

Modern Information Retrieval

Introduction

Hamid Beigy

Sharif University of Technology

November 13, 2025





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Course Information

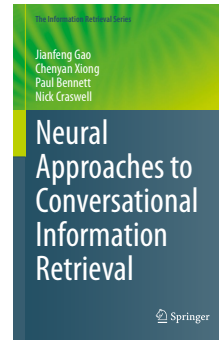
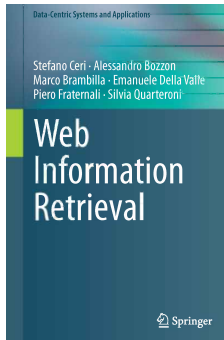
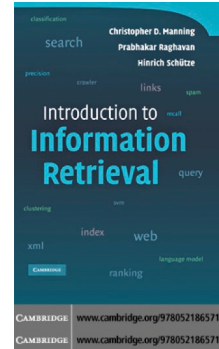
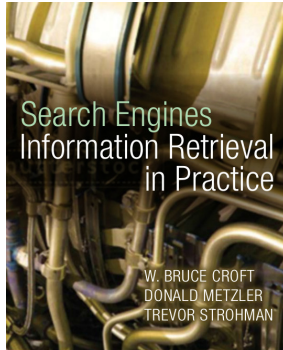


1. Course name : **Modern Information Retrieval**
2. Instructor : Hamid Beigy Email : beigy@sharif.edu
3. Class : **CE 201**
4. Virtual class link: <https://vc.sharif.edu/beigy>
5. Course Website: <http://sharif.edu/~beigy/14032-40324.html>
6. Lectures: **Sat-Mon (9:00-10:30)**
7. Teaching Assistant : Reza Tavakoli Email: seyedreza.shiyade@gmail.com



- Evaluation:

Mid-term exam	25%	1404-09-22
Final exam	30%	
Practical Assignments	35%	
Quiz	15%	



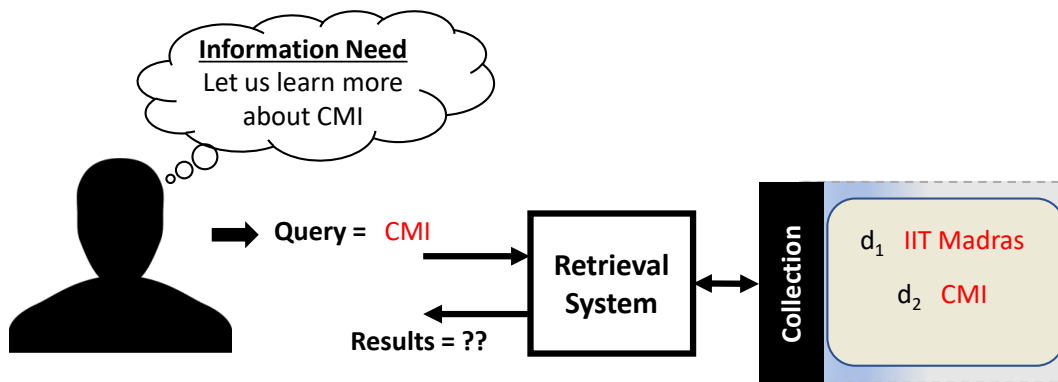


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Introduction



Hamid Beigy (Sharif University of Technology)



Definition (Information retrieval)

Information retrieval (IR) is **finding material** (usually documents) of an **unstructured** nature (usually text) that satisfies an **information need** from within **large collections** (usually stored on computers).



1. If you know
 - Which stock to invest in?
 - Which faculty to work with?
 - How to get into a top college?
 - Which course to register for?
 - What to study?
 - How to prepare for job interviews?
2. **If only you had the information, you could rule this world.**
3. **What happens when you lose access to all your information?**

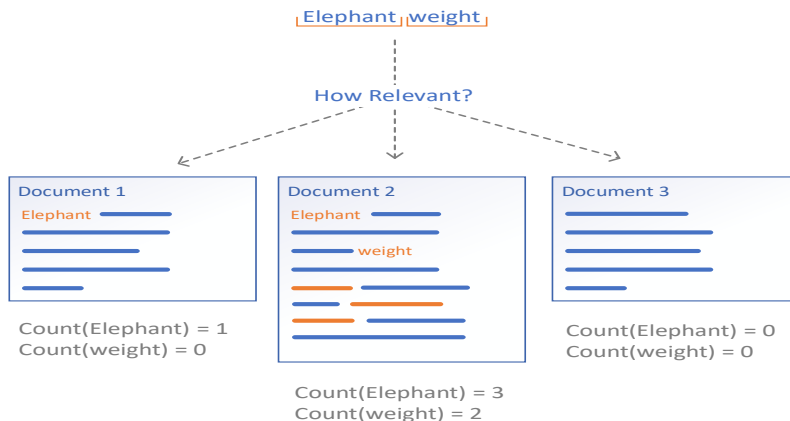


1. **Document Collection:** units we have built an IR system over such as
 - memos
 - book chapters paragraphs
 - scenes of a movie
 - turns in a conversation...
2. Some applications
 - E-mail search
 - Searching your laptop
 - Corporate knowledge bases
 - Legal information retrieval
3. An **information need** is the topic about which the user desires to know more about.
4. A **query** is what the user conveys to the computer in an attempt to communicate the information need.

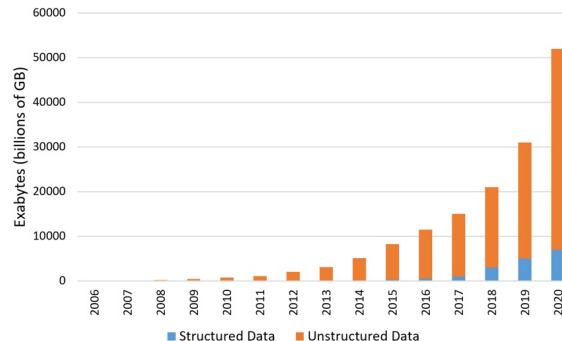


1. A document is **relevant** if the user perceives that it contains information of value with respect to their personal information need.
2. Are the retrieved documents
 - about the target subject ?
 - up-to-date?
 - from a trusted source?
 - satisfying the user's needs?
3. How should we rank documents in terms of these factors?

1. The **effectiveness** of an IR system is determined by two key statistics:
 - **Precision**: What fraction of returned results are relevant to information need?
 - **Recall**: What fraction of relevant documents in collection were returned by system?
 - What is the best balance between the two?
 - Easy to get **perfect recall**: just retrieve everything
 - Easy to get **good precision**: retrieve only the most relevant



1. **Unstructured data**: a formal, semantically overt, easy-for-computer structure is missing.

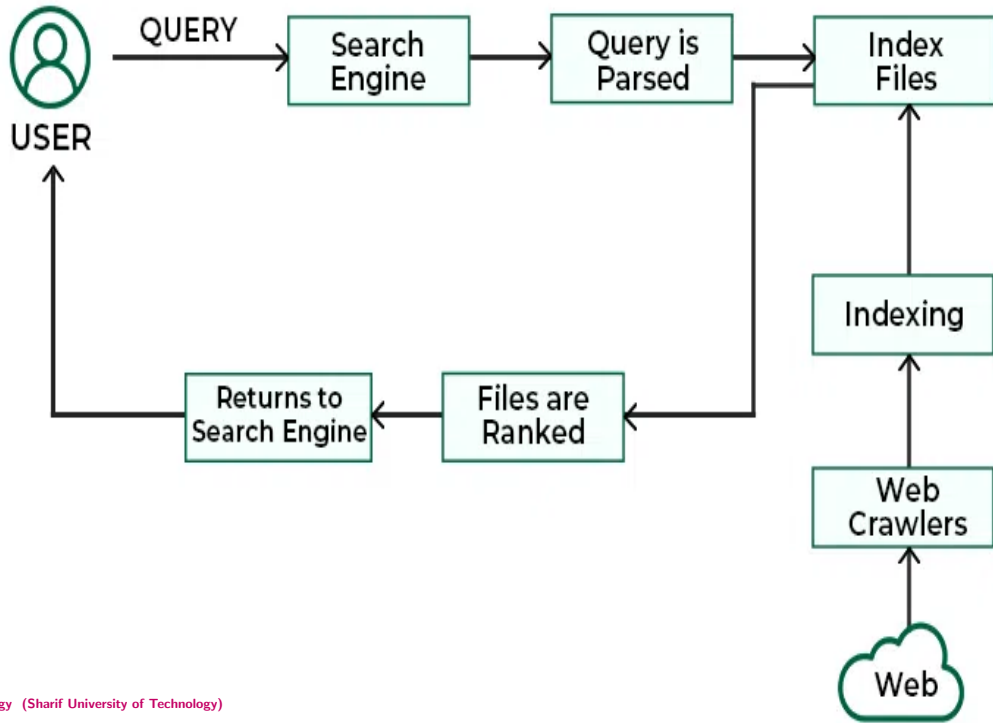


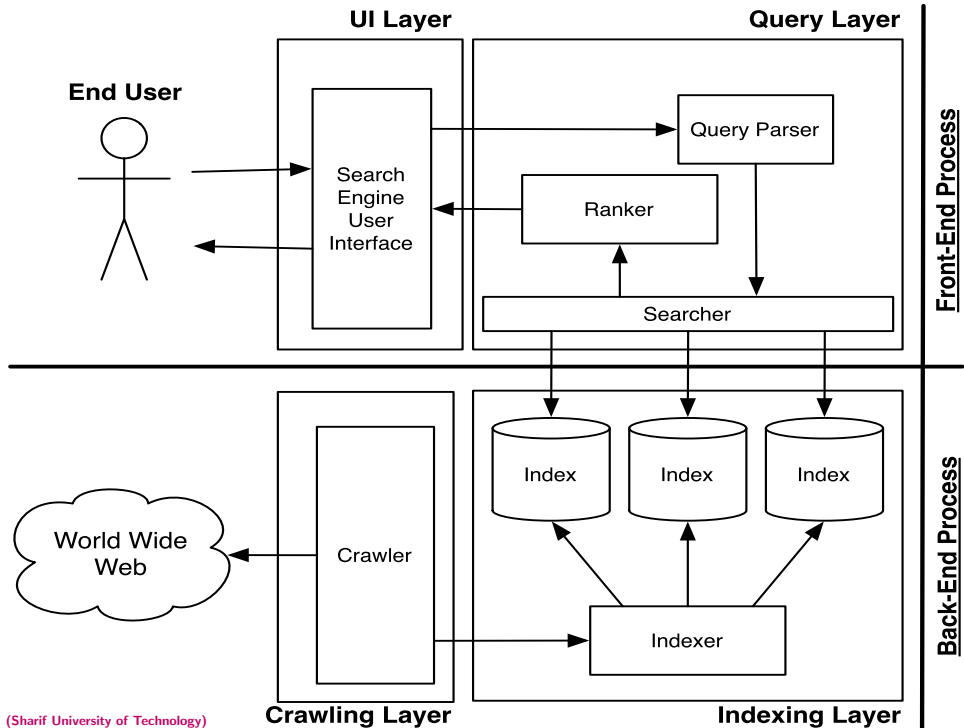
2. **Structured data** used in DB style searching,

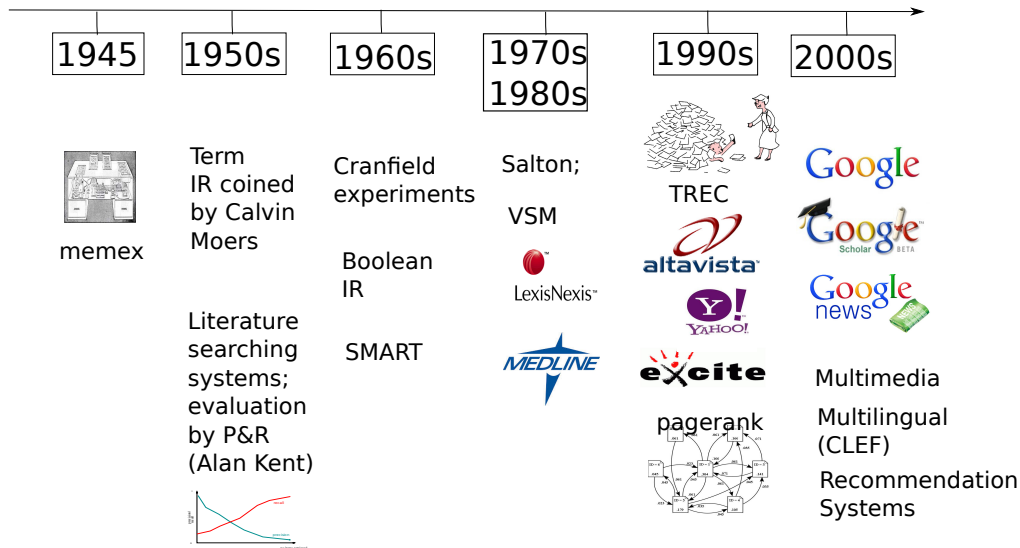
```
SELECT * FROM CATALOGUE WHERE CATEGORY = "FLORIST" AND ZIP = "CB1"
```

3. This does not mean that there is no structure in the data

- Document structure (headings, paragraphs, lists. . .)
- Explicit markup formatting (e.g. in HTML, XML. . .)
- Linguistic structure (latent, hidden)







google.com/search?q=+How+AI+features+work+in+google+Search+engine%3F&sca_esv=c8099ca82f4112b0&sxsrf=AE3TifO72wLYaX...    



?How AI features work in google Search engine



ابزار ▾ بیشتر ▾ وب کتاب‌ها اخبار ویدیوهای کوتاه تصاویر وینوها همه

How AI features work in Search. As with Search overall, the AI features AI Overviews and AI Mode surface relevant links to help people find the information they're looking for quickly and reliably, as well as to help them explore content they may not have discovered before.

Google for Developers

Documentation < ... < <https://developers.google.com>



AI Features and Your Website | Google Search Central

بازخورد  درباره گزیده‌های ویژه • 

The Keyword

google... < search < <https://blog.google>



AI in Search: Going beyond information to intelligence

AI Mode is our most powerful AI search, with more advanced reasoning and — اردیبهشت ۱۴۰۴ — multimodality, and the ability to go deeper through follow-up questions and helpful ...

Google AI

ترجمه این صفحه < <https://ai.google>



google.com/search?q=How+can+i+backup+from+my+iphone%3F&sca_esv=c8099ca82f4112b0&sxsrf=AE3TifMFn1SjCp6GIGR9DzHGe...    |  



?How can I backup from my Iphone



همه ویدئوها تصاویر ویدیوهای کوتاه اخبار وب کتابها بیشتر ابزار ▾

Back up iPhone using iCloud

1. Go to the Settings app on your iPhone.
2. Tap [your name], tap iCloud, then tap iCloud Backup.
3. iCloud automatically backs up your iPhone daily when iPhone is Turn on Back Up This iPhone. ... connected to power, locked, and connected to Wi-Fi.
4. To perform a manual backup, tap Back Up Now.

Apple Support



ios < iphone < guide < <https://support.apple.com>

Back up iPhone - Apple Support

بازخورد  • درباره گزیده‌های ویژه 

Apple Support



en-us < <https://support.apple.com> • [ترجمه این صفحه](#)

Backup methods for iPhone or iPad

You can back up your device using iCloud and also using your computer. Learn how — ۷ اسفند ۱۴۰۳
to back up your device or restore your device from a backup.

How AI features work in google Search engine?

 Perplexity  Sources · 20  Steps



Google

Generative AI in Search: Let Google do the searching f...



Google

AI in Search: Going beyond information to intelligence



Google

The latest AI news we announced in September



support.google.com

Find information in faster & easier ways with AI...

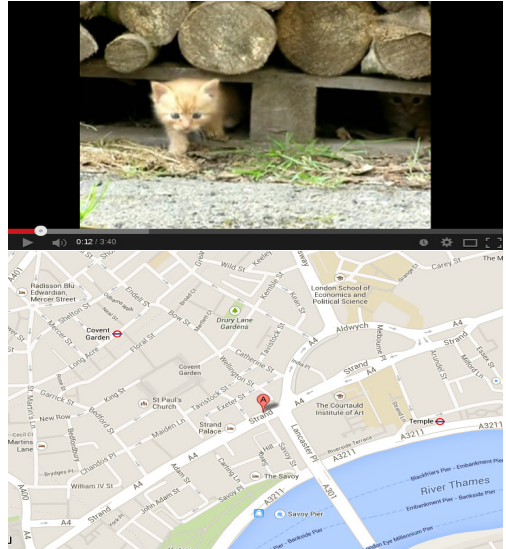
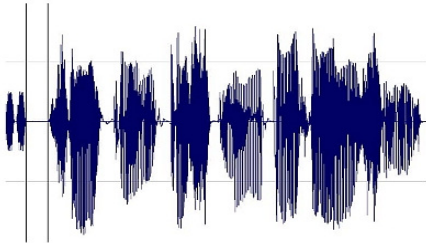
Google Search now uses advanced AI features to deliver more helpful, conversational, and visually rich results. The most prominent of these include AI Overviews, AI Mode, Gemini-powered reasoning, and live multimodal search, reimagining how people find and interact with information online. [blog +2](#)

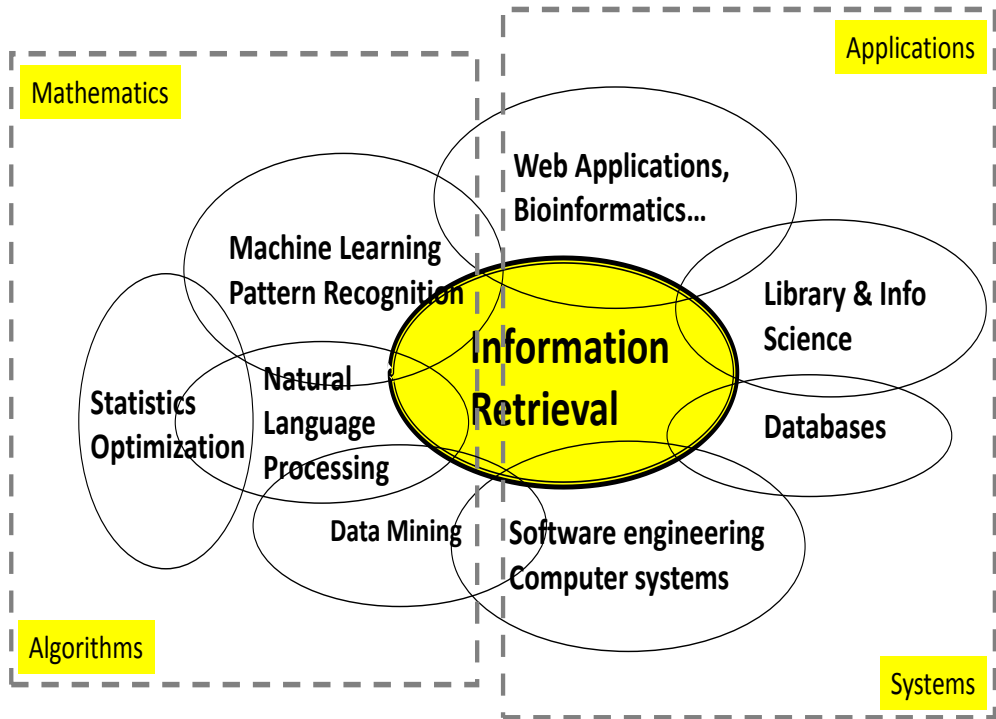
AI Overviews and Summaries

Google's AI Overviews provide a concise, generative AI snapshot of key information about a topic or question directly at the top of search results. These overviews synthesize data from multiple web sources, highlighting main points and offering links to dive deeper, especially for complex or exploratory questions. The goal is to let users quickly grasp the essentials, and then explore

Ask a follow-up...







Course overview



1. Introduction
2. Information retrieval
 - Text processing
 - Ranking with indexes
 - Queries and interfaces
 - Retrieval models
 - Evaluation of IR systems
 - Machine Learning in IR (classification, clustering, and learning to rank)
3. Web search engines
 - Architecture of search engines
 - Crawlers
 - Link analysis
4. AI-powered search engines
 - Neural information retrieval
 - AI in search engines



Information retrieval

1. Text processing
2. Ranking with indexes
3. Queries and interfaces
4. Retrieval models
5. Evaluation of IR systems
6. Machine Learning in IR
 - Classification
 - Clustering
 - Ranking
 - Dimensionality reduction

Web search engines

1. Architecture of search engines
2. Crawlers
3. Link analysis

AI-powered search engines

1. Neural information retrieval
2. AI in search engines

Applications

1. Recommender systems
2. Personalized IR
3. Sentiment Analysis
4. Corss-lingual IR
5. QA systems

References



1. Chapter 1 of [Information Retrieval](#)¹
2. Chapter 1 of [Search Engines - Information Retrieval in Practice](#).²

¹Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze (2008). *Introduction to Information Retrieval*. New York, NY, USA: Cambridge University Press.

²W. Bruce Croft, Donald Metzler, and Trevor Strohman (2009). *Search Engines - Information Retrieval in Practice*. Pearson Education.

Questions?