

# Evaluation Overview

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(Some slides courtesy of Fernando Diaz, Microsoft Research)

# Information Retrieval

- Given a **query** and a **corpus**, find **relevant** documents

**Query:** user's textual description of their information need

**Corpus:** a repository of textual documents

**Relevance:** satisfaction of the user's information need

# Information Retrieval

- In some disciplines, you can prove that solution **A** is better than **B** without experimentation.
- Is information retrieval one of these disciplines?
- If not, why not?

# Uncertainty in Information Retrieval

# Uncertainty in Information Retrieval

- The user may not know what they want
- Even if they do, they may not know how to describe it

# Uncertainty in Information Retrieval

- ▶ soft surroundings
- ▶ trains interlocking dog sheets
- ▶ belly dancing music
- ▶ christian dior large bag
- ▶ best western airport sea tac
- ▶ www.bajawedding.com
- ▶ marie selby botanical gardens
- ▶ big chill down coats
- ▶ www.magichat.co.uk
- ▶ broadstone raquet club
- ▶ seadoo utopia
- ▶ seasons white plains condo
- ▶ priority club.com
- ▶ aircat tools
- ▶ epicurus evil
- ▶ instructions
- ▶ hinds county city of jackson
- ▶ last searches on aol a to z

(AOL query-log)

# Uncertainty in Information Retrieval

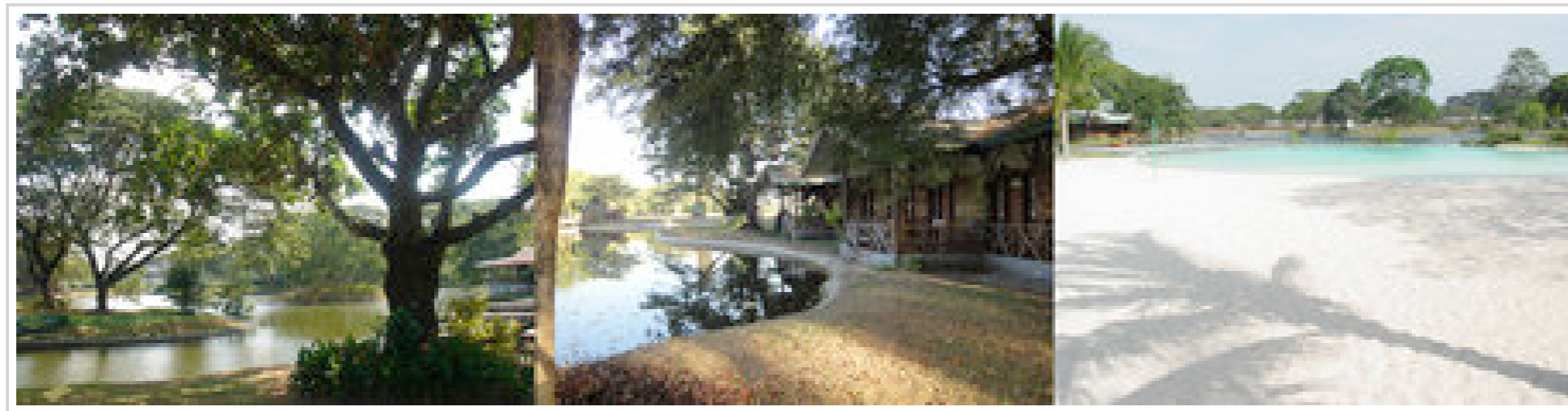
- Even if the user knows how to describe their information need, it will probably still be ambiguous
  - ▶ to the system
  - ▶ to a human trying to see if system **A** is better than **B**

# Uncertainty in Information Retrieval

- **Query:** curbing population growth

## **Dengue in Philippines taken seriously at one hotel in Clark Philippines**

Jul 18, 2010 23:58 EDT



Philippines government department of Health has issued warning of Dengue epidemic in July 2010 which is expected to last until the end of the year.

While most hotels and resorts are slow to take steps to address this health and safety issues, one hotel in Clark Philippines is already well on its way to implementing proactive measures to prevent the spread of Dengue by curbing population growth of mosquito.





# Uncertainty in Information Retrieval

- Document relevance is subjective
  - ▶ many factors affect whether a document is relevant to a query
  - ▶ relevance is difficult to define in a way that generalizes across users, tasks, and environments

# Uncertainty in Information Retrieval

- **Query:** cures for anatidaephobia

## Anatidaephobia - The Fear That You are Being Watched by a Duck

December 08, 2008 by [Tammy Duffey](#)

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Popular searches: [YouTube](#) | [Rihanna](#) | [Tiger Woods](#) | [Search more](#)

### What Is Anatidaephobia?

Anatidaephobia is defined as a pervasive, irrational fear that one is being watched by a duck. The anatidaephobic individual fears that no matter where they are or what they are doing, a duck watches.

Anatidaephobia is derived from the Greek word "anatidae", meaning ducks, geese or swans and "phobos" meaning fear.

An advertisement for Aflac featuring a white duck with a yellow beak on a blue background. The text reads: "Aflac can help attract and retain employees, at no direct cost to your company." Below the duck is the Aflac logo and the slogan "We've got you under our wing." At the bottom is a yellow button that says "Learn More Now".

### What Causes Anatidaephobia?

As with all phobias, the person coping with Anatidaephobia has experienced a real-life trauma. For the anatidaephobic individual, this trauma most likely occurred during childhood.

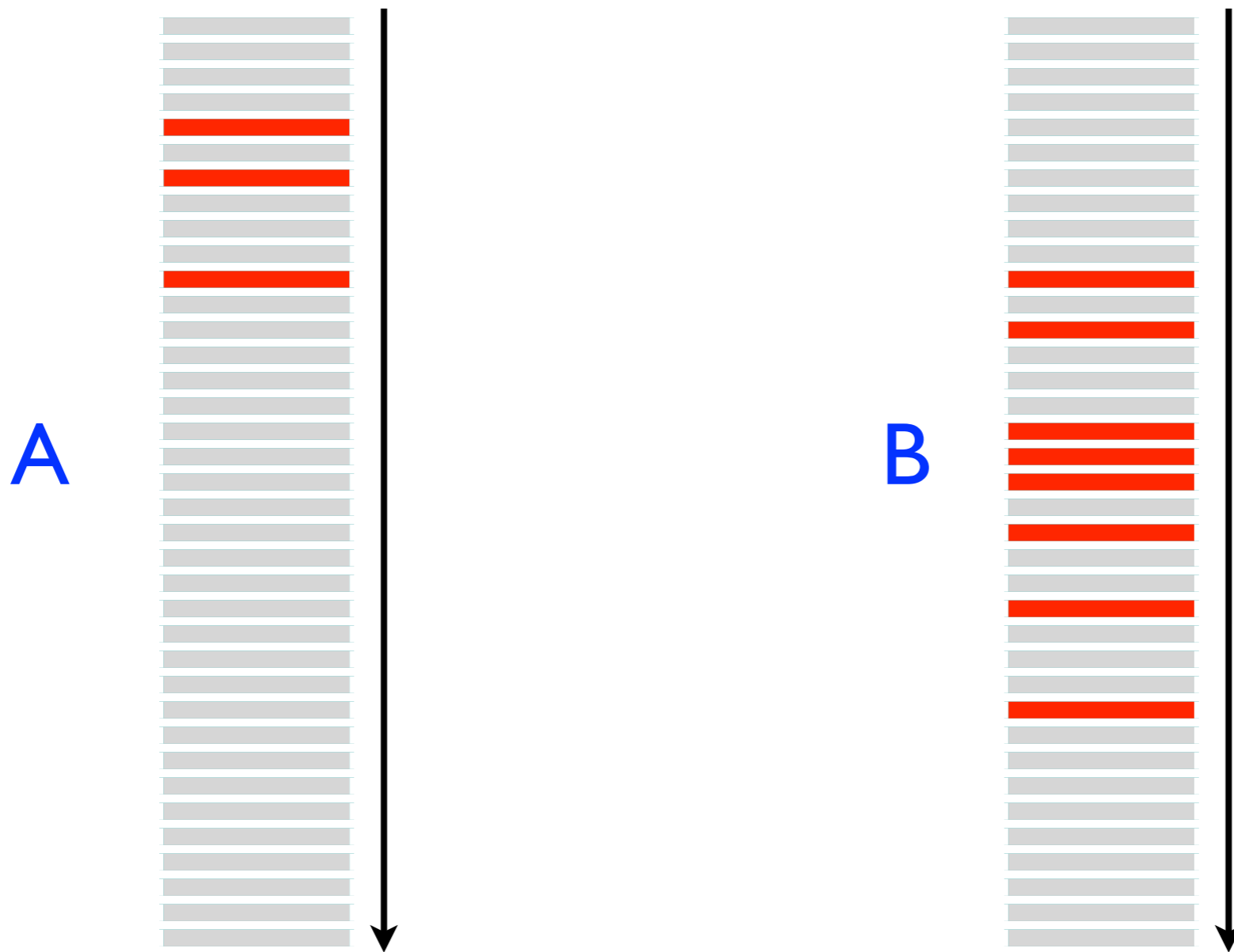
Perhaps the individual was intensely frightened by some species of water fowl. Geese and swans are relatively well known for their aggressive tendencies and perhaps the anatidaephobic person was actually bitten or flapped at. Of course, the Far Side comics did little to minimize the fear of being watched by a duck.

# Uncertainty in Information Retrieval

- Even if we know which documents are relevant, the preferred ranking may be difficult to determine without understanding the user population and their objectives

# Uncertainty in Information Retrieval

- Which ranking is better?



# Information Retrieval

- In some disciplines, you can prove that solution **A** is better than **B** without experimentation.
- Is information retrieval one of these disciplines?
- No, it is not. There is too much uncertainty
- For now, the only way to show that **A** is better than **B**, is through extensive experimentation

# Information Retrieval Evaluation

- Evaluation is a fundamental issue of information retrieval
  - ▶ an area of IR research in its own right
- Evaluation methods:
  - ▶ batch evaluation
  - ▶ user-study evaluation
  - ▶ online evaluation
- Each method has advantages and disadvantages

# Batch Evaluation

## overview

- Collect a set of queries (to test average performance)
- Construct a more complete description of the information being sought for each query

# Batch Evaluation

overview: query + description (example)

- **QUERY:** pet therapy
- **DESCRIPTION:** Relevant documents must include details of how pet- and animal-assisted therapy is or has been used. Relevant details include information about pet therapy programs, descriptions of the circumstances in which pet therapy is used, the benefits of this type of therapy, the degree of success of this therapy, and any laws or regulations governing it.



# Batch Evaluation

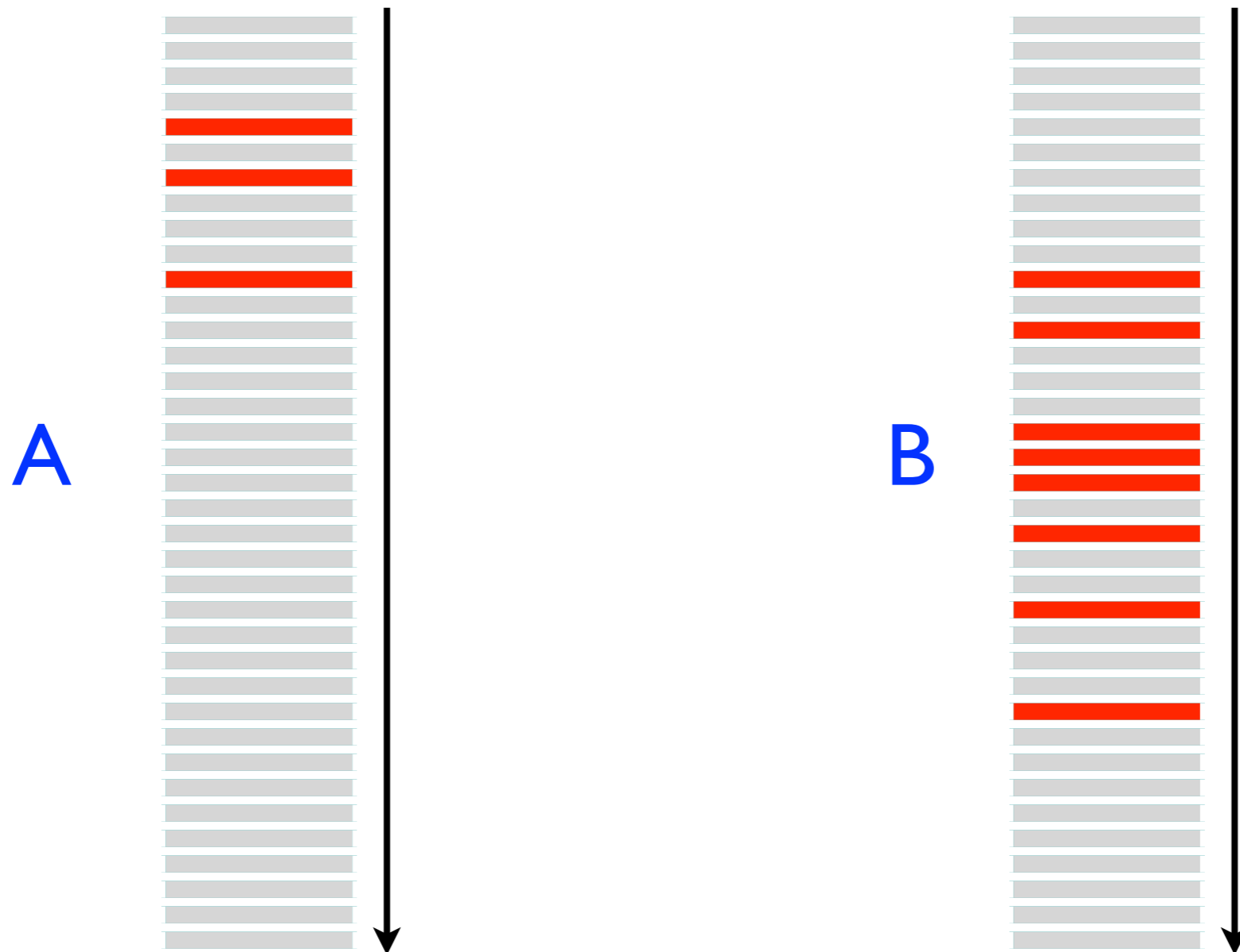
## overview

- Using these descriptions, have human judges determine which documents are relevant for each query
- Evaluate systems based on their ability to retrieve the relevant documents for these queries
  - ▶ **evaluation metric:** a measurement that quantifies the quality of a particular ranking of results with known relevant/non-relevant documents

# Batch Evaluation

## overview: metrics

- Which ranking is better?

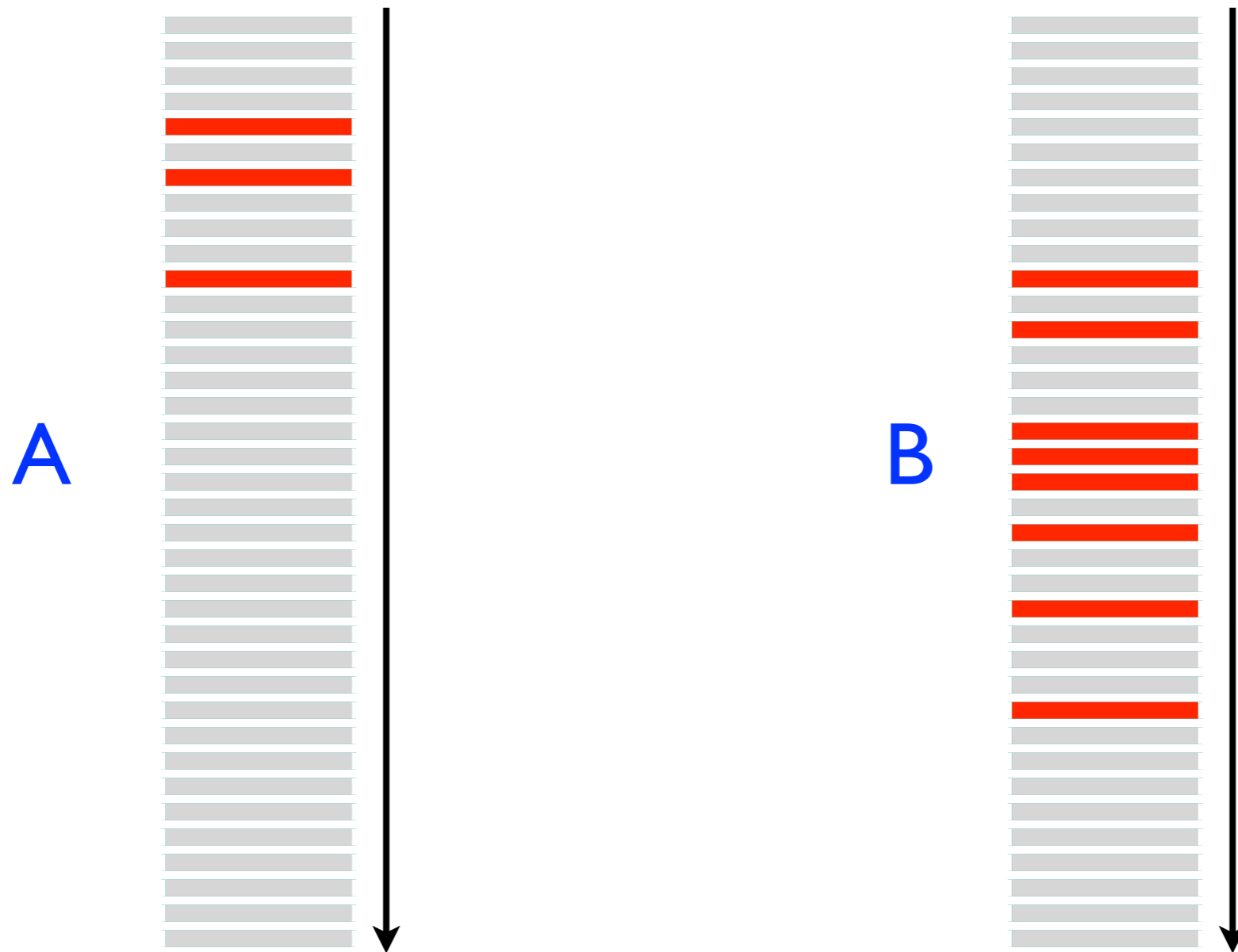


- rank of the first relevant document (lower value is better)

# Batch Evaluation

overview: metrics

- Which ranking is better?

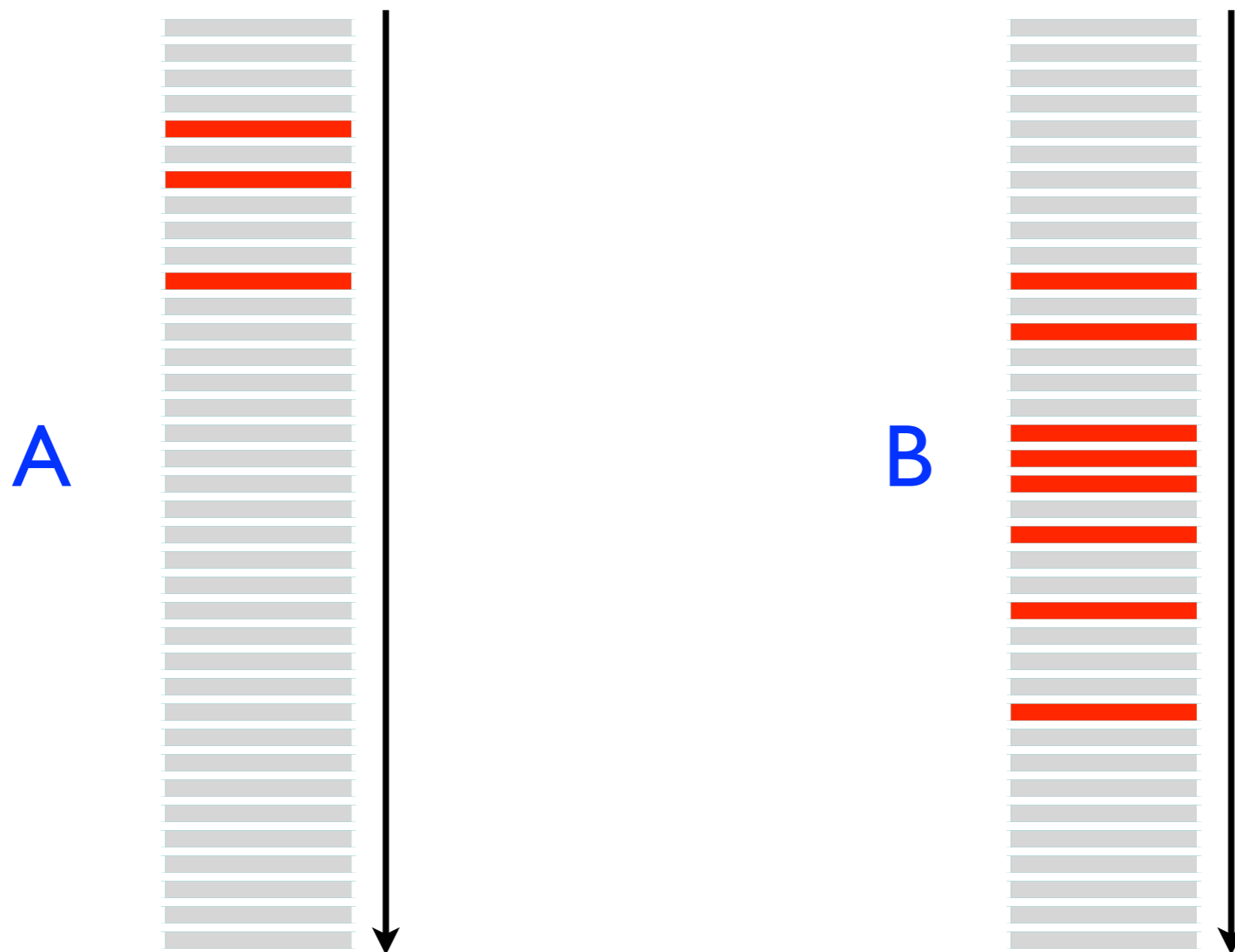


- precision at rank 10 (higher value is better)

# Batch Evaluation

## overview: metrics

- Which ranking is better?

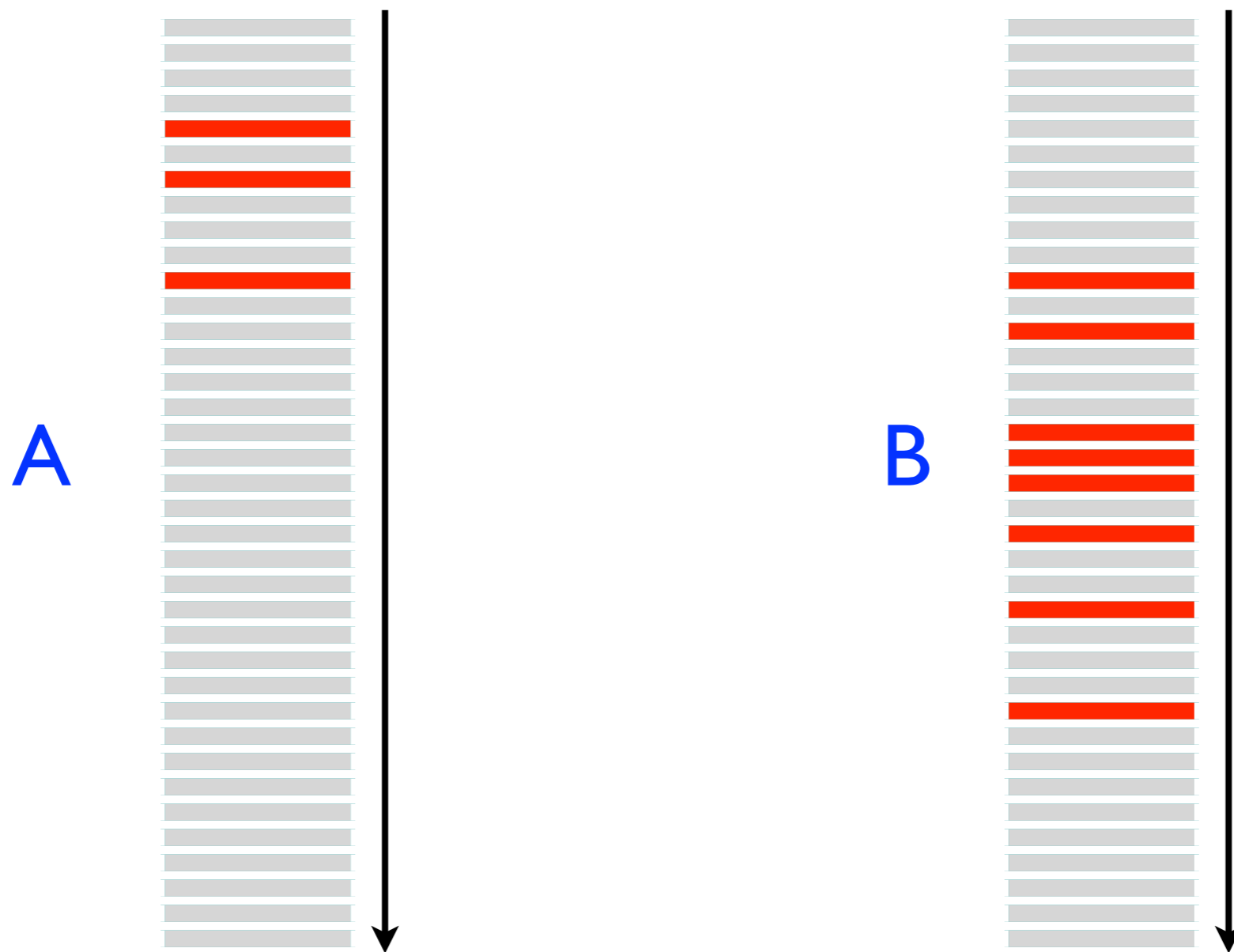


- precision at rank 1 (higher value is better)

# Batch Evaluation

## overview: metrics

- Which ranking is better?

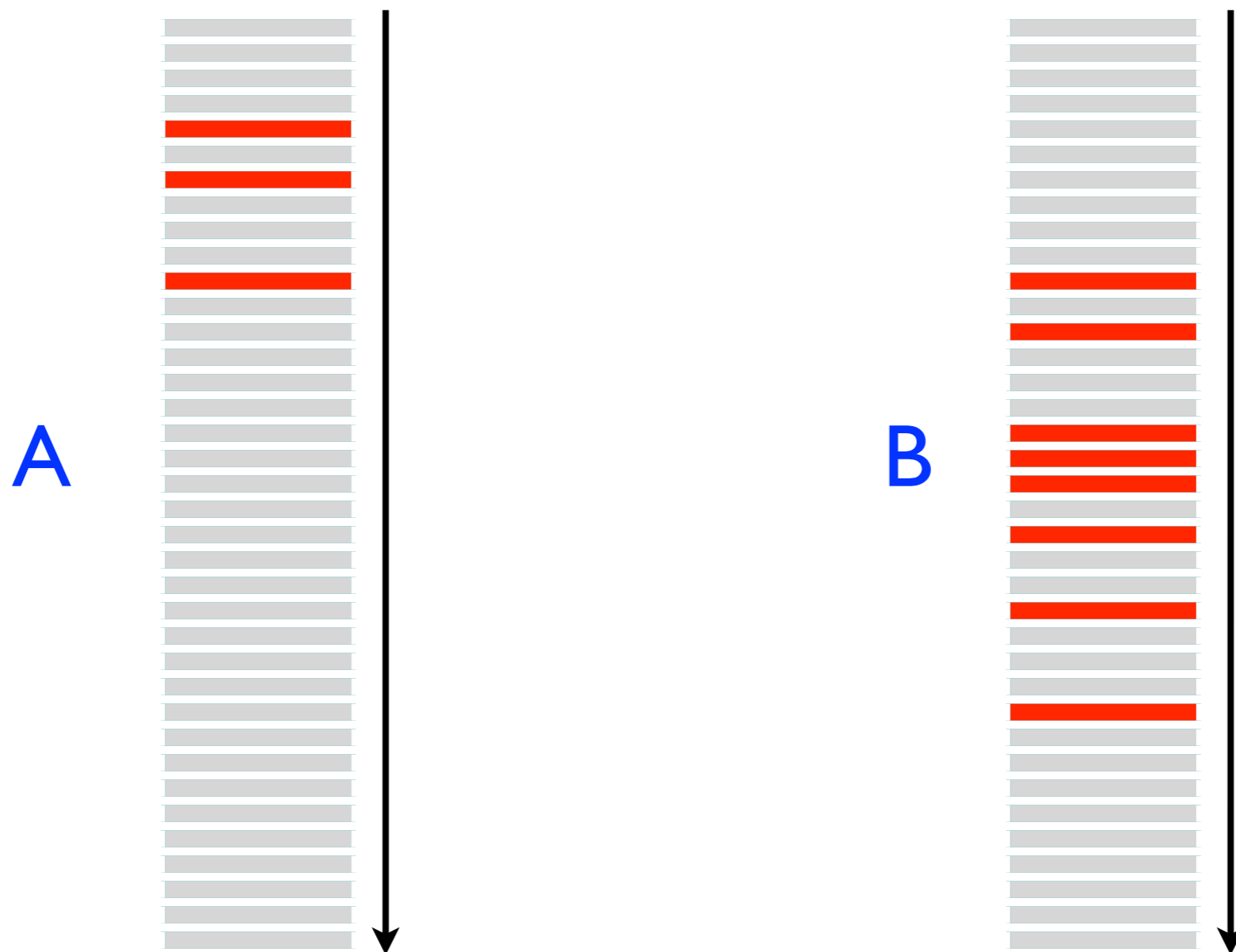


- recall at rank 10 (higher value is better)

# Batch Evaluation

## overview: metrics

- Which ranking is better?



- recall at rank 30 (higher value is better)

# Batch Evaluation

overview: trade-offs

- Advantages:
  - ▶ inexpensive (once the test collection is constructed)
  - ▶ the experimental condition is fixed; same queries, and same relevance judgements
  - ▶ evaluations are reproducible; keeps us “honest”
  - ▶ by experimenting on the same set of queries and judgements, we can better understand how system **A** is better than **B**

# Batch Evaluation

## overview: trade-offs

- Disadvantages:
  - ▶ high initial cost. human assessors (the ones who judge documents relevant/non-relevant) are expensive
  - ▶ human assessors are not the users; judgements are made “out of context”
  - ▶ assumes that relevance is the same, independent of the user and the user’s context



# Batch Evaluation

## overview: trade-offs

- Many factors affect whether a document satisfies a particular user's information need
- Topicality, novelty, freshness, authority, formatting, reading level, assumed level of expertise
- **Topical relevance:** the document is on the same topic as the query
- **User relevance:** everything else
- Which kind of relevance does batch-evaluation address?

# Batch Evaluation

## overview: trade-offs

- Many factors affect whether a document satisfies a particular user's information need
- Topicality, novelty, freshness, authority, formatting, reading level, assumed level of expertise
- **Topical relevance:** the document is on the same topic as the query
- **User relevance:** everything else
- Which kind of relevance does batch-evaluation address?
- Whether the document contains the sought-after information

# User-Study Evaluation

## overview

- Provide a small set of users with several retrieval systems
- Ask them to complete several (potentially different) search tasks
- Learn about system performance by:
  - ▶ observing what they do
  - ▶ asking about their actions and thought processes
  - ▶ measuring success (task completion, time, etc.)
  - ▶ measuring perceived success (questionnaire data)

# User-Study Evaluation

## overview: trade-offs

- Advantages:
  - ▶ very detailed data about users' reaction to systems
  - ▶ in reality, a search is done to accomplish a higher-level task
  - ▶ in user studies, this task can be manipulated and studied
  - ▶ in other words, the experimental 'starting-point' need not be the query

# User-Study Evaluation

## overview: trade-offs


- Disadvantages:
  - ▶ user studies are expensive (pay users/subjects, scientist's time, data coding)
  - ▶ difficult to generalize from small studies to broad populations
  - ▶ the laboratory setting is not the user's normal environment
  - ▶ need to re-run experiment every time a new system is considered

# On-line Evaluation

## overview

- Given a search service with an existing user population (e.g., Google, Yahoo!, Bing) ...
- Have  $x\%$  of query traffic use system **A** and  $y\%$  of query-traffic use system **B**
- Compare system effects on logged user interactions (**implicit feedback**)
  - **clicks**: surrogates for perceived relevance (good)
  - **skips**: surrogates for perceived non-relevance (bad)

# Implicit Feedback

implicit feedback in information retrieval  Advanced search

[PDF] [Implicit Feedback for Interactive Information Retrieval](#)

[research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf](http://research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf)

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by RW White - 2004 - Cited by 30 - Related articles

**Implicit Feedback** for Interactive. **Information Retrieval**. Ryen William White.

Department of Computing Science. Faculty of Computing Science, Mathematics and ...

click!

[PDF] [Context-Sensitive Information Retrieval Using Implicit Feedback](#)

[citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.61.987...](http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.61.987...)

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by X Shen - 2005 - Cited by 217 - Related articles

exploit **implicit feedback** information, including previous queries and clickthrough information, to improve retrieval accuracy in an in- teractive **information retrieval** ...

can we say that the first result is more relevant than the second?

[Context-Sensitive Information Retrieval Using Implicit Feedback](#)

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[Relevance feedback - Wikipedia, the free encyclopedia](#)

[en.wikipedia.org/wiki/Relevance\\_feedback](http://en.wikipedia.org/wiki/Relevance_feedback)

Relevance feedback is a feature of some **information retrieval** systems. The idea ... 1


Explicit feedback; 2 **Implicit feedback**; 3 Blind feedback; 4 Using relevance ...

[A Search Engine that Learn from Implicit Feedback](#)

[striver.joachims.org/](http://striver.joachims.org/)

OSMOT - Learning **Retrieval** Functions from **Implicit Feedback**. ... Such observable behavior gives weak and noisy feedback **information** about which links the ...

# Implicit Feedback

implicit feedback in information retrieval  Advanced search

## [Implicit Feedback - Under the Reading Lamp](#)

[bcao.wikidot.com/implicit-feedback](http://bcao.wikidot.com/implicit-feedback)

Xuehua Shen, Bin Tan, and ChengXiang Zhai, "Context-sensitive **information retrieval** using **implicit feedback**," in Proceedings of the 28th annual ...

skip!

## [PDF] [Implicit Feedback for Interactive Information Retrieval](#)

[research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf](http://research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf)

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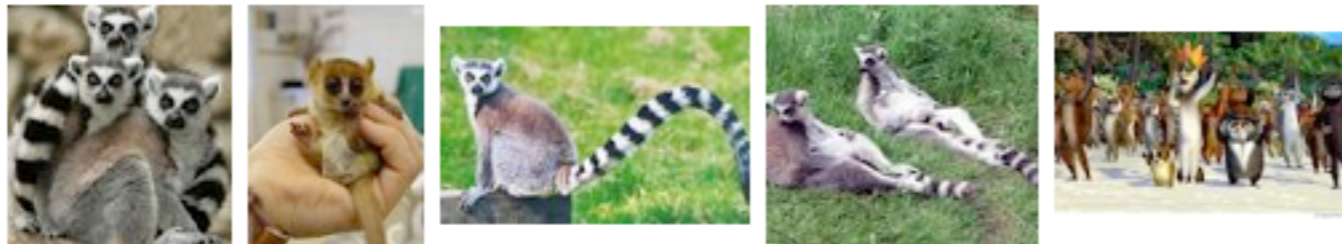
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# Implicit Feedback

implicit feedback in information retrieval

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[research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf](http://research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf)

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a click is a noisy surrogate for relevance!

# Implicit Feedback

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[research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf](http://research.microsoft.com/en-us/um/people/ryenw/papers/thesis.pdf)  
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Explicit feedback; 2 **Implicit feedback**; 3 Blind feedback; 4 Using relevance ...

user sees the results and closes the browser

# Implicit Feedback

capital of honduras  Advanced search

► [Tegucigalpa Honduras](#) [maps.google.com](#)



[Tegucigalpa - Wikipedia, the free encyclopedia](#)

[en.wikipedia.org/wiki/Tegucigalpa](#)

As **capital of Honduras**, as department head and as a municipality, the Central District seats ... For all practical purposes the **capital of Honduras** is Tegucigalpa. ...

[Etymology](#) - [History](#) - [Geography](#) - [Cityscape](#)

[Honduras - Wikipedia, the free encyclopedia](#)

[en.wikipedia.org/wiki/Honduras](#)

Comayagua was the **capital of Honduras** until 1880, when it was transferred to ...

[Geography of Honduras](#) - [List of cities in Honduras](#) - [Economy of Honduras](#) - [Colón](#)

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[Honduras Facts and Figures, Honduras History, Political, Banking ...](#)

[www.ca-bc.com/zip\\_internacional/about\\_honduras.html](#)

Tegucigalpa, the **capital of Honduras**, got its tongue twisting name from the ancient Nahuatl language, and translated means "silver mountain" In effect, ...

[What is the capital city of Honduras](#)

[wiki.answers.com](#) > ... > [Countries States and Cities](#) > [Honduras](#)

What is the name of the **capital** city of **Honduras**? Tegucigalpa. What is the **capital** city ... **Honduras capital** city is Tegucigalpa. What city is the Italian **capital** city? ...

the absence of a  
click is a noisy  
surrogate for non-  
relevance

# On-Line Evaluation

## overview: trade-offs

- Advantages:
  - ▶ system usage is naturalistic; users are situated in their natural context and often don't know that a test is being conducted
  - ▶ evaluation can include lots of users

# On-Line Evaluation

## overview: trade-offs

- Disadvantages:
  - ▶ requires a service with lots of users (enough of them to potential hurt performance for some)
  - ▶ this is often referred to as the “cold-start problem”
  - ▶ requires a good understanding on how different implicit feedback signals correlate with positive and negative user experiences
  - ▶ experiments are difficult to repeat

# Information Retrieval Evaluation

- Evaluation is a fundamental issue of information retrieval
  - ▶ an area of IR research in its own right
- Evaluation methods:
  - ▶ batch evaluation
  - ▶ user-study evaluation
  - ▶ online evaluation
- Each method has advantages and disadvantages