Welcome to the class of
Web Information Retrieval

Min ZHANG
z-m@tsinghua.edu.cn
May 11, 2012
Tea Time:
Workshop Announcement
Workshop

• **Talk: Everybody** need to give a lecture on the workshop.
  
  – Option I: Search Engines: comparison, user satisfaction, and the future

  Your talk should include:

  • 1. Introduce the search engines you’d like to use in your motherland, and Compare it with Google, if it is not Google
    – If it’s Google, then pls. compare it with another SE (e.g. Bing, Baidu, Yahoo!, Yippy, …)
  
  • 2. What are major problems on current SEs (that makes you unsatisfied)?
  
  • 3. What is the ideal future SE in your mind?
    – You can even show a design with pictures, animation, …
  
  • 4. Any other topics (optional) …

  – Option II: Project design and demo

• **Paper:** Write & submit a ~6 pages paper (no less than 2000 words) on your workshop topic **before** the workshop (May 24th) (required)
Workshop schedule

Part I: Search Engines: comparison, user satisfaction, and the future

<table>
<thead>
<tr>
<th>Date</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 25th</td>
<td>费 伦，张世秋怀，菲 娜</td>
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<tr>
<td>June 1st</td>
<td>赵 玮，迪夫，Bryan Annan</td>
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</tbody>
</table>

For each talk: 30 Minutes presentation + 10 minutes QA

Part II: Projects and demos (June 8th)

<table>
<thead>
<tr>
<th>Presenter</th>
<th>Project and demo topic</th>
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<tbody>
<tr>
<td>达 米</td>
<td>Web Contacts Grabber</td>
</tr>
<tr>
<td>孙银海</td>
<td>Search Engines Evaluation Application</td>
</tr>
<tr>
<td>爱 里</td>
<td>A crawler for using search engines as a vulnerability detection system and confirmation</td>
</tr>
</tbody>
</table>

For each talk:
15~20 minutes presentation + 10~15 minutes demo + 10 minutes QA
Tentative Scoring

- **Workshop (~30%)**
  - Evaluated by the other students (15%)
  - + by the teacher/TA (15%)
  - We will have a **best presentation award**

<table>
<thead>
<tr>
<th>Slides (1)</th>
<th>Comparative analysis (3)</th>
<th>Unsatisfied factors (2)</th>
<th>Future SE (3)</th>
<th>QA (5)</th>
<th>Timing (1)</th>
<th>Total (15)</th>
</tr>
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<tbody>
<tr>
<td>Slides (1)</td>
<td>Project design (4)</td>
<td>Demo (4)</td>
<td>QA (5)</td>
<td>Timing (1)</td>
<td>Total (15)</td>
<td></td>
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</tbody>
</table>

- **The paper (~15%)**: basic score 10%, plus bonus if you have very good description on some topics

- Everybody is required to raise **at least two questions** on each workshop day. (~ 10%)
  - Those who have not raised enough questions will be punished on the scoring.
Social Network and Computing

Min ZHANG
z-m@tsinghua.edu.cn
May 11, 2012
Outline

I. Social Network Services
   - Social Search
   - Social/Human Computation Examples
Social Network

• Society
• Nodes: individuals
• Links: social relationship
  □ family
  □ friendship
  □ work
  □ common interest
  □ beliefs
  □ etc.
Social Network

• Many individuals with diverse social interactions between them.

• Proposed by J. A. Barnes, 1954
  • At Journal Human Relations 7:39–58
  • “Class and Committees in a Norwegian Island Parish”

John Arundel Barnes, Sept. 1918 - 13 Sept. 2010
Six Degrees of Separation

- Everyone is at most six steps away from any other person on Earth
- John Guare (dramatist)
- Stanley Milgram
- Manfred Kochen
- Frigyes Karinthy

American film, 1993
Six Degrees of Separation

FROM JORDAN TO THE QUEEN (AND OTHER CLOSE ENCOUNTERS)

Jordan
Dane Bowers
Victoria Beckham
Elton John
Prince Andrew
The Queen

Beyoncé
Mike Myers
Liz Hurley
Pamela Anderson
Hugh Hefner, in his magazine Playboy

Saddam Hussein
Sir Edward Heath
Liam Fox MF
Natalie Imbruglia
Anne Charleston, who had earlier worked with...

Kylie Minogue
Six Degrees of Separation

- Jure Leskovec and Eric Horvitz (MSR)
- 2006, MSN, 30B conversation, 240M people
- 180M nodes, 1.3B undirected edges
- The average path length among users is 6.6 (72%)
Social Network Services

- An online service, platform, or site
- Building and reflecting of social networks or social relations among people
- Allow users to share ideas, activities, events, and interests within their individual networks.
Social Network Services

- Famous sites
# Social Network Services (2010)

<table>
<thead>
<tr>
<th>Alexa, April, 2010</th>
<th>Global</th>
<th>USA</th>
<th>China</th>
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# Social Network Services (2011)

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Social Network Services

- Social Media
- Social Knowledge Sharing
- Social Bookmarking
- Social News
- Social Search
- Social Computation
SN services: 1. Social Media
SN services: 1. Social Media (cont.)
SN services: 2. Social Knowledge Sharing

- Wiki+pedia
- 2001
SN services: 2. Social Knowledge Sharing

- Wiki+pedia
- 2001
- April 22, 2012
  - 285 languages
  - 21,808,129 articles
  - 1,997,740 images
  - 34,167,122 registered users
SN services: 2. Social Knowledge Sharing (cont.)

Scholarpedia:
the peer-reviewed open-access encyclopedia written by scholars from all around the world.
Scholarpedia:
the peer-reviewed open-access encyclopedia written by scholars from all around the world.

Scholarpedia differs from Wikipedia in some very important ways:

- Each article is written by an expert.
- Each article is anonymously peer reviewed to ensure accurate and reliable information.
- Each article has a curator -- typically its author -- who is responsible for its content.
- Any modification of the article needs to be approved by the curator before it appears in the final, approved version.
SN services: 3. Social Bookmarking

del.icio.us
→ Oct. 2005, by Yahoo!
→ 2011, by Chad Hurley and Steve Chen
SN services: 3. Social Bookmarking (cont.)

- **Social tagging**
  - Many users add meta data in the form of keyword to the shared content

- **Folksonomy**
  - The system of classification derived from social tagging
SN services: 4. Social News
SN services: 5. Social Search

Social search engine: Leverage your social networks for searching
SN services: 5. Social search (cont.)

- folkd.com works pretty much like a normal SE with 2 major differences
  - It does not only rely on machines but on real people to discover the best websites.
  - It can deliver better quality by serving results that your friends also like (and if you allow us to do so).

- How does it work?
  - Start as a social bookmarking
  - After a while the best websites bubbled up by being bookmarked over and over again
  - Search on these quality links → social SE was born

- The wisdom of the crowd
  - People are not fooled as easily as machines
  - They often store additional information with a link (description, keywords)
SN services: 5. Social Search (cont.)

Social search engine: Leverage your social networks for searching

April, 2011

Currently 1.157.233 users share 20.644.500 bookmarks and >61.195.000 websites

April, 2012

Currently 2.374.085 users share 31.630.100 bookmarks and >71.072.000 websites

Use your Social-Account

If you already have an account at one the following services, you can use direct registration by simply clicking the button:

- Use your Twitter-Account
- Use your Facebook-Account
New Apple iPad3 Features and Apple iPad3 Price in India
ghdtbrjghv: New Apple iPad3 Features and Apple iPad3 Price in India
Today Apple Mobile company launched New Apple iPad3 only USD 499.
this iPad Features are Retina Display, A5X Chip, 5 Megepixel iSight Camera and Ultrafast 4G LTE. small and whole features...
to tags: apple ipad3 in india price features new and

iPad3 Retina Display พบในปั๊มน้ำมัน UAE 7 มีนาคม
www.itallnews.com/all/iPad3%8B%8A%E0%B7%8A%EA%9D%A5... - Details
itallnews: iPad3 ได้ถูกนำเสนอในuae 7 มีนาคมที่ ณ (ฮัลลิคัป)
to tags: ipad3 ipad3 retina display ipad3

Ipad3 | World Information Daily
http://www.ruralrunway.com/latest-apple-ipad3 - Details
dimasadi: iPad3 which deprive expected levels of market and
Samsung and Amazon remain the king of consumer electronics and mobile devices...
to tags: ipad3 price update ipod3 ibad3 youtube gadget ipad3 apple

Hier einkaufen! Amazon.de 
www.amazon.de - Details
mattcut32: Rumors have been roaming around the world about the launch of iPad3 even without pass of a few months after the launch of iPad2. According to grape-wine sou...
to tags: ipad3 updates ipad3

iPod3 News
http://www.squidoo.com/ipad3-news - Details
mattcut32: Rumors have been roaming around the world about the launch of iPad3 even without pass of a few months after the launch of iPad2. According to grape-wine sou...
to tags: protective case hard hard ipad3 skin apple leopard

Leopard Skin Apple iPad3 Hard Protective Cover Case
www.east4ali.com/eopard-skin-apple-ipad3-hard... - Details
faliuica002: Leopard Skin Apple iPad3 Hard Protective Cover Case

iPod3 News and Updates
http://hubpages.com/hub/ipad3-News - Details
mattcut32: It has been a great but sweet torture for the past 2 or 3 months to hear the conjectures about the advent of iPad3 into media pod market in the final quarter part of the year 2011. But disappointingly...
to tags: ipad3
SN services: 6. Social/Human Computing
SN services: 6. Social/Human Computing (cont.)

• Any computer-mediated communication and interaction

• Gathering, representation, processing, use, and dissemination of information
  • Distributed across social collectivities such as teams, communities, organizations, and markets
  • Different types of usages on social information:
    o Direct / Filtered or aggregated / Indirect
SN services: 6. Social/Human Computing (cont.)

Collective Intelligence

Social Behavior
- social network services
- wikis
- blogs
- emails
- instant messaging
- mobile devices
- social bookmarking

Intelligent Computation
- ranking
- tagging
- collaborative filtering
- social marketing
- human computation
- opinion mining/sentiment analysis
- query logs analysis
- large graph algorithms

Algorithms
Regression
NLP
Model Selection
Clustering
Theory
Classification
Security & privacy
SN services: 6. Social/Human Computing (cont.)

- **Weaker (broad) Sense**
  - supporting any sort of social behavior in or through computational systems
  - e.g. blogs, email, instant messaging, social network services, wikis, social bookmarking, etc.

- **Stronger (narrow) sense**
  - supporting “computations” that are carried out by a group of people
  - e.g. collaborative filtering, online auctions, prediction markets, reputation systems, tagging, verification games, etc.
Outline

- I. Social Network Services
- II. Social Search
- Social/Human Computation Examples
Social Search

• An umbrella term used to describe search acts that make use of social interactions with others
Social Search

• Traditional search
  • The relevance of search results is determined by analyzing the text of each document or the link structure of the documents

• Social search
  • Determines the relevance of search results by considering the interactions or contributions of users
Social Search

• Social interaction
  • explicit or implicit
  • co-located or remote
  • synchronous or asynchronous

• Many forms
  • shared bookmarks or tagging of content with descriptive labels (simple)
  • combine human intelligence with computer algorithms (complicated)
Three Flavors of Social Search

Collective

Collaborative

Friend filtered
Three Flavors: 1. Collective Social Search

- Search is augmented by trends shared on a network (e.g. Twitter Trends) or results ranked against the real-time buzz of a group
- Wisdom of crowds

```
Search the realtime web
```

```
Breaking
Gordon Brown iPad rival LG Ally Super Bowl Daytime Emmy Oprah

02:09:44 am Trending right now across Twitter, Facebook, Myspace, and Digg
```

- “Search results are influenced by what people are sharing on Twitter, MySpace, Digg, Facebook and our own panel of user”
- “Search results reflect the realtime social buzz around any piece of content”
- PulseRank: PageRank for the real time web

Unfortunately, now it has been changed to some other services (online Ads).
Three Flavors: 2. Friend-Filter Social Search

- Make use of social data that your peers, friends of friends and wider "social circle" have shared
- This data could appear alongside traditional search results (as with Google) or be exclusive results from within your peer network (as with TuneIn)

- People are the filter
- Builds a channel from all the media (articles, videos, photos and soon, audio) recommended by the people you follow.
- Sort it by popularity or recency, and filter it by media type.

Unfortunately, now it also has been changed: selling players/radios/…
Three Flavors: 3. Collaborative Search

- Two or more users work together to find the answer to a problem
- Passive and asynchronous question-answer, e.g. Yahoo! Answer
- IM based question-answer, e.g. Aardvark
- Over-the-shoulder two-person search

Tap the knowledge of people in your network!

Ask a question and I’ll find someone to answer

What's the best...

Example questions

Ask someone

http://vark.com/
Three Flavors: 3. Collaborative Search

- Two or more users work together to find the answer to a problem
- **Passive and asynchronous** question-answer, e.g. Yahoo! Answer
- **IM based** question-answer, e.g. Aardvark
- **Over-the-shoulder** two-person search

**http://vark.com/**
Aardvark joins Google!

By Max, Zoo Director | Published: February 12, 2010

We’re thrilled to announce that Aardvark has been acquired by Google!

Aardvark has defined a new kind of social search: sometimes you want a person, not a web page, to answer your question. We’re extremely excited that Google shares our vision for how search can continue to evolve by including social features.

We have spent the past two years carefully designing and building Aardvark, combining our own vision with a rigorous user-driven development process. This acquisition represents an incredible opportunity to accelerate this development, working with some of the most amazing folks in the industry to offer a new kind of search to hundreds of millions of people.

As a first step, effective immediately, Aardvark will be available through Google Labs. Aardvark will remain fully operational and completely free, providing quick, helpful answers to all of your questions. You can sign up here.
Unresolved issues/hard problems in social search

- How is **user authority** measured?
- How is **expertise** measured?
  - Who you are connected to is probably more important than how you describe yourself.
- How to deal with **reputation**, especially in changing social contexts?
- How important is a person’s **social graph** in ranking results and personalizing search?
- There is the issue of **privacy**
  - Not wanting your social graph to have access to everything you say, do, or search for
Outline

- I. Social Network Services
- II. Social Search
- III. Social/Human Computation Examples
  - reCAPTCHA
  - GWAP: 4 examples and 3 game structures
  - Advanced issues
A good example: reCAPTCHA

- CAPTCHA
  - Completely Automated Public Turing test to tell Computers and Humans Apart
  - [http://www.captcha.net/](http://www.captcha.net/)
  - 2002, CMU, [Luis von Ahn](http://www.captcha.net/), Manuel Blum, Nicholas, J.Hopper and John Langford

reCAPTCHA: Human-Based Character Recognition via Web Security Measures

- Luis von Ahn
  - **MacArthur Fellowship** (a.k.a. the "genius grant") in 2006
  - One of the **50 Best Brains in Science** by Discover Magazine
  - The founder of the company reCAPTCHA

**Spam protection:**
Type the two words shown into the yellow box below:

![reCAPTCHA](image)
reCAPTCHA: Human-Based Character Recognition via Web Security Measures

- Suspicious words in Ancient Works
  - 1 Control word + 1 unknown word
- Evaluation results
  - 50 articles
    - Year 1860, 1865, 1908, 1935, 1970
  - 24080 words
  - ReCAPTCHA (99.1%, 216 error)
    - Compared with the performance of OCR and human:
      - OCR (83.5%, 3976 error), Transcribers (99.2%, 189 error)

**reCAPTCHA**: Human-Based Character Recognition via Web Security Measures

- 1 year of running the system
  - 1.2 billion CAPTCHAs
  - 440 million suspicious words
  - 17600 books

- The system continuously grows in population
  - 4M suspicious words per day (≈160 books per day)
  - ≈ workforce: 1500 persons, 40 hours/week (60 words/min.)
reCAPTCHA: Human-Based Character Recognition via Web Security Measures

• Why web sites use reCAPTCHA
  • More secure than the conventional CAPTCHA
  • ReCAPTCHA takes roughly the same amount of time

• Acquired by Google, 16 Sep 2009
A more general idea…

- “Wasted” human processing power can be harnessed to solve problems that computers can not yet solve
- Take advantage of people’s desire to be entertained and perform useful tasks as a side effect
- **GWAP: Game With A Purpose**
Having Fun = Work
Having Fun = Work
A boring task with Heavy workload: Image Labeling

- Determine the contents of images by providing meaningful labels for them
GWAP

• Industry Facts
  • Computer / video games, 200 M hours per day
  • 10000 hours by age 21

• Games with a purpose
  • ESP game
  • Phetch
  • Peekaboom
  • Tag a Tune
GWAP: 1. ESP game

- Labeling Images with a Computer Game

- Provide meaningful, accurate labels for images on the Web
- As of July 2008, 200,000 players had contributed more than 50M labels
Detail Description for Image?

- Keyword is insufficient to describing the contents
GWAP: 2. Phetch

- Attach descriptive paragraphs to images
- One describer and 2-4 seekers
Phetch

Seeker’s interface

Justin Timberlake and Janet Jackson at the Superbowl! They are performing a duet and Justin ripped off a piece of Janet’s shirt.
The Phetech description are different: “half-man half-woman with black hair” and “an abstract line drawing of a man with a violin and a woman with a flute”
GWAP: 3. Peekaboom

- Locating objects in Images
Peekaboom

• Anti-cheating

• Usage
  • August 1, 2005 – September 1 2005
  • 14,153 different people, 1,122,998 pieces of data

• Accuracy
  • Compared with Bounding box by human, 0.754
    (The union of area by the game players / the area marked by human)
GWAP: 4. Tag A Tune

- Pair you up with someone, somewhere else in the world
- Play you both a tune
- You can type descriptive words or phrases, visible to your 'partner'
- Find out if you're listening to the same song or not with a time limit

**Tag A Tune**

![Tag A Tune Game Interface]
Transform a computational problem into a Game

- Social Games or Game with A purpose is an innovative idea that make use of human brain power to solve difficult problems.
- People play not because they are personally interested in solving an instance of a computational problem but because of they wish to be entertained.
Three game-structure (1)

- Output-agreement games
- ESP game

Players win if/when $output_{1,i} = output_{2,i}$
Three game-structure (2)

• Inversion-problem games
  • Peekaboom
  • Phetch

Players win if/when output$_{2,i}$ = INPUT
Three game-structure (3)

- Input-agreement games
- Tag a tune

Win if players guess whether INPUT₁ = INPUT₂
Designing a Game With Purpose

<table>
<thead>
<tr>
<th></th>
<th>Input-agreement</th>
<th>Inversion-problem</th>
<th>Output-agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial setup</strong></td>
<td>Two random strangers</td>
<td>Two (or more) random strangers</td>
<td>Two random strangers</td>
</tr>
<tr>
<td><strong>Rules</strong></td>
<td>Same input; Both produce output</td>
<td>Describer sees the input and produces output; Guesser(s) searches for input</td>
<td>Same or different input; Both produce output and guess whether input are the same</td>
</tr>
<tr>
<td><strong>Winning-condition</strong></td>
<td>Same output</td>
<td>Guesser produce the same input</td>
<td>Both correctly determine</td>
</tr>
</tbody>
</table>
Make Game More Entertaining

• Introduce challenge
  □ Timed response
  □ Score keeping
  □ Player skill level
  □ High score lists
  □ Randomness …

• Introduce competition

• Introduce variation

• Introduce communication
Ensure Output Accuracy

- Random matching
  - Cannot collaborate to cheat
- Player testing
  - Quality of intelligent
- Repetition
  - Probabilistic correct
- Taboo output
  - Eliminate obvious answers, increase diversity
Three challenging issues

• Game integrity issues
  • How do we make the game do what we want to do?

• Quality assurance issues
  • How do we know the results are correct and useful?

• Game design issues
  • How do we make the system interesting to play?
Overview

Social Network Services
- Six Degrees of Separation
- Social media, knowledge sharing, news, search, computation, bookmark

Social Search
- 3 flavors:
  - Collective, Collaborate, Friend-filtered

Social/Human Computation Examples
- reCAPTCHA
- GWAP: 4 examples and 3 game structures
- Advanced issues
The End!