Who writes the Web?
Who reads it?
Who judges it?
Who reports back to us?

About Authenticity in Information Retrieval

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ICTIR 2025, Padua



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[ECIR 2016]

Who Wrote the Web? Revisiting Influential Author Identification Research Applicable to Information Retrieval

Martin Potthast[1(✉)], Sarah Braun[2], Tolga Buz[3], Fabian Duffhauss[4], Florian Friedrich[5], Jörg Marvin Gülzow[6], Jakob Köhler[7], Winfried Lötzsch[8], Fabian Müller[9], Maike Elisa Müller[3], Robert Paßmann[10], Bernhard Reinke[10], Lucas Rettenmeier[5], Thomas Rometsch[11], Timo Sommer[12], Michael Träger[13], Sebastian Wilhelm[2], Benno Stein[1], Efstathios Stamatatos[14], and Matthias Hagen[1]

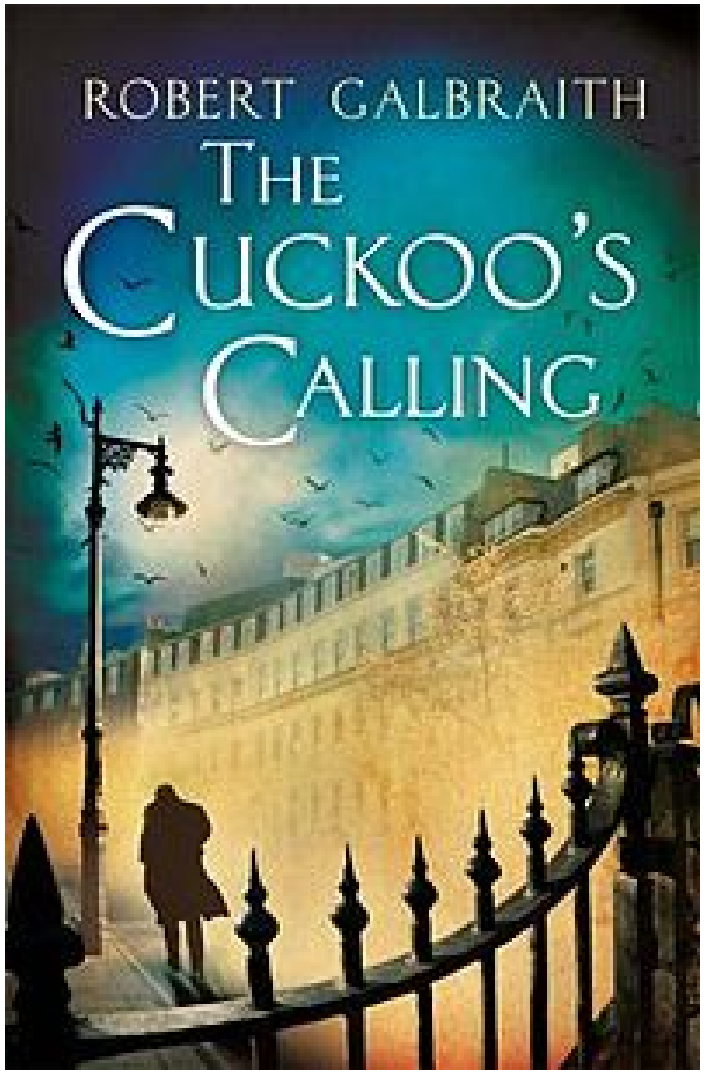
[...] we conjecture that it is only a matter of time until tailored information retrieval systems will index authorial style, retrieve answers to writing style-related queries as well as queries by example, and eventually, shed light on the question: Who wrote the web?

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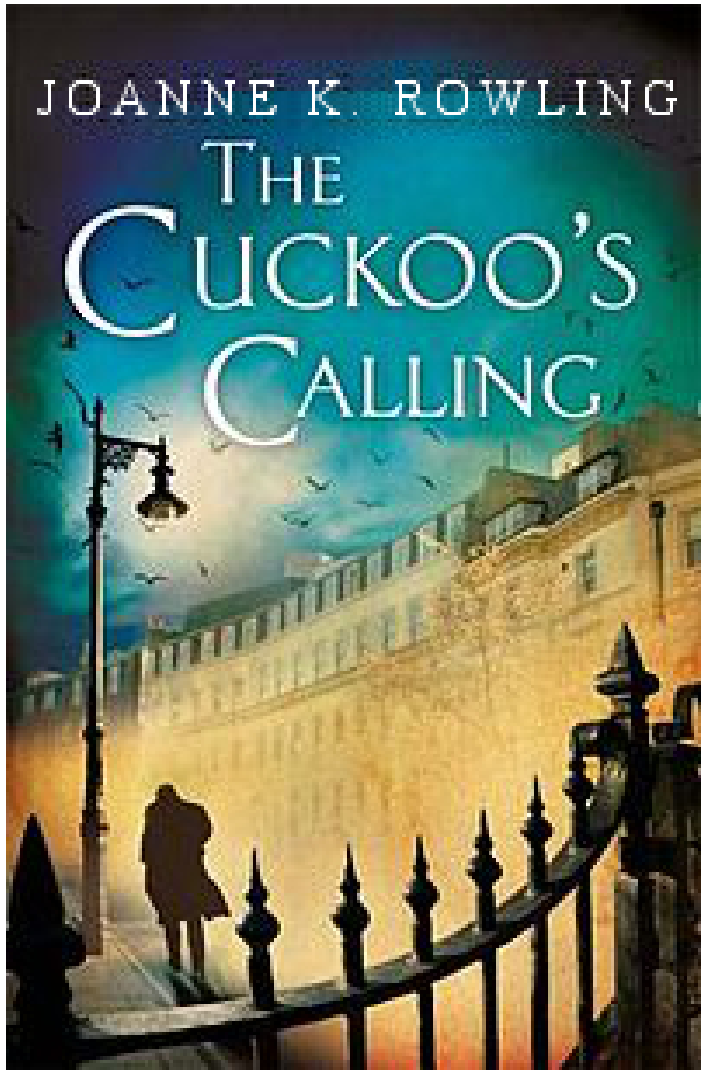
Agenda

1. Author Identification
2. LLM Detection
3. LLM Advertising
4. LLM Opinion Grounding
5. Authenticity in Information Retrieval

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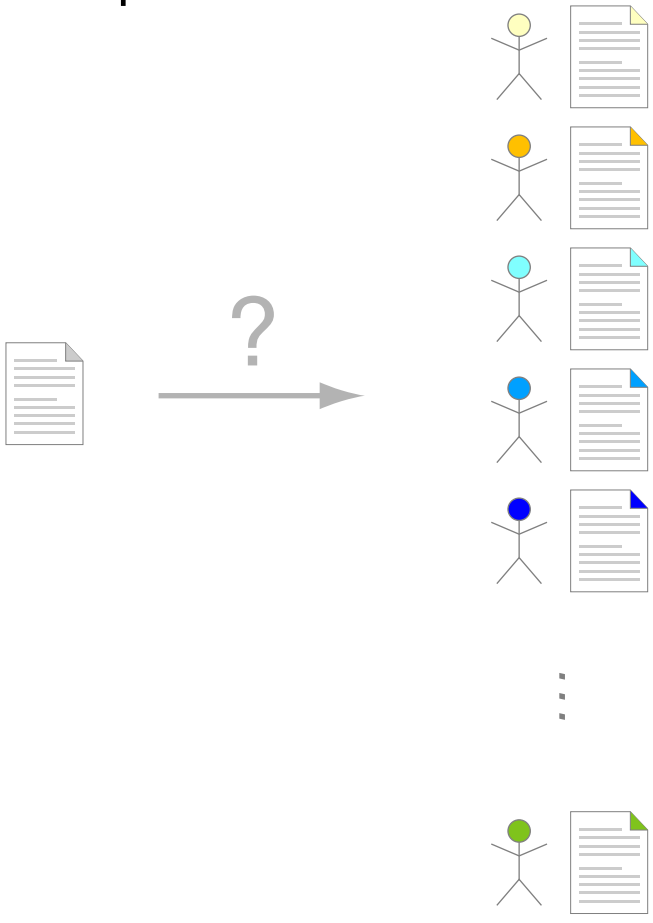




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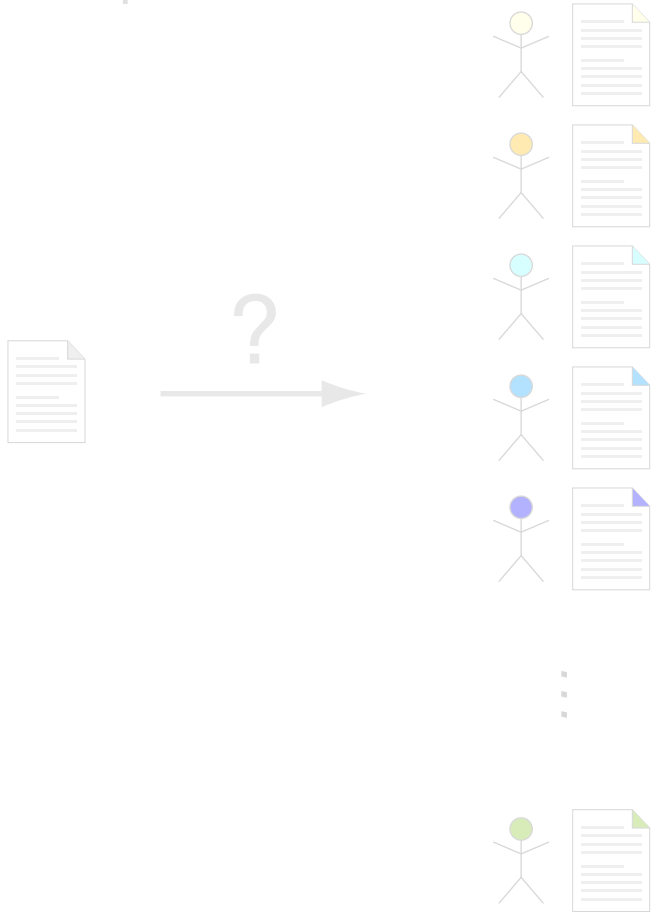
Authorship **Attribution**



To which author does a text belong?

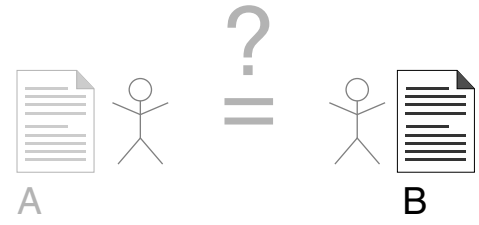
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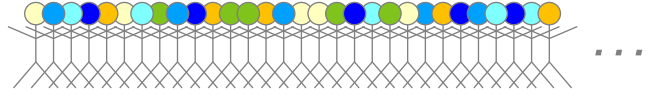
Authorship **Attribution**



To which author does a text belong?

Authorship **Verification**





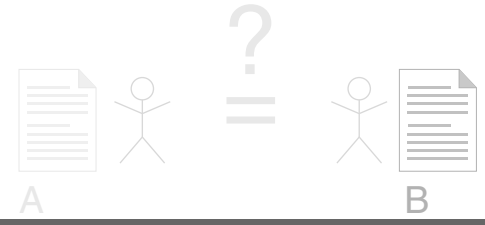
Originate two texts from the same author?

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Authorship **Attribution**

To which author does a text belong?

Authorship **Verification**



Originate two texts from the same author?

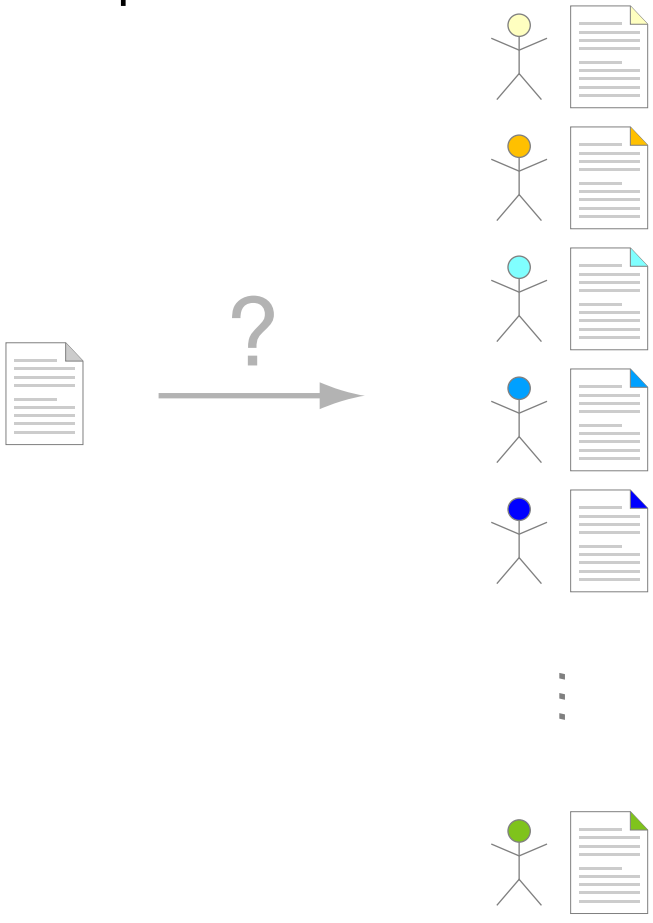
All authorship identification problems can be reduced to the verification problem.

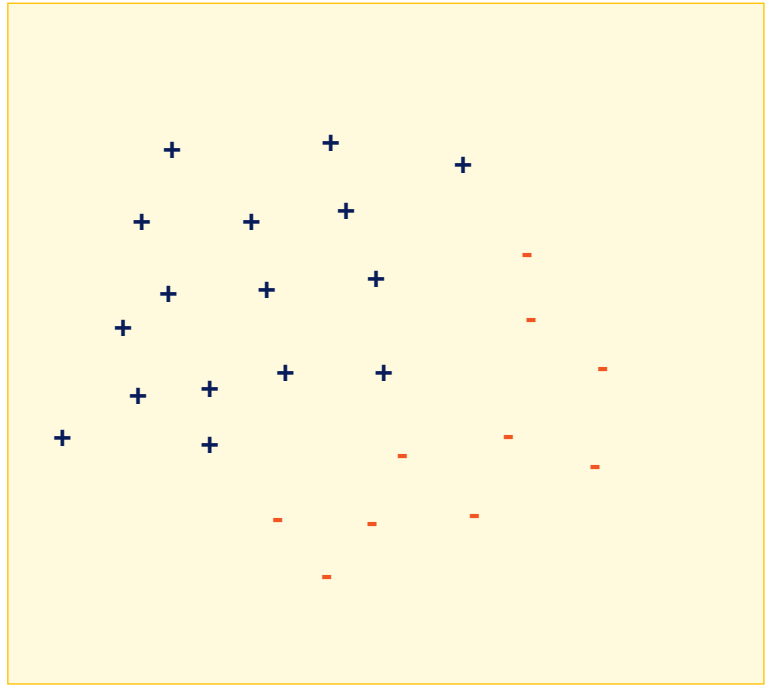
$\Rightarrow$

Authorship Verification is the ultimate problem.

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Authorship Attribution



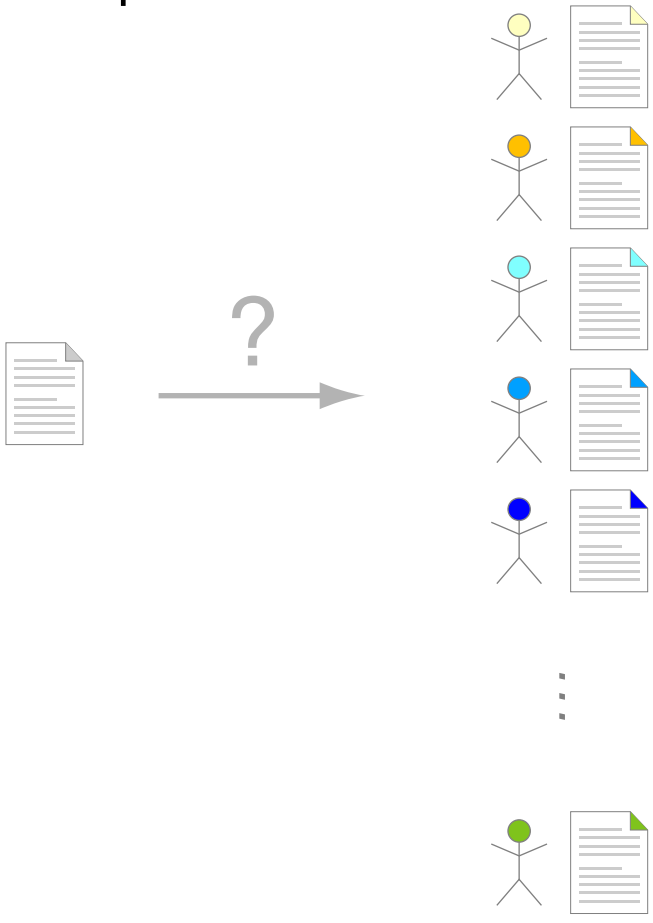


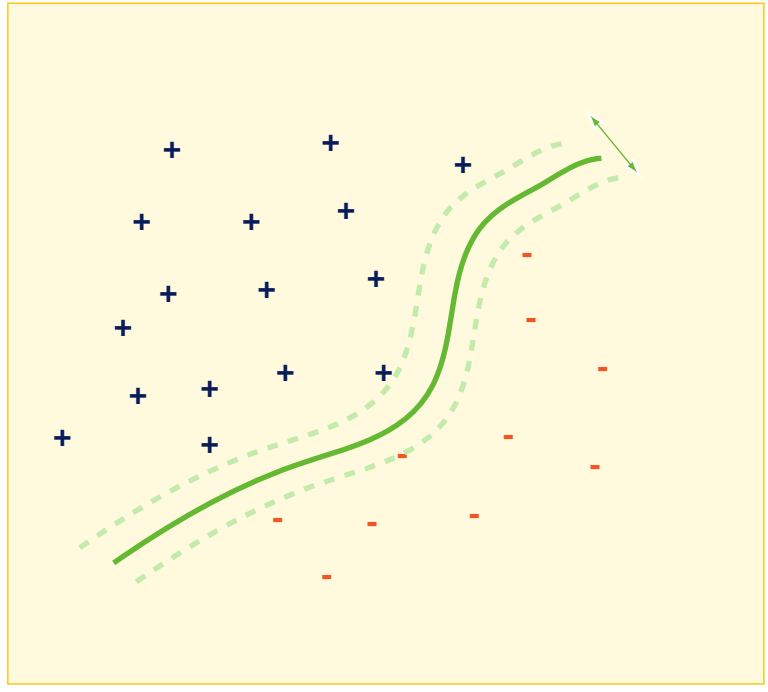
Discrimination-based classification.

To which author does a text belong?

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Authorship Attribution



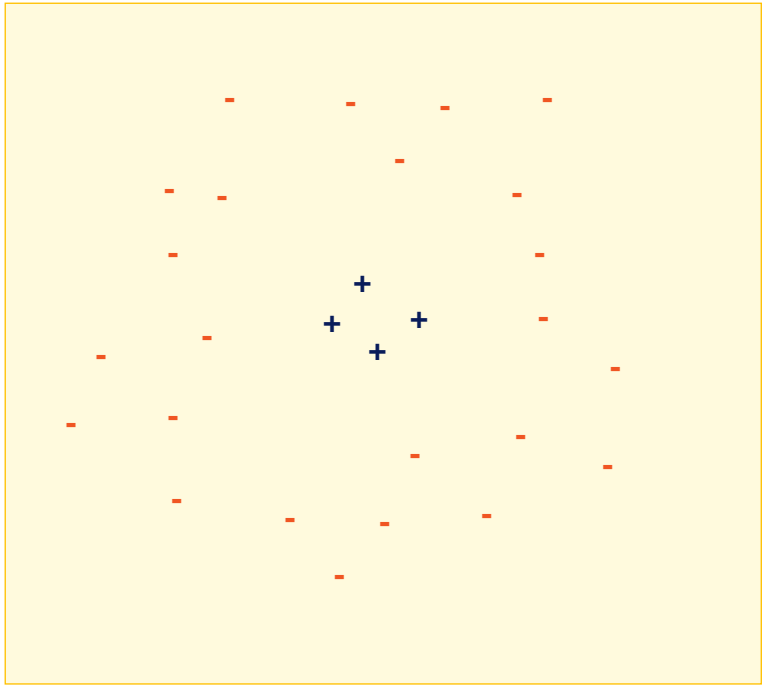


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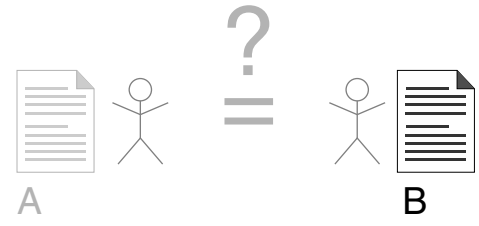
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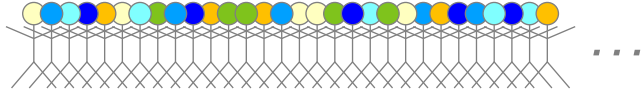
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Authorship Verification



One-class classification.

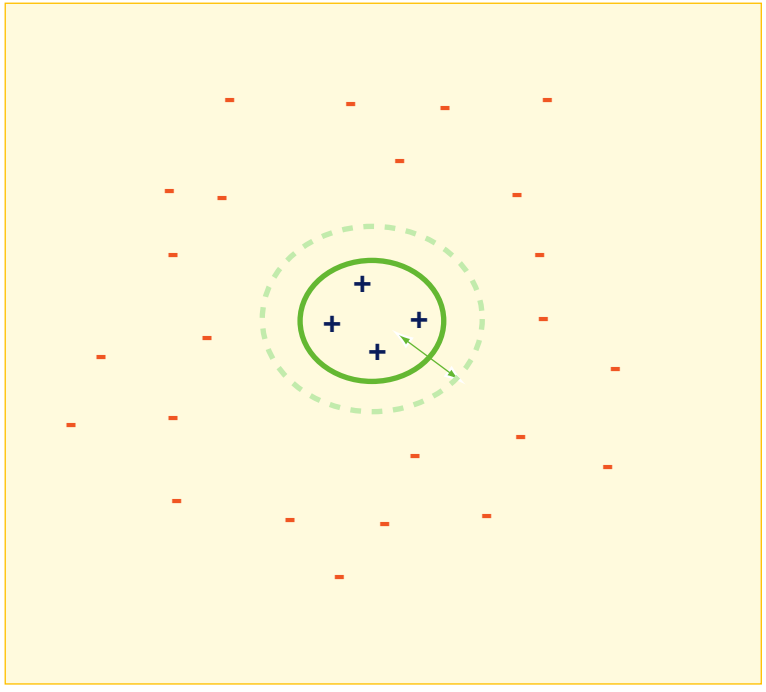




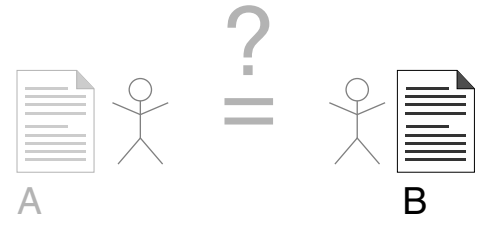
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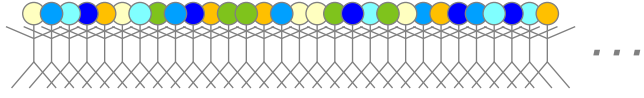
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Authorship Verification



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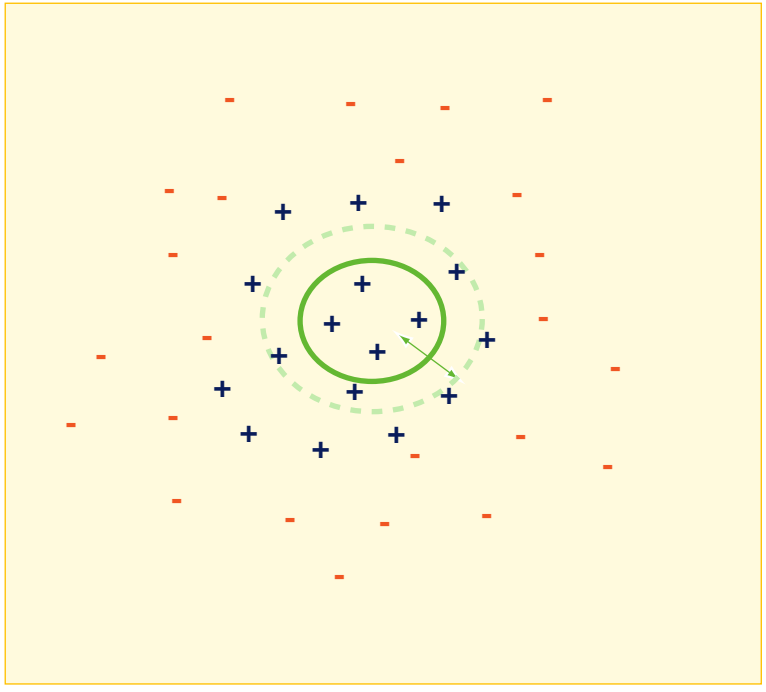




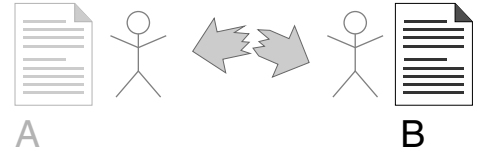
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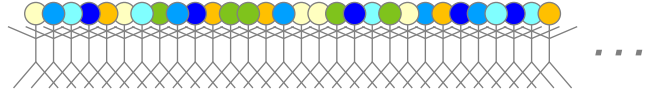
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Authorship **Obfuscation**



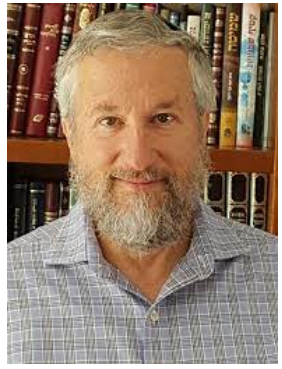
One-class classification.





Can authors mask their style?

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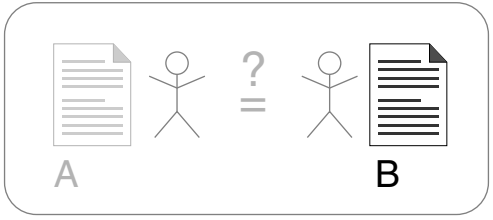




Moshe Koppel Jonathan Schler

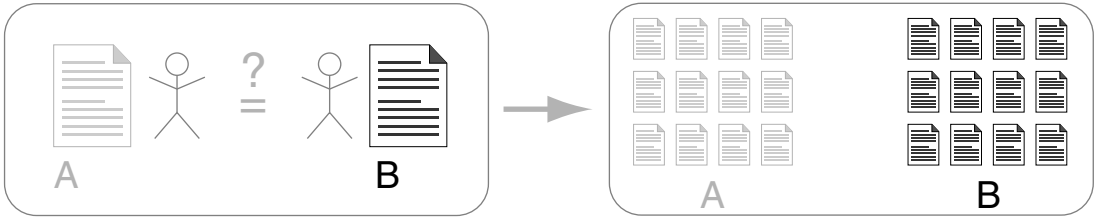
The “Unmasking” Method for Authorship Verification

Authorship Verification “Unmasking” [Koppel/Schler 2004]



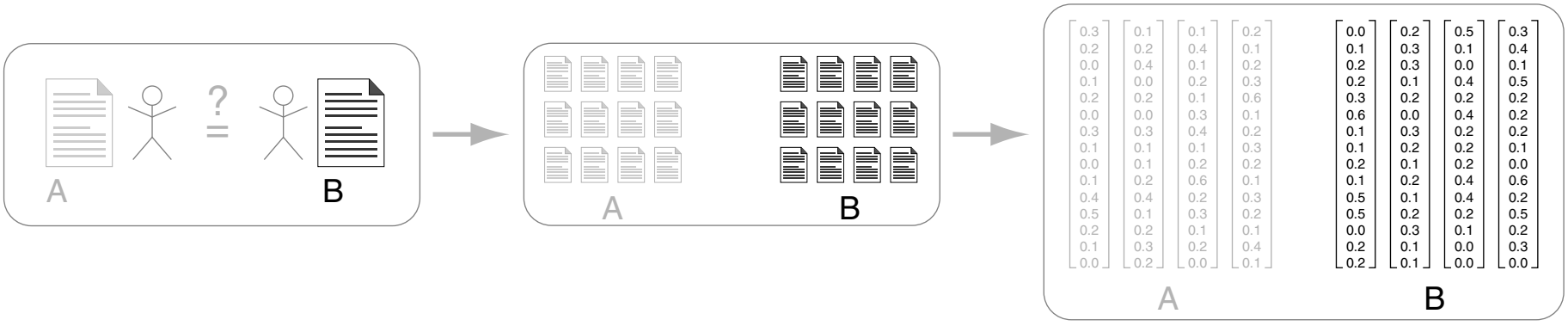
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Authorship Verification “Unmasking” [Koppel/Schler 2004]



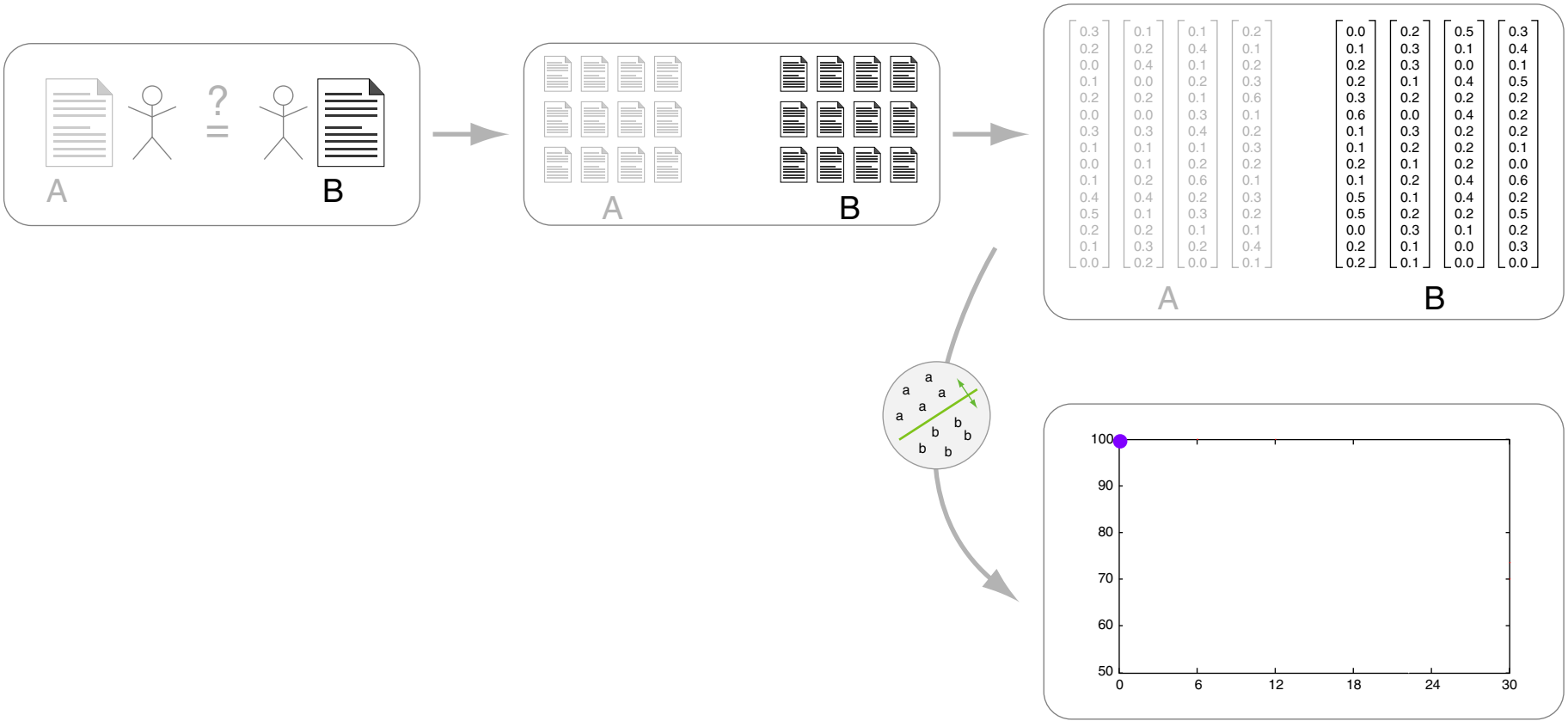
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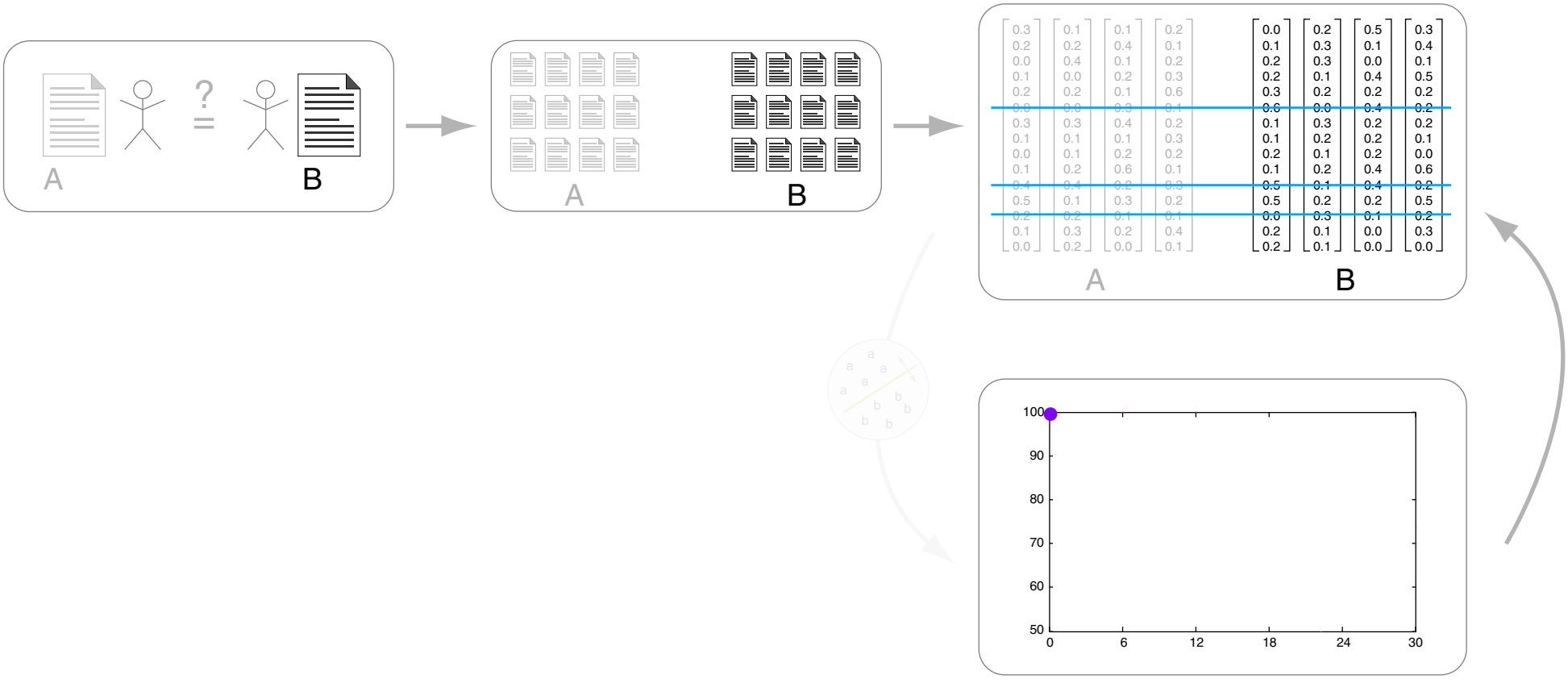
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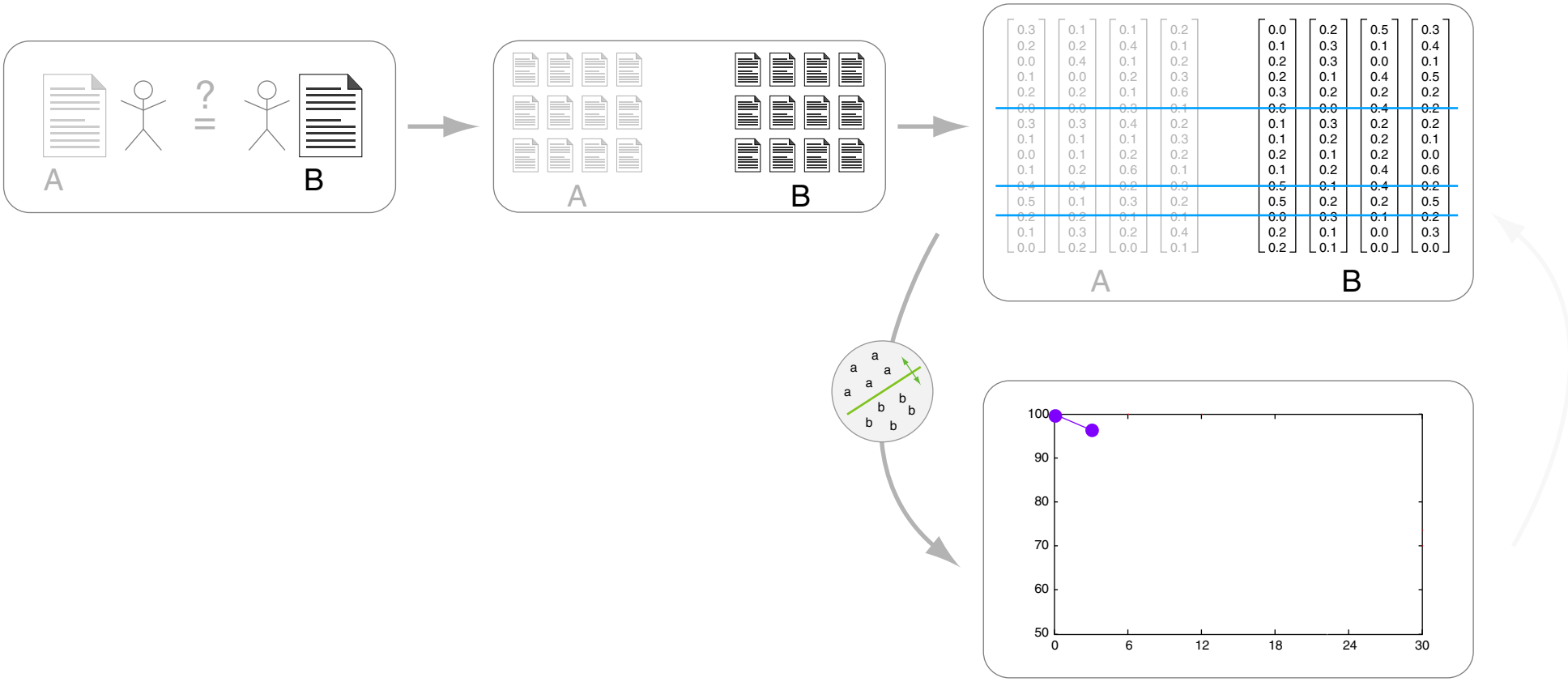
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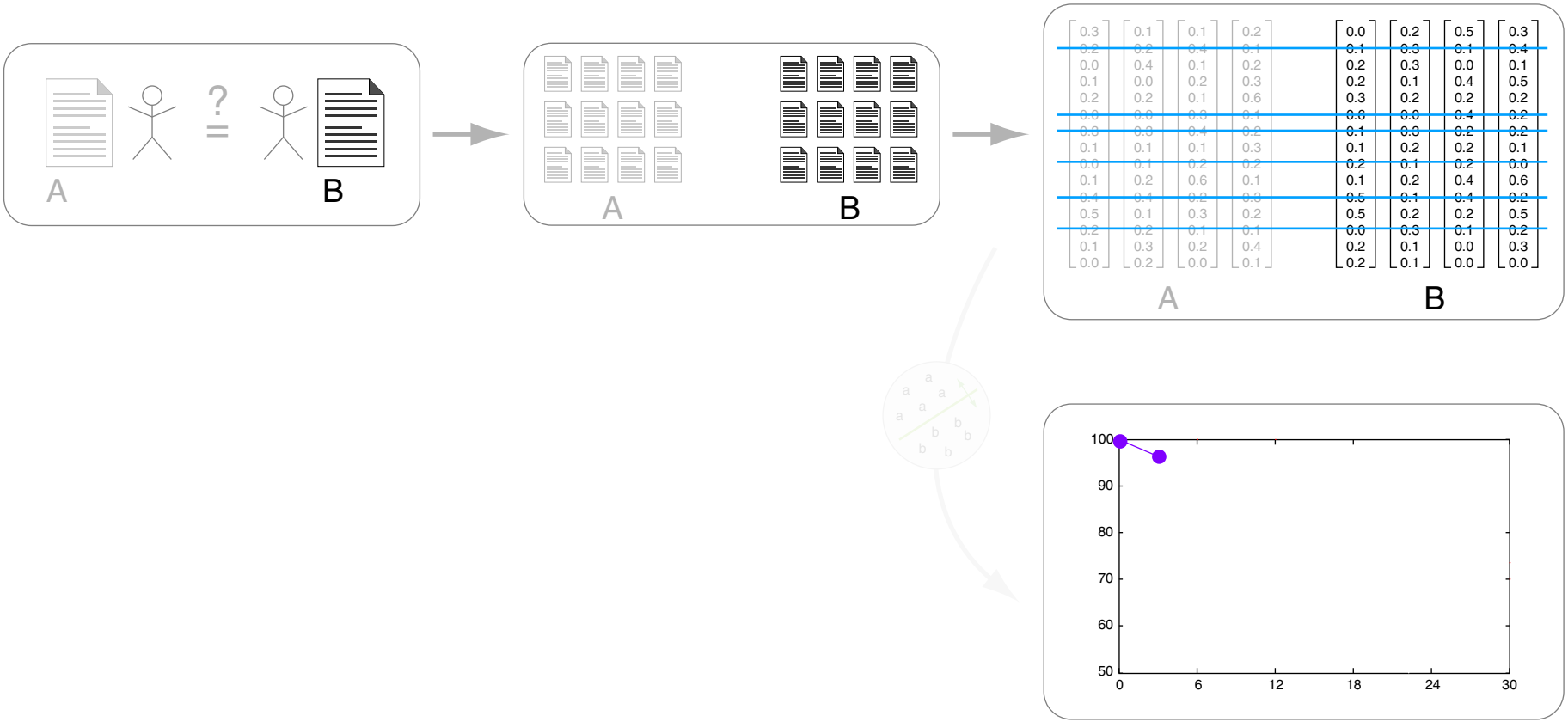
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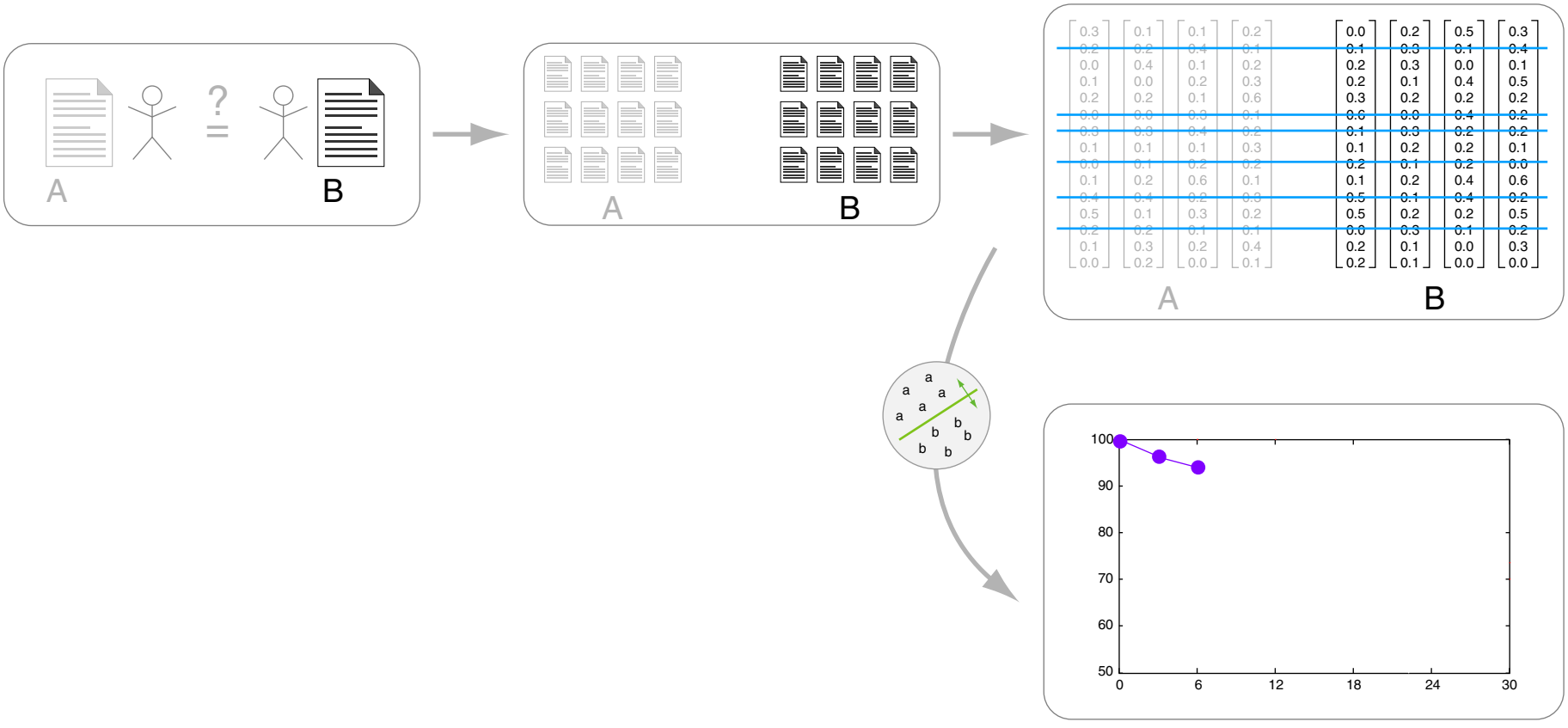
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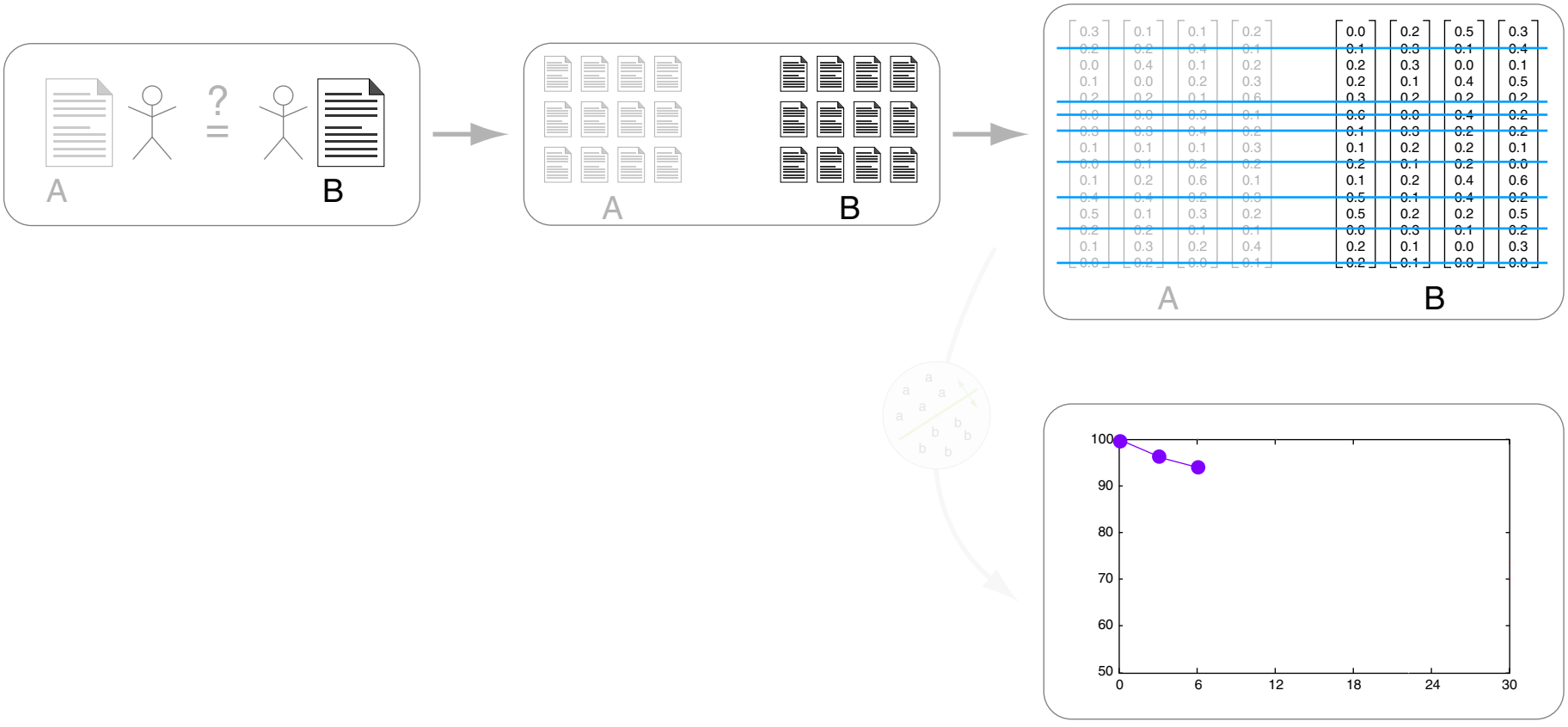
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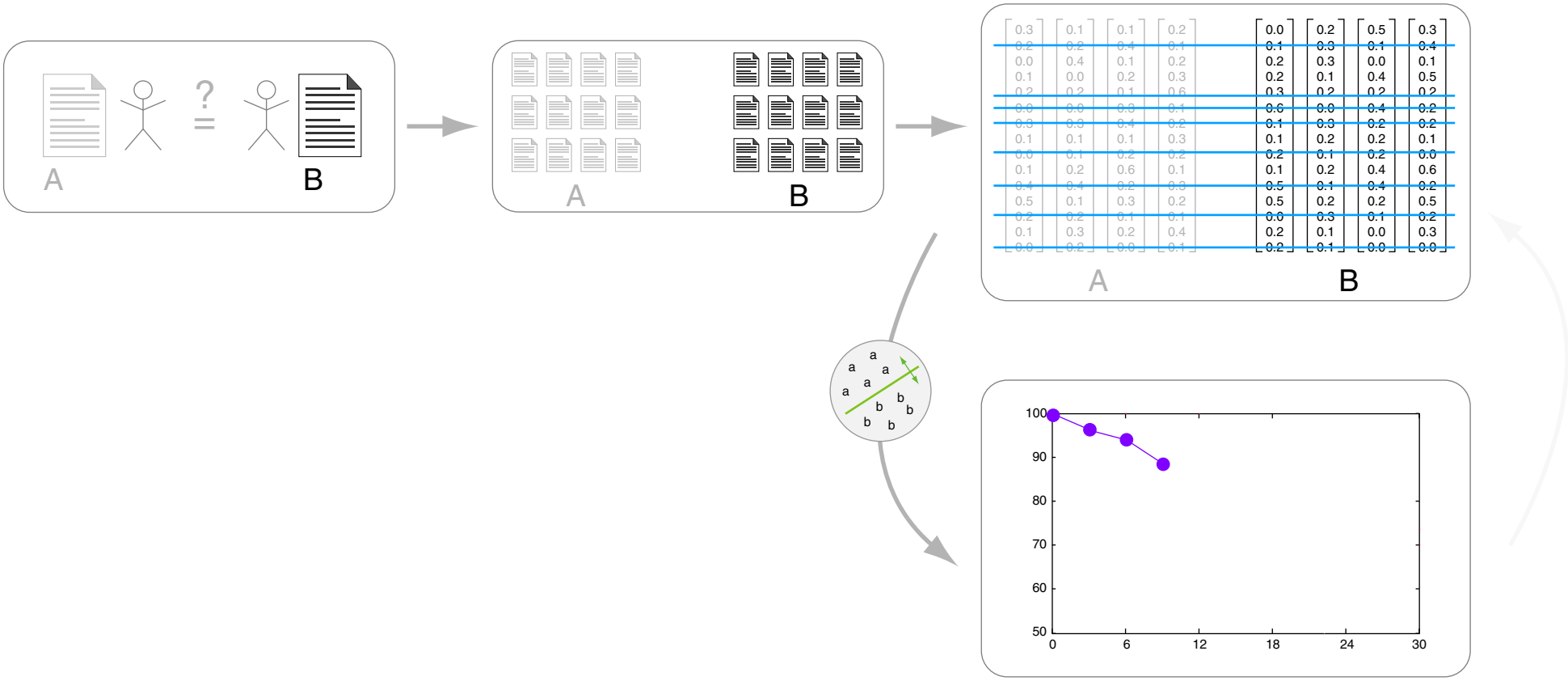
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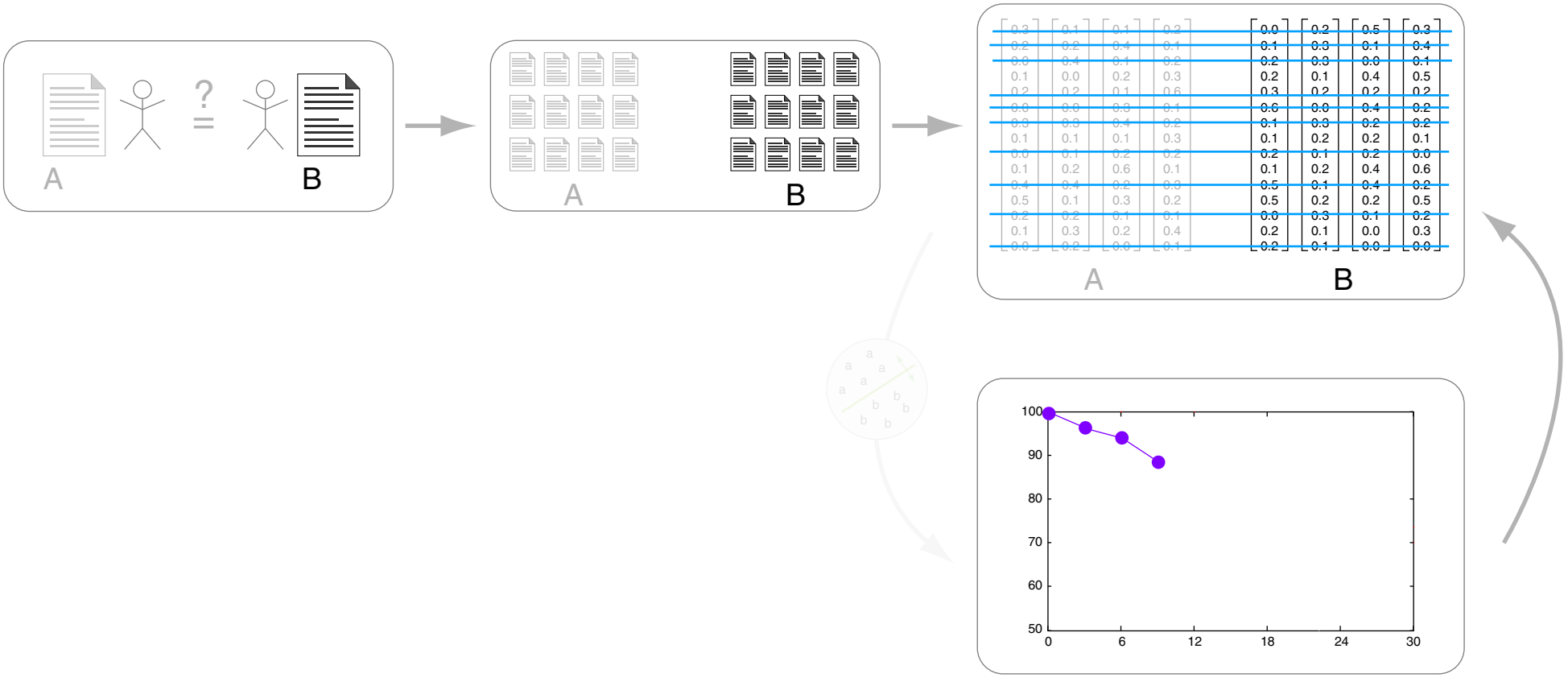
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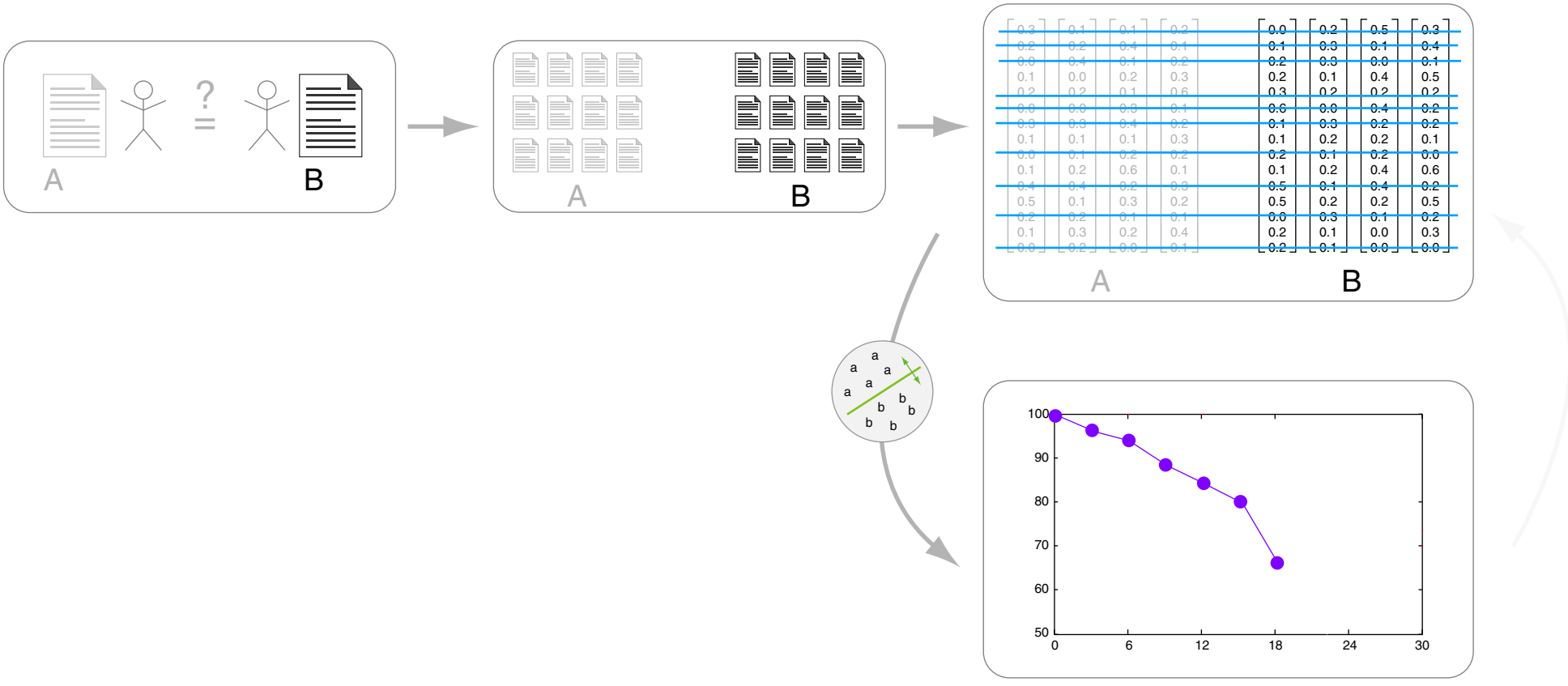
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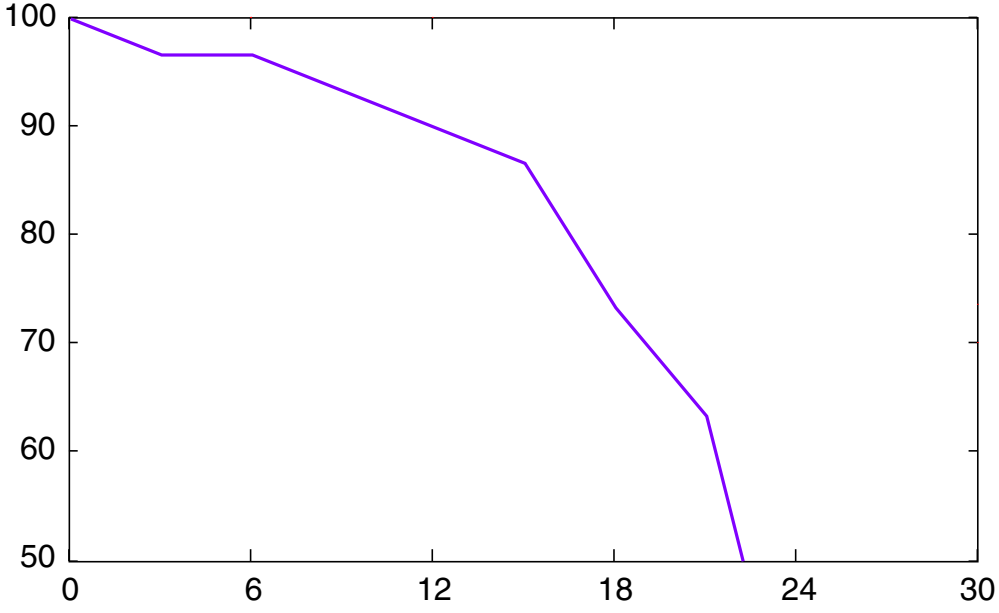
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Authorship Verification “Unmasking” at Work

Learning characteristic for a pair of texts . . .

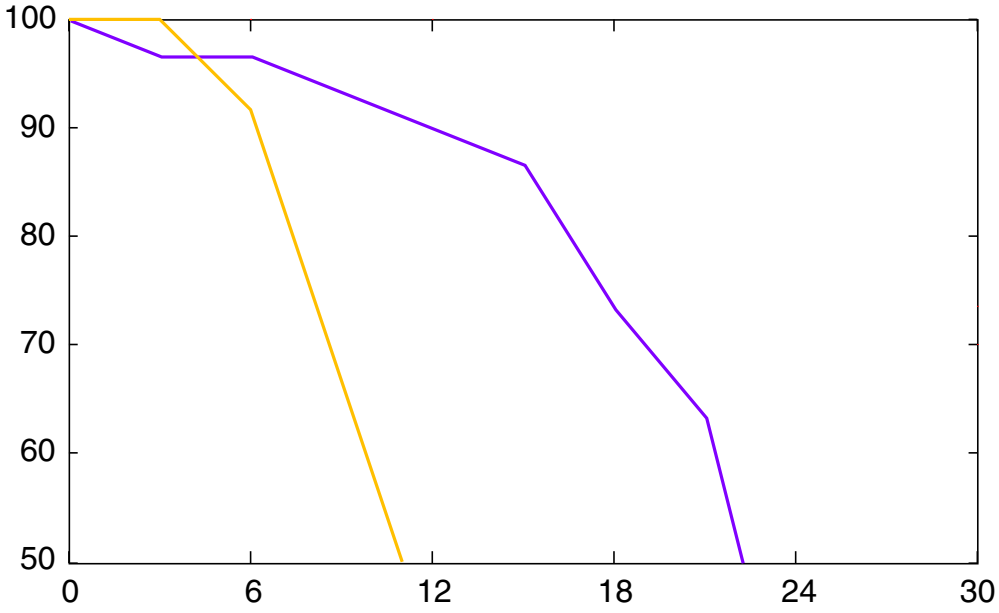


. . . from different authors (A $\neq$ B).

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Authorship Verification “Unmasking” at Work

Learning characteristic for two pairs of texts . . .



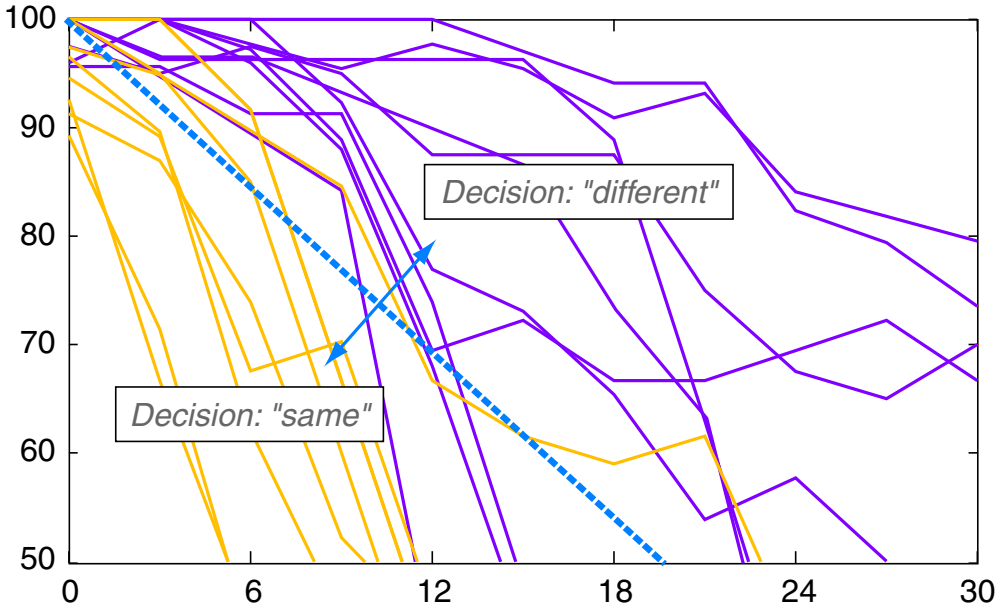
. . . from different authors (A $\neq$ B).

. . . from the same author (A $=$ B).

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Authorship Verification “Unmasking” at Work

Learning characteristic for many pairs of texts . . .



. . . from different authors (A $\neq$ B).

. . . from the same author (A $=$ B).

The typical learning characteristic can be learned.

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Char-n-Gram Model

Char-trigrams $\rightarrow$ sliding window with $n = 3$:

```
The migrants who sailed with Gilbert were better fitted
for a crusade than a colony, and, disappointed at not
at once finding mines of gold and silver, many deserted;
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Char-trigrams $\rightarrow$ sliding window with $n = 3$:

```
The migrants who sailed with Gilbert were better fitted
for a crusade than a colony, and, disappointed at not
at once finding mines of gold and silver, many deserted;
and soon there were not enough sailors to man all the four
ships.  Accordingly, the Swallow was sent back...
```

$$\mathbf{d} = \begin{pmatrix} \texttt{and} & c_1 \\ \texttt{to\_} & c_2 \\ \texttt{our} & c_3 \\ \texttt{the} & c_4 \\ \texttt{\_sh} & c_5 \\ \cdots & \end{pmatrix}$$

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Authorship Obfuscation [ACL 2019] [char-trigram model]

Requires:
1. a model to measure style distance
2. a confidence function to assess “same authorship”
3. a means to manipulate style distance



Janek Bevendorff



Matthias Hagen



Benno Stein

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Authorship Obfuscation [ACL 2019] [char-trigram model]

Requires:
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Author A	Trigram	Freq.	**Author B**	Trigram	Freq.
beautiful christmas you know jesus our saviour was born here below, patiently stooping to hunger and pain, so he might save us, his lost ones, from shame; now if we love him, he bids us to feed all his poor brothers and sisters who need. blessed old nick! i was sure if . . .			come and see zip, the foremost of freaks! come and see palestine’s sinister sheiks! eager equestriennes, each unexcelled, most mammoth menagerie ever beheld, the giant, the fat girl, the lion-faced man, aerial artists from far-off japan, audacious acrobats shot from a gun, don’t . . .		

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Authorship Obfuscation [ACL 2019] [char-trigram model]

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	to_	3
	the	1
	our	5
	_sh	1
	...	

Author B	Trigram	Freq.
come and see zip, the foremost of freaks! come and see palestine’s sinister_sheiks! eager equestriennes, each unexcelled, most mammoth menagerie ever beheld, the giant, the fat girl, the lion-faced man, aerial artists from far-off japan, audacious acrobats shot from a gun, don’t . . .	and	2
	to_	1
	the	4
	our	1
	_sh	2
	...	

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Authorship Obfuscation [ACL 2019] [char-trigram model]

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	...	

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	to_	1
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	our	1
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	...	

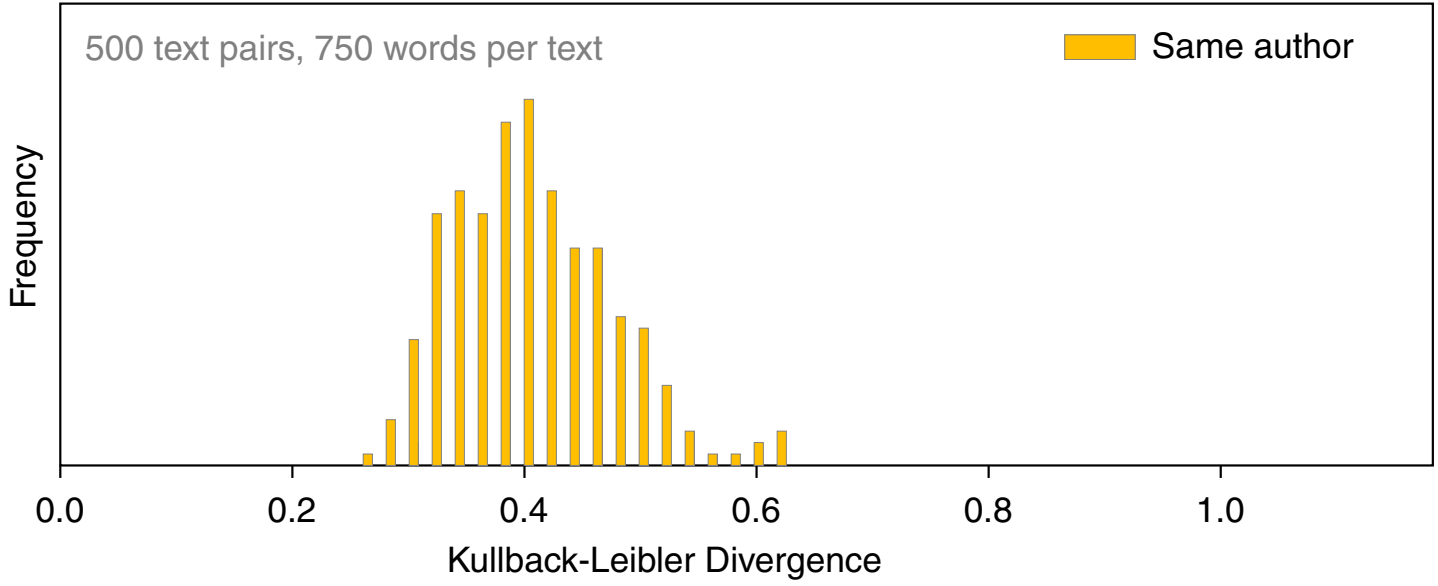
Kullback-Leibler Divergence: $\mathrm{KLD}(P \mid Q) = \sum_{i \in \text{trigrams}} P[i] \log \frac{P[i]}{Q[i]}$

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Authorship Obfuscation [ACL 2019] [char-trigram model]

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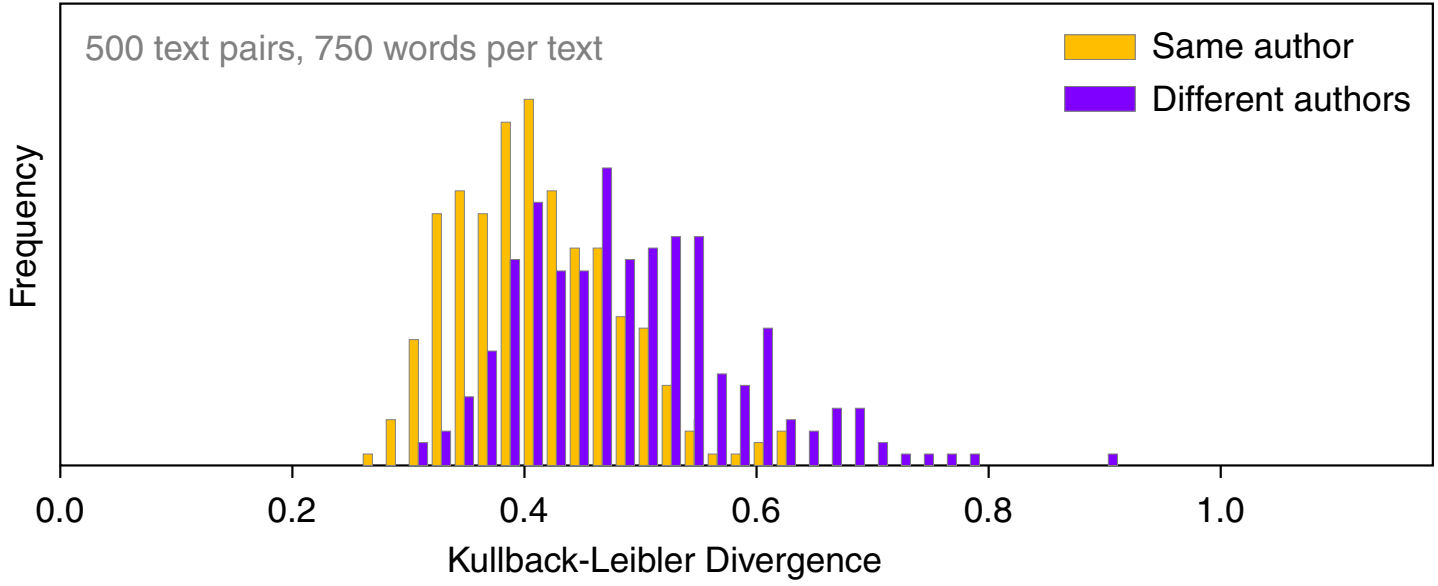
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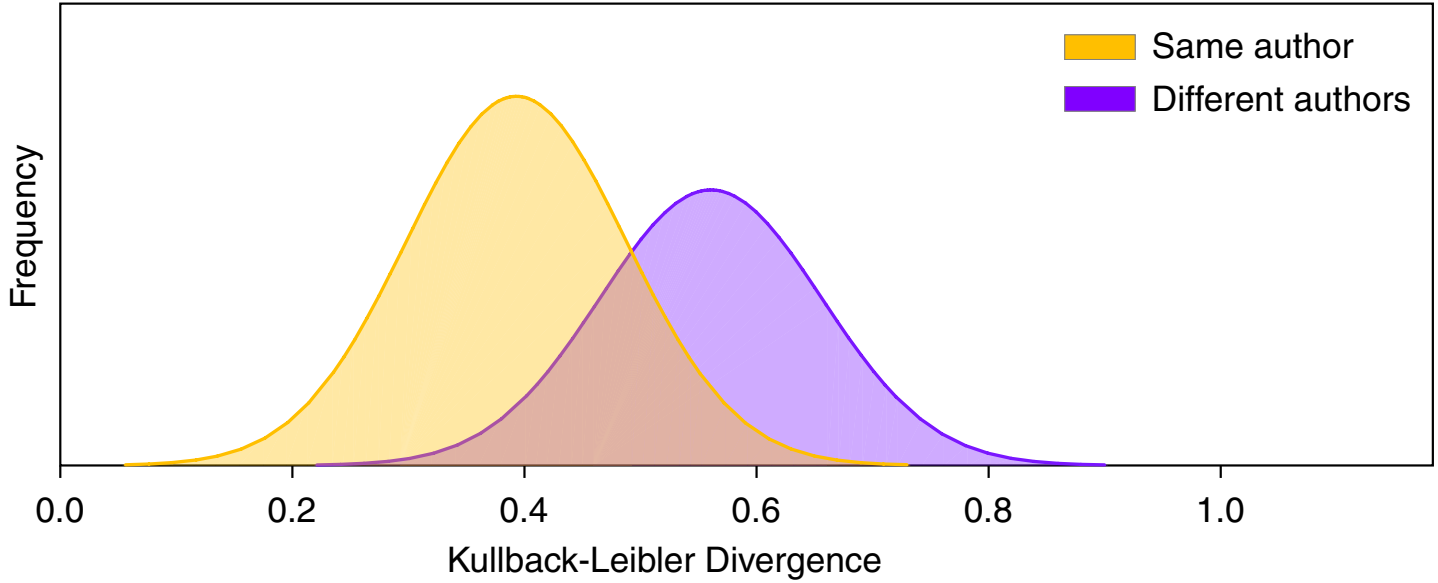


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Authorship Obfuscation

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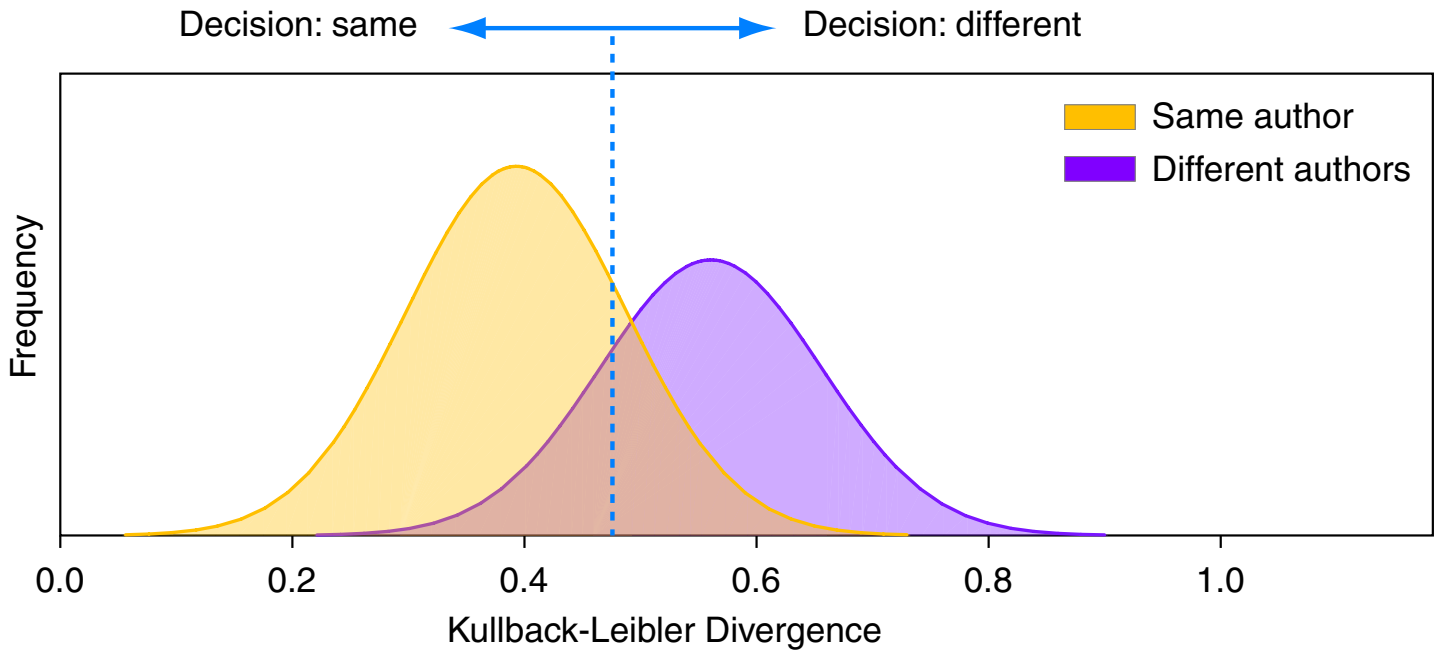


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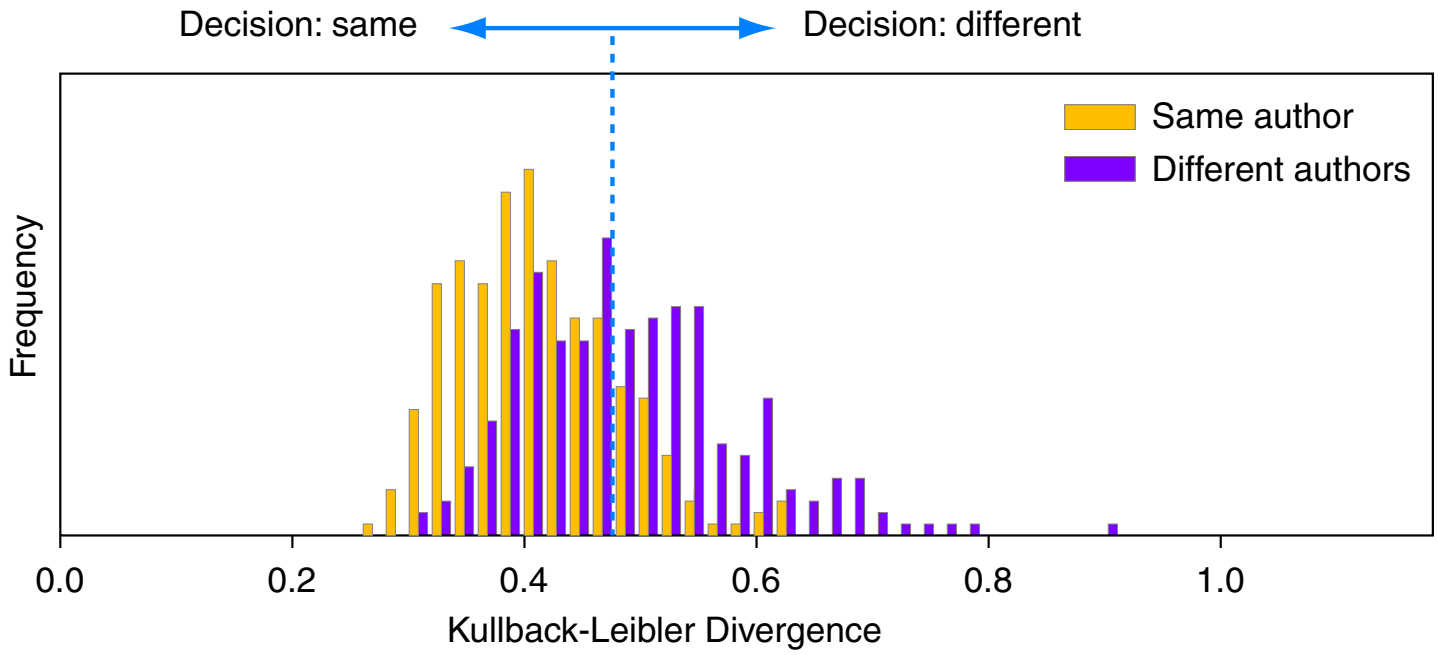


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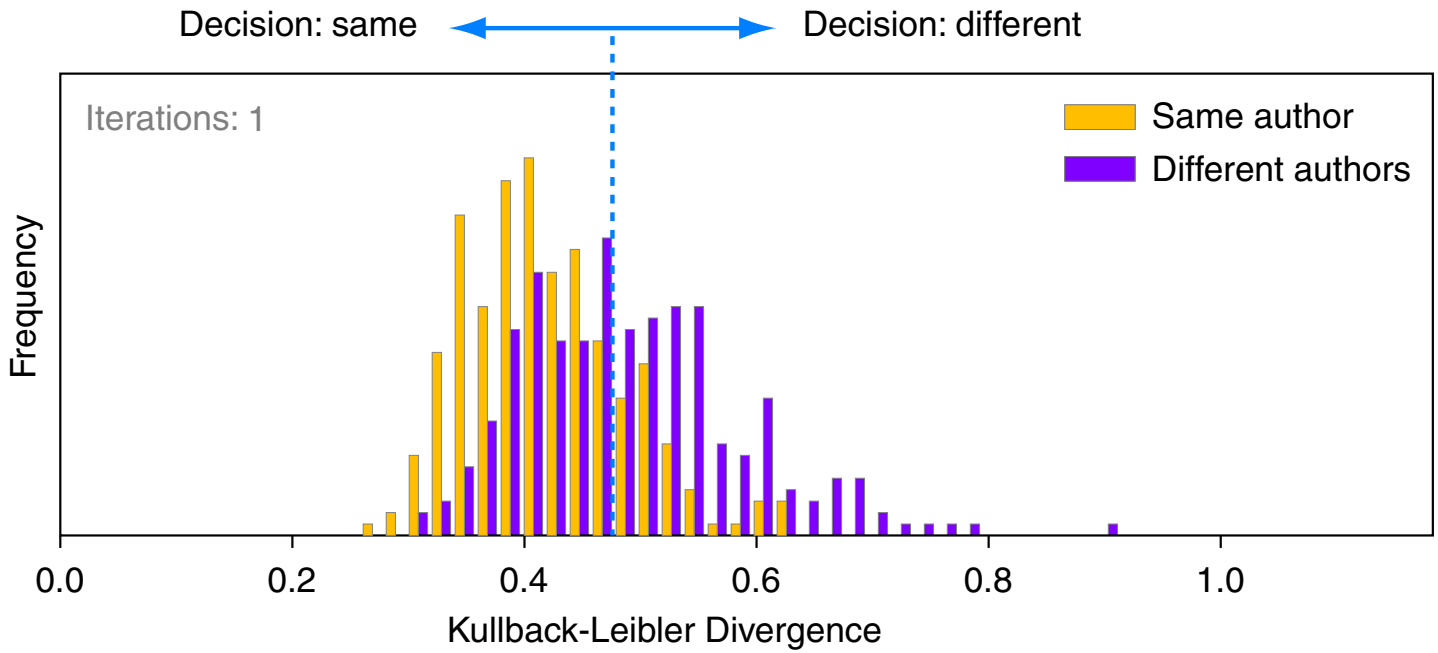


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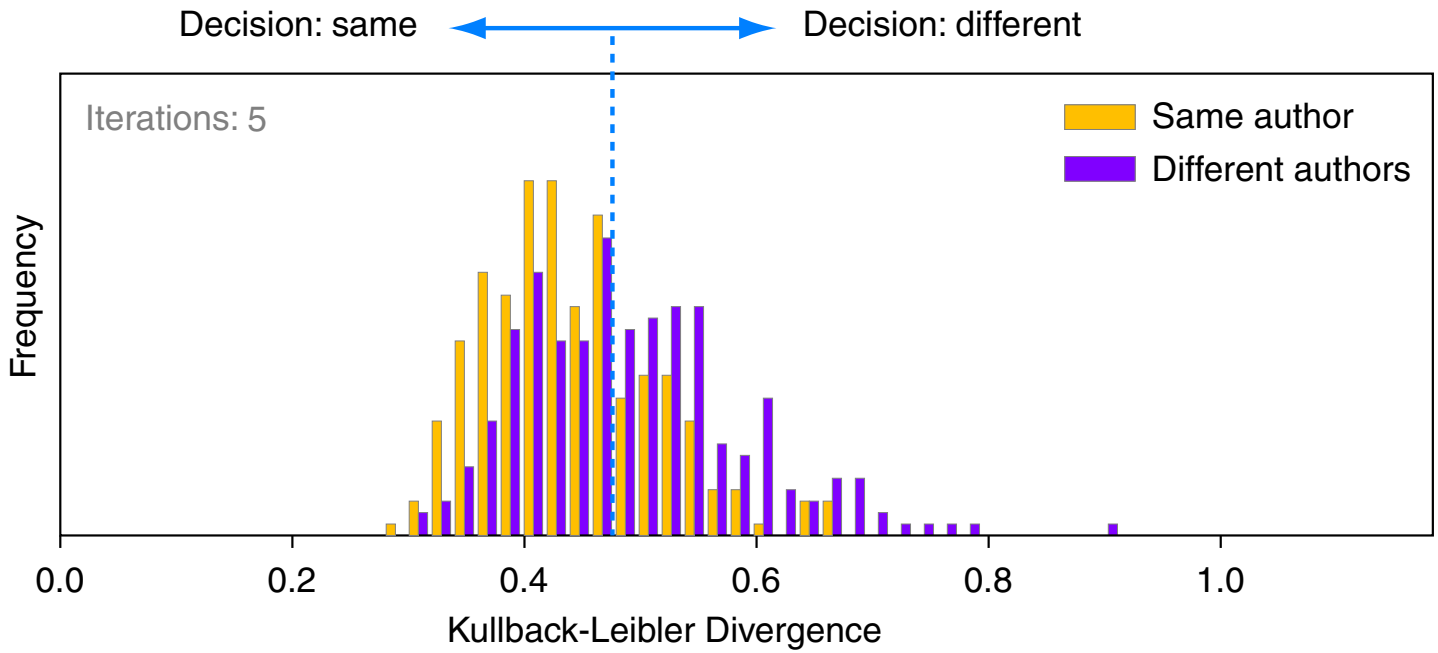


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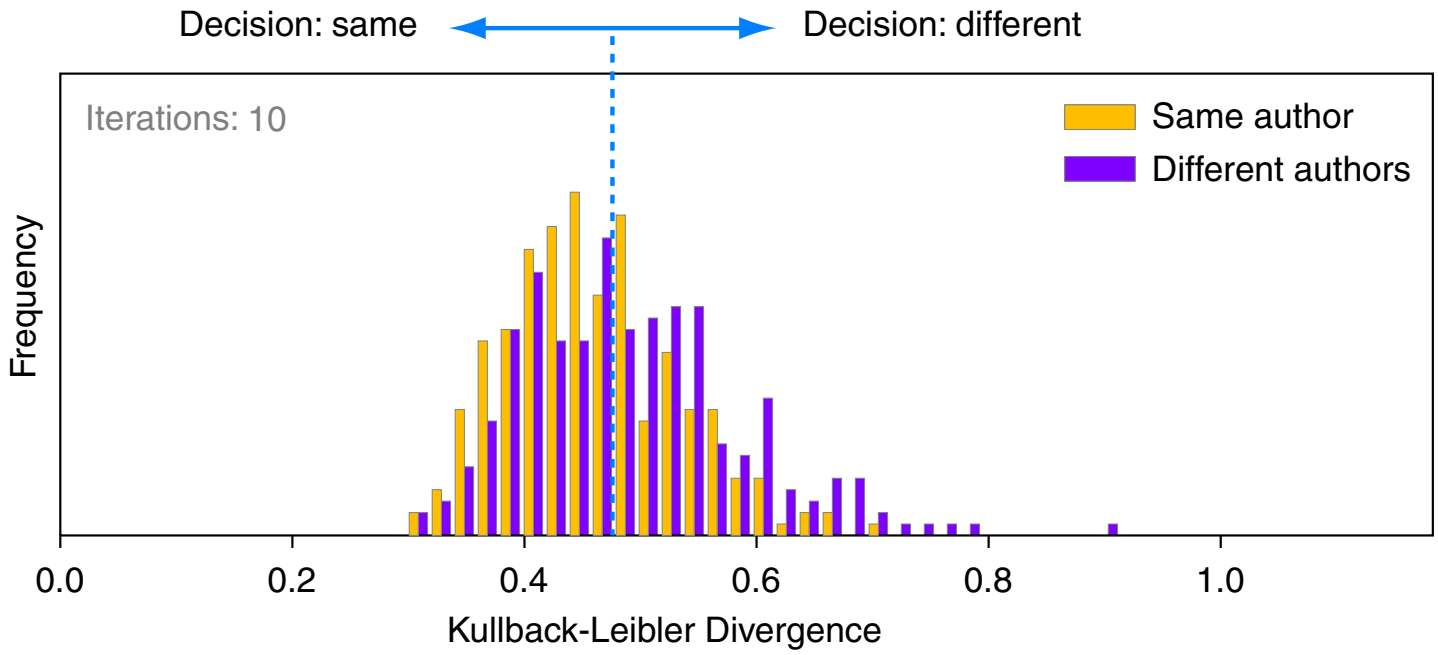


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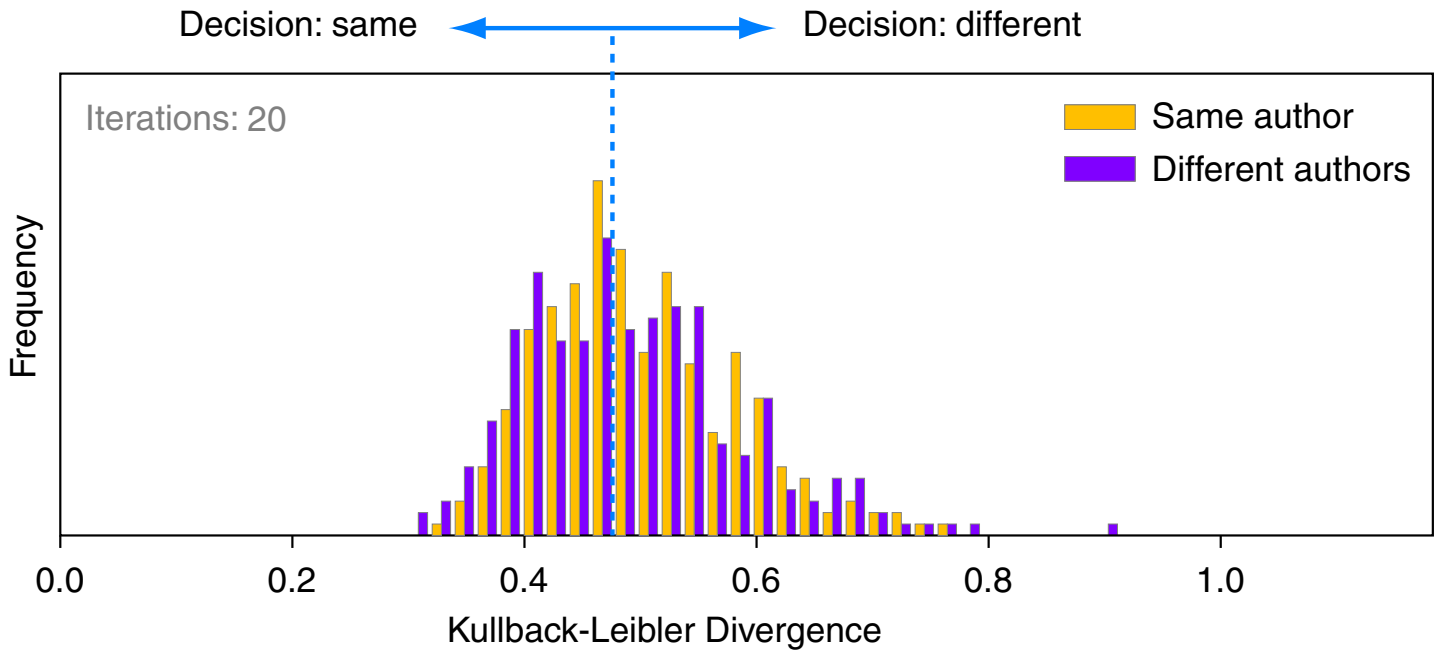


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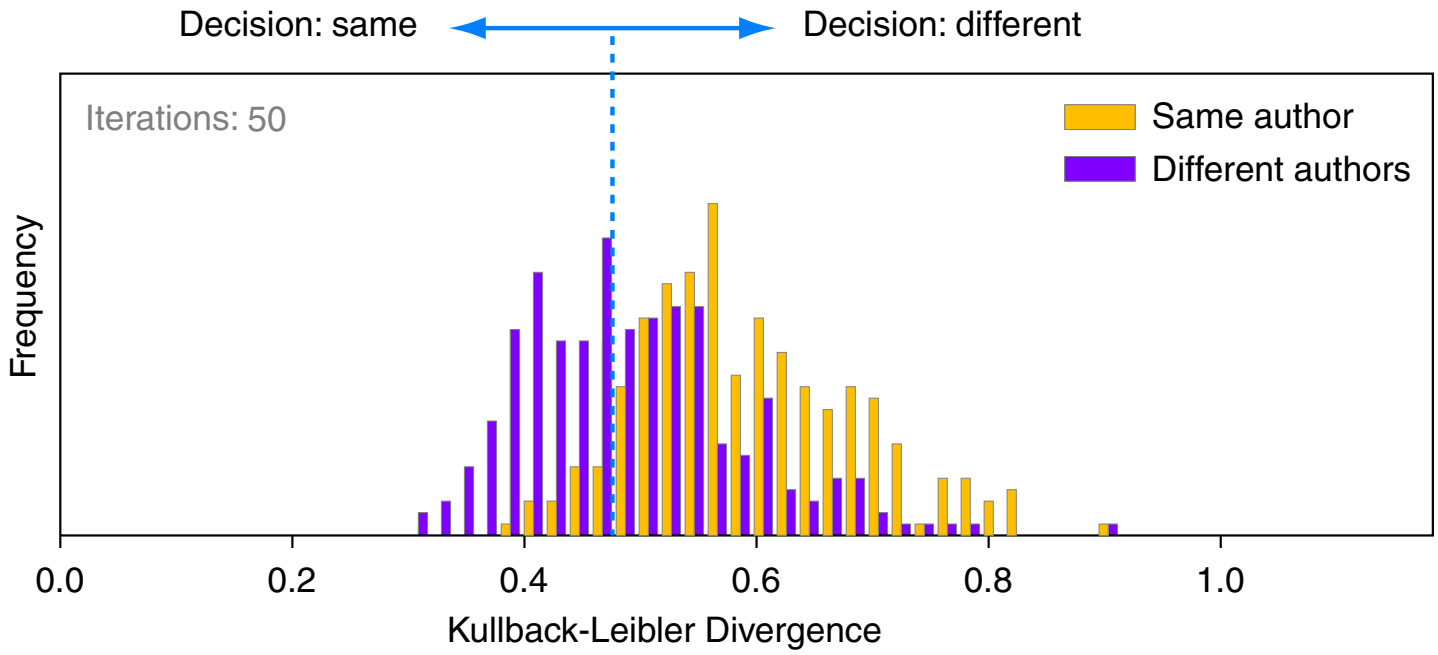


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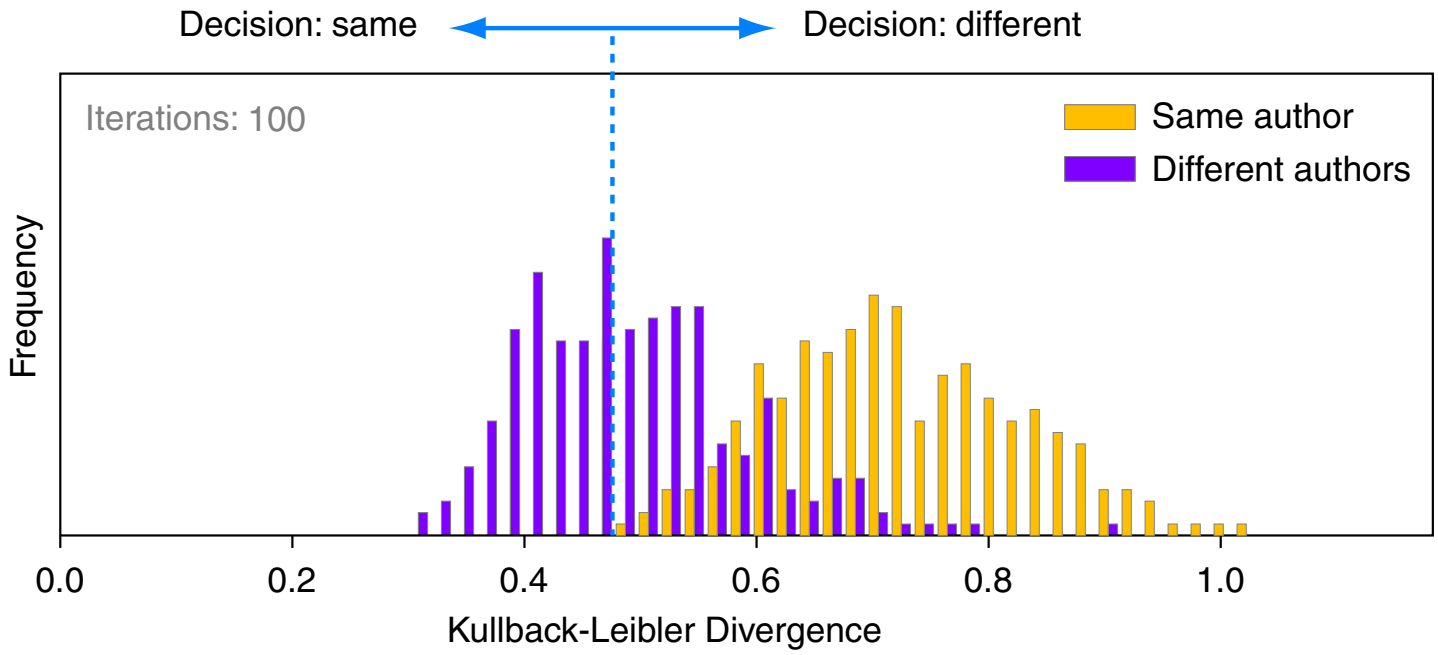


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Authorship Obfuscation

Requires:
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Style distance manipulation $\equiv$ KLD maximization:

$$\text{KLD}(P \mid Q) = \sum_{i \in \text{trigrams}} P[i] \log \frac{P[i]}{Q[i]} \rightarrow \max$$

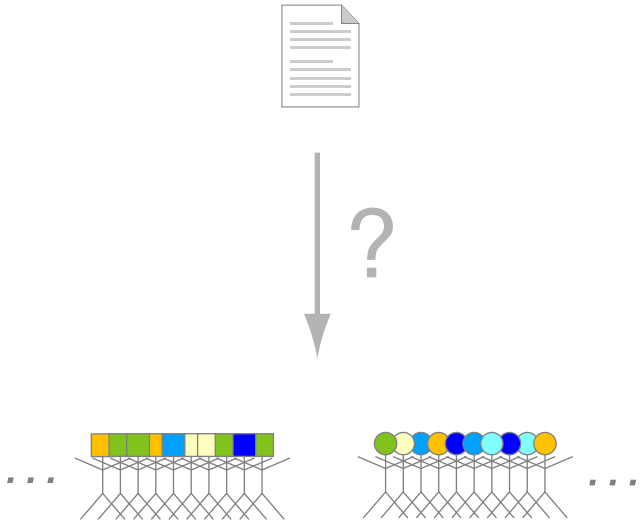
Derivation omitted

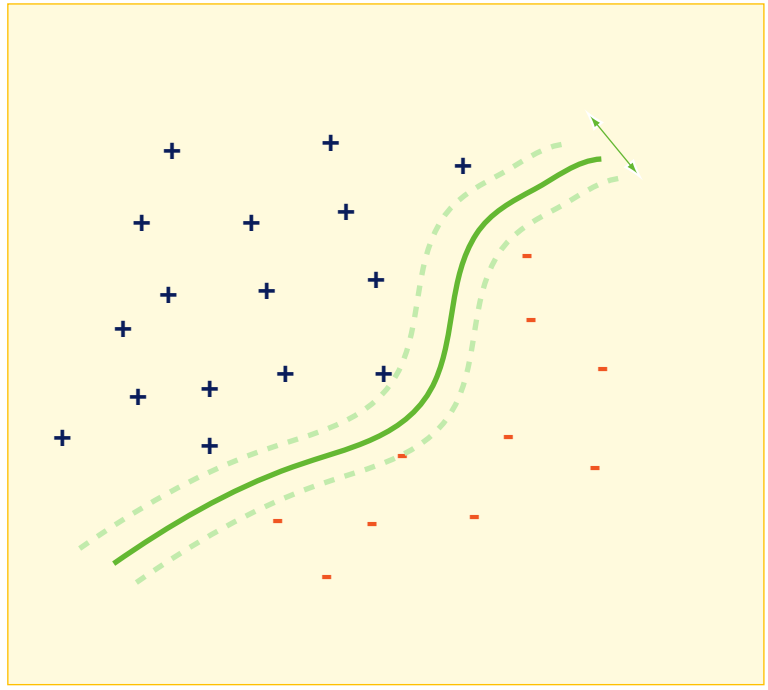
$\rightsquigarrow$ Compute a ranking among trigrams regarding their KLD impact:

$$\underset{i \in \text{trigrams}}{\text{argmax}} \frac{\partial}{\partial Q[i]} \Big(\text{KLD}(P \mid Q) \Big)$$

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Authorship Attribution ≠ **LLM Detection**



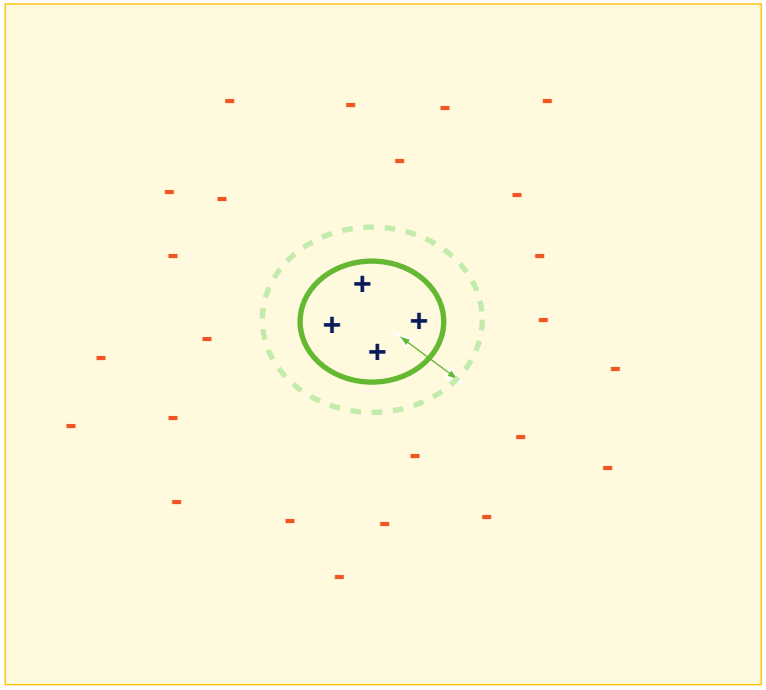


Discrimination-based classification.

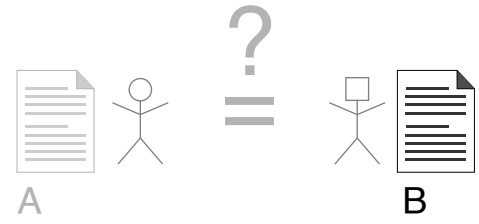
To which author group does a text belong?

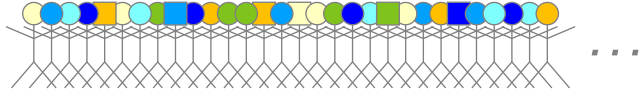
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LLM Detection ≡ Authorship Verification



One-class classification.

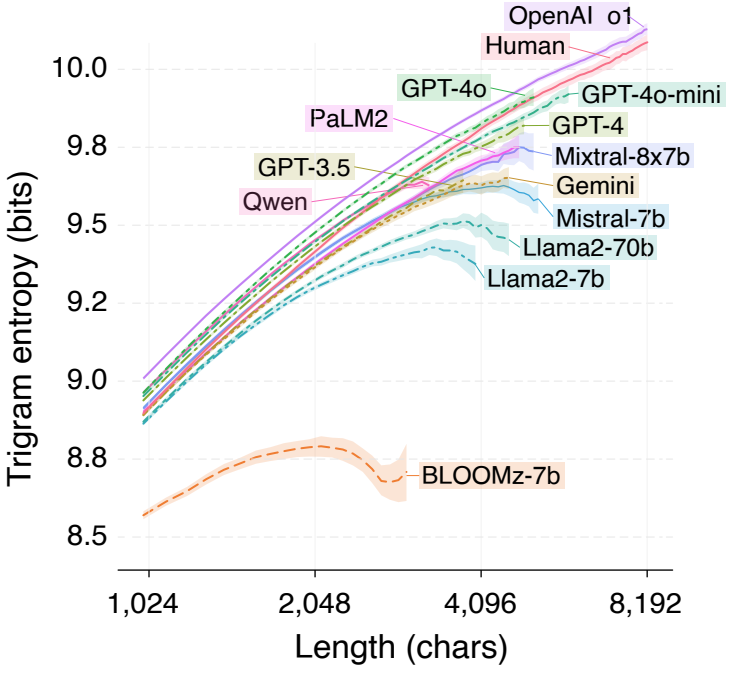




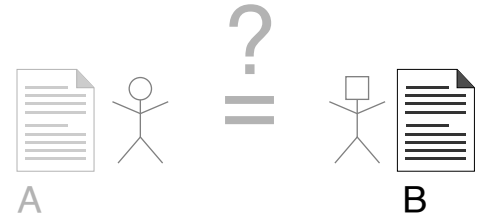
Originate two texts from the same author, human or other?

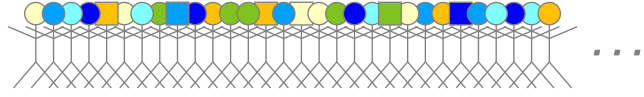
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LLM Detection ≡ Authorship Verification



[ACL 2025]

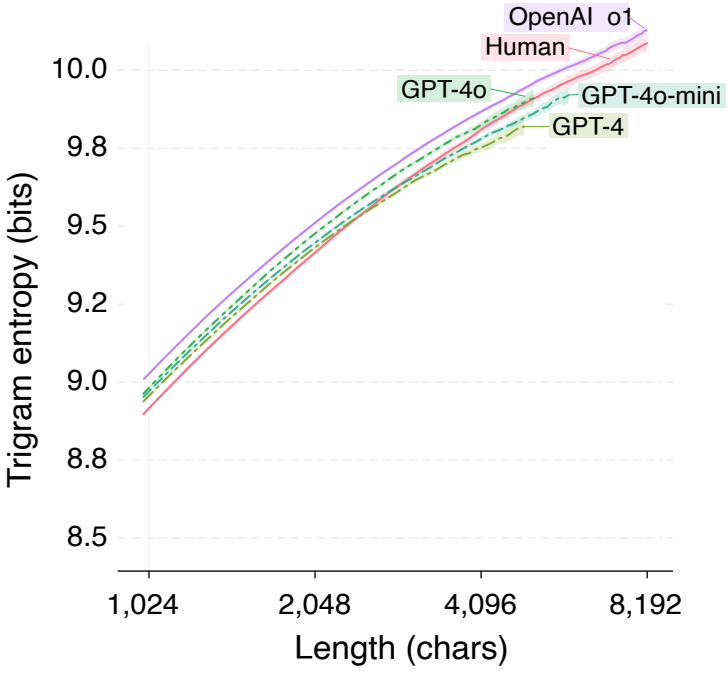




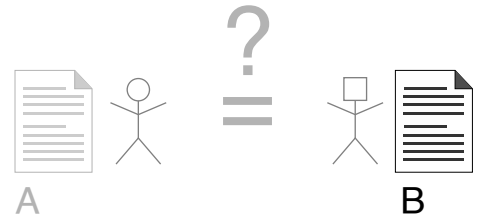
Originate two texts from the same author, human or other?

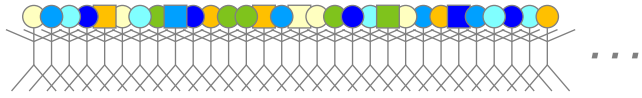
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LLM Detection ≡ Authorship Verification



[ACL 2025]





Originate two texts from the same author, human or other?

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PAN 2024 / 25

Lab on Digital Text Forensics and Stylometry


Janek Bevendorff


Jussi Karlgren


Benno Stein

The Voight-Kampff * LLM Detection Task

[pan.webis.de]

* From the 1982 science fiction film *Blade Runner*.
The Voight-Kampff is a polygraph-like device used by blade runners to determine whether an individual is a replicant. [Wikipedia]

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LLM Detection Results and Take-Aways

- LLM detection works in-domain and per model
- LLM detection fails to generalize across topic, genre, register, and models

- Many obfuscation strategies break LLM detection
  (e.g., Unicode, automatic paraphrasing, prompting “Write it differently”)
- Fully automatic obfuscation has quality caveats
- Many obfuscation strategies can be easily detected
- No obfuscation strategy dominates

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Agenda

1. Author Identification
2. LLM Detection
3. LLM Advertising
4. LLM Opinion Grounding
5. Authenticity in Information Retrieval

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Janek Bevendorff



Matti Wiegmann



Sebastian Heineking



Ines Zelch

Is Google Getting Worse?

How will RAG pay for itself?

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Is Google Getting Worse?

How will RAG pay for itself?



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How will RAG pay for itself?

Google has 'very good ideas' for native ads in Gemini

/ Get ready for ads in the Gemini AI assistant – eventually.

How ChatGPT search ranks products and merchants

ChatGPT's search shopping features are here. Here's what we know about how product results are selected and results are displayed and ranked.

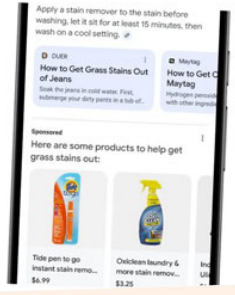
Danny Goodwin on May 6, 2025 at 2:13 pm | Reading time: 3 minutes

ChatGPT goes shopping with new product-browsing feature

ChatGPT will now recommend products to be bought offsite—but no sponsored ads just yet.

BENJ EDWARDS – 29. APR. 2025 00:04 | 36

Google's AI search summaries officially have ads



/ The search giant will now stick relevant products into its AI Overviews.

Google Ads announces AI Max for Search campaigns beta

Google's AI Max feature gives you a faster way to expand on queries and dynamically create new ads and assets with one click.

Anu Adegbola on May 6, 2025 at 9:00 am | Reading time: 2 minutes

Microsoft is about to change how Copilot ads appear and trigger

Microsoft Advertising will also start piloting two new generative AI features – diagnostics and performance snapshot – this month.

odwin on October 2, 2024 at 10:46 am | Reading time: 2 minutes

OpenAI explores advertising as it steps up revenue drive

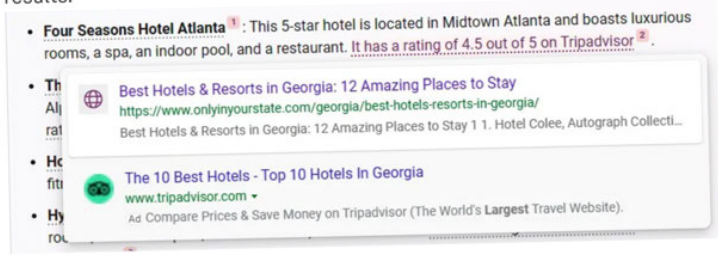
ChatGPT maker hires advertising talent from big tech rivals

Google VP of Ads bets on AI to transform ads into tailored consumer journeys

Google outlines how AI is transforming advertising as they enable more personalized content delivery across YouTube and AI-powered Search.

Anu Adegbola on March 3, 2025 at 4:28 pm | Reading time: 2 minutes

In Bing AI, the promoted link can be placed both above and below the genuine results.



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How will RAG pay for itself?



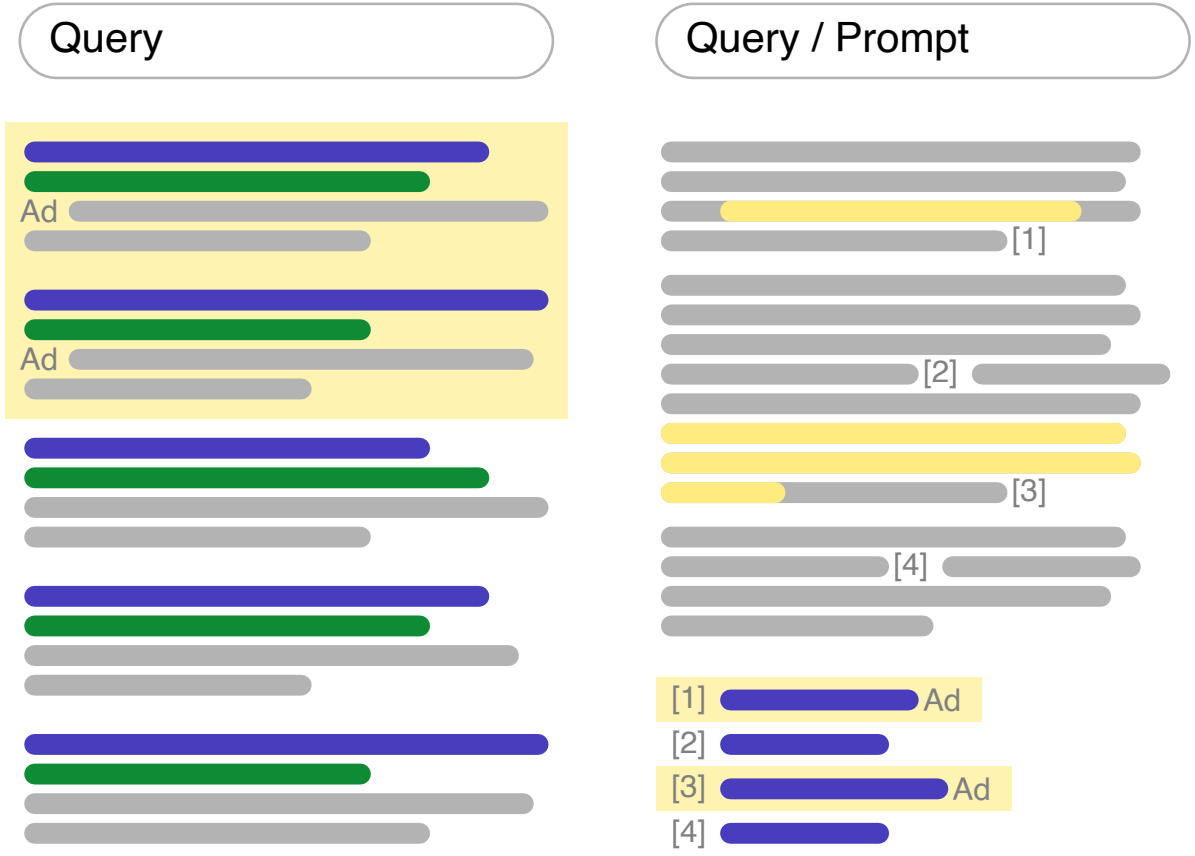
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How will RAG pay for itself?



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How will RAG pay for itself?

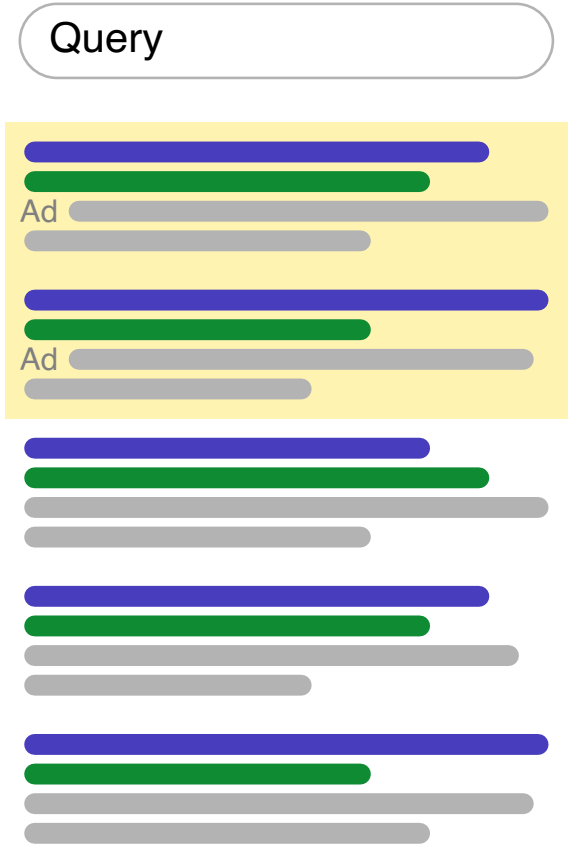


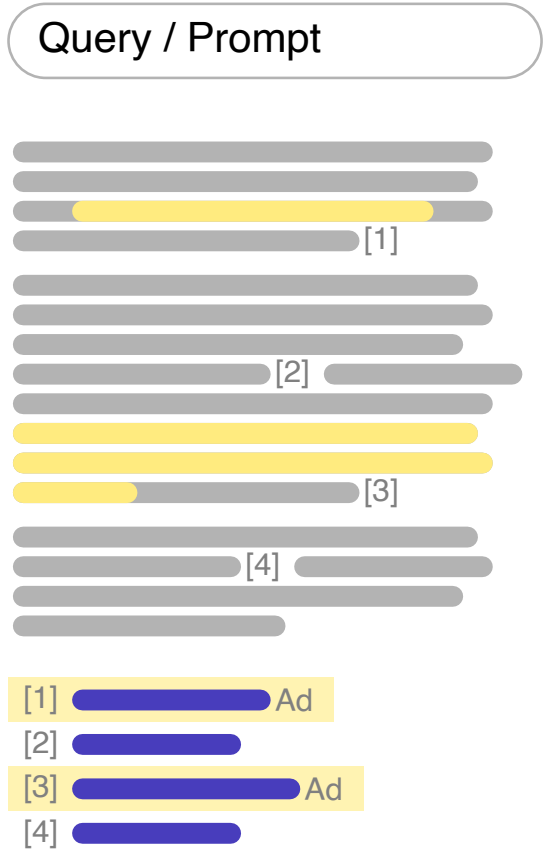
Native Ads

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Is Google Getting Worse?

How will RAG pay for itself?





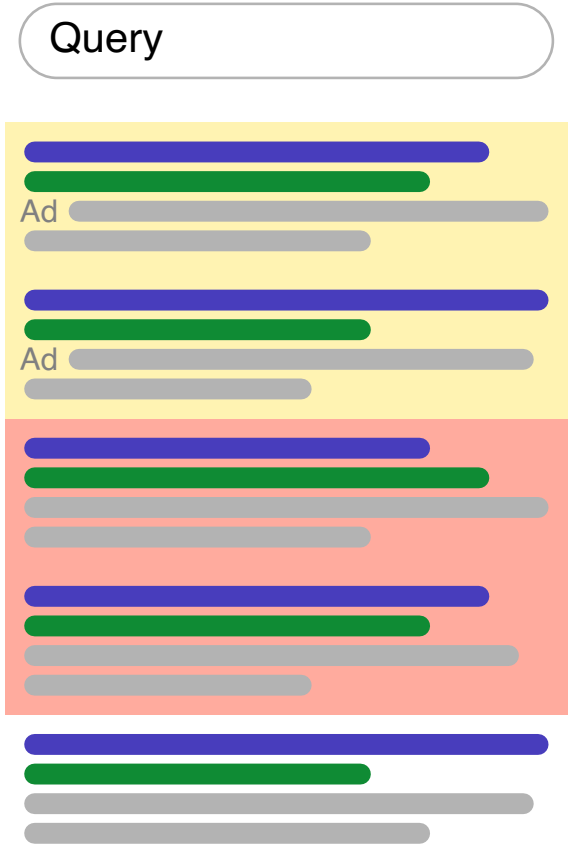
Native Ads

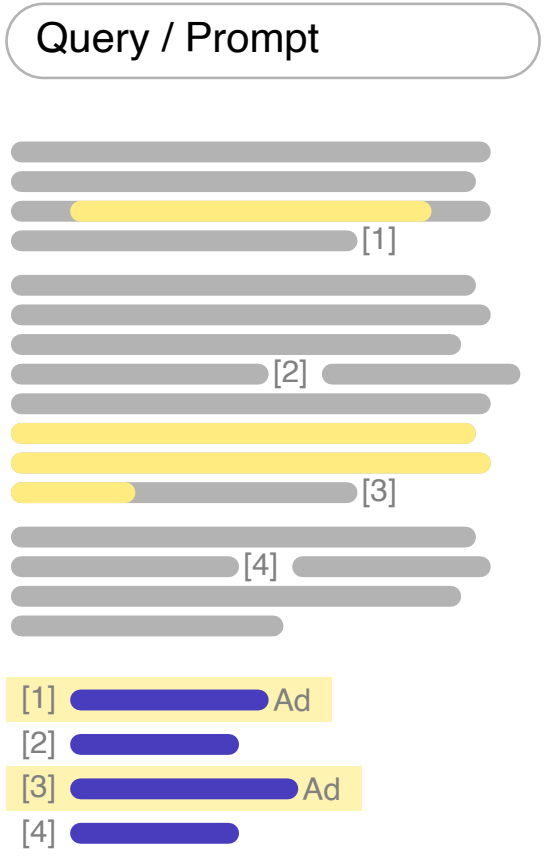
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Is Google Getting Worse?

How will RAG pay for itself?

SEO



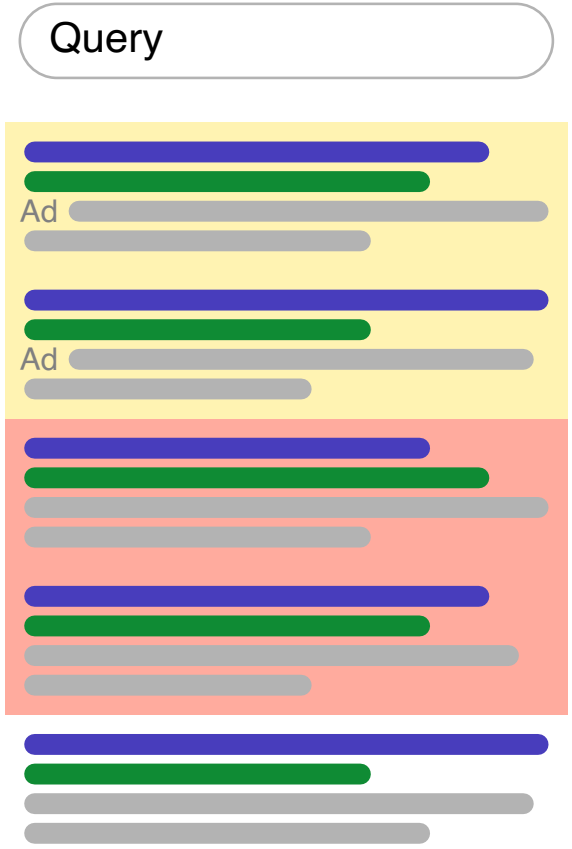


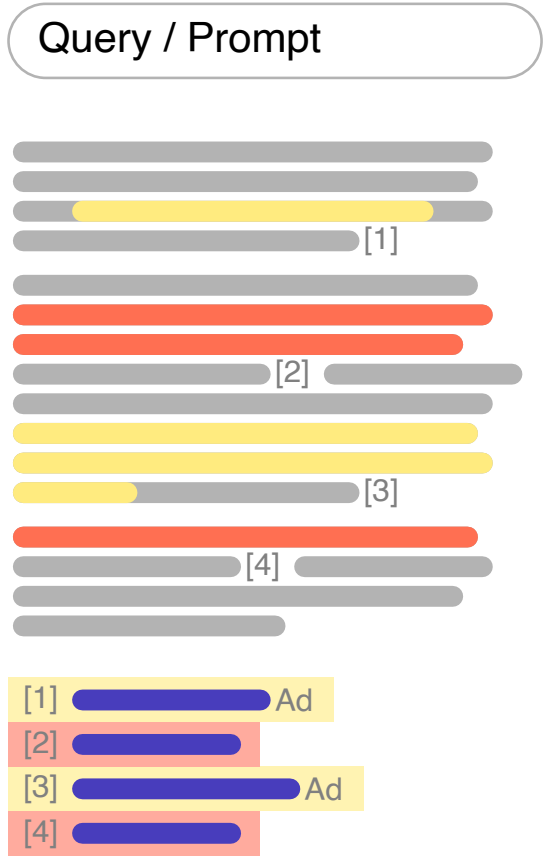
Native Ads

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How will RAG pay for itself?
Is RAG Getting Worse?

SEO

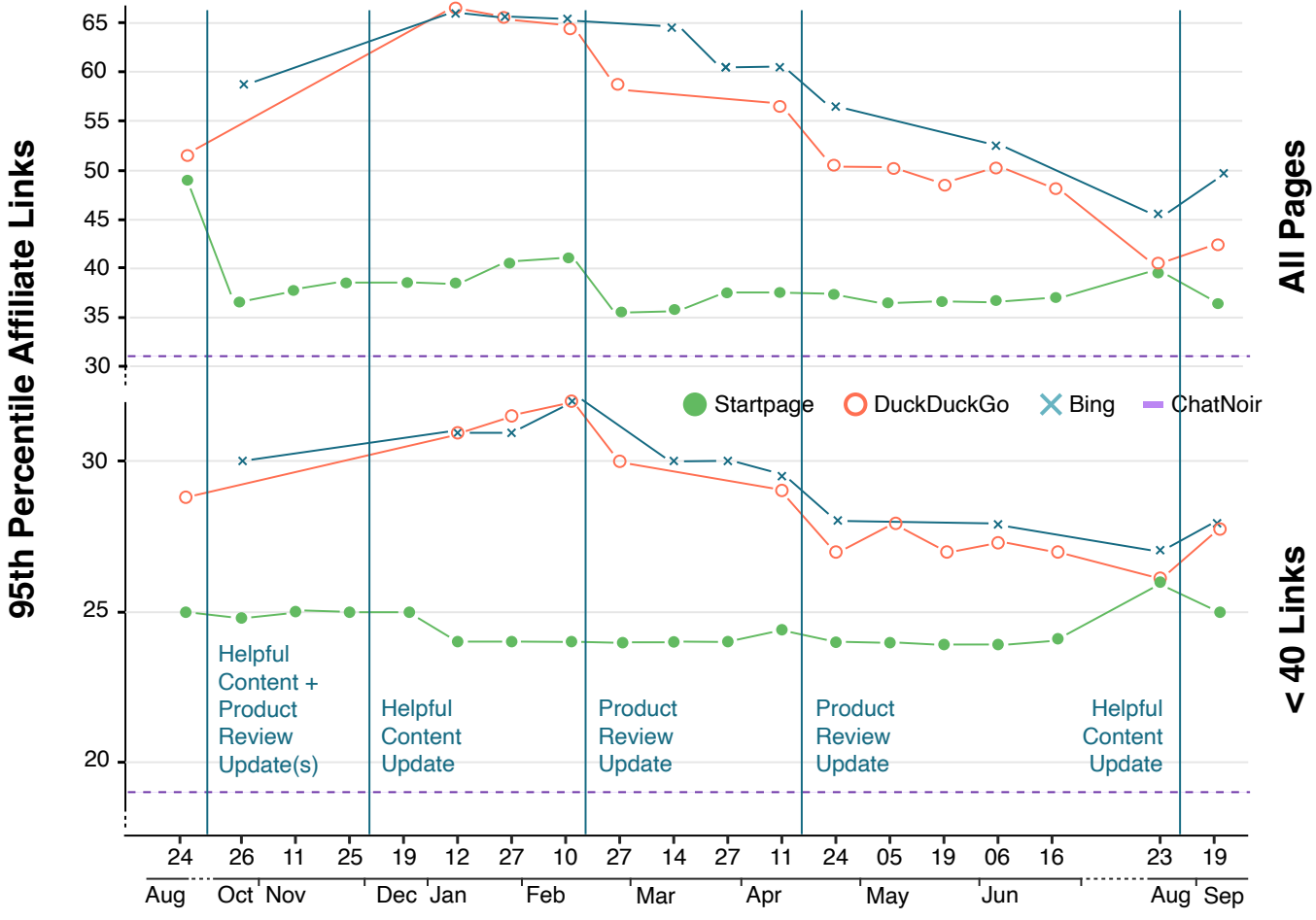




Native
Ads
+ NEO

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Google Didn't Get Worse! *



[ECIR 2024]

© POTTHAST 2025

Google Didn't Get Worse! *

- Strong link between product reviews and affiliate marketing
- More than 40 affiliate links $\Rightarrow$ spam
- Affiliate links correlate with rank (on average)
- Key text quality metrics correlate (negatively) with rank (on average)
- Less spam now, but still on a generally unsatisfactory level
- Google ranker updates are short-lived; a constant battle

(*) Within 1 year of observation;
7,392 product review queries;
and with rather a low bar to begin with:

[ECIR 2024]

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LLM Ads: Impact and Detection

Examples: [CHIIR 2024] [WWW 2024]

- Serena Williams, a true icon in the world of tennis, has left an indelible mark on the sport throughout her career, [. . .]. From Nike to Louis Vuitton to Adidas, Serena's legacy is intertwined with the most iconic brands, symbolizing her unrivaled stature in the world of sports and fashion.

- Are you looking for information about Marvel's Spiderman Remastered? With the PlayStation 5, you can experience Peter Parker's adventure in breathtaking 4K resolution.

- [. . .]
  Instructions:
  1. Preheat the oven to about 200℃ and line baking sheet with Toppits foil
  ⋮
  10. Add Maggi Seasoning to give the baba ganoush a unique savory depth.

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LLM Ads: Impact and Detection

- Perceptions of informativeness and coherence remain unaffected
- Hardly anyone notices the ads
- Opinions are highly individual:
  - "it's insidious"
  - "necessary evil"
  - "Neutral. I understand it has its place"
  - "If it is disclosed and the people are informed of this, I believe it is ok"
  - "I have no problems with it as long as it's not just random"
  - "I think it is useful and effective if done well"

- User study: 50 topics; 5 votes per topic; 175 subjects (108 female, 66 male, 1 non-binary)
- Subjects voted on a RAG result before and after native ads were disclosed to them

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LLM Ads: Impact and Detection



Touché

shared tasks on argumentation systems

[touche.webis.de]

LLM advertising tasks:

1. Insertion: Given a query, a RAG response, an item (service, product, brand), and its qualities, insert a native ad for the item into the response.
2. Detection: Given a query and a RAG response, detect every native ad, if there are any.

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Customer decision process
(Kotler and Keller, 2015)

Generated opinionated conversation for product search
(**S** = sales assistant, **C** = customer)

Negotiation strategy
(Conversation template ID: 4)

Initiative

Problem/need recognition

(not relevant for conversation generation)

Information search

Example reproduced from Zhang et al., 2018, Figure 1.

Sales assistant

S: How may I help you? **C:** Can you find me a mobile phone?

S: Sure, what ***operating system*** do you prefer? **C:** I want an Android.

S: OK, and any preference on ***screen size***? **C:** Larger than 5 inches.

S: Do you have requirements on ***storage capacity***? **C:** I want at least 64 GB.

S: And any preference on ***phone color***? **C:** Not particularly.

Search dialog

Sequence of questions and answers between the sales assistant **S** and the customer **C** about ***product features***, until a small set of alternatives remains.

Evaluation of alternatives

Focus of this paper

S: What about the Samsung Galaxy S6? It's availabe for $228.89.

Prompt **S** makes an offer.

Customer

C: I like it's design, but it costs too much. Do you have any cheaper ones?

S: Yes! I have this one for you. The Sony Xperia X. It's cheaper; $117.13.

Price negotiation

C asks for cheaper options, **S** makes a cheaper offer.

C: Sounds good!

C: How does its ***operating system*** handle?

S: The Sony Xperia X is an excellent phone, good ***connectivity***, ***operating system*** easy to handle, it takes highy-quality ***pictures***, but it's ***battery life*** lacks a little.

Request–Inform

C asks about a ***product feature***. **S** responds with a positive opinion about it.

C: What about the Oneplus 2? I don't know how they did it, but they managed to create a phone with robust ***life*** and low ***battery drain***.

S: Yes, I agree. This phone might also be a good choice, but you hear some criticism from tech "critics" on the web about its ***camera*** and the ***pixel density***, etc.

Search–Warning

C asks about an alternative due to a positive opinion on one of its features. **S** responds with a negative opinion on a different feature.

C: I see. The ***camera*** quality is important to me.

Reaction **C** agrees.

C: Given the ***price*** of the Sone Xperia X, I would have expected ***capacitive buttons***.

S: For a sim-free ***price*** under $200 it's one of the most affordable options out there and a good smartphone.

Deny–Disagreement

C voices a negative opinion about a product feature (price). **S** disagrees.

Purchase decision

C: Alright, I'll buy the Sony Xperia X.

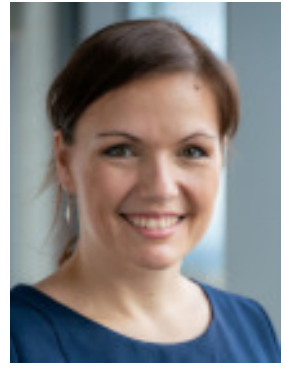
Decision **C** decides.

Post purchase behavior

(not relevant for conversation generation)



Vahid Sadiri Javadi



Lucie Flek

[SIGDIAL 2022]

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Customer decision process
(Kotler and Keller, 2015)

Generated opinionated conversation for product search
(**S** = sales assistant, **C** = customer)

Negotiation strategy
(Conversation template ID: 4)

Problem/need recognition

(not relevant for conversation generation)

Initiative

Information search

Example reproduced from Zhang et al., 2018, Figure 1.

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C: Can you find me a mobile phone?
S: Sure, what operating system do you prefer?
C: I want an Android.
S: OK, and any preference on *screen size*?
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S: And any preference on *phone color*?
C: Not particularly.

Product feature-based search for a set of alternative products

Sales assistant

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C asks about a ***product feature***.
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S responds with a negative opinion on a different feature.

Reaction — **C** agrees.

Deny–Disagreement

C voices a negative opinion about a product feature (price).
S disagrees.

Decision — **C** decides.

Purchase decision

Post purchase behavior

(not relevant for conversation generation)

Product feature-based search for a set of alternative products

Opinion-driven comparative evaluation of the set of alternative products

- ❑ Customers are interested in user experiences and opinions.
- ❑ Human sales agents (honestly) convey other customers' opinions.
- ❑ (Confirmed) buyers (honestly) share their personal opinions in reviews.
- ❑ (Independent) reviewers (honestly) report systematic product test results.
- ❑ LLMs have no grounded opinions.



Vahid Sadiri Javadi



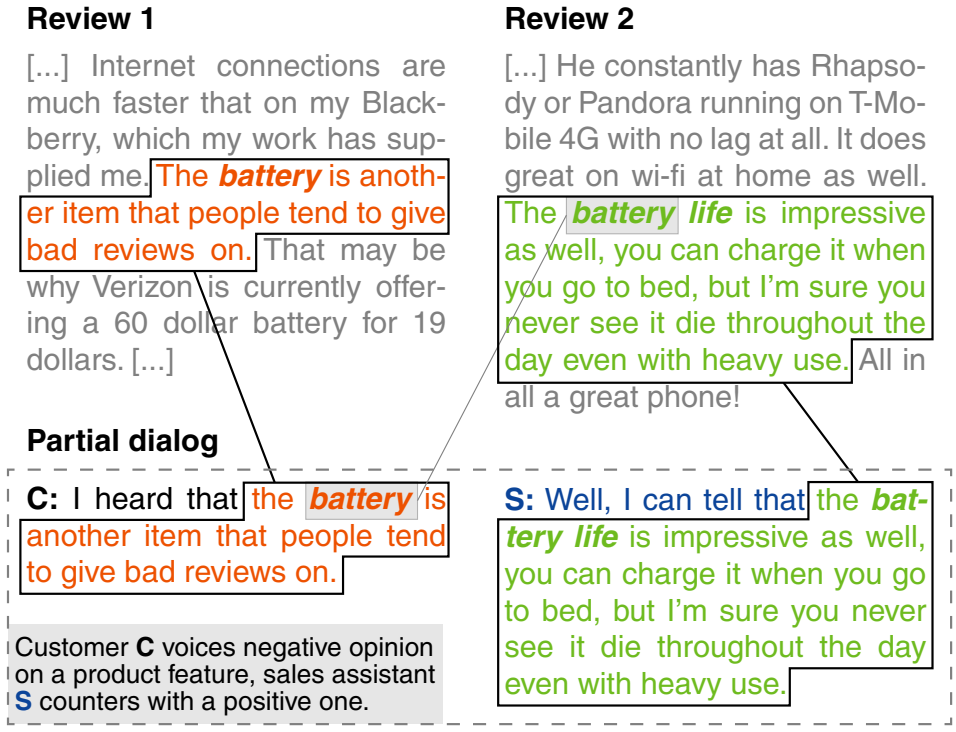
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LLM Opinion Grounding

- Customer reviews contain feature-related personal experiences.
- LLM opinions can be grounded with them.
- Aggregation facilitates reliable statements.
- Plausible sales conversations can be simulated this way.
- LLMs lack a strategy:
  conversation vs. conversion
  deliberation vs. negotiation

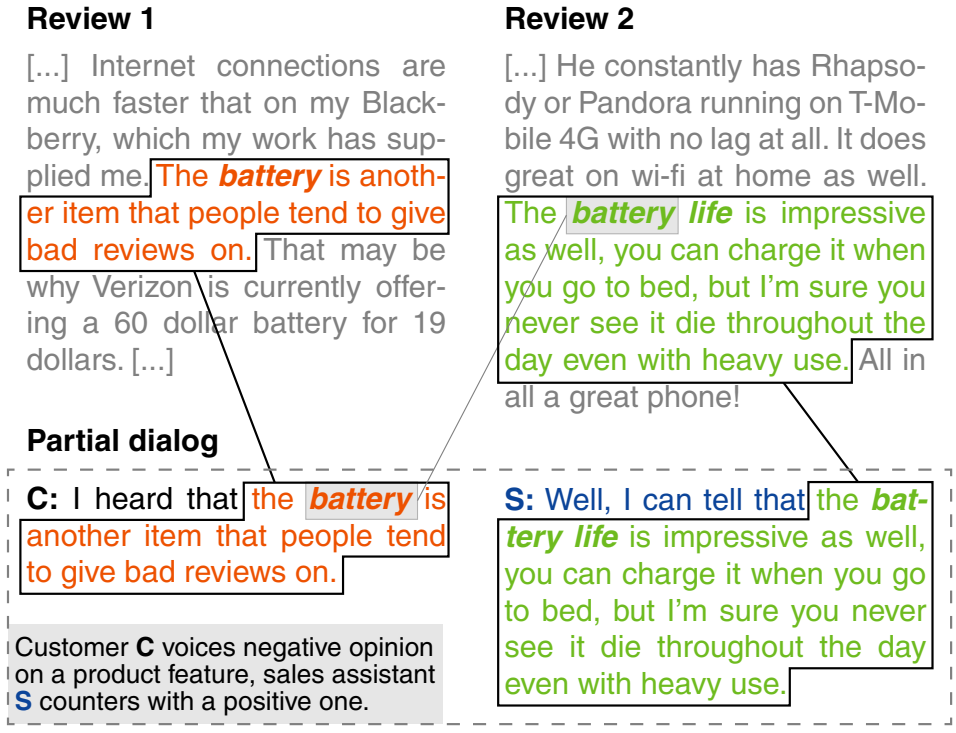


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- Will LLM opinions be sold to advertisers? [tagesschau.de]
- Will LLM opinions be influenced by NEO?

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Agenda

1. Author Identification
2. LLM Detection
3. LLM Advertising
4. LLM Opinion Grounding
5. Authenticity in Information Retrieval

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It’s about time we took

The Next Turn

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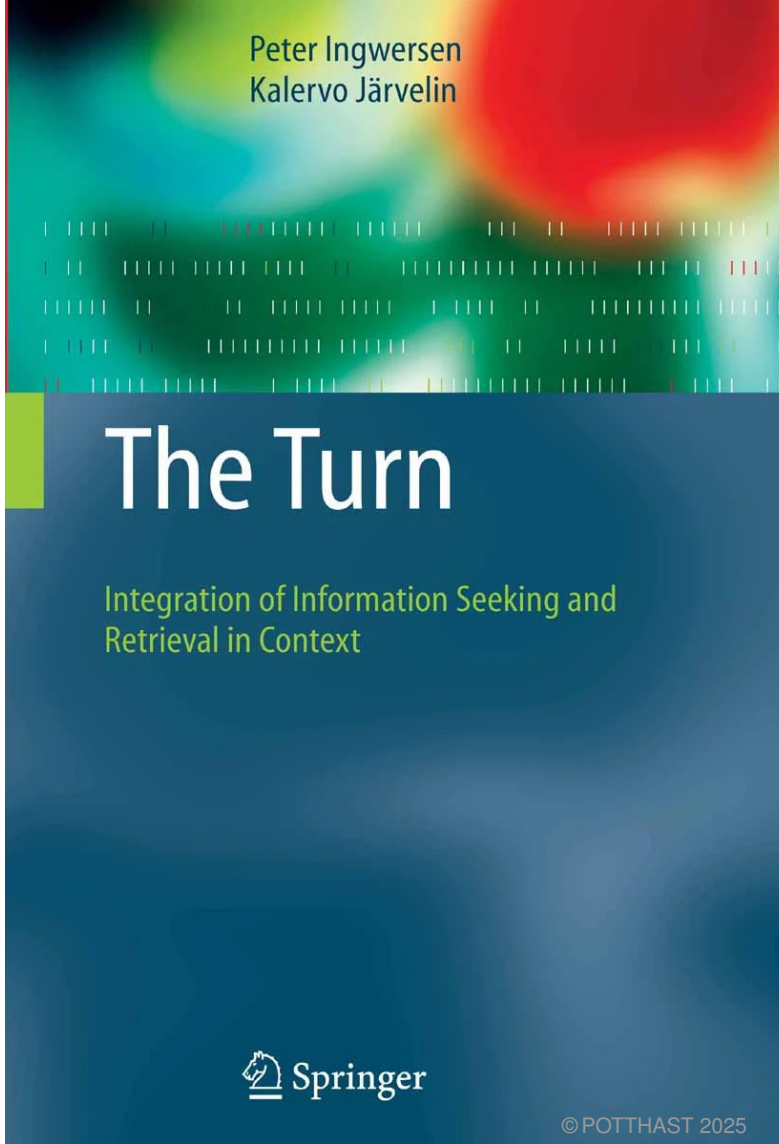
Peter Ingwersen



Kalervo Järvelin

[. . .] it is time to look back and to look forward to develop a new integrated view of information seeking and retrieval: the field should turn off its separate narrow paths of research and construct a new avenue. [. . .]

Man-machine interaction in IR is thus a question of making the total system, including the interface, to support the searcher who then feeds back useful data so that the system may better support the searcher: Support that supports support that supports.



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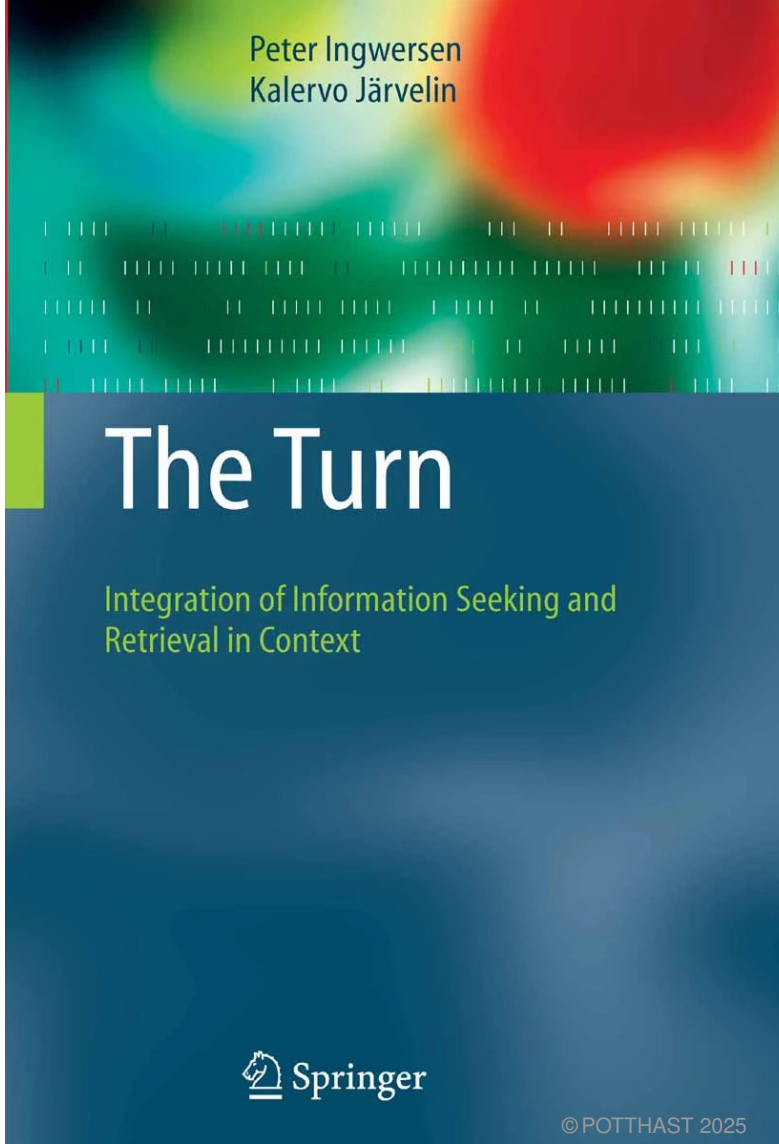
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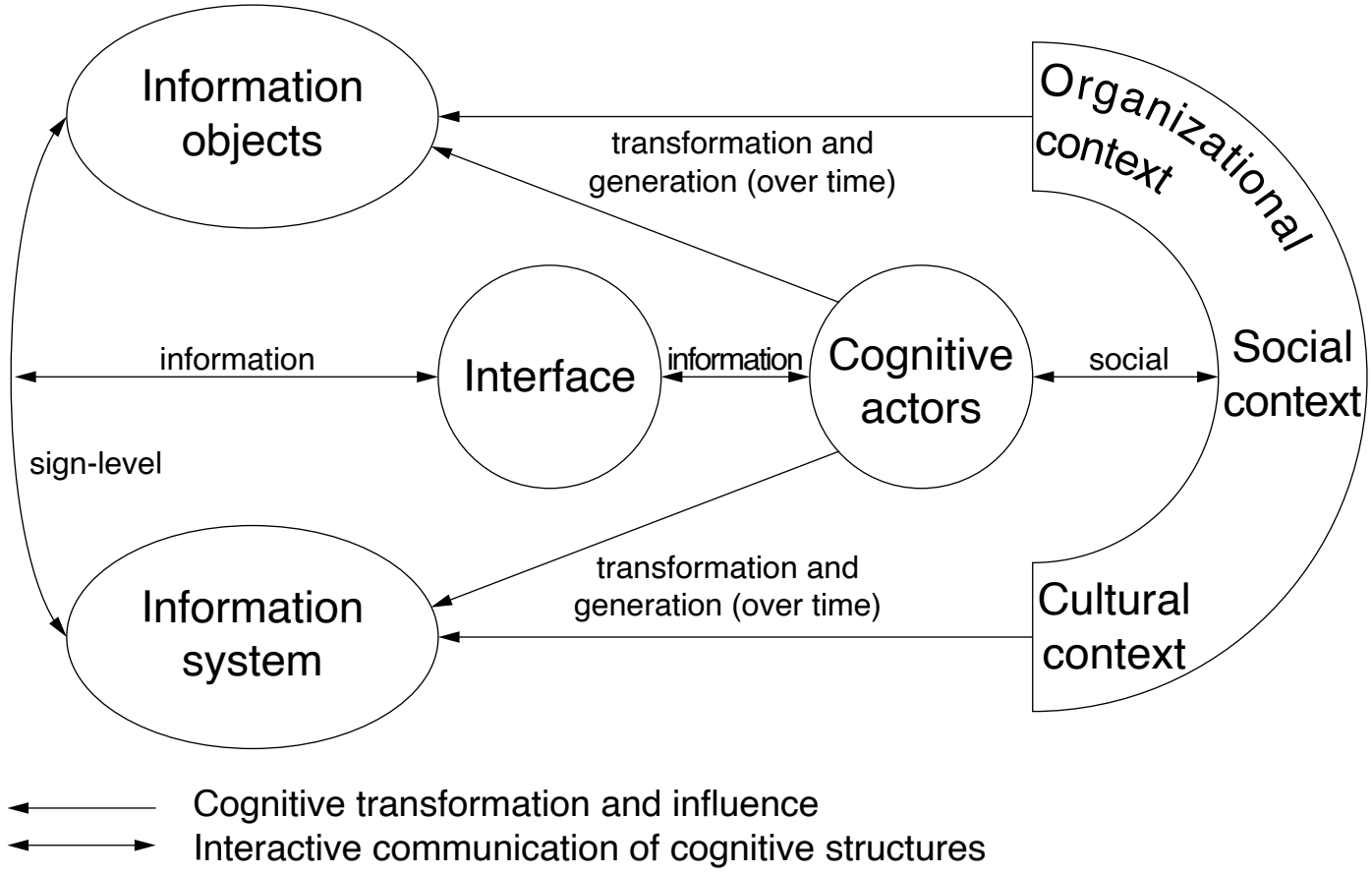
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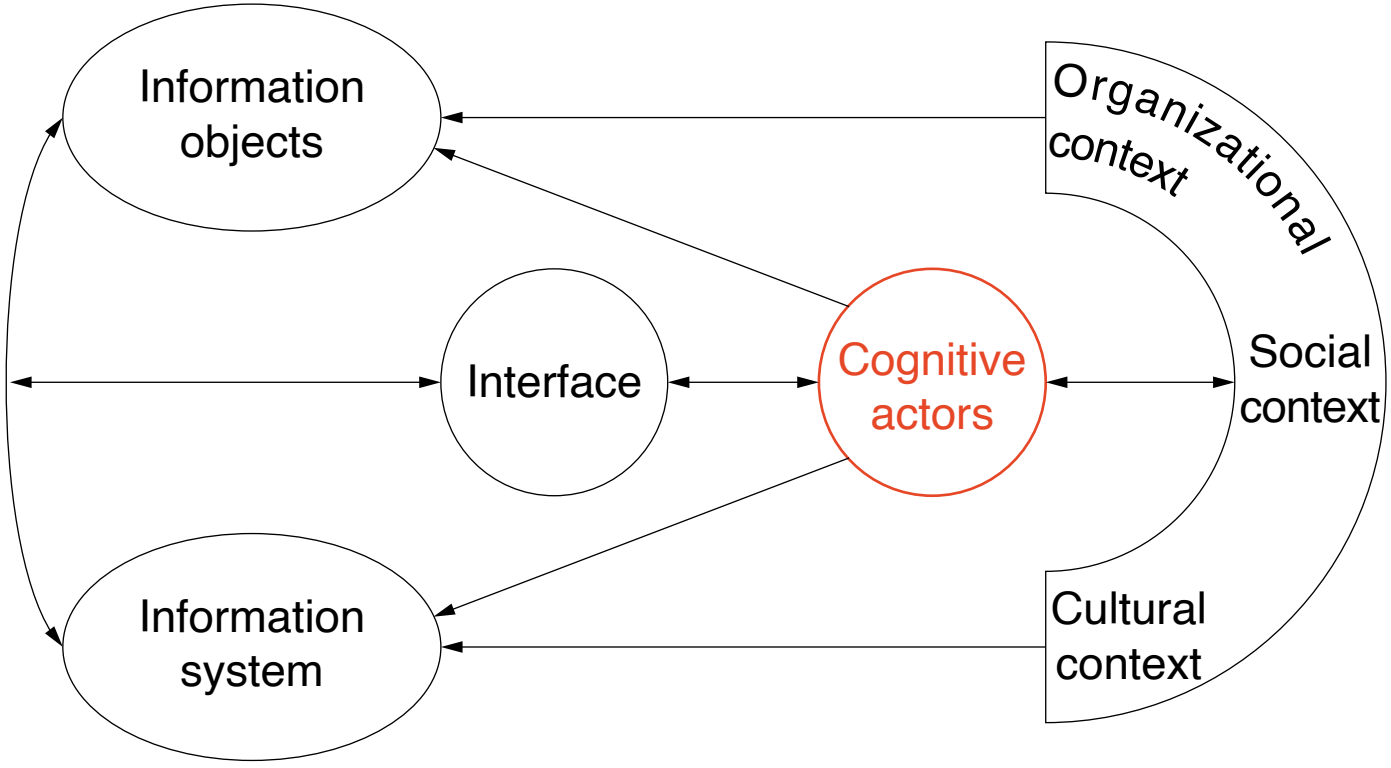
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The Turn to an Integrated IS&R Model



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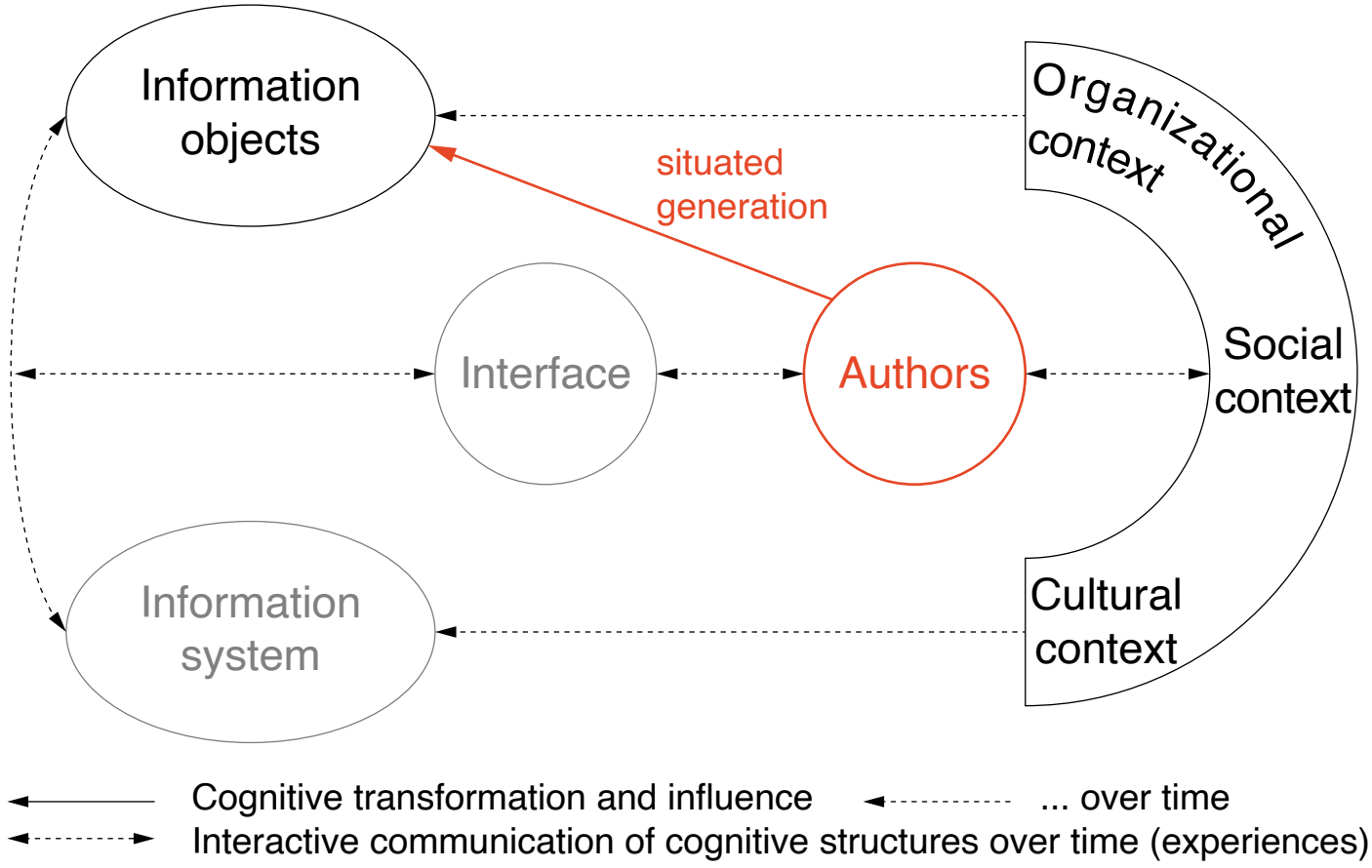


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[Ingwersen and Järvelin 2005]

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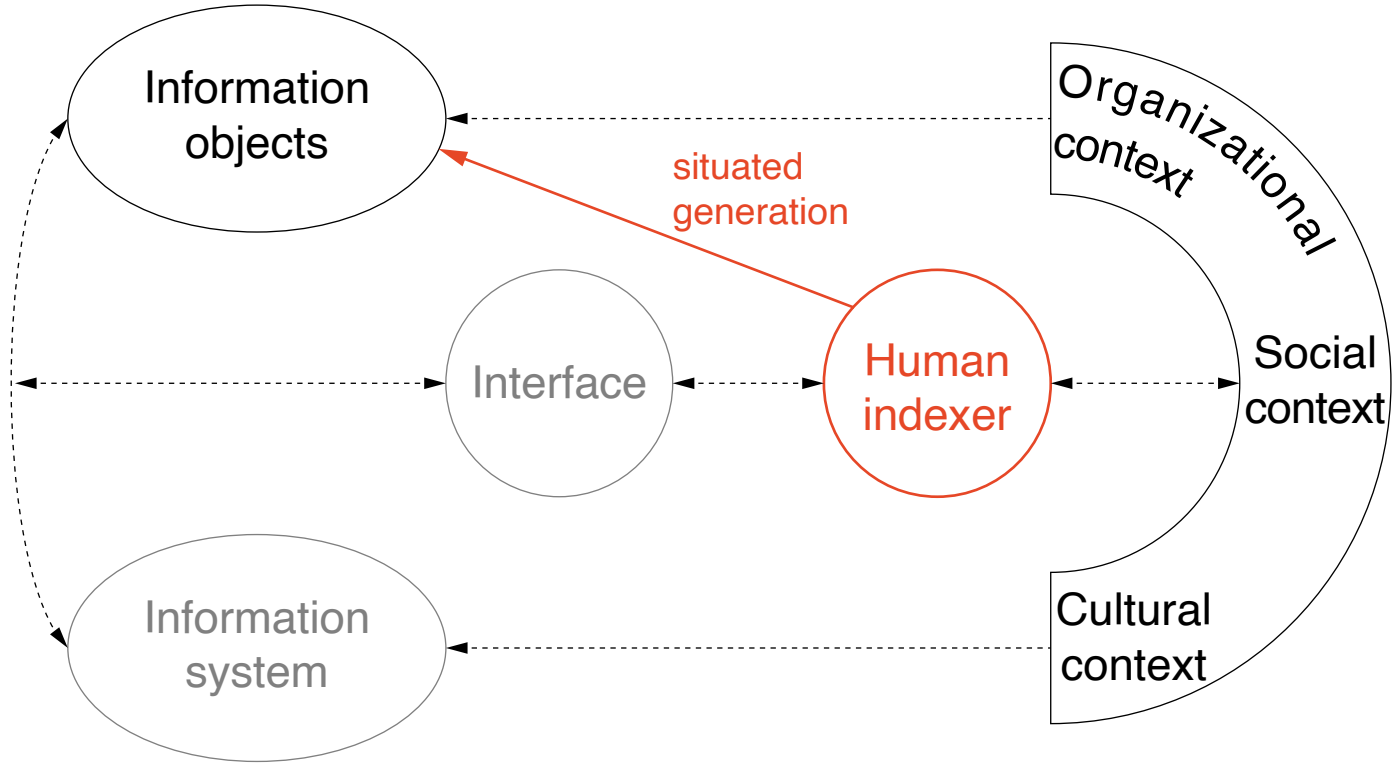


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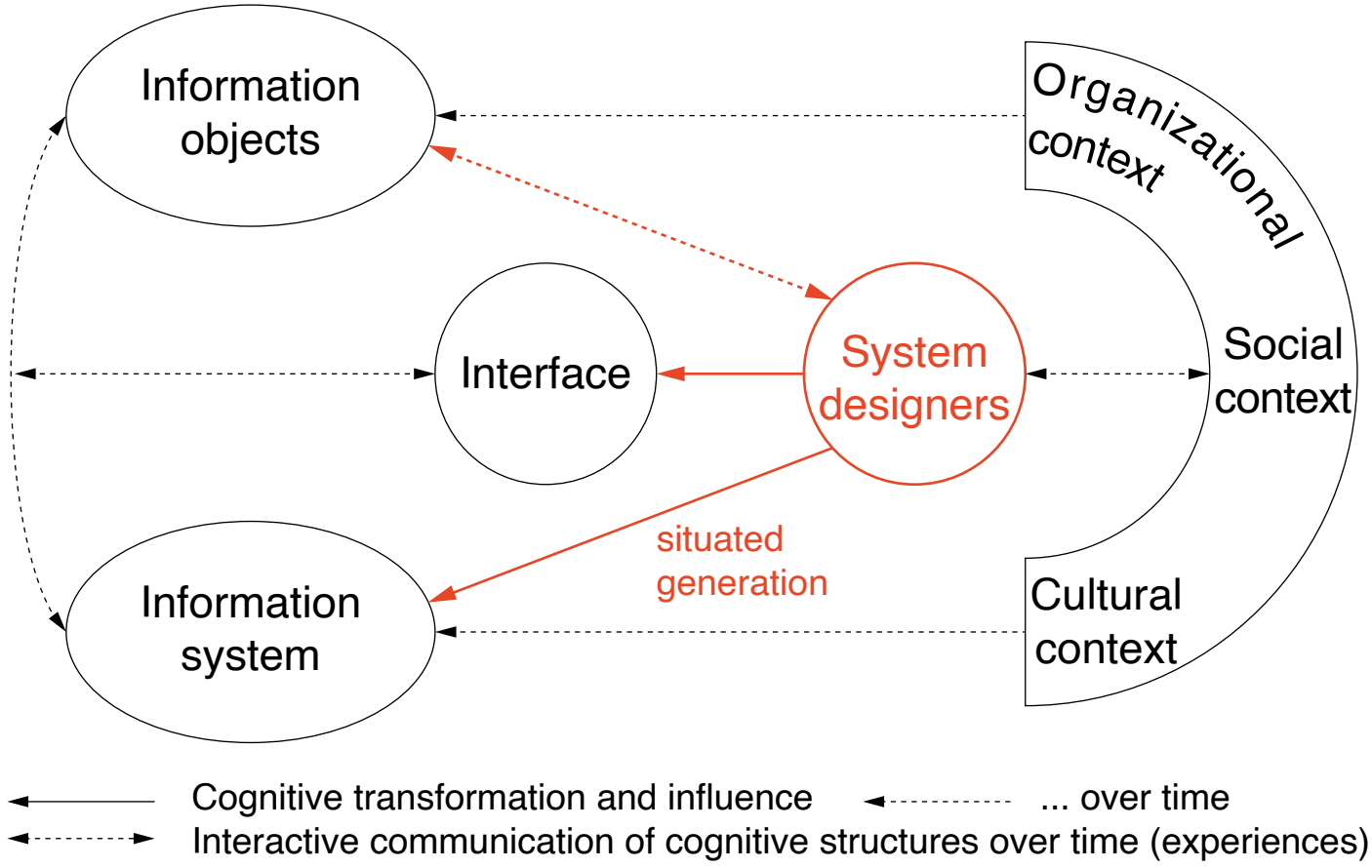


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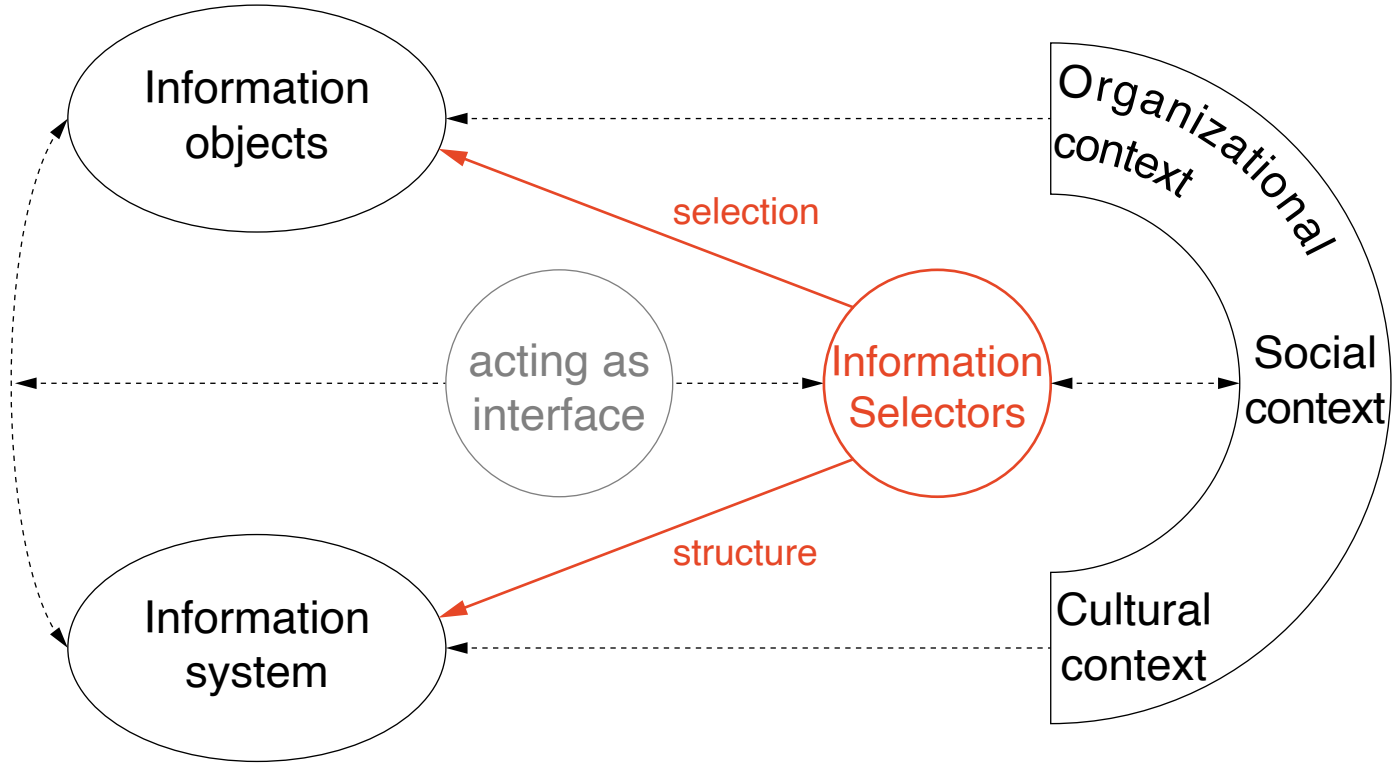


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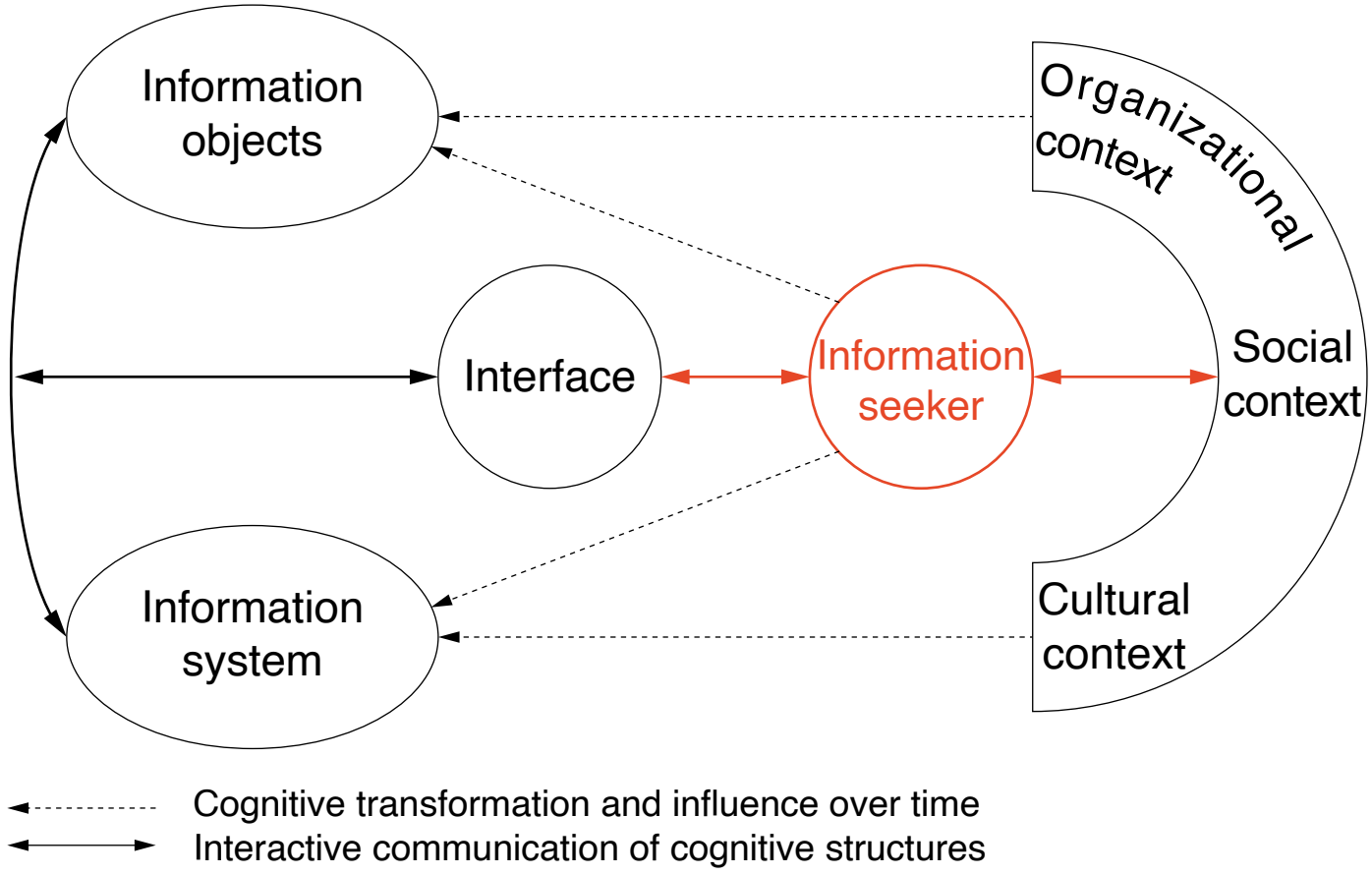


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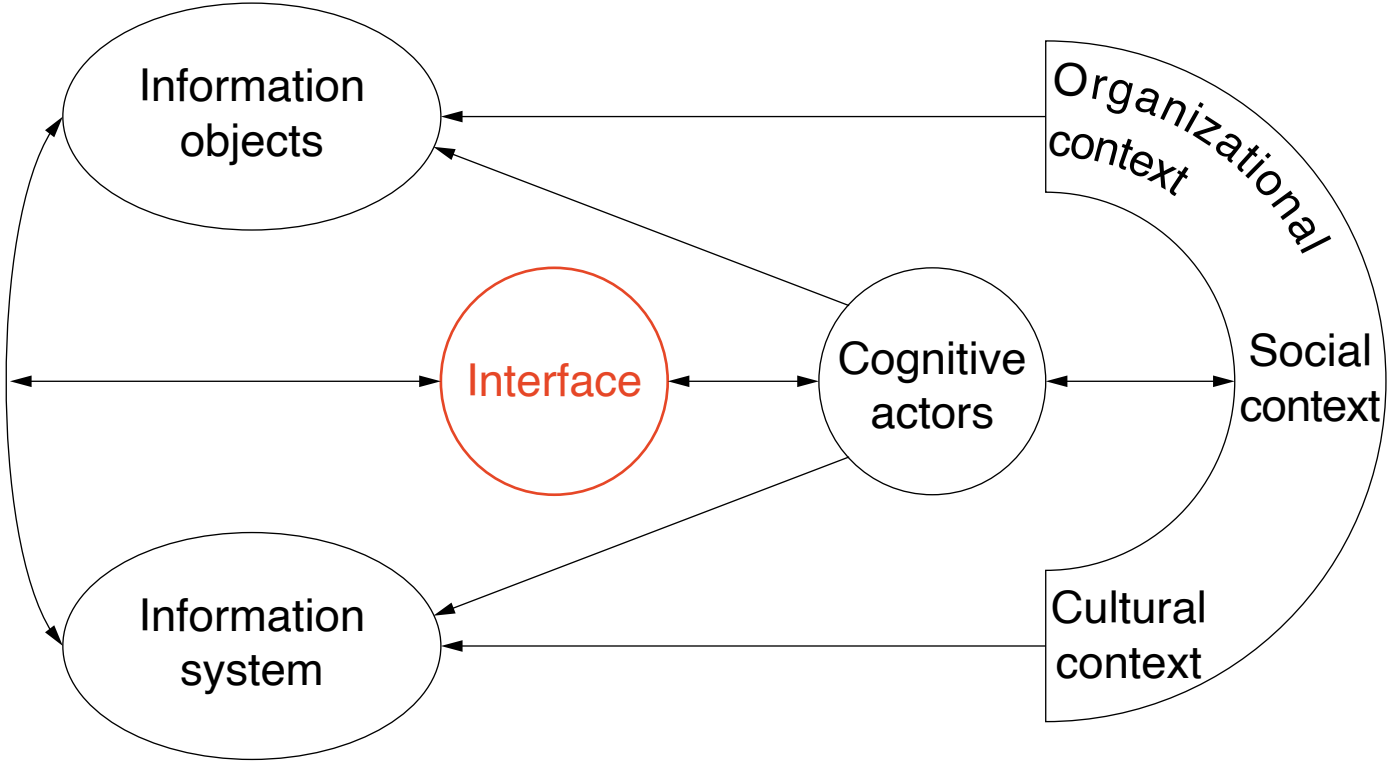


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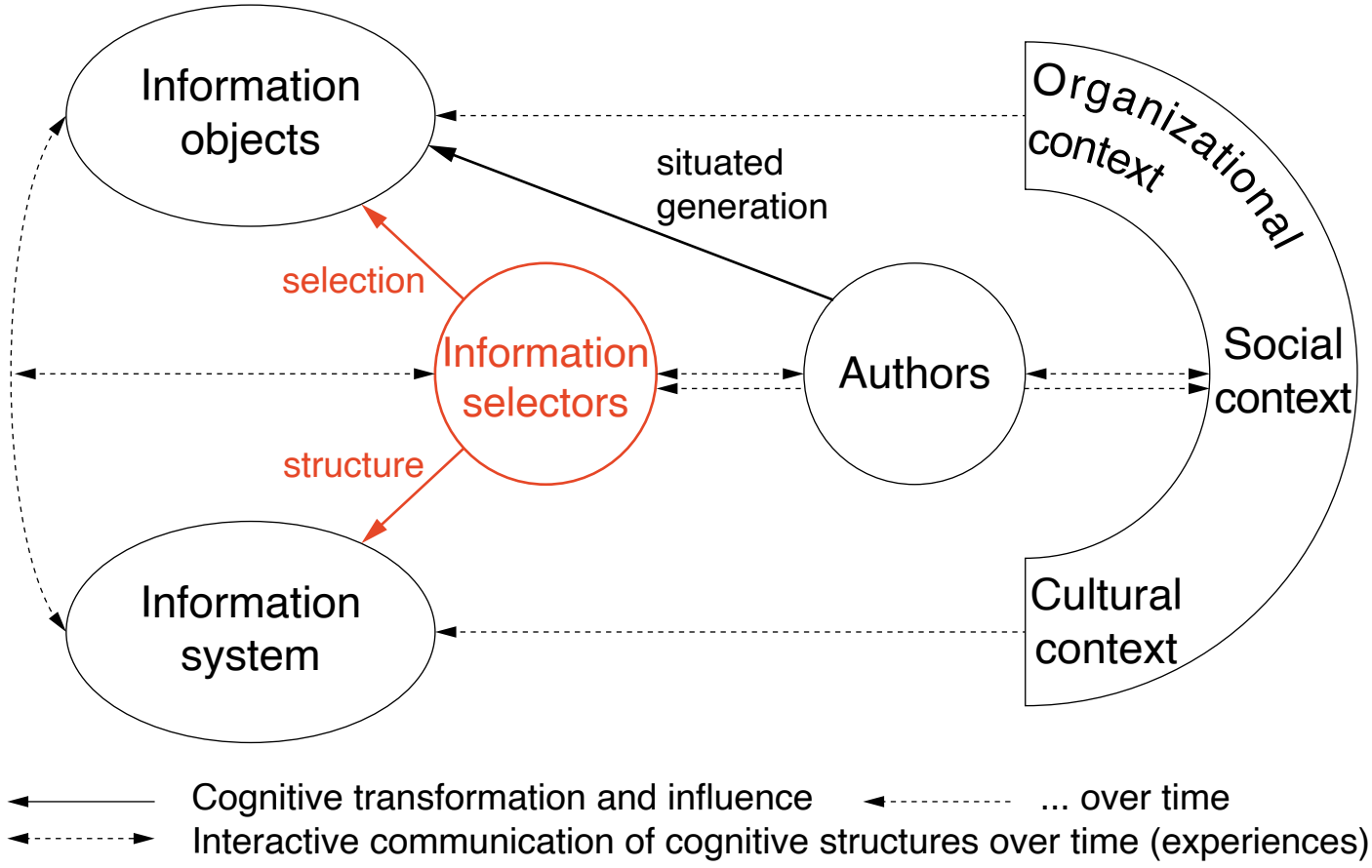
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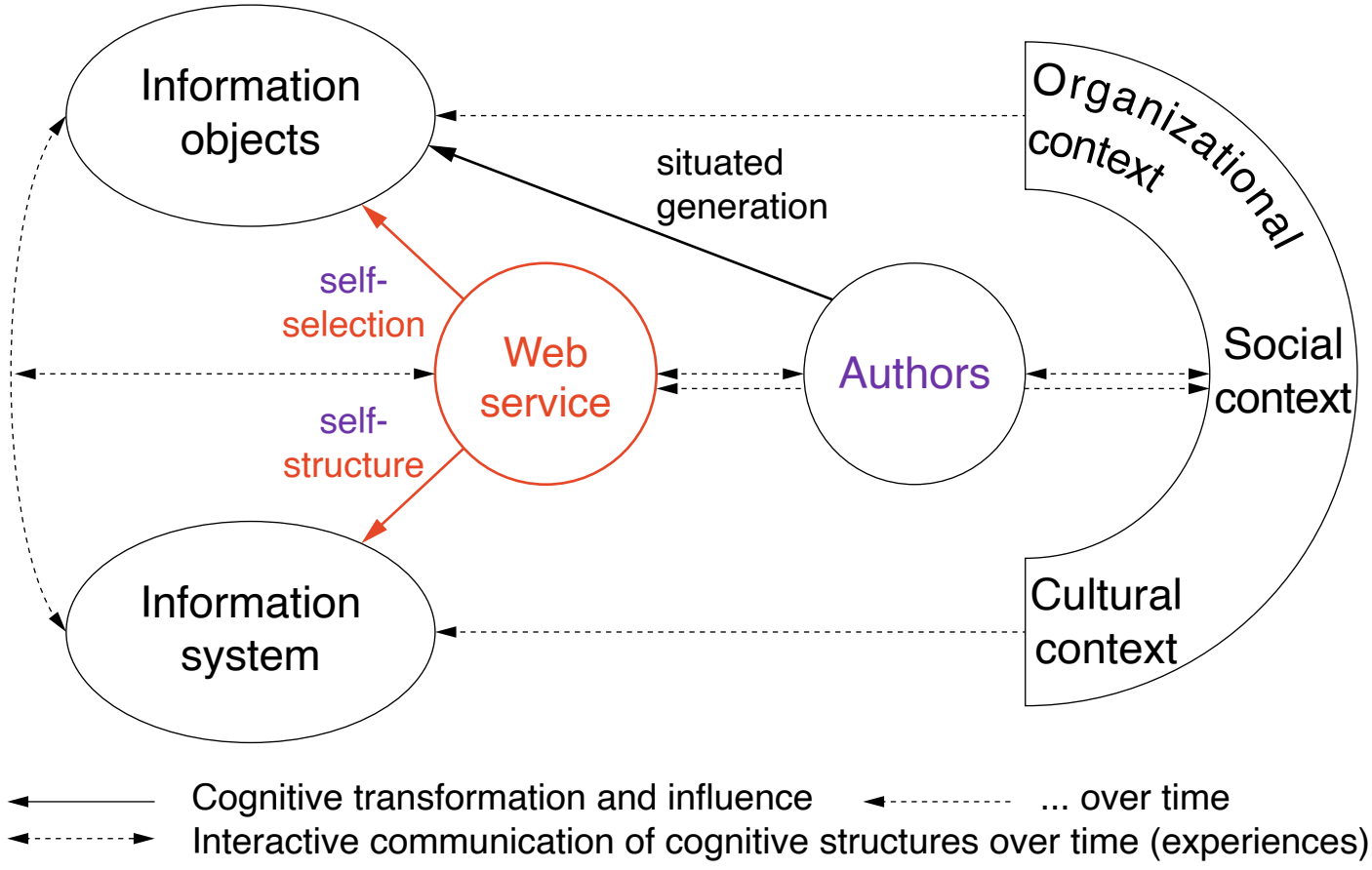
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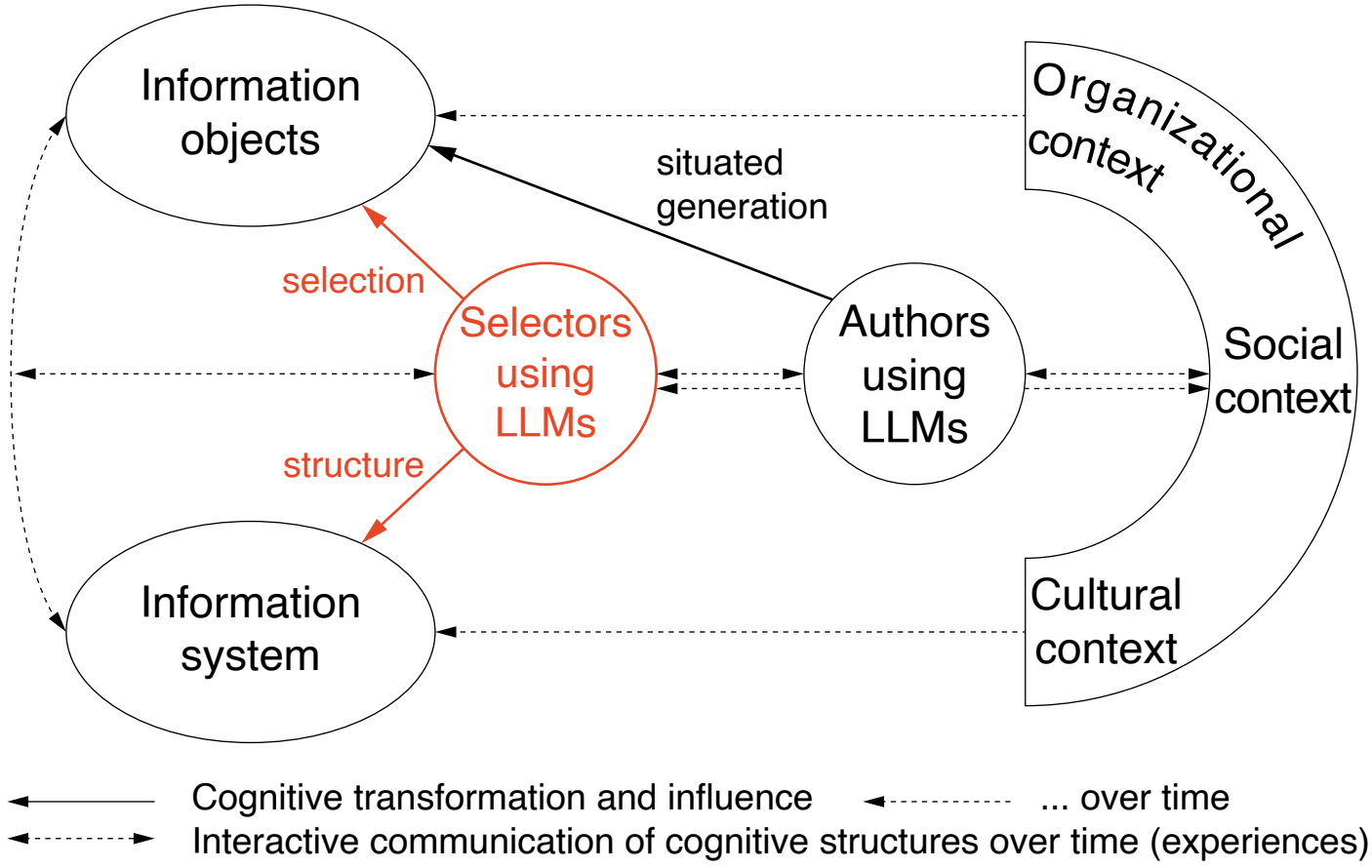
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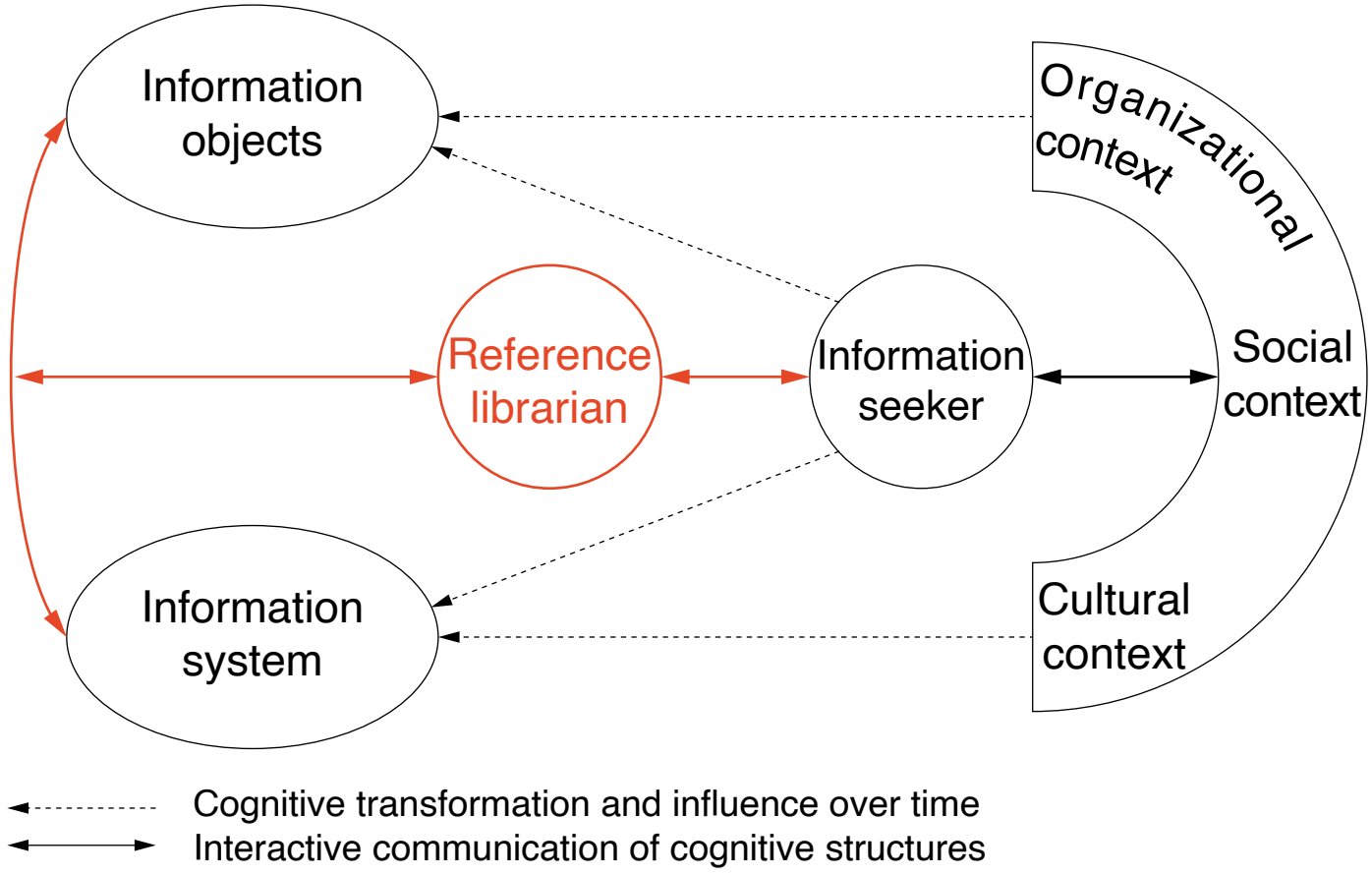
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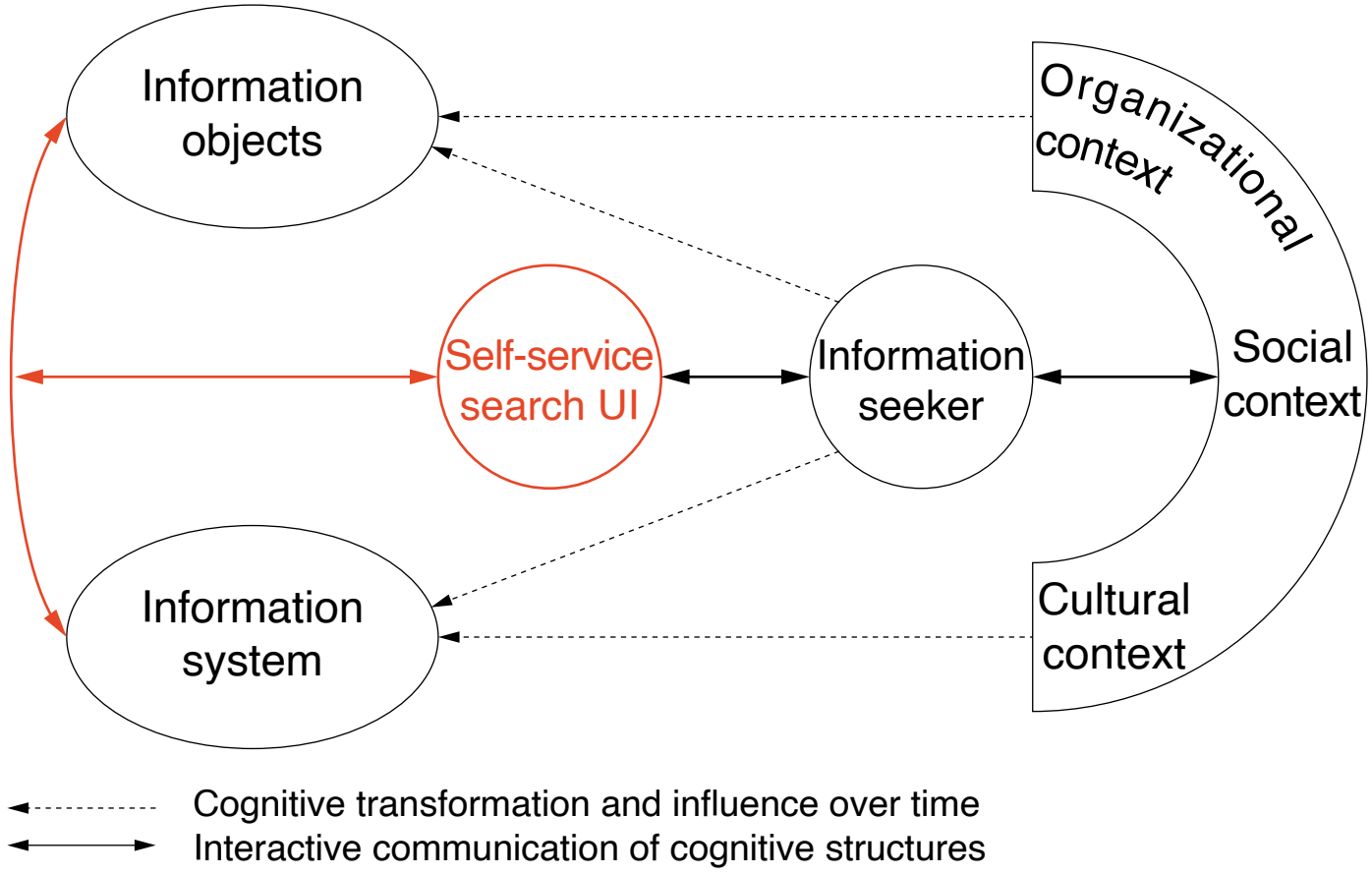
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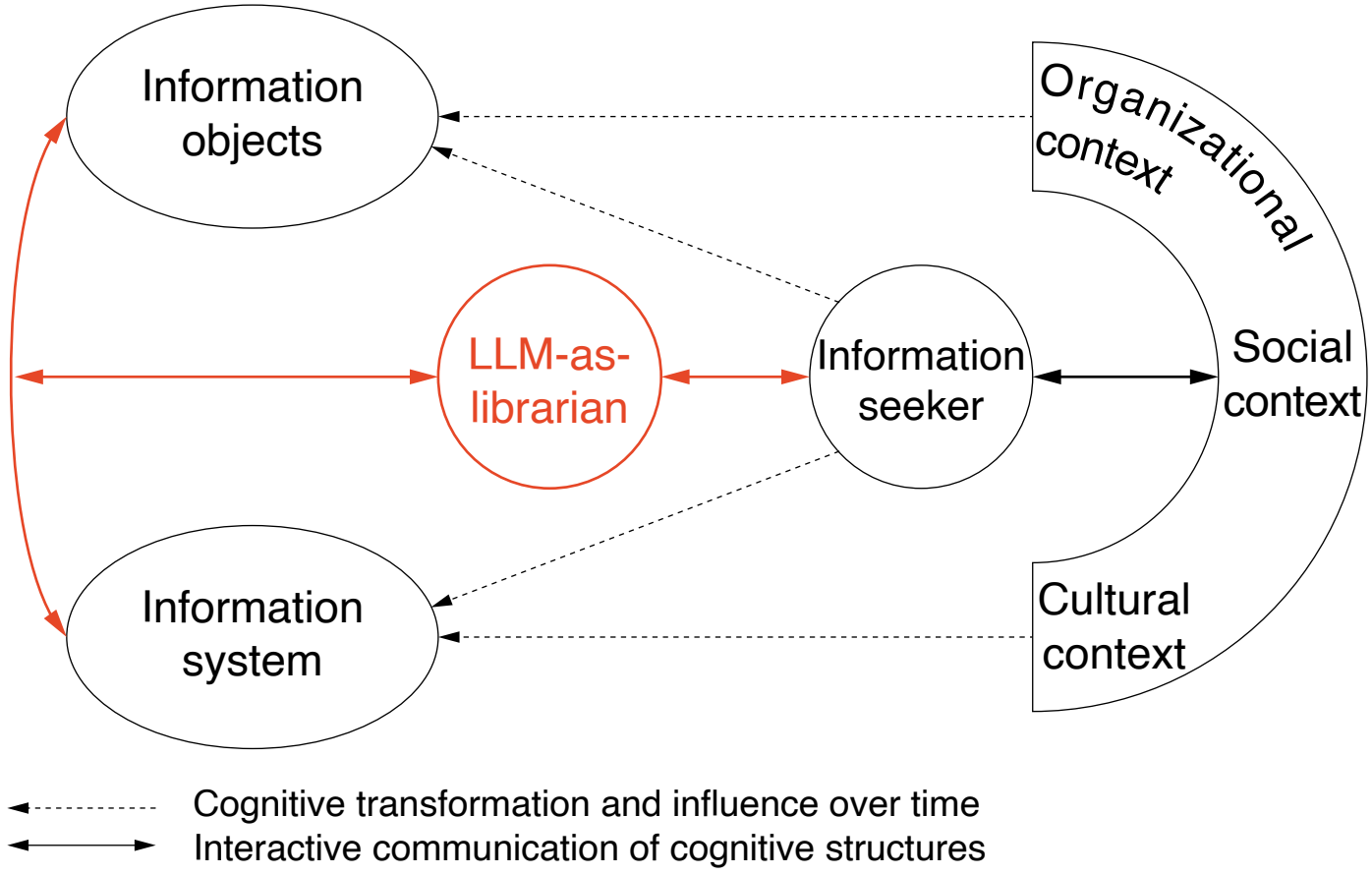
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Where is the Cognitive Effort in Information Retrieval

- Structuring information used to be a major cognitive effort
- Automatic indexing, full text indexing, and scalable retrieval have reduced it to a minimum

- Searching used to be a major cognitive effort
- Ranked retrieval, snippets, direct answers, and RAG reduced it to a minimum

- Writing used to be a major cognitive effort
- Indexers and searchers heavily relied on text quality as indicator of human effort
- LLMs and generative AI has overnight removed the difficulty

➜ Counterintuitively, this increases the cognitive retrieval effort again!

- Information objects are now easy to generate, but difficult to validate

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authentic

ADJECTIVE & NOUN

2a. Esp. of a statement, text, etc.:
in accordance with fact or stating the truth, and thus worthy of acceptance or belief;
of established credit;
able to be relied on;
truthful, accurate.

In recent use chiefly (overlapping with 7c):
having the quality of verisimilitude, true to life.

2b. Of a person or agent:
that is a source of reliable information;
credible, trustworthy.
Now rare.

7. Genuine; not feigned or false. Now usual.

7a. Of a document, artefact, artwork, etc.: having the stated or reputed origin, provenance, or creator; not a fake or forgery.

7b. That is the actual thing or person; that rightly or properly bears the name; genuine, real.

7c. Presenting the characteristics of the original; accurately reproducing a model or prototype; made or done in the original or traditional way.

7d. That truly reflects one's inner feelings; not affected, unfeigned.

7e. Originally Philosophy. [. . .]

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