# Course Info

## Pre-requisites

- Data structures and algorithms
- Probability and Statistics
- Basics of Machine Learning
- Basics of Natural Language Processing
- Basics of Graph algorithms
- Programming in Python

# Books and Materials

*Text book:*

- Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze. *Introduction to Information Retrieval*, Cambridge university press.
- Available online: `https://nlp.stanford.edu/IR-book/information-retrieval-book.html`

*Other materials:*

- Lecture Slides
- Additional Readings to be given as necessary

# *Course Evaluation Plan: Tentative*

- Mid-Sem : 20%
- End-Sem : 50%
- Term Project / Assignments (Programming-based): 30%

# What is Information Retrieval?

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**What is a document?**

web pages, emails, books, news stories, scholarly papers, text messages, Powerpoint, PDF, forum postings, patents, tweets, question answer postings, etc.

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- Database records (or tuples in relational databases) are typically made up of well-defined fields (or attributes),
  - e.g., bank records with account numbers, balances, names, addresses, social security numbers, dates of birth, etc.
- Easy to compare fields with well-defined semantics to queries in order to find matches

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## *Example search engine query*

- *bank scandals in 2019 in India*
- This text must be compared to the text of entire news stories

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**_What is the "killer" app?_**

Searching for the pages on WWW

# *IR over text and other modes of data*

- IR does not necessarily deal with text data
- Both the documents and the query can be in other modes as well, e.g., similar image search
- In this course, we will consider only textual IR

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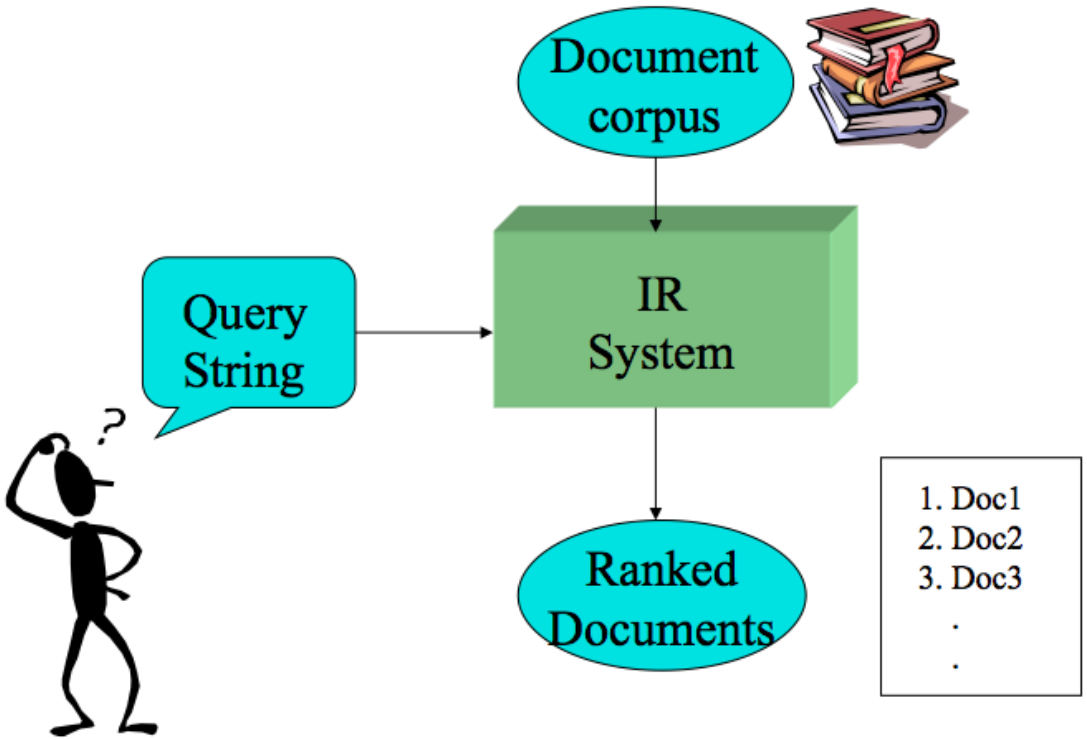
*Find:*

- A ranked set of documents that are relevant to the query.

# IR System




*The system should be able to retrieve the relevant docs efficiently*

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- Being on the proper subject.
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- Being authoritative (from a trusted source).
- Satisfying the goals of the user and his/her intended use of the information (information need).

# *Simplest notion of Relevance from Retrieval Models' Perspective*

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## *Keyword Search*

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## *Keyword Search*

- Simplest notion of relevance is that the query string appears verbatim in the document.
- Slightly less strict notion is that (most of) the words in the query appear frequently in the document, in any order (*bag of words*).

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- 'Java' (programming language vs. Island)

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## *Top Conferences in the field*

- SIGIR
- WWW
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## *Other Venues*

- ECIR
- ACM Transactions on Information Systems
- Information Retrieval (Springer), Information Processing & Management (Elsevier), etc.

# *Active Areas of Research*

*Compiled based on some recent papers at SIGIR and related conferences, just indicative, not exhaustive*

# What to retrieve

- *Leveraging User Reviews to Improve Accuracy for Mobile App Retrieval*. SIGIR 2015.
- *Multi-Stage Math Formula Search: Using Appearance-Based Similarity Metrics at Scale.* SIGIR 2016.
- *On Application of Learning to Rank for E-Commerce Search*. SIGIR 2017.
- *Understanding and Modeling Success in Email Search.* SIGIR 2017.
- *ANNE: Improving Source Code Search using Entity Retrieval Approach.* WSDM 2017.
- *Exploiting Food Choice Biases for Healthier Recipe Recommendation.* SIGIR 2017.
- *Toward an Interactive Patent Retrieval Framework based on Distributed Representations.* SIGIR 2018.
- *A Test Collection for Evaluating Legal Case Law Search.* SIGIR 2018.
- *Cross-Modal Interaction Networks for Query-Based Moment Retrieval in Videos.* SIGIR 2019.

# *Personalization, Privacy, Social, Bias, Fairness, etc.*

- *Predicting Which Topics You Will Join in the Future on Social Media*. SIGIR 2017.
- *Why People Search for Images using Web Search Engines*. WSDM 2018.
- *The Utility and Privacy Effects of a Click*. SIGIR 2017.
- *How Do Biased Search Result Rankings Affect User Attitudes on Debated Topics?*. SIGIR 2021.
- *When Fair Ranking Meets Uncertain Inference*. SIGIR 2021.

# What do we cover in this course

## IR Basics

- Boolean retrieval
- Term vocabulary & postings lists
- Scoring, term weighting & the vector space model
- Dictionaries and tolerant retrieval
- Index construction and compression
- Evaluation in information retrieval
- Relevance feedback & query expansion
- Probabilistic information retrieval
- Language models for information retrieval

# Course Contents

## *Web Search, Applications, Recent Advances*

- Web crawling and Link analysis (HITS, PageRank)
- Summarization
- Domain-specific IR - case studies
- Fairness and Bias in IR