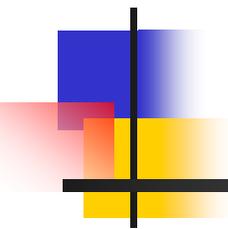
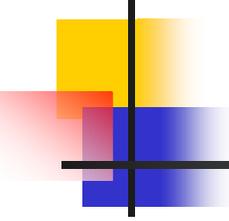


# Using Annotations in Enterprise Search



Pavel Dmitriev, Nadav Eiron, Marcus Fontoura, Eugene Shekita  
*Cornell Univ. \*      Google Inc. \*      Yahoo! Inc. \*      IBM Almaden  
Research Center*

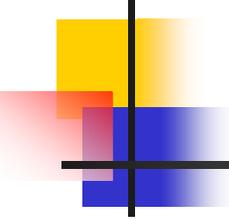
Presented by Pavel Dmitriev



# Enterprise Search

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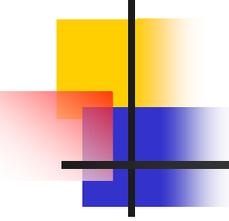
- Enterprise Search is search over the data in the company's corporate intranet
  - Intranets can be quite large (millions of pages)
- Recent research shows that employees spend a large percentage of their time searching for information
  - Improvement in quality of enterprise search directly results in increased employee productivity



# Problems in Enterprise Search

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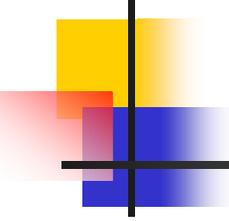
- Users cannot freely create web pages in intranets
  - Algorithms based on link structure analysis do not apply directly
  - The amount of anchor text is limited
  - Anchor text is of “lower quality”
- Lack of good anchor text is one of the major factors affecting search quality



# Good News

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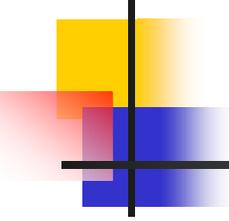
- No spam in intranets
- Users are willing to cooperate with the search engine



# Good News

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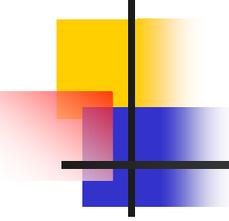
- No spam in intranets
- Users are willing to cooperate with the search engine
- → *Use user feedback!*



# Our Solution

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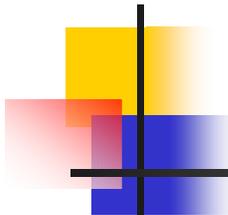
- Use user feedback to make up for the lack of anchor text in intranets
- Focus on a specific form of feedback: “user annotations”



# Outline

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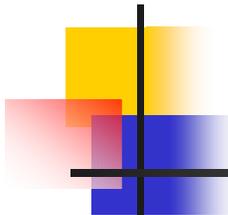
- Introduction to Annotations
- Collecting Annotations
  - Explicitly
  - Implicitly
- Integrating Annotations into Search Engine
- Experimental Results
- Conclusion & Future Work



# Introduction to Annotations

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- An *annotation* is a short description of the contents of a web page
- Intranet users cannot create anchor text → let them create annotations, and use annotations as substitutes for anchor text
- Explicit Annotations: let users enter short descriptions of the pages they see
- Implicit Annotations: derive annotations automatically from users' behavior



# Environment

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- Implemented our ideas in the context of IBM Intranet (5.8 million pages, 1.8 million visits per day on average)
- Used Trevi – an experimental search engine for IBM Intranet

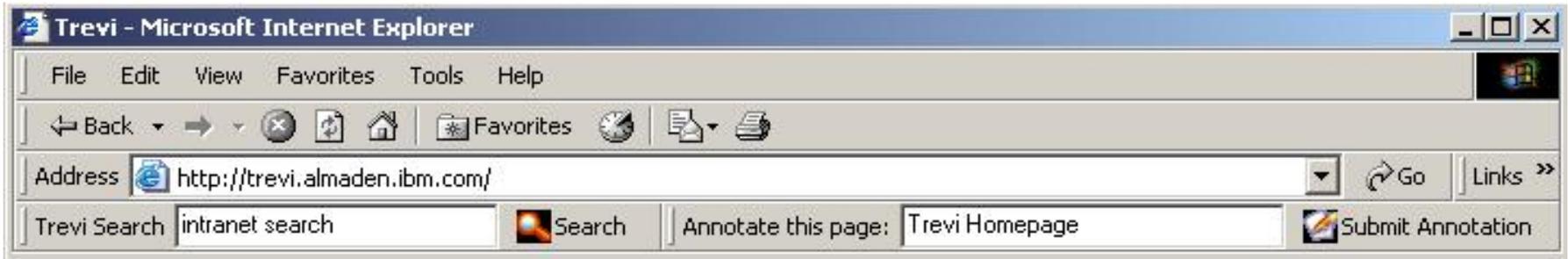


*Trevi is an experimental search engine for IBM's intranet. Please use Trevi and send us your [comments](mailto:nadav@us.ibm.com) (nadav@us.ibm.com). Your feedback can help us improve its search quality. Be warned that some of Trevi's features are still in the experimental stage, so they may disappear without notice or perform erratically. Your feedback can help us improve its search quality. More about [Trevi...](#)*

- [Advanced Search](#)
- [Help](#)
- [Search in German](#)

# Explicit Annotations: Trevi Toolbar

- Users can enter annotations using Trevi Toolbar:



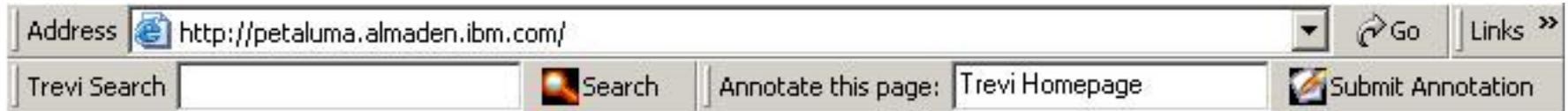
Trevi Search Bar

Trevi Annotation Bar

- Trevi Search Bar lets users enter queries to Trevi
- Trevi Annotation Bar lets users enter annotations for the pages they visit

# Benefits to the User

- Users directly benefit in two ways
  - They see their annotations in the toolbar while browsing:



- They see their annotations in the search results:

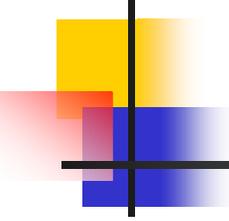
[Trevi](#)

**Your annotation: Trevi Homepage**

TREVI Trevi is an experimental **search** engine for IBM 's **intranet**. ...Advanced **Search**. Help **Search** in German. TREVI **search Searching** 7,404,416 IBM web pages. ...10/04/03 Rate your **search** results to further enhance Trevi 's **search** quality.

...

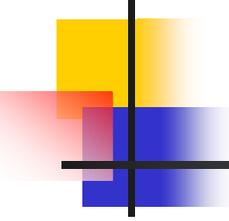
[petaluma.almaden.ibm.com/](http://petaluma.almaden.ibm.com/)



# Implicit Annotations

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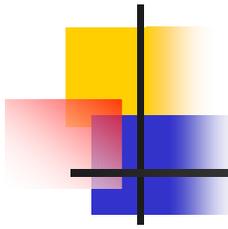
- Idea: use the queries users submit to the search engine as annotations
  - Extract which search results users click on from Trevi log, and use this information to determine which pages are relevant to the query
  - Attach annotations to these pages



# Implicit Annotations

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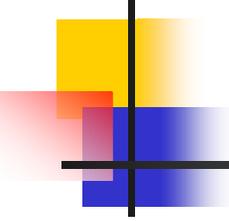
- Idea: use the queries users submit to the search engine as annotations
  - Extract which search results users click on from Trevi log, and use this information to determine which pages are relevant to the query
  - Attach annotations to these pages
- Question: which pages to consider relevant?
  - Strategy 1: Every clicked page is relevant



# Implicit Annotations (cont.)

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- Session – time-ordered sequence of clicks on search results the user makes for a given query
  - Strategy 2: Attach annotation only to the last clicked page in the session
- Query chain – time ordered sequence of queries, executed by the user over a short period of time
  - Annotation = concatenation of all queries from the query chain
  - Strategy 3: Attach annotation to every clicked page
  - Strategy 4: Attach annotation only to the last click in the last session in the query chain

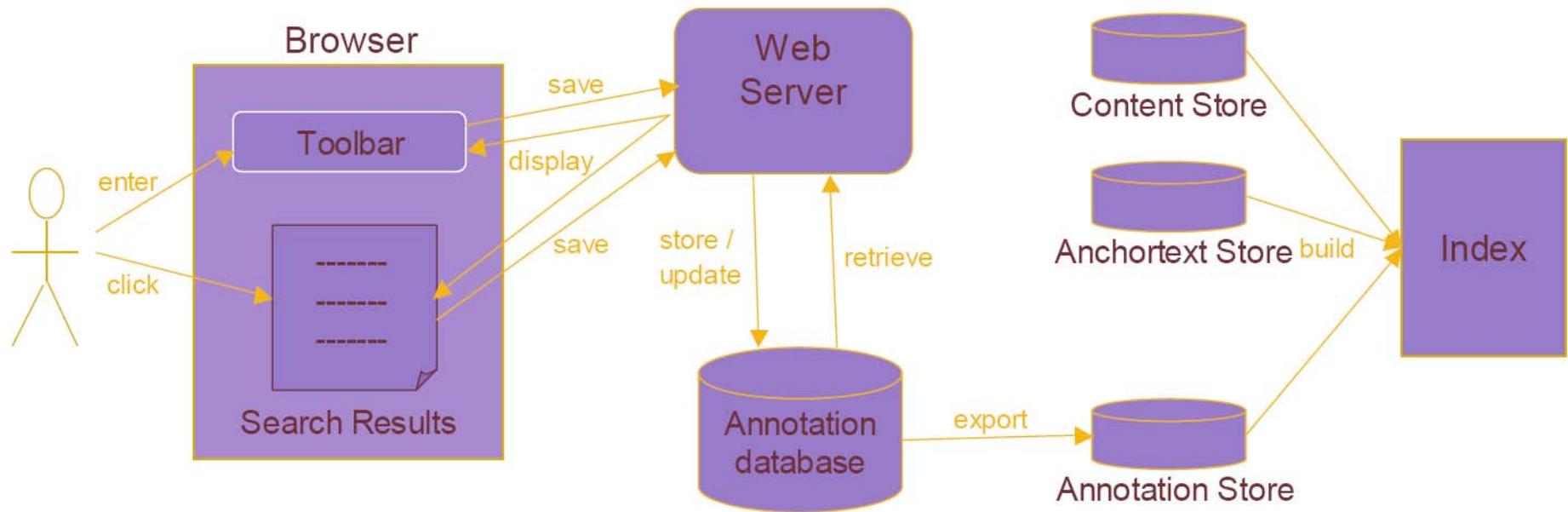


# Outline

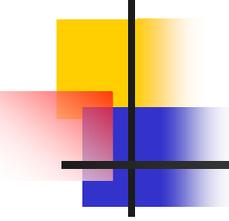
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- Introduction to Annotations
- Collecting Annotations
  - Explicitly
  - Implicitly
- **Integrating Annotations into Search Engine**
- Experimental Results
- Conclusion & Future Work

# Integrating Annotations into Trevi



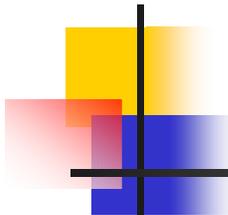
Flow of annotations through the system



# Experiments

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- Conducted experiments on IBM intranet using Trevi
- Explicit annotations: 158 annotations for 67 pages, 14 in the index
- Implicit annotations: ~12500 for the 1<sup>st</sup> and 3<sup>rd</sup> strategies, ~8500 for the 2<sup>nd</sup> strategy, ~4000 for the 4<sup>th</sup> strategy

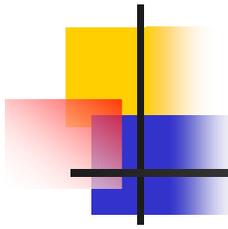


# Types of Annotations

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- Three common types:
  - Concise descriptions
  - Abbreviations
  - Opinions

<b>Annotation</b>	<b>Annotated Page</b>
change IBM passwords	Page about changing various passwords in IBM intranet
stockholder account access	Login page for IBM stock holders
download page for Cloudscape and Derby	Page with a link to Derby download
ESPP home	Details on Employee Stock Purchase Plan
EAMT home	Enterprise Asset Management homepage
PMR site	Problem Management Record homepage
coolest page ever	Homepage of an IBM employee
most hard-working intern	an intern's personal information page
good mentor	an employee's personal information page

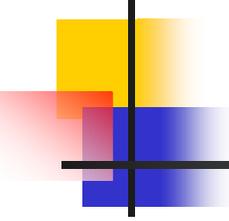


# Impact on Search Quality

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- Generated test set from explicit annotations
  - Queries = annotations
  - Correct answers = annotated pages
- Measured “Precision at 10”, using search results without annotations as a baseline

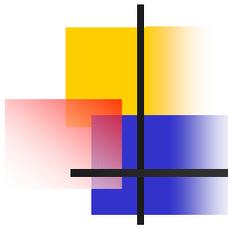
Baseline	EA	IA 1	IA 2	IA 3	IA 4
8.9%	13.9%	8.9%	8.9%	9.5%	9.5%



# Conclusion

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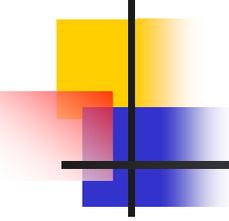
- Described an architecture for collecting annotation and adding them to search indexes
- Presented algorithms for generating implicit annotations from query logs
- Showed preliminary experimental results, suggesting that annotations have potential to improve search quality



# Future Work

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- More accurate extraction of query chains
- Ranking with annotations
- Detecting irrelevant annotations
- Managing annotations over time
- Other ways of collecting user feedback



Thank you!

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