Lecture 11 Question Answering

(Based on: Rada Mihalcea's coursware, some of his slides were adapted from Chris Manning's IR course, who in turn borrowed them from Nicholas Kushmerick, ISI)

Backgr [poc] A Graph-Based Information Retrieval Model File Format: Microsoft Word - View as HTML

by O Sornil - Related articles

Example This decision usually depends upon similarity calculation intrinsic to the information retrieval model which attempts to establish an ordering of the ... retrieval model which attempts to establish an ordering of the ...

conference, nida [PDF] Robust model estimation methods for information retrieval

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Pablo Cas <bold>Statist

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storage and retrieval of documi learning-and-ge and Sparck Jones 1976; van Rijsbergen 1979). ...

Amazon.com bust, general-p டூரை A Taxonomy of Information Retrieval Models and Tools

Table 1. Vertical taxonomy of a set of Information Retrieval Models. space models of information retrieval with P-norm queries and multiple concept ... cit.srce.hr/index.php/CIT/article/view/1546/1250

John W. S. Modern Infor by N Fuhr - Cit [PDF] ICSM'00: Information Retrieval Models for Recovering Traceability ...

Retrieval. Hypertext mode Probabilistic M File Format: PDF/Adobe Acrobat - Quick View Pa History - C relationships as introduction an by G Antoniol - Cited by 67 - Related articles

people.ischool.b citeseerx.ist.ps results of vector space and probabilistic models and formu- late hypotheses to explain the differences. 1. Introduction. Automated Information Retrieval ...

www.sdml.info/library/Antoniol00b.pdf

[PDF] Term Feedback for Information Retrieval with Language Models

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IPDELA tul www.ncbi.nlm.ni linguistic statel H.3.3 [Information Search and Retrieval]: Retrieval models. General Terms. Algorithms. www.gimac.um Keywords, Query expansion, interactive retrieval, 1, INTRODUCTION ...

net.pku.edu.cn/~course/cs410/reading/sigir07-term.pdf

[PDF] An Object-Based Information Retrieval Model: Toward the ...

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In this paper, we propose an information retrieval model, where the ... Proposed in this paper is a new information retrieval model employing an ...

ozzy.chonbuk.ac.kr/.../98 An%20Object-Based%20Information%20Retrieval%20Model.pdf

citeseerx.ist.psu.edu/viewdoc/ Guest Post: [PDF] The Dirichlet-Multinomial Model for Bayesian Information Retrieval

4 Apr 2010 ... | File Format: PDF/Adobe Acrobat - Quick View

This paper describes the devel thenoisychann to the development of a binary independence model for information retrieval (Robert-son

interstat statiournals net/YEAR/2007/articles/0710004 ndf - Similar

Previous

Rese:

Question Answering from text

- □ An idea originating from the IR community
- □ With massive collections of full-text documents, simply finding *relevant documents* is of limited use: we want *answers* from textbases
- □ QA: give the user a (short) answer to their question, perhaps supported by evidence.
- □ The common person's view? [From a novel]
 - "I like the Internet. Really, I do. Any time I need a piece of shareware or I want to find out the weather in Bogota ... I'm the first guy to get the modem humming. But as a source of information, it sucks. You got a billion pieces of data, struggling to be heard and seen and downloaded, and anything I want to know seems to get trampled underfoot in the crowd."
 - □ M. Marshall. *The Straw Men*. HarperCollins Publishers, 2002.

People want to ask questions...

Examples from AltaVista query log

who invented surf music?

how to make stink bombs

where are the snowdens of yesteryear?

which english translation of the bible is used in official catholic liturgies?

how to do clayart

how to copy psx

how tall is the sears tower?

Examples from Excite query log (12/1999)

how can i find someone in texas

where can i find information on puritan religion?

what are the 7 wonders of the world

how can i eliminate stress

What vacuum cleaner does Consumers Guide recommend

Around 12–15% of query logs

The Google answer #1

- □ Include question words etc. in your stop-list
- □ Do standard IR

- □ Sometimes this (sort of) works:
- □ Question: Who was the first chairman of People's republic of China?
- □ Answer: *Mao Zedong*.



阿页 图片 资讯 地图^新 论坛 更多 »

Who was the chairman of People's republic of C

Google 搜索 高级搜索 | 使戶

所有两页 中文两页 简体中文两页

网页

约有469,000项符合Who was the chairman of People's republic of China in

Who was the chairman of People's republic of China in 1949 的图书搜索结果



Fundamental Legal Documents of Communist China - 作者: Albert Paul Blaustein, China, ... - 603 页 The People's Republic of China - 作者: Richard Clarence Bush, James Roger Townsend - 114 页 Documents on China's Relations with South and ... - 作者: Ambekar, G. V - 491 页

China in Brief - china.org.cn

On October 1, 1949, Chairman Mao Zedong declaration the forum of Tian'anmen Square.

Special Economic Zone of Guangdong Province. ..

Page about the founding of PRC (Can deduce answer)

www.china.org.cn/e-china/history/Contemporary.htm - 23k - 四贝快瓶 - 实际四贝

China in Brief - china.org.cn

On March 3, 2000, the 3rd Session of the 9th National Congress of the Chinese People's Political Consultative Conference was ... The current Executive Committee chairman is Wei Jianxing. All-China Youth Federation Founded in May 1949, ... www.china.org.cn/e-china/politicalsystem/politicalOrgnization.htm - 31k - 网页快照 - 类似网页

Propaganda in the People's Republic of China: Infor

Chinese poster saying: "Chairman Mao is the Red the People's Republic of China (PRC) was prevented in 1949.

Chinese poster saying: "Chairman Mao is the Red in our bar Page about propaganda in China (Can deduce answer)

But often it doesn't...

- □ Question: *How much money did IBM spend on advertising in 2006?*
- □ Answer: *I dunno*, but *I'd like to* ... ⊗

Comments on: Bill Gates says we' re back in a bubble - kind

It's just that Google thought it was worth more than the other combashing MS for? ... So much noise and so much poorly spent vents and blogging that the odds of survival are low. [...] ...

It's even not about IBM!

scobleizer.com/2006/11/13/bill-gates-says-were-back-in-a-bubble-kind-of/feed/ - 61k -

<u> 网页快照</u> - <u>类似网页</u>

Bill Gates says we're back in a bubble -- kind of « Scobleizer ...- [翻译此页 вета]

Comment by Jeelz — November 13, 2006 @ 6:22 am. Does Microsoft need to be in the advertising business? ... So much noise and so much poorly spent venture money in podcasting and blogging that the odds of survival are low. […] ... scobleizer.com/2006/11/13/bill-gates-says-were-back-in-a-bubble-kind-of/ - 54k - 阿页快照 - 类似网页

Blog archive

文件格式: 无法识别 - HTML 版

By SAUL HANSELL and JOHN MARKOFF Published: July 3, 2006 graduate-school project being run from a ... after Dell, Hewlett-Packard and I biggest rivals, Microsoft and Yahoo, certainly write much of their ... zhaozg.spaces.live.com/?_c11_BlogPart_FullView=1&

No relevant info

Dan Washburn's Shanghai Diaries: IBM's moronic new dat

If IBM has too much money how actually using it more production calculations and commercial is speaking english, common farmers by, and don't have the money to spend on a computer, ...

_c11_BlogPart_blogpart=&_c=BlogPart&partqs=a... - 类似网页

Seems closing to answer?

www.shanghaidiaries.com/archives/2005/01/24/**ibm**s_moronic_new_ad_about_china/ - 49k - 网页快照 - 类似网页

The Google answer #2

- □ Take the question and try to find it as a string on the web
- □ Return the next sentence on that web page as the answer
- Works brilliantly if this exact question appears as a FAQ question, etc.
- □ Works lousily most of the time
 - Remind of the line about monkeys and typewriters producing Shakespeare
- □ But a slightly more sophisticated version of this approach has been revived with considerable success...

Question: How much money did IBM spend on advertising in 2016?

Advertising & Promotions expenses of IBM 2001-2017 - Cheshnotes

https://www.cheshnotes.com/advertising-promotions-expenses-of-ibm/ ▼ May 15, 2018 - In 2017, it spent **1445 million dollars** which was **118 million USD** higher than its previous years' expenditure on Advertising and promotions. Its 2016 expenditure on advertising and promotions was **1327 million dollars** which was again **37 million dollars** higher than 2015.



Watson Yields Big Programmatic Returns for IBM | Digital - Ad Age

https://adage.com/article/digital/ibm-s-watson-programmatic...big...ibm/304946/ ▼ IBM used Watson to purchase ads for its campaign ... Published on July 19, 2016 of the year, a big commitment for a company that spent nearly \$53 million on digital ... But the trick, Mr. Sheinkin says, is to figure out what Watson did when it ...

IBM: advertising and marketing profile at Adbrands.net

https://www.adbrands.net/us/ibm-us.htm •

Although it was one of the original pioneers in computer hardware, IBM is now ... "We don't believe brands are built from advertising any more," says ... Adbrands Weekly Update 14th Apr 2016: Ads of the Week: "Designed For Data". In 2001, IBM doubled the size of its database division, spending another \$1bn in cash to ...

In 2017, it spent **1445 million dollars** which was **118 million USD** higher than its previous years' expenditure on Advertising and promotions. Its 2016 expenditure on advertising and promotions was **1327 million dollars** which was again **37 million dollars** higher than **2015**. May 15, 2018

Advertising & Promotions expenses of IBM 2001-2017 - Cheshnotes https://www.cheshnotes.com/advertising-promotions-expenses-of-ibm/

60% of our budget is spent on content partnership and brand ...

https://www.exchange4media.com > Marketing-news ▼

Vasantha Kumar, Director of Marketing, IBM, talks about IBM Watson's latest campaign, his emphasis on print ... This is why we have started to shift more of our budget to digital. ... We will first show people, then use advertising to talk about it. ... Mumbai Madhuwanti reports on marketing, OTT and radio with a focus on trends.



Still a lot of noise

The 12 Companies That Spend The Most On Advertising

https://www.businessinsider.com/12-biggest-advertising-spenders-in-2013-2014-6 ▼ Jun 25, 2014 - L'Oreal America's 100 biggest advertisers spent a record \$109 billion

A Brief (Academic) History

- ☐ In some sense question answering is not a new research area
- Question answering systems can be found in many areas of NLP research, including:
 - □ Natural language database systems
 - A lot of early NLP work on these
 - □ Spoken dialog systems
 - Currently very active and commercially relevant
- ☐ The focus on open-domain QA is still challenging
 - MURAX (Kupiec 1993): Encyclopedia answers
 - Hirschman: Reading comprehension tests
 - TREC QA competition: 1999–
- □ Question types:
 - Factoid Question Answering 事实陈述问答
 - List Question Answering 列表问答
 - Definition Question Answering定义问答

Online QA Examples

- Examples
 - Baidu Knows: http
 - "知识": http//ks.
 - AnswerLogic, Ans Mulder, Webclope
 - Microsoft Xiaoice
- □ Apple Siri, IBM W

历史里科瑁蚀

@小冰,我最讨厌考试了!

我也特别讨厌考试! [握手] 每次一想到考试脑子就像短路了一样。。。

可我真是搞不懂 既然你不喜欢 为什么还老是要提起它呢?



是你笨...

Question Answering at TREC

- □ Question answering competition at TREC consists of answering a set of 500 fact-based questions, e.g., "When was Mozart born?".
- □ For the first three years systems were allowed to return 5 ranked answer snippets (50/250 bytes) to each question.
 - IR think
 - Mean Reciprocal Rank (MRR) scoring:
 - \square 1, 0.5, 0.33, 0.25, 0.2, 0 for 1, 2, 3, 4, 5, 6+ doc
 - Mainly Named Entity answers (person, place, date, ...)
- □ From 2002 the systems are only allowed to return a single *exact* answer and the notion of confidence has been introduced.

Sample TREC questions

- 1. Who is the author of the book, "The Iron Lady: A Biography of Margaret Thatcher"?
- 2. What was the monetary value of the Nobel Peace Prize in 2001?
- 3. What does the Peugeot company manufacture?
- 4. How much did Mercury spend on advertising in 1993?
- 5. What is the name of the managing director of Apricot Computer?
- 6. Why did David Koresh ask the FBI for a word processor?
- 7. What debts did Qintex group leave?
- 8. What is the name of the rare neurological disease with symptoms such as: involuntary movements (tics), swearing, and incoherent vocalizations (grunts, shouts, etc.)?

Top Performing Systems

- □ The best performing systems at TREC can answer approximately 70% of the questions
- □ Approaches and successes have varied a fair deal
 - Knowledge-rich approaches, using a vast array of NLP techniques stole the show in 2000, 2001
 - AskMSR system stressed how much could be achieved by very simple methods with enough text (and now various copycats)
 - Middle ground is to use large collection of surface matching patterns (ISI)

Sample TREC questions

TREC 2016 Live QA question:

<question number="5003">

Why does my cats behavior change so diradticly at night? So I have two litter mate cats, over one year old and have been neutered for more than six months. one of the cats has the same attitude all day and just gets more lovey at night. The other one is super cute and friendly during the day, and loves attention from me. But when night rolls around and I m about to get ready for bed, he avoids my touch. Walks away when I walk up and even one time when I picked him up, he hissed at me. It s not like he s mad at me for going to bed Bc he doesn t do this to my mother or sister. The other thing he does is when his brother is sleeping with me, he ll come in, wake him up, and then leave my room with his brother following him. Does anything describe this behavior? Why does this happen?

</question>

<question number="5218"> <question> Question: Why does all of my
power go out in my house when i turn on the air conditioner? How does
this get fixed? </question>

TREC 2017

CAR-Complicate Answer Retrieval

- □ Passage Task: Given an outline for complex topic outline Q, retrieve for each of its sections Hi, a ranking of relevant passages S.
- Entity Task: Given outline for complex topic Q, retrieve for each of its sections Hi, a ranking of relevant entities E and with support passages S.
 These support passage should motivate the why the entity is relevant for the query.

	benchmarkY1train	benchmarkY1test	train	test200
number of articles (complex topics)	117	133	285,924	198
hierarchical sections (queries)	1,816	2,125	2,180,868	1,860
total positive paragraphs assessments	4,530	5,820	$5,\!276,\!624$	4,706
total positive entity assessments	13,031	15,085	12,310,616	11,396

TREC 2017 CAR-Complicate Answer Retrieval

□ E.g. query: "Candy Making / Hard Candy"

MUST be mentioned:

Sugar glass is made by dissolving sugar in water and heating it to at least the "hard crack" stage (approx. 150 C / 300 F) in the candy making process. Glucose or corn syrup is used to prevent the sugar from recrystallizing, by getting in the way of the sugar molecules forming crystals. Cream of tartar also helps by turning the sugar into glucose and fructose.

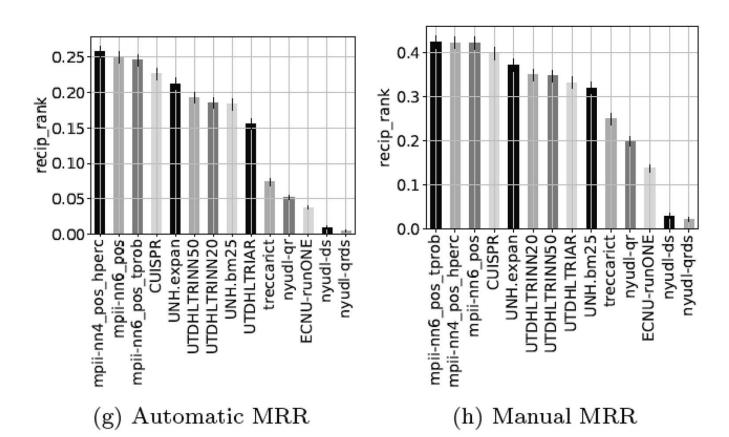
CAN be mentioned:

Sinuklob is a very sweet candy that is also used in making Bukayo. It is the cheaper version of caramel in the Philippines. Sinuklob is made from melted brown sugar hardened into a chewy consistency.

Roughly on TOPIC but non-relevant:

Most candies are made commercially. The industry relies significantly on trade secret protection, because candy recipes cannot be copyrighted or patented effectively, but are very difficult to duplicate exactly. Seemingly minor differences in the machinery, temperature, or timing of the candy-making process can cause noticeable differences in the final product.

TREC 2017 CAR-Complicate Answer Retrieval



AskMSR

- □ Web Question Answering: Is More Always Better?
 - Dumais, Banko, Brill, Lin, Ng (Microsoft, MIT, Berkeley)
- □ Q: "Where is the Louvre museum located?"
- □ Want "Paris"
 or "France"
 or "75058
 Paris Cedex 01"
 or a map
- □ <u>Don't</u> just want URLs



AskMSR: Shallow approach

- In what year did Abraham Lincoln die?
- Ignore hard documents and find easy ones

Abraham Lincoln, 1809-1865

*LINCOLN, ABRAHAM was born near Hodgenville, Kentucky, on February 12, 1809. In 1816, the Lincoln family mo Pigeon Creek in Perry (now Spencer) County. Two years later, Abraham Lincoln's mother died and his father married a woman his "angel" mother. Lincoln attended a formal school for only a few months but acquired knowledge through the reading of books Illinois, in 1830 where he obtained a job as a store clerk and the local postmaster. He served without distinction in the Black Haw

lost his attempt at the state legislature, but two years later he tried again, was successful, and Lincoln was admitted to the bar and became noteworthy as a witty, honest, competent circuit

al attention for his series of debates with Stephen A. Doug st the election he became a significant figure in his party. Ir his inauguration on March 4, seven southern states had se te artillery. Lincoln called for 75,000 volunteers (approxim seceded, for a total of 11. Lincoln immediatley took action ership would eventually be the central difference in maintai ry Emancipation Proclamation which expanded the purpo

he dedica ar emine ieneral U ce at Ford

6, at which time he opposed the war with Mexico. By 185

xplains w Abraham Lincoln

16th President of the United States (March 4, 1861 to April 15, 1865) Born: February 12, 1809, in Hardin County, Kentucky Died: April 15, 1865, at Petersen's Boarding House in Washington, D.C.

"I was born February 12, 1809, in Hardin County, Kentucky, My parents were both born in Virginia, of undistinguished families, perhaps I should say. My mother, who died in my tenth year, was of a family of the name of



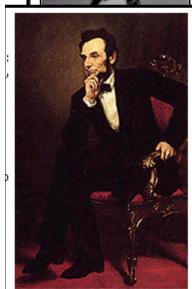




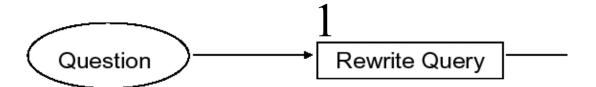
ABRAHAM LINCOLN

Born in 1809 - Died in 1865

of the United States



AskMSR: Details



Step 1: Rewrite queries

- ☐ Intuition: The user's question is often syntactically quite close to sentences that contain the answer
 - Where is the Louvre Museum located?
 - The Louvre Museum is located in Paris
 - Who created the character of Scrooge?
 - Charles Dickens created the character of Scrooge.

Query rewriting

- □ Classify question into seven categories
 - Who is/was/are/were...?
 - **When** is/did/will/are/were ...?
 - Where is/are/were ...?
- a. Category-specific transformation rules

eg "For Where questions, move 'is' to all possible locations"

"Where is the Louvre Museum located"

- → "is the Louvre Museum located"
- → "the <u>is</u> Louvre Museum located" ^
- → "the Louvre is Museum located" ✓
- → "the Louvre Museum <u>is</u> located"
- → "the Louvre Museum located is"

b. Expected answer "Datatype" (eg, Date, Person, Location, ...)

When was the French Revolution? \rightarrow DATE

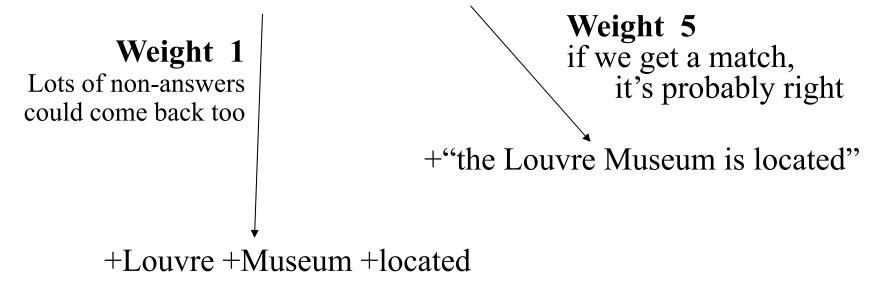
Hand-crafted classification/rewrite/datatype rules (Could they be automatically learned?)

Nonsense, but who cares? It's only a few more queries to Google.

Query Rewriting - weights

□ Some query rewrites are more reliable than others

Where is the Louvre Museum located?



Step 2: Query search engine

- □ Send all rewrites to a Web search engine
- □ Retrieve top N answers (100?)
- □ For speed, rely just on search engine's "snippets", not the full text of the actual document

Step 3: Mining N-Grams

Unigram, bigram, trigram, N-gram: list of N adjacent terms in a sequence Eg, "Web Question Retter" Unigrams: We ways, Better How can we use this Bigrams: V ering Is, Is More, More n-grams to find out the Always, Aly right answer? Trigrams: W Answering Is, Answering Is More, Is More A

Mining N-Grams

Simple: Enumerate all N-grams (=1,2,3 say) in all retrieved snippets

□ Use hash table

□ Weight of an notice "reliability"

How can we make sure that the high weighted n-grams match the type of expected answers?

□ Example: "W

Dickens - 1

Christmas Carol

Charles Dickens - 75

■ Disney - 72

Carl Banks - 54

A Christmas - 41

Christmas Carol - 45

■ Uncle - 31

make this efficient

ch weighted by the document

crooge?"

Step 4: Filtering N-Grams

□ Each question type is associated with one or more "data-type filters" = regular expression

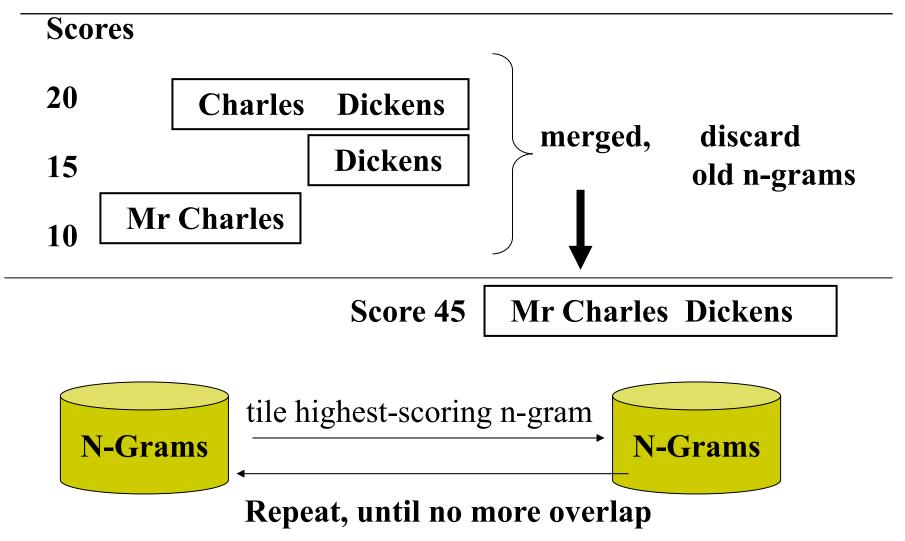
Location

Person



- □ Where...
- □ What ...
- □ Who ...
- □ Boost score of n-grams that do match regexp
- □ Lower score of n-grams that don't match regexp

Step 5: Tiling the Answers



Results

- □ Standard TREC contest test-bed:
 - ~1M documents; 900 questions
- □ Technique doesn't do too well (though would have placed in top 9 of ~30 participants!)
 - MRR = 0.262 (ie, right answered ranked about #4-#5)
 - Why?

Issues

- □ In many scenarios (e.g., monitoring an individuals email...) we only have a small set of documents
- Works best/only for "Trivial Pursuit"-style fact-based questions
- □ Limited/brittle for
 - question categories
 - answer data types/filters
 - query rewriting rules

ISI: Surface patterns approach

- Use of Characteristic Phrases
- □ "When was <person> born"
 - Typical answers
 - □ "Mozart was born in 1756."
 - □ "Gandhi (1869-1948)..."
 - Suggests phrases like
 - □ "<NAME> was born in <BIRTHDATE>"
 - □ "<NAME> (<BIRTHDATE>-"
 - as Regular Expressions can help locate correct answer

Use Pattern Learning

- □ Example:
 - "The great composer Mozart (1756-1791) achieved fame at a young age"
 - □ "Mozart (1756-1791) was a genius"
 - "The whole world would always be indebted to the great music of Mozart (1756-1791)"
 - Longest matching substring for all 3 sentences is "Mozart (1756-1791)"
 - Suffix tree would extract "Mozart (1756-1791)" as an output, with score of 3
- □ Reminiscent of IE (Information Extraction) pattern learning

Pattern Learning (cont.)

- □ Repeat with different examples of same question type
 - Gandhi 1869", "Newton 1642", etc.
- □ Some patterns learned for BIRTHDATE
 - a. born in <ANSWER>, <NAME>
 - b. <NAME> was born on <ANSWER> ,
 - \bullet c. <NAME> (<ANSWER> -
 - \bullet d. <NAME> (<ANSWER>)

Experiments

- □ 6 different Q types
 - from Webclopedia QA Typology (Hovy et al., 2002a)
 - BIRTHDATE
 - LOCATION
 - □ INVENTOR
 - DISCOVERER
 - DEFINITION
 - WHY-FAMOUS

Experiments: pattern precision

- □ BIRTHDATE table:
 - \square 1.0 <NAME> (<ANSWER>)
 - \square 0.85 < NAME > was born on < ANSWER >,
 - □ 0.6 <NAME> was born in <ANSWER>
 - \square 0.59 < NAME > was born < ANSWER >
 - \square 0.53 < ANSWER > < NAME > was born
 - \square 0.50 <NAME> (<ANSWER>
 - \square 0.36 < NAME > (< ANSWER > -
- □ INVENTOR
 - □ 1.0 <ANSWER> invents <NAME>
 - □ 1.0 the <NAME> was invented by <ANSWER>
 - □ 1.0 <ANSWER> invented the <NAME> in

Experiments (cont.)

□ DISCOVERER

- □ 1.0 when <ANSWER> discovered <NAME>
- □ 1.0 <ANSWER>'s discovery of <NAME>
- □ 0.9 <NAME> was discovered by <ANSWER> in

DEFINITION

- □ 1.0 <NAME> and related <ANSWER>
- □ 1.0 form of <ANSWER>, <NAME>
- \square 0.94as <NAME>, <ANSWER> and

Experiments (cont.)

- WHY-FAMOUS
 - □ 1.0 <ANSWER> <NAME> called
 - □ 1.0 laureate <ANSWER> <NAME>
 - \square 0.71<NAME> is the <ANSWER> of
- LOCATION
 - \square 1.0 <ANSWER>'s <NAME>
 - □ 1.0 regional : <ANSWER> : <NAME>
 - □ 0.92near <NAME> in <ANSWER>
- □ Depending on question type, get high MRR (0.6–
 0.9), with higher results from use of Web than TREC
 QA collection

Shortcomings & Extensions

- □ Need for POS &/or semantic types
 - □ "Where are the Rocky Mountains?"
 - "Denver's new airport, topped with white fiberglass cones in imitation of the Rocky Mountains in the background, continues to lie empty"
 - □ <NAME> in <ANSWER>
- □ NE tagger &/or ontology could enable system to determine "background" is not a location

Shortcomings... (cont.)

- □ Long distance dependencies
 - □ "Where is London?"
 - □ "London, which has one of the most busiest airports in the world, lies on the banks of the river Thames"
 - □ would require pattern like: <QUESTION>, (<any word>)*, lies on <ANSWER>
 - Abundance & variety of Web data helps system to find an instance of patterns w/o losing answers to long distance dependencies

Shortcomings... (cont.)

- System currently has only one anchor word
 - Doesn't work for Q types requiring multiple words from question to be in answer
 - □ "In which county(县城) does the city of Long Beach lie?"
 - □ "Long Beach is situated in Los Angeles County"
 - required pattern:
 <Q_TERM_1> is situated in <ANSWER> <Q_TERM_2>
- □ Does not use case
 - □ "What is a micron(微米)?"
 - "...a spokesman for Micron, <u>a maker of semiconductors</u>, said SIMMs are..."
- ☐ If Micron had been capitalized in question, would be a perfect answer

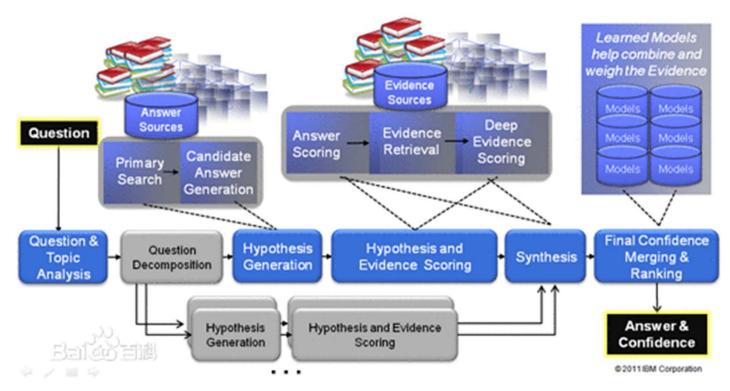
Question Answering (a Complicate Example)

- □ How hot does the inside of an active volcano (火山) get?
- □ get(TEMPERATURE, inside(volcano(active)))
- □ "lava (熔岩) fragments belched out of the mountain were as hot as 300 degrees Fahrenheit"
- □ fragments(lava, TEMPERATURE(degrees(300)), belched(out, mountain))
 - volcano ISA mountain
 - lava ISPARTOF volcano lava inside volcano
 - fragments of lava HAVEPROPERTIESOF lava
- □ The needed semantic information is in WordNet definitions, and was successfully translated into a form that was used for rough 'proofs'

IBM Watson-Brief Architecture



Building Watson: An overview of the DeepQA project[J]



http://researcher.ibm.com/researcher/view_project.php?id=2099

References

- □ AskMSR: Question Answering Using the Worldwide Web
 - Michele Banko, Eric Brill, Susan Dumais, Jimmy Lin
 - http://www.ai.mit.edu/people/jimmylin/publications/Banko-etal-AAAI02.pdf
 - In Proceedings of 2002 AAAI SYMPOSIUM on Mining Answers from Text and Knowledge Bases, March 2002
- **□** Web Question Answering: Is More Always Better?
 - Susan Dumais, Michele Banko, Eric Brill, Jimmy Lin, Andrew Ng
 - http://research.microsoft.com/~sdumais/SIGIR2002-QA-Submit-Conf.pdf
- D. Ravichandran and E.H. Hovy. 2002.
 Learning Surface Patterns for a Question Answering System.
 ACL conference, July 2002.
- Ferrucci D, Brown E, Chu-Carroll J, et al. Building Watson: An overview of the DeepQA project[J]. AI magazine, 2010, 31(3): 59-79.
- □ The IBM DeepQA Project:
 http://researcher.ibm.com/researcher/view_project.php?id=2099

Homework

- □ Read below paper, write a brief introduction of 1 A4 page for the paper. Your PPT should at least include (but not limited to) the motivation(动机), issues of existing work(已有文章的缺点), the methodology(方法), the results(结果) and the conclusion(结论) of the paper. Due date: 30th, July, 2020
- Ferrucci D, Brown E, Chu-Carroll J, et al. Building Watson: An overview of the DeepQA project[J]. AI magazine, 2010, 31(3): 59-79.