COS 435: Information Retrieval, Discovery, & Delivery

Questions about how we ***find***, ***organize***, ***evaluate*** and ***deliver*** information

Concept of Information in Digital Age

- What is information?
- Where do we find it?
- How do we extract it?

Some numbers from Web

(no guarantees)

- From July 25, 2008 Google blog
  - trillion unique URLs crawled
- From IDC market analysis co in 2013
  - 1.9 zettabytes info created since Jan 1, 2011
- From factshunt.com, as of Dec. 31, 2013
  - 14.3 trillion live Webpages
  - 48 billion Webpages indexed by Google.Inc.
  - 14 billion Webpages indexed by Bing.
  - >1 yottabyte total data stored on Internet

Concept of Information in Digital Age

- What is information?
- How is it different from data?
- How is it different from knowledge ?

Retrieval

Have

- Collection of “information objects”
  - “information object” is unit of information
    - think “document” or “image”
- Users who have information needs

Retrieval

Want

- Model to represent information objects
  - precise enough for retrieval
  - Efficient
- Query language for asking for info want
  - able to capture user’s information need
- Retrieval system to find relevant info
  - return “info objects” best satisfy query
  - experiment to get right query
  - “Know it when see it” correctness

Unstructured information objects

- Information retrieval usually refers to unstructured objects:
  - Text
  - Graphics: 2D, 3D
  - Music
  - Video
  - any help with semantic interpretation?

Compare

- Structured information: database system
  - tagged, typed
  - well-defined semantic interpretation
  - precise queries
    - database query languages like SQL
  - precise response
    - data matches query or not
- Semi-structured objects: tagged
  - XML, HTML?
  - some help with semantic interpretation

Discovery

- Content discovery

  What are the information objects?
  - constructed collections: *digital libraries*
    - all in one (conceptually) place
    - curated?
  - harvested collections
    - Web crawling
  - databases behind Web pages
    - "deep Web"
  - temporal issues

Discovery

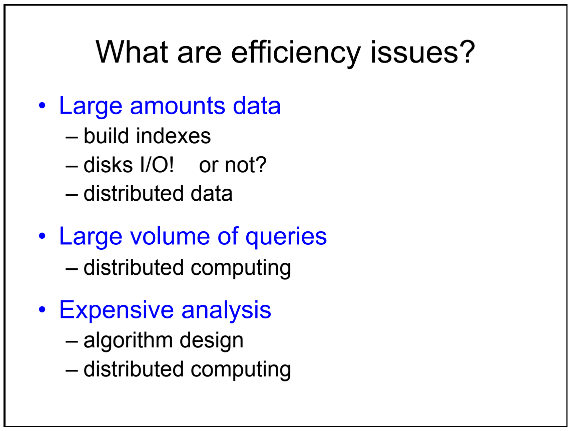
- Information discovery
  - combinations
  - content analysis: data mining
    - clustering
    - prediction
  - relationship analysis
    - network analysis
      - metadata

Delivery

- Content delivery
  - search tool and content repository over one umbrella organization
    - e.g. Facebook, Library of Congress
  - *Web* search engines: actual Web pages not provided by search engines
    - freshness issue
    - can get cached copy sometimes
  - where content stored affects delivery
    - Storage Management
    - Bandwidth management

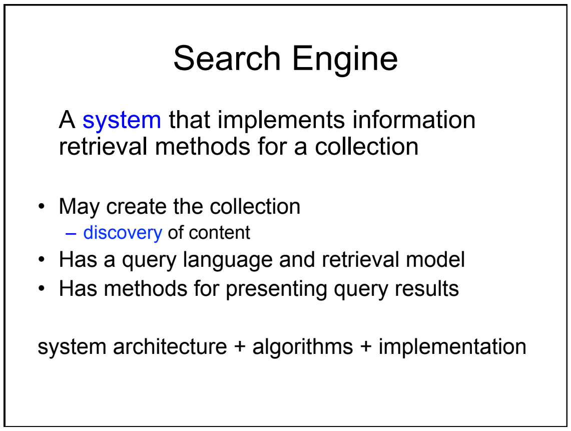
Delivery

- Information delivery - broadly construed:
  - mode of interaction?
    - compare handheld, desktop
  - user interfaces
  - visualization
    - Analysis
  - other ?



What are efficiency issues?

- Large amounts data
  - build indexes
  - disks I/O!   or not?
  - distributed data
- Large volume of queries
  - distributed computing
- Expensive analysis
  - algorithm design
  - distributed computing

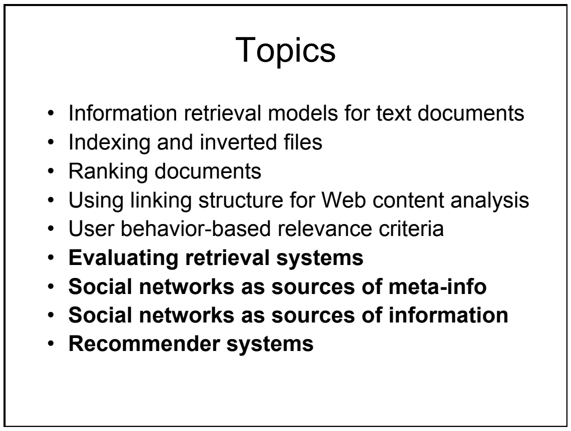


Search Engine

A system that implements information retrieval methods for a collection

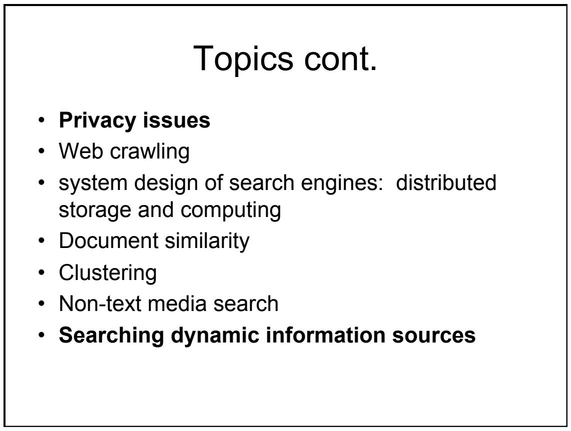
- May create the collection
  - discovery of content
- Has a query language and retrieval model
- Has methods for presenting query results

system architecture + algorithms + implementation



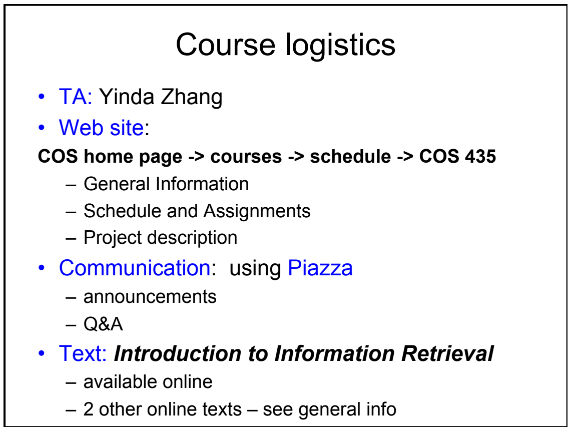
Topics

- Information retrieval models for text documents
- Indexing and inverted files
- Ranking documents
- Using linking structure for Web content analysis
- User behavior-based relevance criteria
- **Evaluating retrieval systems**
- **Social networks as sources of meta-info**
- **Social networks as sources of information**
- **Recommender systems**



Topics cont.

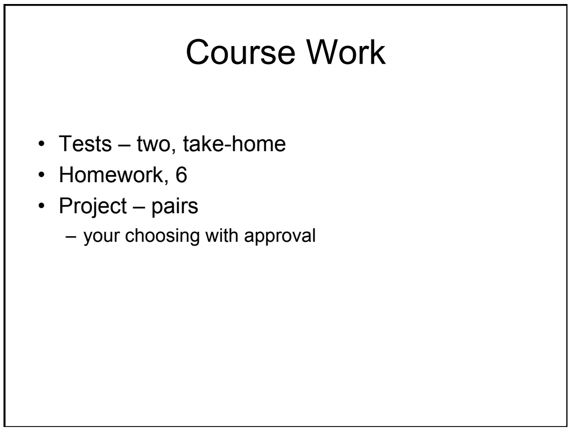
- **Privacy issues**
- Web crawling
- system design of search engines: distributed storage and computing
- Document similarity
- Clustering
- Non-text media search
- **Searching dynamic information sources**



Course logistics

- TA: Yinda Zhang
- Web site:

COS home page -> courses -> schedule -> COS 435
  - General Information
  - Schedule and Assignments
  - Project description
- Communication: using Piazza
  - announcements
  - Q&A
- Text: ***Introduction to Information Retrieval***
  - available online
  - 2 other online texts – see general info



Course Work

- Tests – two, take-home
- Homework, 6
- Project – pairs
  - your choosing with approval