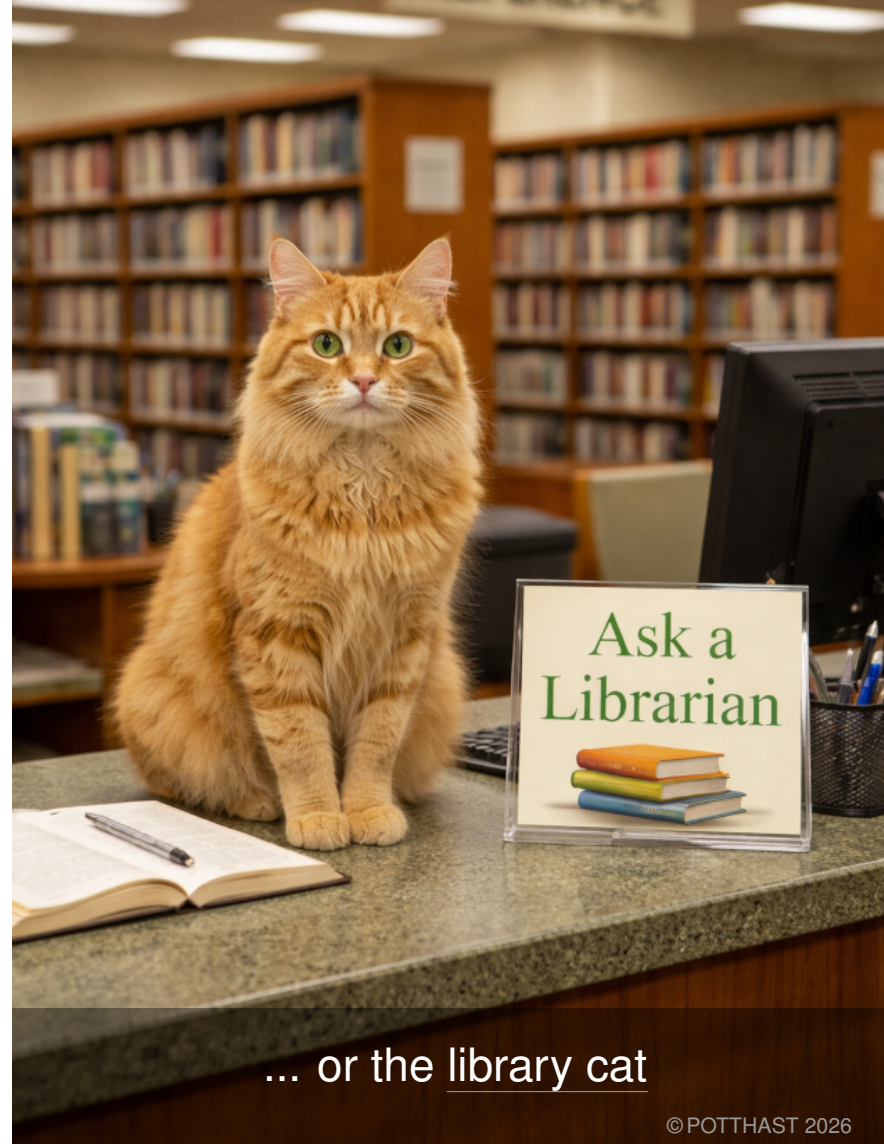
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... or the library cat

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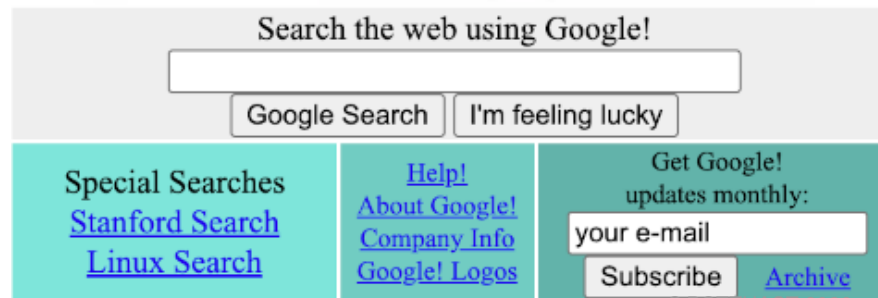
TV, Radio, newspapers, magazines, ...

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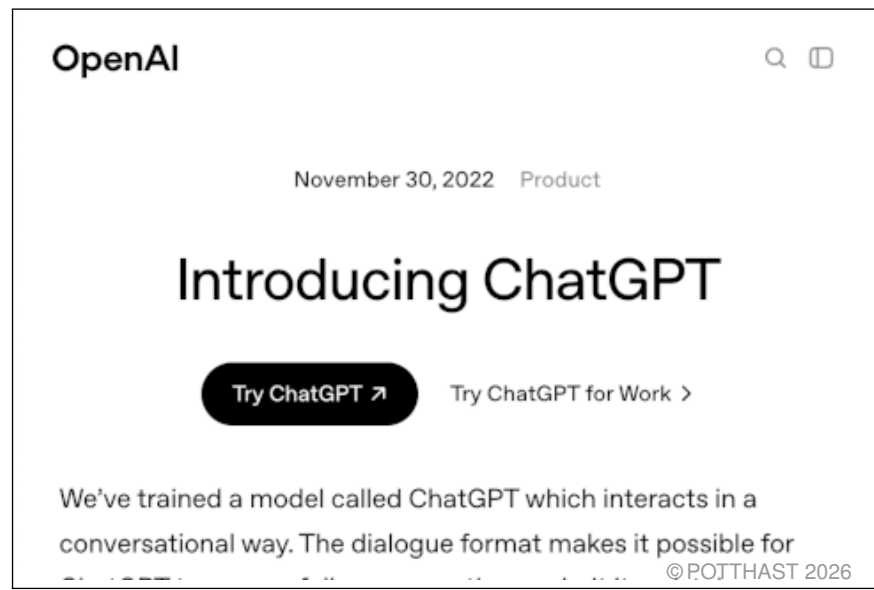
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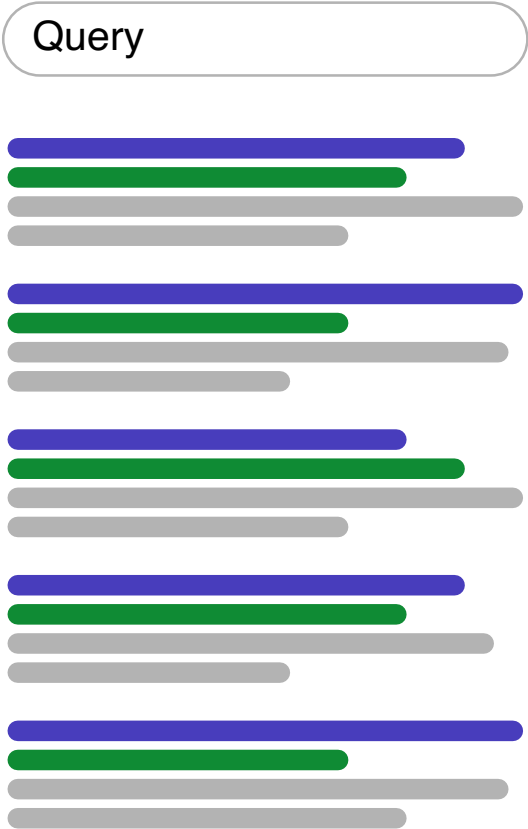
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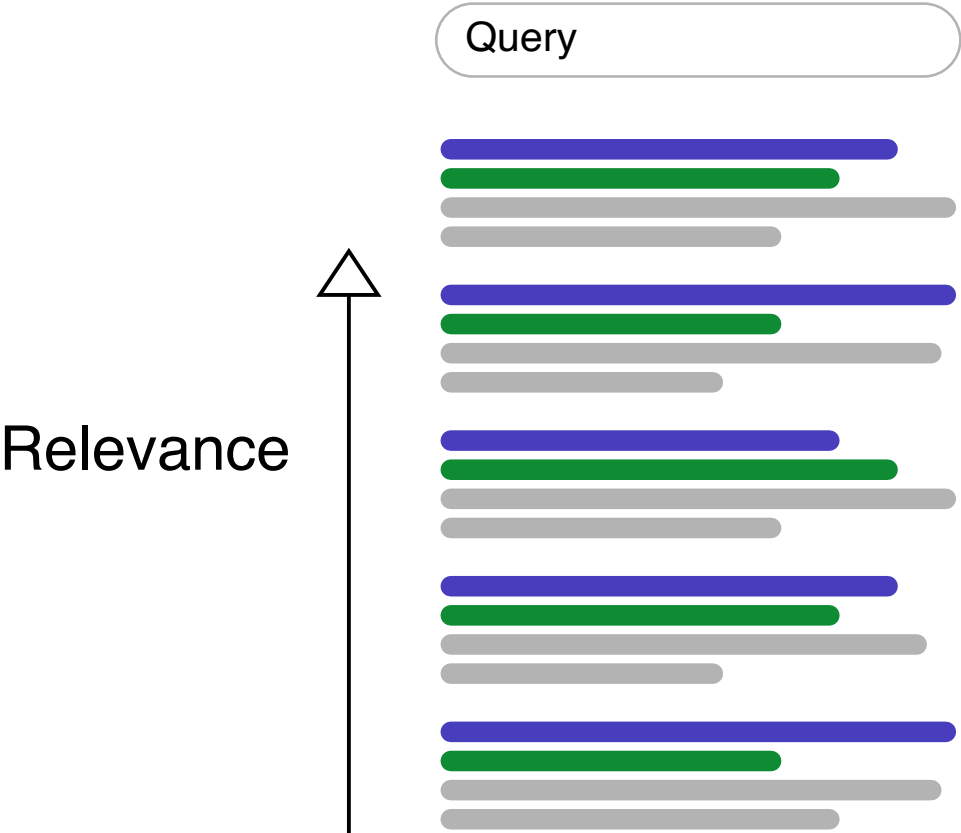
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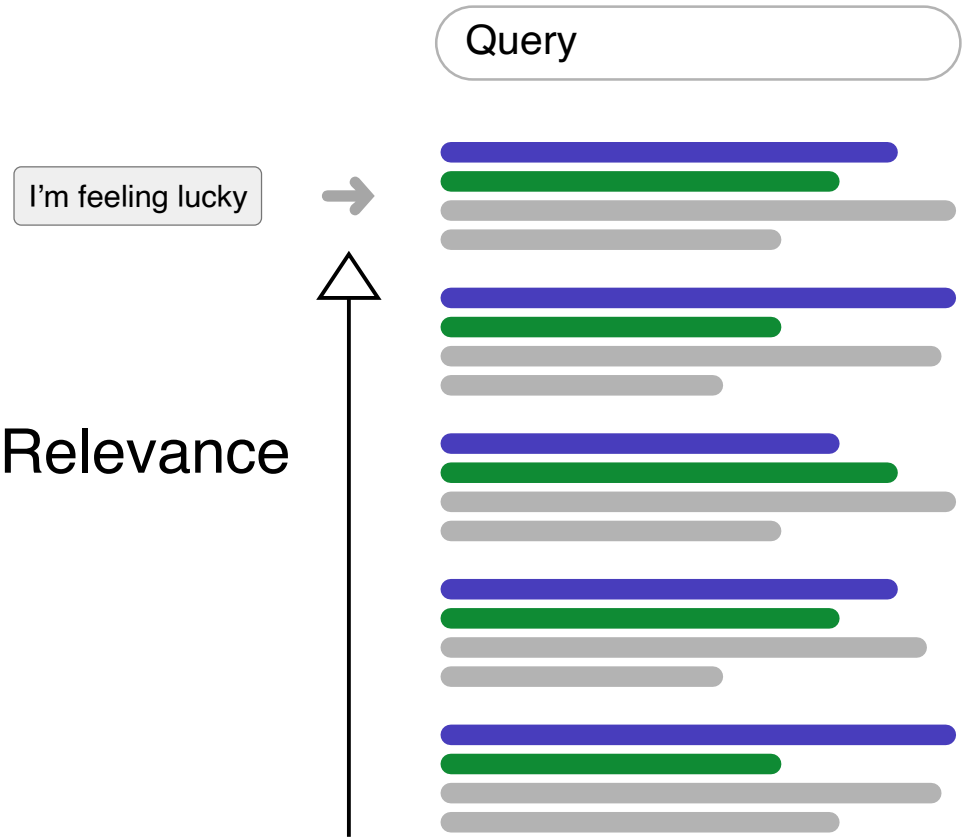
Searching, Fast and Slow



Searching, Fast and Slow



Searching, Fast and Slow



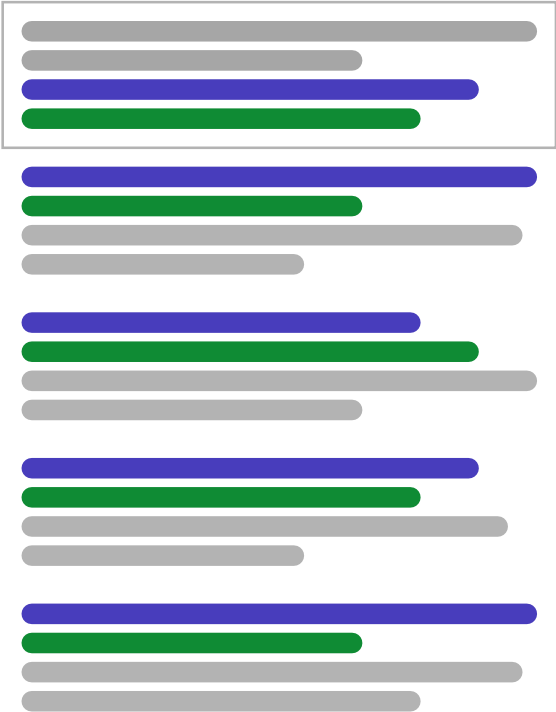
Searching, Fast and Slow



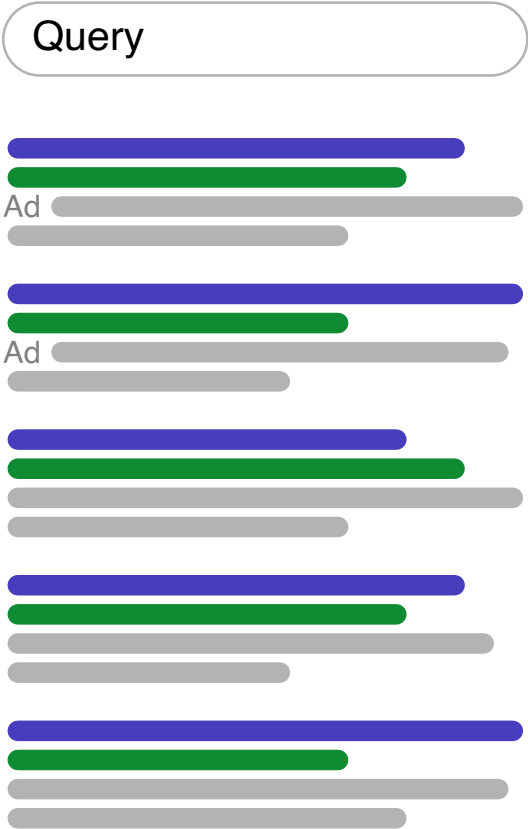
Searching, Fast and Slow

Featured
Snippet

Query

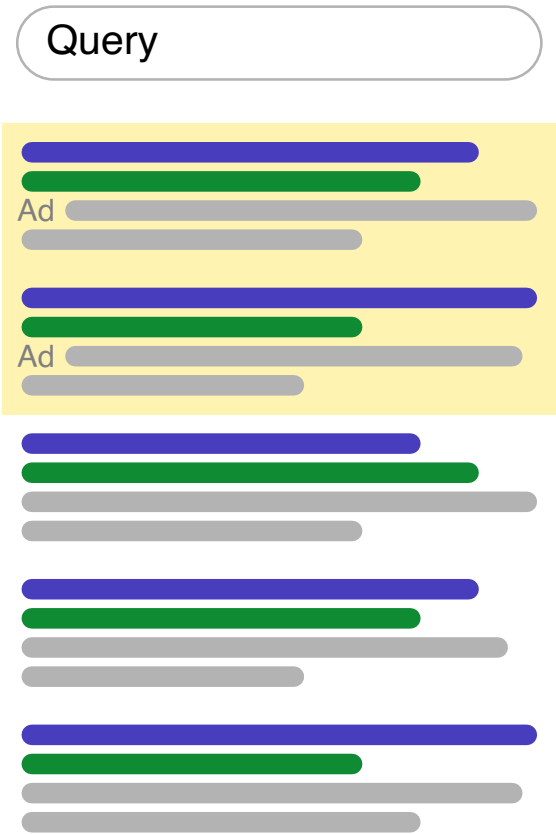


Searching, Fast and Slow



Searching, Fast and Slow

Display
Ads



Searching, Fast and Slow

Query

Display
Ads

SEO

Is Google getting worse?

No, but its complicated

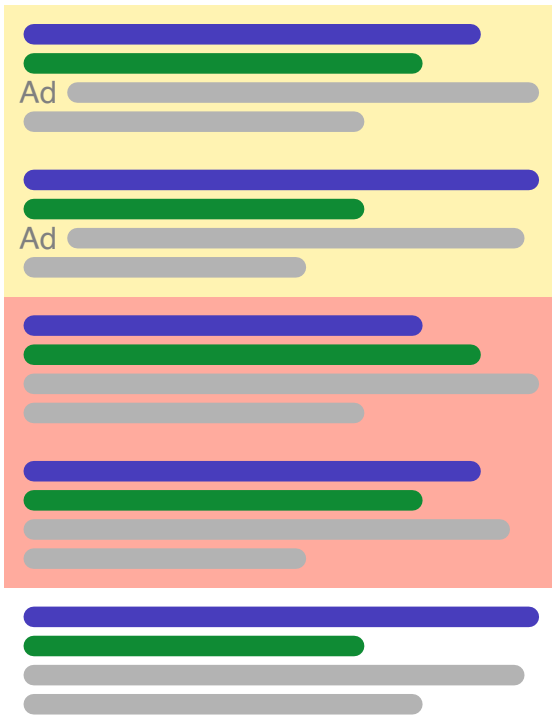
[Bevendorff et al., 2024]

Searching, Fast and Slow

Display
Ads

SEO

Query



Query / Prompt



↑ Convenient, but context-free

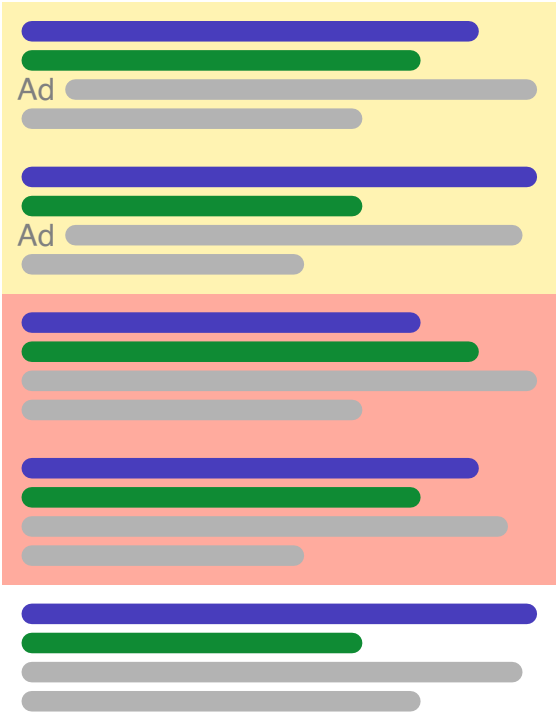
← Tedious, but grounded and diverse

Searching, Fast and Slow

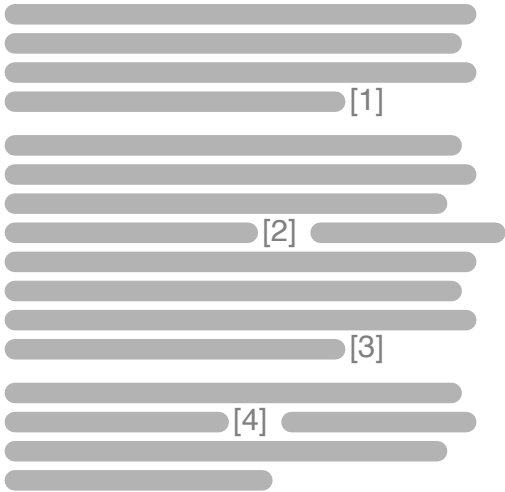
Display
Ads

SEO

Query



Query / Prompt



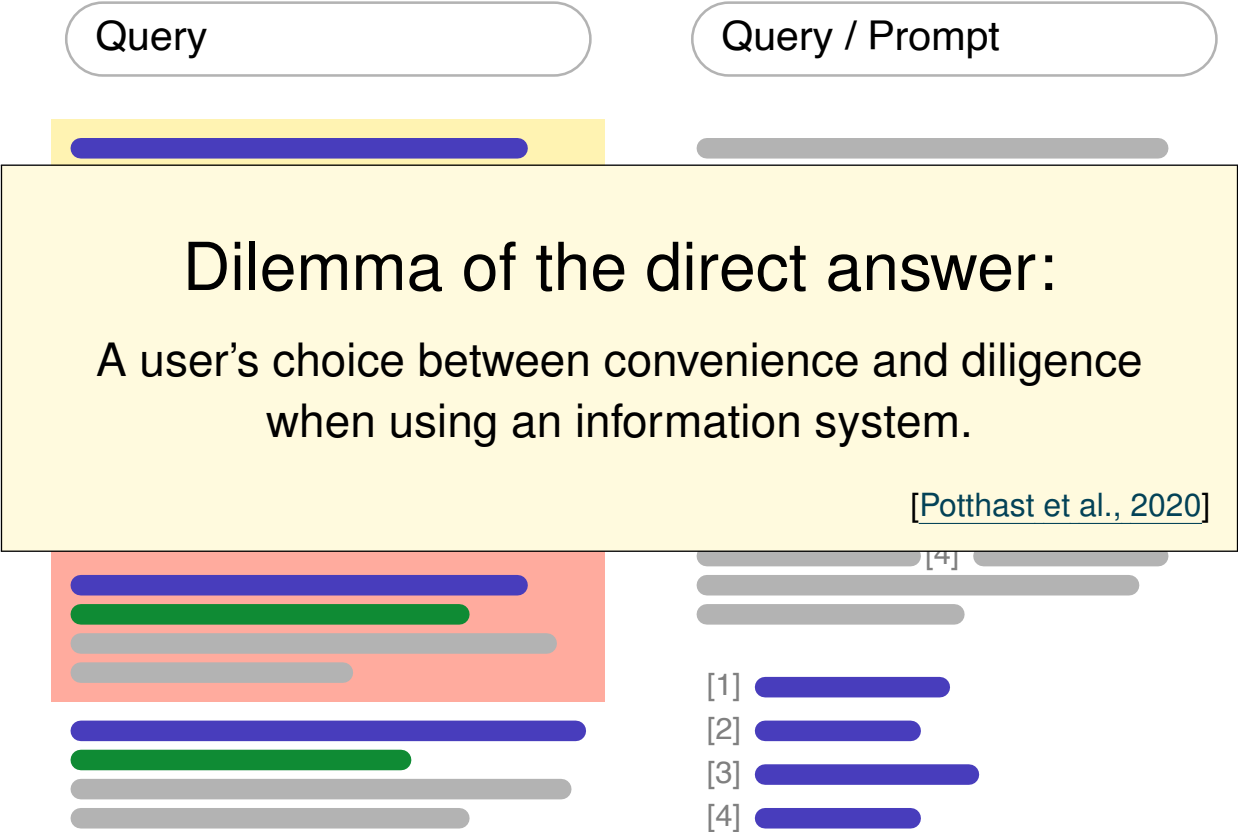
- [1]
- [2]
- [3]
- [4]

↑ More grounded
← Few care to check

Searching, Fast and Slow

Display
Ads

SEO

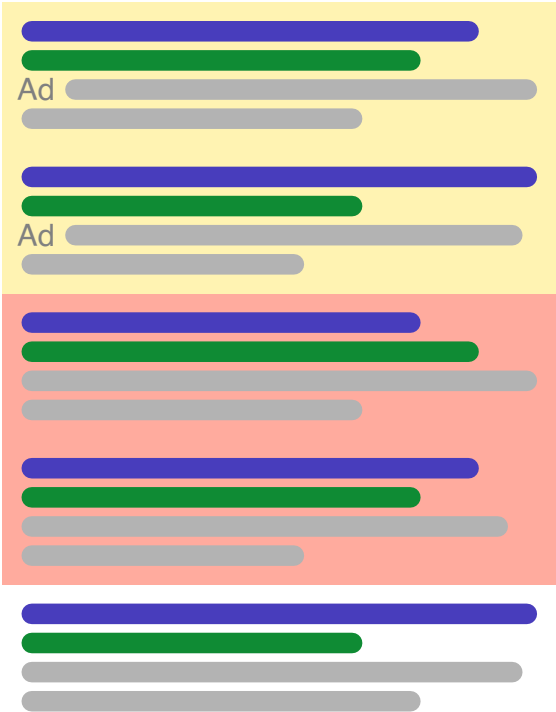


Searching, Fast and Slow

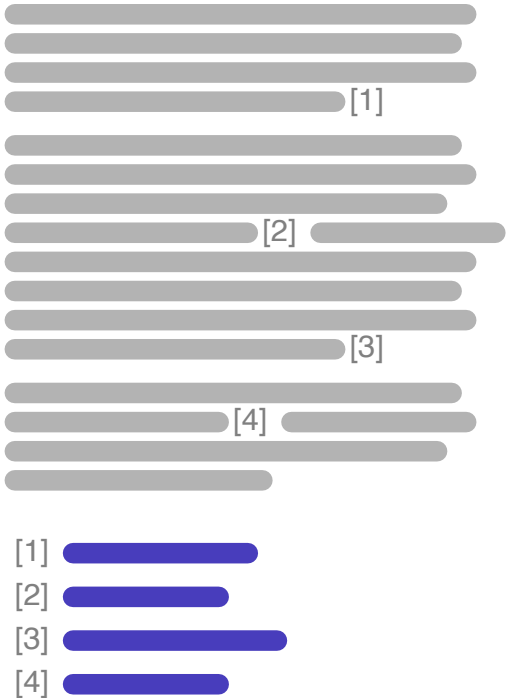
Display
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SEO

Query



Query / Prompt

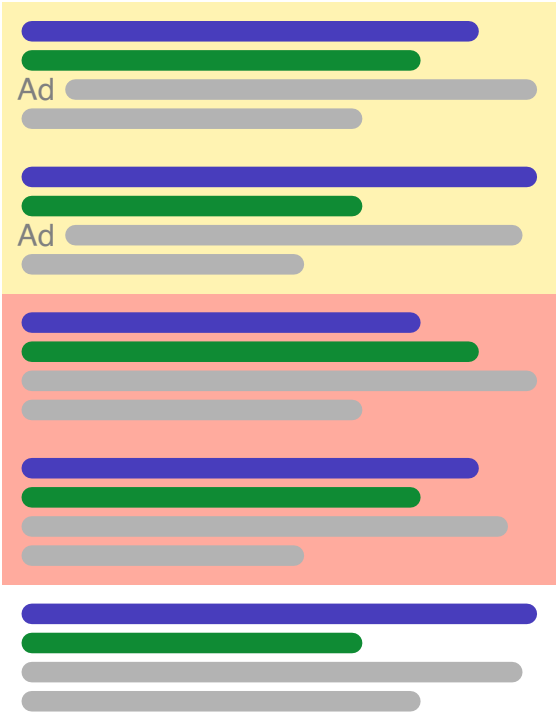


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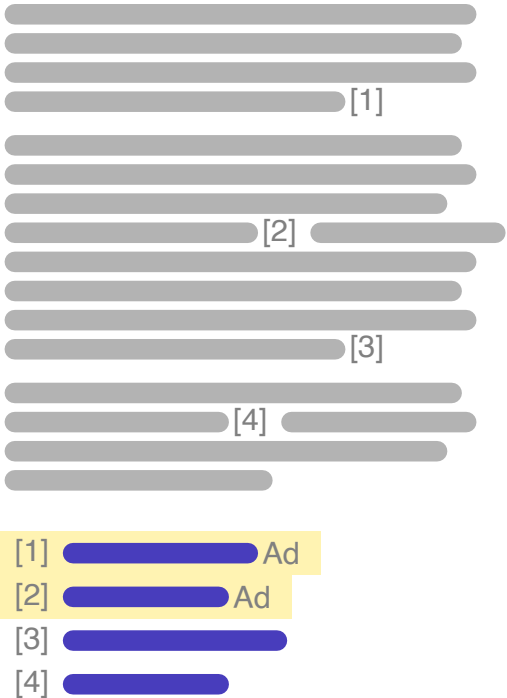
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SEO

Query



Query / Prompt

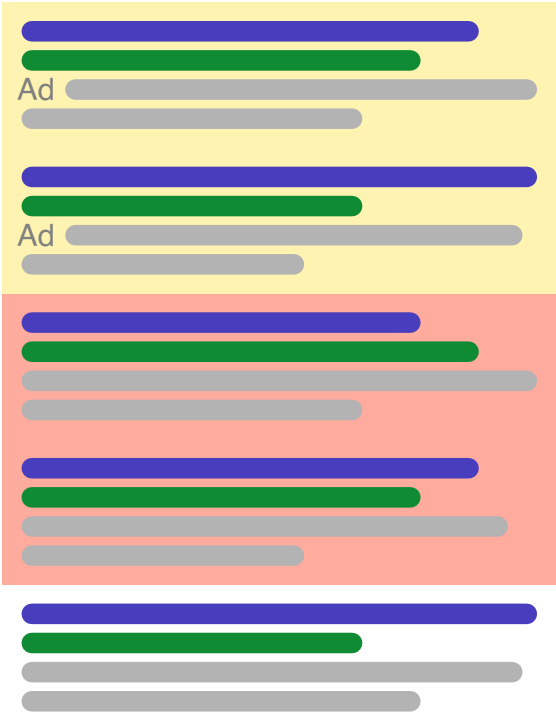


Searching, Fast and Slow

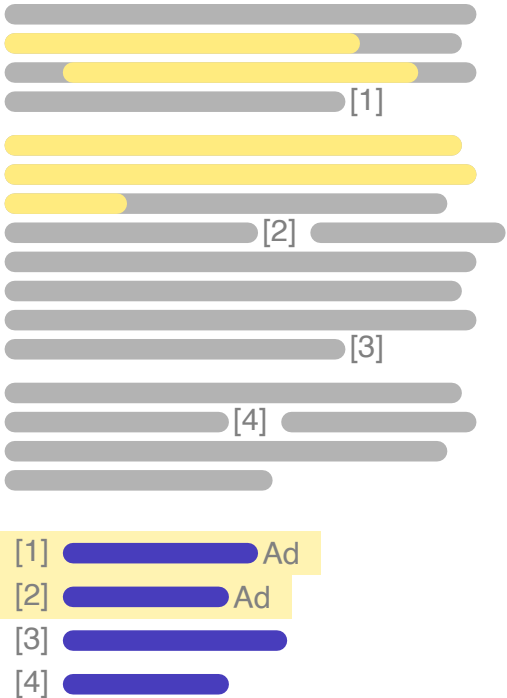
Display
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SEO

Query



Query / Prompt



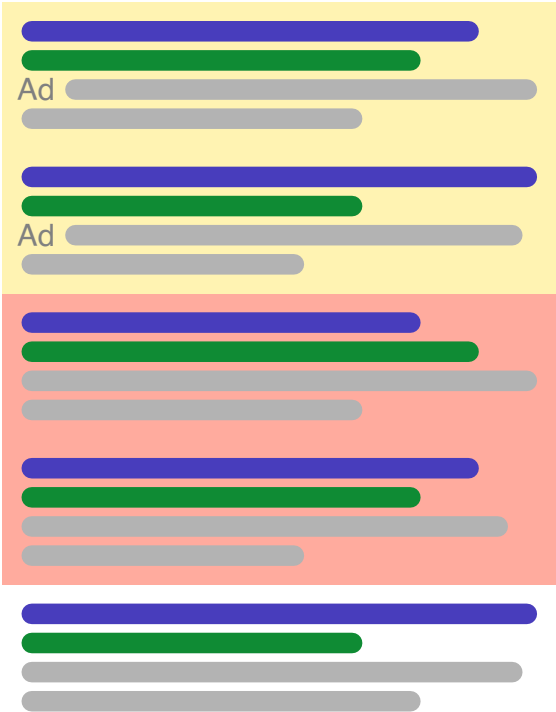
Native
Ads

Searching, Fast and Slow

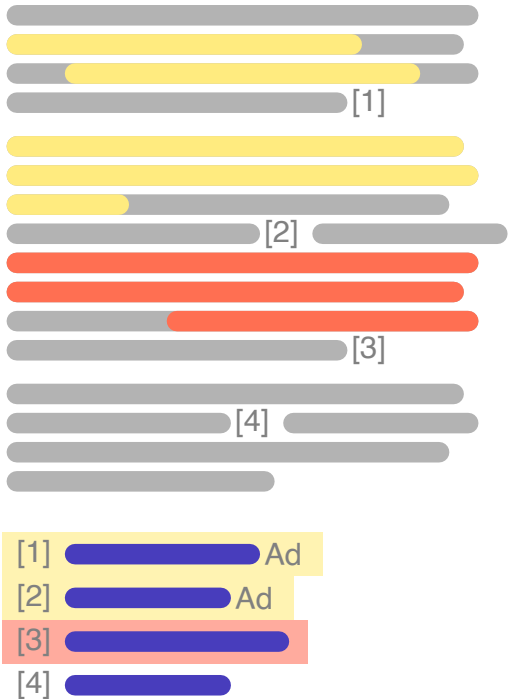
Display
Ads

SEO

Query



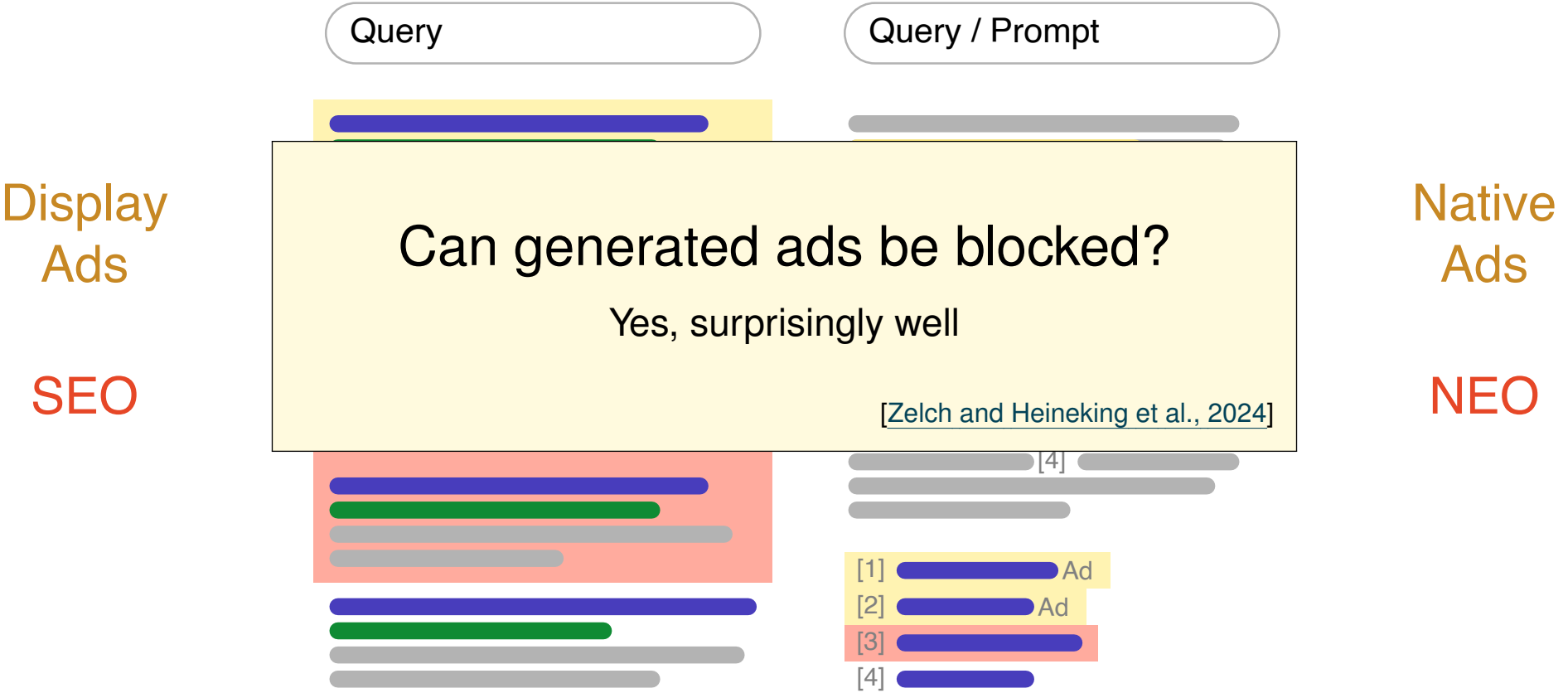
Query / Prompt



Native
Ads

NEO

Searching, Fast and Slow



Future Challenges

- ❑ LLMs “speak” natural language
- ❑ They are used as new user interface
- ❑ Language is ambiguous, misunderstandings occur both ways

Syntax

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- ❑ Language is ambiguous, misunderstandings occur both ways
- ❑ LLMs enable complex semantic text processing
- ❑ They relieve of tedious tasks like searching, summarizing, writing, etc.
- ❑ How much tedium is necessary for (continued) self-formation?

Syntax

Semantics

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- ❑ LLMs enable complex semantic text processing
- ❑ They relieve of tedious tasks like searching, summarizing, writing, etc.
- ❑ How much tedium is necessary for (continued) self-formation?
- ❑ LLMs convey an air of “understanding” and expertise
- ❑ They are used to interpret, value, speculate, judge, decide
- ❑ They have neither experience, nor opinion, nor responsibility, nor a past
- ❑ Who is in charge of, and what influences the LLMs output?

Syntax

Semantics

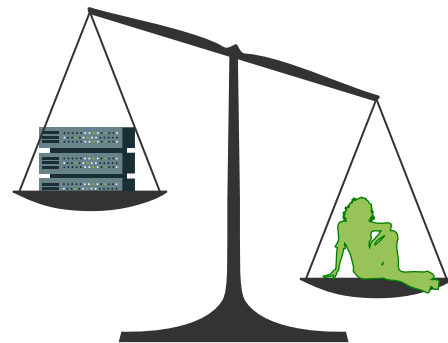
Pragmatics

Future Challenges



More power to the machine?

- ☐ more outsourcing of cognitive effort
- ☐ standardized guardrailing
- ☐ affirmative action
- ☐ prescribed values
- ☐ ...



Empower the user?

- ☐ raise awareness
- ☐ support deliberation
- ☐ demonstrate mechanisms
- ☐ provide meta information
- ☐ ...