CS4051- Information Retrieval

Introduction

Waqas Ali

13th February 2022

Table of Contents

1 **Introduction**
- Why this course
- Information Retrieval: Challenges
- What is Information Retrieval
- The classic Search Model
- Evaluation

Why this course?

- Managing Data is one of the primary uses of computers

Why this course?

- Managing Data is one of the primary uses of computers
- Most of the data is not contained in structured databases
    - Therefore, no structured queries

Why this course?

- Managing Data is one of the primary uses of computers
- Most of the data is not contained in structured databases
  - Therefore, no structured queries
- How do we retrieve the required information?

Why this course?

- Managing Data is one of the primary uses of computers
- Most of the data is not contained in structured databases
  - Therefore, no structured queries
- How do we retrieve the required information?

Information Retrieval

Information Retrieval: Challenges

- Data is unstructured
  - Need to guess what is relevant

Information Retrieval: Challenges

- Data is unstructured
  - Need to guess what is relevant
- Query is unstructured
  - Need to guess user intent

Information Retrieval: Challenges

- Data is unstructured
  - Need to guess what is relevant
- Query is unstructured
  - Need to guess user intent
- Computers cannot guess

Inferring relevance and intent from data, query is the science of Information Retrieval

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).

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).
    - These days we frequently think first of web search, but there are many other cases:
        - E-mail Search
        - Searching your computer
        - Corporate knowledge bases
        - Legal information retrieval

Basic assumptions of Information Retrieval

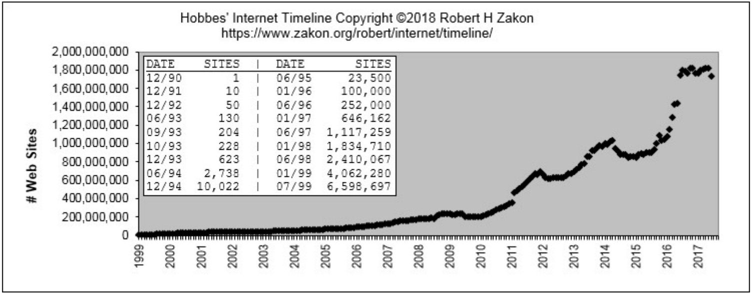
- **Collection:** A set of documents
    - Assume it is a static collection for the moment

Basic assumptions of Information Retrieval

- **Collection:** A set of documents
  - Assume it is a static collection for the moment

- **Goal:** Retrieve documents with information that is relevant to the user's information need and helps the user complete a task.

The growth of WWW



Hobbes' Internet Timeline Copyright ©2018 Robert H Zakon
https://www.zakon.org/robert/internet/timeline/

DATE	SITES	DATE	SITES
12/90	1	06/95	23,500
12/91	10	01/96	100,000
12/92	50	06/96	252,000
06/93	130	01/97	646,162
09/93	204	06/97	1,117,259
10/93	228	01/98	1,834,710
12/93	623	06/98	2,410,067
06/94	2,738	01/99	4,062,280
12/94	10,022	07/99	6,598,697

IR vs RDBMS

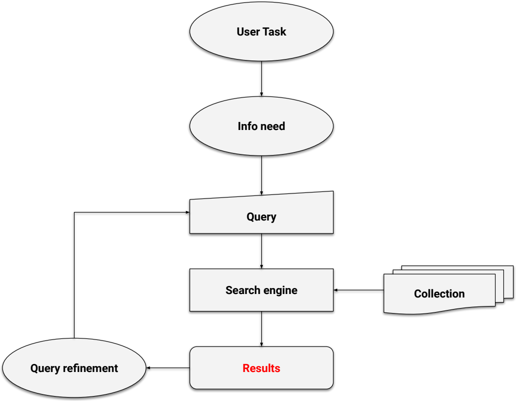
- Relational Database Management Systems (RDBMS)
  - Semantics of each object are well defined
  - Complex query languages (e.g., SQL)
  - Exact retrieval for what you ask
  - Emphasis on efficiency

IR vs RDBMS

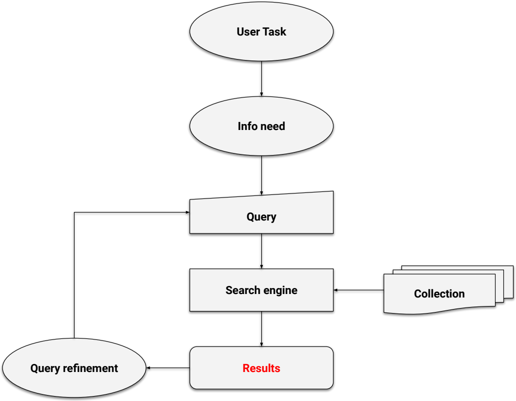
- Relational Database Management Systems (RDBMS)
  - Semantics of each object are well defined
  - Complex query languages (e.g., SQL)
  - Exact retrieval for what you ask
  - Emphasis on efficiency

- Information Retrieval (IR)
  - Semantics of object are subjective, not well defined
  - Usually simple query languages (e.g., natural language query)
  - You should get what you want, even the query is bad
  - Effectiveness is primary issue, although efficiency is important

The classic search model



The classic search model



User Task

Info need

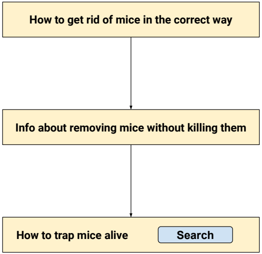
Query

Search engine

Collection

Results

Query refinement



How to get rid of mice in the correct way

Info about removing mice without killing them

How to trap mice alive

Core Concepts of IR

- Query Representation
  - Bridge lexical gap: system and systems; create and creating (stemmer)
  - Bridge semantic gap: car and automobile (feedback)
- Document Representation
  - Internal representation of document contents: a list of documents that contain specific word (inverted document list)
  - Representation of document structure: different fields (e.g., title, body)
- Retrieval Model
  - Algorithms that best match meaning of user query and available documents. (e.g., vector space model and statistical language modeling)

How good are the retrieved documents?

- **Precision:** Fraction of the retrieved documents that are relevant to the user's information need
- **Recall:** Fraction of relevant documents in collection that are retrieved
    - More precise definitions and measurements to follow later