

Christopher Manning

Pandu Nayak

Introduction to **Information Retrieval**

CS276: Information Retrieval and Web Search
Lecture 19: Web Question Answering

“Information retrieval”

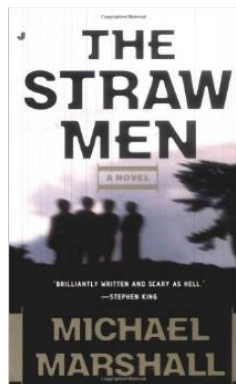
The name **information retrieval** is standard, but as traditionally practiced, it's not really right

All you get is **document retrieval**, and beyond that the job is up to you

Getting information

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."



Michael Marshall. *The Straw Men*. HarperCollins, 2002.

Web Search in 2025?

The web, it is a changing.

What will people do in 2025?

- Type key words into a search box?
- Use the Semantic Web?
- Ask questions to their computer in natural language?
- Use social or “human powered” search?

What do we know that's happening?

- Much of what is going on is in the products of companies, and there isn't exactly careful research explaining or evaluating it
- So most of this is my own meandering observations giving voice over to slides from others

Google

What's been happening? 2013–2019

- Many updates a year ... and 3rd party sites try to track them
 - e.g., <https://moz.com/google-algorithm-change> by & aimed at SEOs
- I just mention a few changes here
- New search index at Google: “Hummingbird” (2013)
 - <http://www.forbes.com/sites/roberthof/2013/09/26/google-just-revamped-search-to-handle-your-long-questions/>
 - Answering long, “natural language” questions better
 - Partly to deal with spoken queries on mobile
- More use of the Google Knowledge Graph (2014)
 - Concepts versus words
- RankBrain (second half of 2015):
 - A neural net helps in document matching for the long tail

Google

What's been happening? 2013–2019

- “Pigeon” update (July 2014):
 - More use of distance and location in ranking signals
- “Mobilegeddon” (Apr 21, 2015):
 - “Mobile friendliness” as a major ranking signal
- “App Indexing” (Android, iOS support May 2015)
 - Search results can take you to an app
- Mobile-friendly 2 (May 12, 2016):
 - About half of all searches are now from mobile
- “Fred” (1st quarter 2017)
 - Various changes discounting spammy, clickbaity, fake? sites

Google

What's been happening? 2013–2019

- Longer snippets in results pages (Nov 2017)
- Mobile-first Index (Mar 2018)
 - Index mobile version of websites in preference to desktop!
- Revert snippet length in results pages (May 2018)
- “Medic” update (Aug 2018)
 - More emphasis on expertise, authoritativeness, trust
 - Big changes for diet, nutrition, medical products sites
- Core Algorithm Update (Mar 2019)
 - Seems kind of like “Medic 2”
- 2019 seems to have been kinda quiet so far ...

The role of knowledge bases

- Google Knowledge Graph
- Facebook Graph Search
- Bing's Satori
- Things like Wolfram Alpha

Common theme: Doing graph search over structured knowledge rather than traditional text search

What's been happening

- More semi-structured information embedded in web pages
 - schema.org

The screenshot shows the top navigation bar of The New York Times website, including 'SECTIONS', 'HOME', 'SEARCH', and 'SUBSCRIBE LOG IN'. Below the navigation is a sports section with several article thumbnails. One article is titled 'After Nadal and Ferrer, Spanish Tennis Talent Pool Looks Thin'. Below the sports section is a Chromecast advertisement with the text 'Everything you love, now on your TV. For \$35.' and a 'Buy Now' button.

TENNIS

After Nadal and Ferrer, Spanish Tennis Talent Pool Looks Thin

JUNE 2, 2014

On Tennis

By CHRISTOPHER CLAREY

EMAIL

FACEBOOK

PARIS — The future of Spanish tennis may not be Spanish in the future.

Garbiñe Muguruza, the last unseeded player remaining in the



```

275 <p class="byline-column">
276     On Tennis </p>
277 <p class="byline">By <span itemprop="author creator" itemscope
itemtype="http://schema.org/Person"
itemid="http://topics.nytimes.com/top/reference/timestopics/people/c/christopher_clarey/index.html">
278     <a
href="http://topics.nytimes.com/top/reference/timestopics/people/c/christopher_clarey/index.html" rel="author"
title="More Articles by CHRISTOPHER CLAREY"> <span class="byline-author" data-byline-
name="Christopher Clarey" itemprop="name">CHRISTOPHER CLAREY</span>
279     </a> </span>
280 </p>

```

Mobile

Move to mobile favors a move to **speech** which favors **natural language information search**

- Will we move to a time when over half of searches are spoken?



Mobile

- Mobile proved importance of NLU/QA
- [What is the best time for wildflowers in the bay area]

Where to See Wildflowers in the Bay Area - Bay Area Parent

www.bayareaparent.com/Article/Where-to-See-Wildflowers-in-the-Bay-Area/ ▼

This is a great time of year to find **wildflowers** in the **Bay Area**. Call parks ... Loop Trail, known for being flat, moderate in difficulty and **best** for viewing the blooms.

Best Bay Area hikes into wildflower country - Bay Nature

baynature.org/article/best-bay-area-hikes-into-wildflower-country/ ▼ Bay Nature ▼

Mar 28, 2013 - It's spring, and all you nature lovers know what that means ... **time** to go see **wildflowers**! You've probably already noticed them popping in little ...

Bay Area Wildflower Hikes | EveryTrail

www.everytrail.com/guide/bay-area-wildflower-hikes ▼

★★★★★ Rating: 5 - 2 votes

Download the **Bay Area Wildflower Hikes** mobile travel guide to your iPhone or ... Even in lean years, **wildflower season** offers hikers beautiful reminders of the The **best** bloom is on the Chisnantuk Peak Trail, which is deep in the park and ...

Information quality

- There have always been concerns about **information provenance** (the source) and **information reliability**, especially among “information professionals” (reporters, lawyers, spies, ...)
- It wasn't ignored on the web: ideas like PageRank were meant to find good content, and there has been a decade of work targeting link farms, etc.
- However, a lot of recent events have shown the limited effectiveness of that work, and how “fake” information easily gets upvoted and spreads

Towards intelligent agents

Two goals

- Things not strings
- Inference not search

Two paradigms for question answering

- Text-based approaches
 - TREC QA, IBM Watson, DrQA
- Structured knowledge-based approaches
 - Apple Siri, Wolfram Alpha, Facebook Graph Search

(And, of course, there are hybrids, including some of the above.)

At the moment, structured knowledge is back in fashion, but it may or may not last

Example from Fernando Pereira (GOOG)

painkillers that don't thin blood



Search

painkillers that don't **thin blood**

painkillers that don't **cause constipation**

painkillers that don't **cause nausea**

painkillers that don't **upset stomach** frequent query

painkillers that don't

About 89,300 results (0.14 seconds)

[Advanced search](#)

painkillers that don't upset stomach



Search

About 29,700 results (0.15 seconds)

[Advanced search](#)

► [Symptoms of Crohn's](#)

Sponsored link

www.crohnonline.com

Do You Know the Signs of Crohn's? Read About Symptoms and More Now.

[Best Pain Reliever, Over the Counter Pain Relievers, Prescription ...](#)

For **stomach upset**, eating or drinking milk before you take a painkiller can help. ... **Don't** expect **painkillers** to relieve all your pain, but the best pain ...

www.healthblurbs.com/best-pain-reliever-over-the-counter-pain-relievers-prescription-analgesic-painkillers/ - [Cached](#) - [Similar](#)

[Why do painkillers make your stomach hurt? - Yahoo! Answers](#)

Aug 30, 2008 ... **stomach upset**, reflux/indigestion, or if severe ulcers ... I often take **painkillers** FOR **stomach** aches lol. **Don't** do this again. 2 years ago ...

answers.yahoo.com > [Health](#) > [Other - Health](#) - [Cached](#) - [Similar](#)

[How are painkillers bad for you?](#) - Apr 13, 2010

[What effect do painkillers have on you?](#) - Sep 30, 2009

[What's the difference between OTC painkillers? \(Advil, Aleve ...](#) - Nov 19, 2008

[Is it bad to take painkillers on an empty stomach ?](#) - Aug 20, 2008

[More results from answers.yahoo.com »](#)

[Phys Ed: Does Ibuprofen Help or Hurt During Exercise? - NYTimes.com](#)

Sep 1, 2009 ... When are ibuprofen and other anti-inflammatory **painkillers** justified? ... Can't take NSAIDS due to **upset stomach**. — bonemri ... Perhaps part of the problem is that you **don't** always have the option to rest your injury if ...

well.blogs.nytimes.com/.../phys-ed-does-ibuprofen-help-or-hurt-during-exercise/ - [Cached](#) - [Similar](#)

class negation synonyms

painkillers that don't upset stomach

X Search

About 29,700 results (0.15 seconds)

[Advanced search](#)

► [Symptoms of Crohn's](#)

Sponsored link

www.crohnonline.com Do You Know the Signs of Crohn's? Read About Symptoms and More Now.

[Best Pain Reliever, Over the Counter Pain Relievers, Prescription ...](#)

For **stomach upset**, eating or drinking milk before you take a painkiller can help. ... **Don't** expect **painkillers** to relieve all your pain, but the best pain ...

www.healthblurbs.com/best-pain-reliever-over-the-counter-pain-relievers-prescription-analgesic-painkillers/ - [Cached](#) - [Similar](#)

[Why do painkillers make your stomach hurt? - Yahoo! Answers](#)

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answers.yahoo.com > [Health](#) > [Other - Health](#) - [Cached](#) - [Similar](#)

[How are painkillers bad for you?](#) - Apr 13, 2010

[What effect do painkillers have on you?](#) - Sep 30, 2009

[What's the difference between OTC painkillers? \(Advil, Aleve ...](#) - Nov 19, 2008

[Is it bad to take painkillers on an empty stomach ?](#) - Aug 20, 2008

[More results from answers.yahoo.com »](#)

[Phys Ed: Does Ibuprofen Help or Hurt During Exercise? - NYTimes.com](#)

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well.blogs.nytimes.com/.../phys-ed-does-ibuprofen-help-or-hurt-during-exercise/ - [Cached](#) - [Similar](#)

"painkillers such as * tylenol"



Search

About 19,200 results (0.21 seconds)

[Advanced search](#)

[TYLENOL® Official Site](#)

Sponsored link

[Tylenol.com](#) Pain Relief from TYLENOL. Get Information and Coupons Here.
Head & Body Pain - Arthritis Pain - Sinus - Cold & Flu

[Ovarian hyperstimulation syndrome \(OHSS\): Treatments and drugs ...](#)

To ease abdominal discomfort, take over-the-counter painkillers such as acetaminophen Tylenol (others) or ibuprofen (Advil, Motrin, others). ...

[www.mayoclinic.com/.../DSECTION=treatments-and-drugs](#) - Cached - Similar

tylenol ⇒ painkiller

painkiller "adverse effects include" stomach



Search

About 266,000 results (0.14 seconds)

[Advanced search](#)

[Painkiller Comparison Chart](#)

Oct 31, 2008 ... Chart showing prescription and non-prescription **painkillers** and what they are used for. ... menstrual pain, fever, Common **adverse effects include**: nausea, ... asthma, **upset stomach**, not for last pregnancy trimester. ...

www.disabled-world.com/.../painkiller-chart.shtml - [Cached](#) - [Similar](#)

[\[PDF\] List of Painkillers and what they are used for: Over the Counter ...](#)

File Format: PDF/Adobe Acrobat - [Quick View](#)

Common **adverse effects include**: nausea, dyspepsia, gastrointestinal ulceration/bleeding. ... **upset stomach**, not for last pregnancy trimester. Individuals ...

healingwithsoftlasers.com/.../Painkiller%20side%20effects%20chart%20.pdf

upset stomach \Rightarrow adverse effect (on stomach)

tylenol stomach



Search

About 1,390,000 results (0.28 seconds)

[Advanced search](#)

► [Pain Relievers And Upset Stomach - Tylenol Extra Strength Pain ...](#)

Tylenol Extra Strength Pain Reliever Fever Reducer 100 Caplets - User Rating: 5 stars.

Review Summary: Taking the wrong pain reliver can cause you **stomach** ...

[www.epinions.com](#) › [Wellness & Beauty](#) › [Health Aids](#) - [Cached](#) - [Similar](#)

[Treatment: Pain: Merck Manual Home Edition](#)

TYLENOL has virtually no useful anti-inflammatory activity, does not affect the blood's ability to clot, and has almost no adverse effects on the **stomach** ...

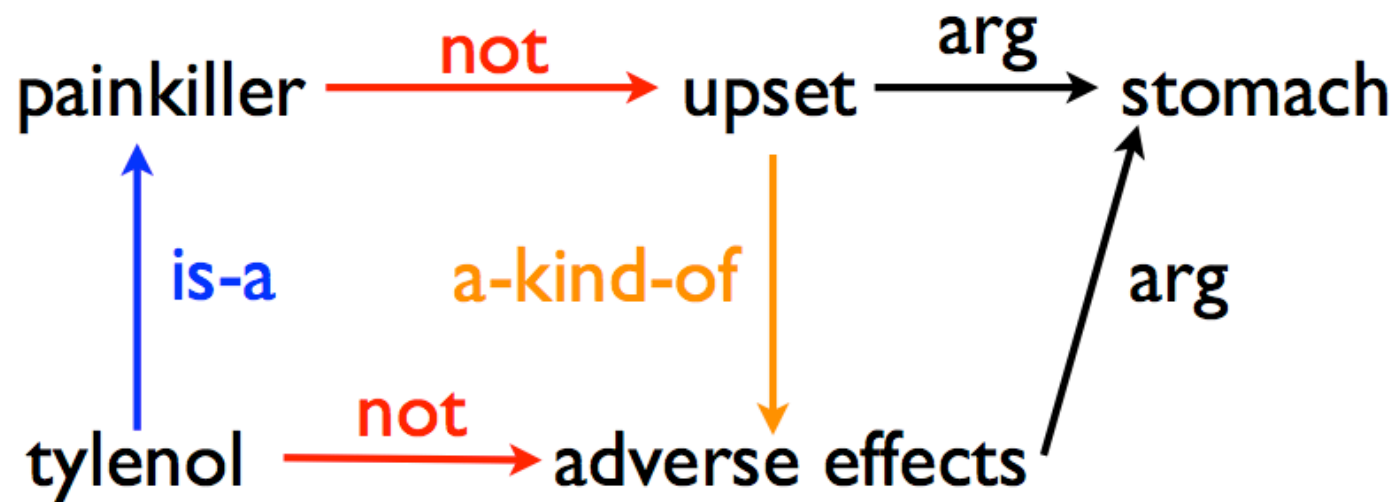
[www.merck.com/mmhe/sec06/ch078/ch078d.html](#) - [Cached](#) - [Similar](#)

tylenol ⇒ no adverse effects (on stomach)
⇒ no upset stomach

painkiller

upset

stomach



“Things, not strings”

| From | To | Requires |
|---------------|--------------------|--------------------------------------|
| Term | Concept | Parsing, disambiguation, coreference |
| Term identity | Entailment | Concept relations |
| Co-occurrence | Syntactic relation | Document structure, parsing |
| Term index | Semantic index | Concept disambiguation, inference |

Slides from Patrick Pantel (MSFT)

The image shows a screenshot of a Yahoo! search result for "Seven Samurai". The search bar contains "Seven Samurai" and shows "82,800,000 result". Below the search bar are tabs for "WEB", "IMAGES", "VIDEO", "SHOPPING", "BLOGS", and "MORE". The main result is for "Seven Samurai (1954)" from "movies.yahoo.com". The description reads: "Yahoos B+ A Japanese farming village, constantly beseiged and pillaged by an army of bandits, recruits seven independent... more". Below the description is a box with structured data: "Running Time: 2 hr 40 min", "Directed by: Akira Kurosawa", and "Starring: Takashi Shimura, Toshiro Mifune, Yoshio Inaba, Seiji Miyaguchi, ... more". To the left of the main result is a "RELATED MOVIES" section with a list of movies: "Dreams", "Ran", "Dersu Uzala", "Throne of Blood", "Yojimbo", and "Stray Dog".

Entity Detection (points to the search bar)

Structured Recommendations (points to the Related Movies list)

Play trailer (points to the movie poster)

Structured Data (points to the movie details box)

bing flights to maui

Web Flights More

Flights from Seattle, WA to Maui, HI

FROM Seattle, WA (SEA) - Seatl TO Kahului, HI (OGG) - Kahul

LEAVE 03/23/2012 RETURN 03/25/2012 Find flights

bing.com/travel

WEEKEND ESTIMATES

- \$639 Depart March 09
- \$748 Depart March 16
- \$649 Depart March 23

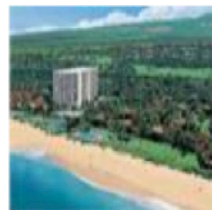
Price prediction

Task completion

bing royal lahaina resort

Web Hotels Images More

Royal Lahaina Resort - Bing Travel



2780 Kekaa Dr · Lahaina
(808) 661-9469
[Details](#) · [Photos](#) · [Amenities](#) · [Directions](#) · [Website](#)
★★★★☆ (12)
Sample rate: \$230

Aggregate ratings

Compare rates from major travel sites

CHECK IN 03/15/2012 CHECK OUT 03/17/2012 Find rate

bing.com/travel/hotels/search?q=royal+lahaina+resort

Task completion

Mel Gibson - movies

All genres

Popular first



The Expendables 3 (2014) ★★★★★



Mad Max (1980) ★★★★★



Braveheart (1995) ★★★★★



Mad Max 2: The Road Warrior (1982) ★★★★★



Get the Gringo (2012) ★★★★★



Edge of Darkness (2010) ★★★★★



The Passion of the Christ (2004) ★★★★★



Apocalypto (2006) ★★★★★



Mad Max Beyond Thunderdome... (1985) ★★★★★



Let's Kill Hitler (1992) ★★★★★

Mel Gibson - IMDb

www.imdb.com/name/nm0000154

Born Jan 03, 1956 · 59 years old · 368 photos

Mel Gibson, Actor: **Braveheart**. Mel Columcille Gerard **Gibson** was born January 3, 1956 in Peekskill, New York, USA, as the sixth of eleven children of Hutton **Gibson**, a ...
[Biography](#) · [Awards](#) · [Films](#) · [News](#)

Mel Gibson Movies | Movies.com

www.movies.com/actors/mel-gibson/mel-gibson-movies/p181347

50 rows · Get the full list of all **Mel Gibson** movies. See who they starred with and ...
[Linda Hunt](#) · [Beth Orton](#) · [Watch at Home](#) · [Contact Us](#) · [Bill Kerr](#) · [Mad Max](#)

Videos of mel gibson movies

bing.com/videos

| | | | |
|---------------------------------------|---------------------------------|-------------------------------------|----------------------------|
| | | | |
| Ransom (1996) - Full Movie YouTube | 'The Beaver' Trailer YouTube | Ransom Trailer HQ (1996) YouTube | Payback Trailer YouTube |

[See more videos of mel gibson movies](#)

Mel Gibson - Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/Mel_Gibson

Mel Colm-Cille Gerard **Gibson** AO (born January 3, 1956) is an American actor and filmmaker. He is most well known as an action hero, for roles such as Martin Riggs in ...
[Early life](#) · [Career](#) · [Film work](#) · [Prospective films](#) · [Personal life](#)

Mel Gibson filmography - Wikipedia, the free encyclopedia

Mel Gibson

American Actor



Mel Colm-Cille Gerard Gibson AO is an American actor and filmmaker. He is most well known as an action hero, for roles such as Martin Riggs in the Lethal Weapon buddy cop film series and Max Rockatansky in the first three films in the Ma... +



[Wikipedia](#)



[IMDb](#)



[Facebook](#)

Born: Jan 03, 1956 (age 59) · Peekskill

Height: 5' 10" (1.77 m)

Romance: [Oksana Grigorieva](#) · [Oksana Pochepa](#)

Spouse: [Robyn Moore Gibson](#) (1980 - 2011)

Children: [Hannah Gibson](#) (Daughter) · [Christian Gibson](#) (Son) · [Edward Gibson](#) (Son) · [Louis Gibson](#) (Son) · [William Gibson](#) (Son) +

Upcoming movies: [Hacksaw Ridge](#)

People also search for

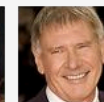
[See all \(10+\)](#)



[Oksana Grigorieva](#)
Former partner



[Sylvester Stallone](#)



[Harrison Ford](#)



[Arnold Schwarzenegger](#)



[Robert Downey Jr.](#)



How old is mariah carey



manning@stanford.edu

Web Images News Shopping Videos More Search tools

About 102,000,000 results (0.55 seconds)

45 years (March 27, 1970)

Mariah Carey, Age



Direct Answer



Madonna
56 years



Nick Cannon
Spouse
34 years



Jennifer Lopez
45 years

Feedback

Mariah Carey - Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/Mariah_Carey

Mariah Carey was born on March 27, 1969 or 1970 in Huntington, New York. Her father, Alfred Roy, was of African American and Venezuelan (including Afro-Venezuelan) descent, while her mother, Patricia (Hickey), is of White Irish descent.

Nick Cannon - Tommy Mottola - Albums - Me. I Am Mariah... The Elusive ...

Nick Cannon & Mariah Carey Fighting: Split Caused By ...

hollywoodlife.com/.../nick-cannon-mariah-carey-fightin...

Aug 22, 2014 - Nick Cannon and Mariah Carey announced their separation after six years of marriage, and now HollywoodLife.com has learned EXCLUSIVELY what caused the power couple to split up. Nick Cannon, 33, and Mariah Carey, 44, have separated after six years of marriage, and two beautiful children together.

Mariah Carey - Biography - Music Producer, Film Actress ...

www.biography.com/people/mariah-carey-9542177

Mariah Carey was born March 27, 1970, in Huntington, Long Island, New York, and began taking voice lessons at age four. At 18 she signed with Columbia ...

Mariah Carey Divorce Explained: Nick Cannon Cheating ...

www.celebdirtylaundry.com/.../mariah-carey-divorce-nick-cannon-cheat...

Aug 29, 2014 - Mariah Carey Divorce Explained: Nick Cannon Cheating and Paying For 23-Year Old Mistress Jasmine Sanders and Dancer Brittany Dailey.

Mariah Carey

Structured Data

Singer-songwriter

Listen now

Google Play

Listen with free trial

Spotify

Listen for free

Mariah Carey is an American singer, songwriter, record producer, and occasional actress. She rose to prominence after releasing her self-titled debut studio album Mariah Carey in 1990; it went multiplatinum ...

Born: March 27, 1970 (age 45), Huntington, NY

Height: 5' 9" (1.75 m)

Children: Moroccan Scott Cannon, Monroe Cannon

Spouse: Nick Cannon (m. 2008), Tommy Mottola (m. 1993–1998)

Songs

| | | |
|----------------------|------|--------------------|
| Without You | 1993 | Music Box |
| Hero | 1993 | Music Box |
| I Want to Know Wh... | 2009 | Memoirs of an I... |
| I'll Be There | 1990 | Mariah Carey |
| We Belong Together | 2005 | The Emancipatio... |

Albums

View 20+ more





how old is christopher manning



All News Shopping Images Videos More Settings Tools

About 18,600,000 results (0.61 seconds)

Christopher D. Manning / Age

53 years

September 18, 1965



People also search for



Daniel Jurafsky
57 years



Prabhakar Raghavan
58 years



Dan Klein
43 years

Feedback

Christopher Manning, Stanford NLP - Stanford NLP Group

<https://nlp.stanford.edu/manning/>

Jan 13, 2019 - Christopher Manning, Professor of Computer Science and Linguistics, ... is directed at students who have already been admitted to Stanford.

[Christopher Manning: Papers ...](#) · [Christopher Manning and Ph ...](#)

Christopher Manning's Profile | Stanford Profiles

<https://profiles.stanford.edu/chris-manning>

Christopher Manning is part of Stanford Profiles, official site for faculty, postdocs, ... Chris Manning. SUNet ID(s): Chris.Manning. Christopher.Manning. manning ...

Christopher D Manning - Google Scholar Citations

scholar.google.com/citations?user=1zmD0dwAAAAJ&hl=en

CD Manning, M Surdeanu, J Bauer, J Finkel, SJ Bethard, D McClosky ... Improved semantic representations from tree-structured long short-term memory ...

Christopher D. Manning



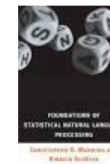
Computer scientist

h-index: 111

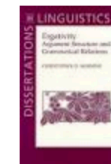
Books



Introduction to informatio...
2008



Foundations of Statistical...
1999



Ergativity: Argument Structure...
1996



Complex Predicates and Infor...
1999

Publications

Introduction to Information Retrieval

CD Manning, P Raghavan, H Schütze
Cambridge: Cambridge University Press

2008

Foundations of statistical natural language processing

CD Manning, H Schütze
Cambridge, MA: MIT Press

1999

Profiles



Google Scholar



Twitter



how old is pandu nayak



Christopher



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Search tools



About 207,000 results (0.80 seconds)

Pandu Nayak

www.pandunayak.com/ ▾

About me. I am currently at Google, working on various aspects of Search Quality. I am particularly interested in query understanding and helping users ...

Pandu Nayak | LinkedIn

<https://www.linkedin.com/in/pandu-nayak-4790201> ▾

View **Pandu Nayak's** professional profile on LinkedIn. ... As a LinkedIn member, you'll join 400 million other professionals **who** are sharing connections, ideas, ...

Google Panda - Was it named after Pandu Nayak? - Quora

<https://www.quora.com/Google-Panda-Was-it-named-after-Pandu-Nayak> ▾ Quora ▾

Oct 27, 2015 - **Pandu Nayak** is the guy behind this famed search algo change. ... name of Navneet Panda along with Vladimir Ofitserov, **who** is the co-inventor ...

Patrick Pantel talk (Then) Current experience

The screenshot shows a Bing search results page for the query "jetbeam rrt-0". The page includes a navigation bar at the top with links for Web, Images, Videos, Shopping, News, Maps, and More, along with MSN and Hotmail. The search bar contains the query "jetbeam rrt-0" and a magnifying glass icon. Below the search bar, there are tabs for "Web", "Videos", and "More". The search results are displayed in a list format, with the first result being "JETBeam RRT-0 R5 with Infinite Ramping LED Flashlight ...". The second result is "Jetbeam RRT-0" and the third is "JETBeam RRT-0 Overview With Lots of Pictures". The page also features a "RELATED SEARCHES" section on the left and a "SEARCH HISTORY" section at the bottom left.

Web Images Videos Shopping News Maps More | MSN Hotmail

Thomas f Sign out Rewards

bing MS Beta

jetbeam rrt-0

Web Videos More

RELATED SEARCHES

- JETBeam RRT 0 Review
- JETBeam Flashlights
- JETBeam RRT-0 R5
- JETBeam Raptor
- JETBeam M1X
- JETBeam RRT-0 R5
- 240 Lumens

SEARCH HISTORY

Search more to see your history

See all

Clear all · Turn off

ALL RESULTS 1-10 of 6,600 results · [Advanced](#)

[JETBeam RRT-0 R5 with Infinite Ramping LED Flashlight ...](#)
Going Gear JETBeam RRT-0 R5 with Infinite Ramping LED Flashlight [jetbeamrrt0r5] - The popular RRT-0 has been updated to be an even more versatile flashlight, ...
goinggear.com/index.php?main_page=product_info&cPath=14_22&products_id=438 · Mark as spam

[Jetbeam RRT-0](#)
Now In Stock! Model: RRT-0 (S2) Specially designed for Military, Law Enforcement, Self-defense, Hunting, Search & Rescue and General Outdoors The Rapid ...
www.jetbeamusa.com/products/RRT%2d0.html · Mark as spam

[JETBeam RRT-0 Overview With Lots of Pictures](#)
I got my JETBeam RRT-0 Raptor today. All I can say is to JETBeam! This thing is a ... PICTURES QUICKLY.... BEFORE MY HEAD EXPLODES!!! Ok... it didnt ...
323 replies since November 2009
www.candlepowerforums.com/vb/showthread.php?248375-JETBeam-RRT-0-Overview-With-Lots-of-... · Mark as spam

[JETBeam Flashlights](#)
Specification: Model: JETBeam RRT-0(R2) Flashlight; Specially designed for Military, Law Enforcement, Self-defense, Hunting, Search & Rescue and Outdoorsman
jetbeamblog.com · Mark as spam

Desired experience: Towards actions

Recognize
entity in query

Actions easily
accessible

Web Images Videos Shopping News Maps More | MSN Hotmail

Thomas Sign out Rewards


bing MS Beta

jetbeam rrt-0

Web Videos More ▾

ENTITY

ALL RESULTS 1-10 of 6,600 results · [Advanced](#)



JETBeam RRT-0 Flashlight (Product)

JETBeam RRT-0 R5 with Infinite Ramping LED Flashlight ...
 Going Gear JETBeam RRT-0 R5 with Infinite Ramping LED Flashlight [jetbeamrrt0r5] - The popular RRT-0 has been updated to be an even more versatile flashlight, ...
goinggear.com/index.php?main_page=product_info&cPath=14_22&products_id=438 · Mark as spam

Jetbeam RRT-0
 Now In Stock! Model: RRT-0 (S2) Specially designed for Military, Law Enforcement, arch & Rescue and General Outdoors The Rapid ...
[Amazon.com](#) · [CandlePowerForums](#) · [Epinions.com](#) · [FlashlightReviews.com](#) · [review With Lots of Pictures](#)
 more ...
 323 replies since November 2009
www.candlepowerforums.com/vb/showthread.php?248375-JETBeam-RRT-0-Overview-With-Lots-of-... · Mark as spam

RELATED SEARCHES

[JETBeam RRT 0 Review](#)
[JETBeam Flashlights](#)
 Specification: Model: JETBeam RRT-0(R2) Flashlight; Specially designed for Military, Law Enforcement, Self-defense, Hunting, Search & Rescue and Outdoorsman
jetbeamblog.com · Mark as spam

Read Reviews
 Watch Demo Video
 Product Comparisons
 Social Discounts
 Find Locally
 Buy Online
 Price Predictions

Politician

Recognize
entity in query

Actions easily
accessible

The screenshot shows a Bing search results page for the query "Obama". The search bar at the top contains "Obama" and the Bing logo. Below the search bar, there are tabs for "Web", "Visual Search", "News", "Images", "Videos", and "More". The search results are categorized into "ENTITY" and "ACTIONS".

ENTITY

Barack Obama (President)

ACTIONS

- Watch Weekly Address
- Follow Social Updates
- Read Biography
- View Approval Ratings
- Support Candidacy

ALL RESULTS 1-10 of 511,000 results · [Advanced](#)

Official Obama Website Ad

www.BarackObama.com · Respect. Empower. Include. Win. Join Barack Obama's campaign now.

Other ideas: [obama barack bio](#) · [president obama website](#)

Obama for America | 2012

Barackobama.com is the official re-election campaign website of President Barack Obama. Visit the site for the latest updates from the Obama campaign, 2012 election news ...

www.barackobama.com · Mark as spam

Ronojoy Chakrabarti and Caroline Mackey like Barack Obama

Barack Obama - Wikipedia, the free encyclopedia

career · Legislative career ... · Presidential campaigns

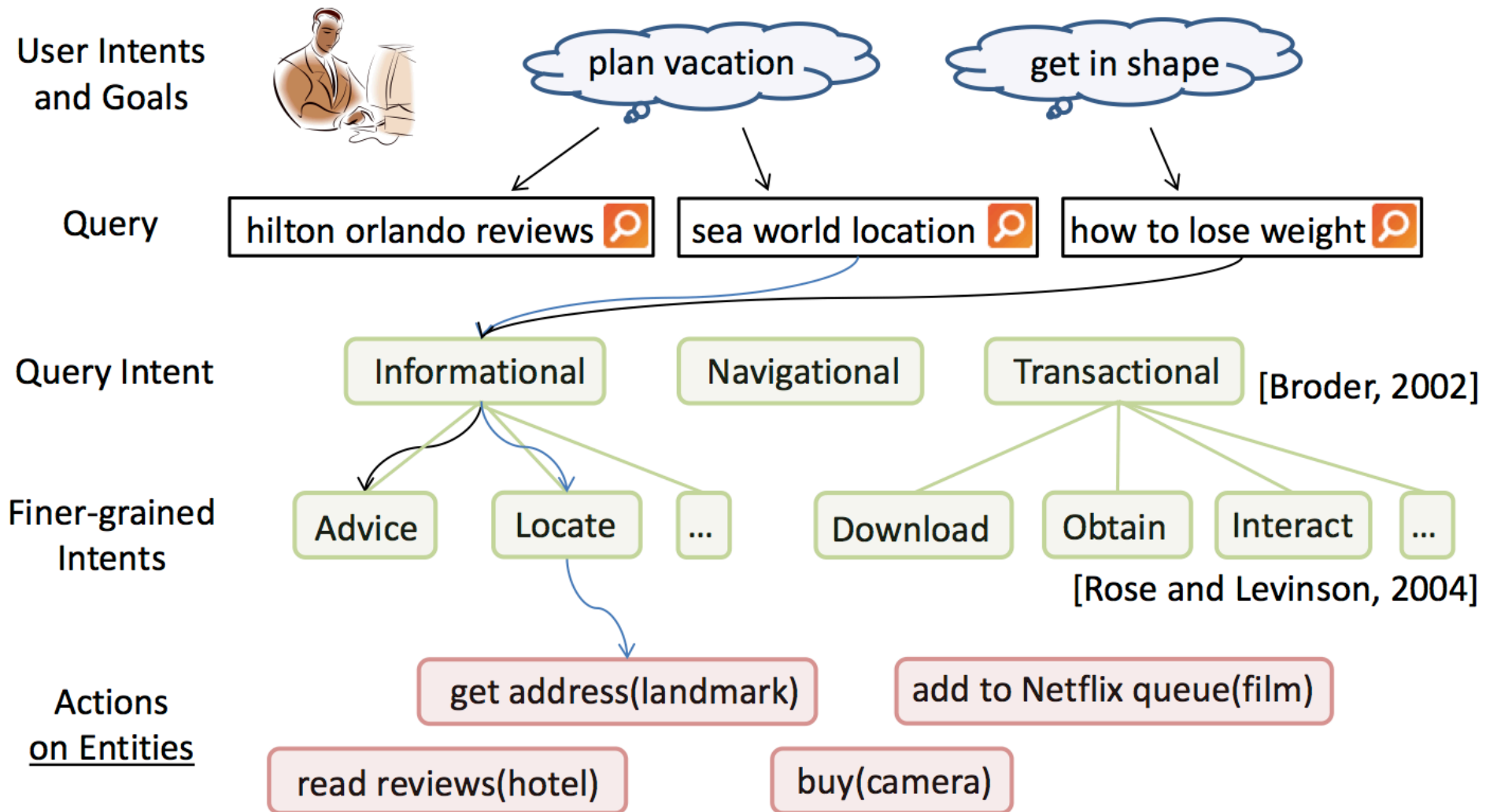
Barack Obama II (born August 4, 1961) is the 44th and current President of the United States. He is the first African American to hold the office. Obama ...

en.wikipedia.org/wiki/Obama · Mark as spam

RELATED SEARCHES

[Barack Obama and other U.S. politicians by office, state, and branch of government](#)

Actions vs. Intents



Learning actions from web usage logs

- Three months of us-en web logs
- Annotate with Freebase entities

2,164,579
(query, host) pairs
over 3 months

235,385 entities

21 types

129,088 contexts

58,123 hosts

- Keep queries with an entity in set of 21 types
- Filter out navigational queries
- Filter out clicked hosts that weren't clicked at least 100 times

get reviews



Orlando hotel reviews

read biography

Does Hope Solo have a boyfriend?

download software

Free Winzip download

watch shows online

watch family guy online

The screenshot shows a Bing search results page for the query "hannah montana". The browser address bar shows "http://www.bing.com/ser... hannah montana - Bing". The search bar contains "hannah montana". The page displays various search results, including a top result for "Hannah Montana Forever | Disney Channel" with a description: "Explore the Hannah Montana Forever home page for videos, full-length episodes, character bios, games, photos, downloads, music, and more!". A red callout box points to the search results with the text: "A hodgepodge of related strings" and "Only actionable through search". Other search results include "Miley Cyrus Angry With Dad Over Hannah Montana Slur" and "Hannah Montana - Wikipedia, the free encyclopedia". The right sidebar contains sponsored sites like "Hannah Montana Forever" and "Hannah Montana Items".

• A hodgepodge of related strings

• Only actionable through search

bing MS Beta br1011 hannah montana

Web Videos News TV Shopping Images More

RELATED PRODUCTS

- Girl Talk Game
Hannah Montana Doll
Kids Rock Guitar

ALL RESULTS 1-10 of 14,500,000 results Advanced

Hannah Montana Forever | Disney Channel
Explore the Hannah Montana Forever home page for videos, full-length episodes, character bios, games, photos, downloads, music, and more!
tv.disney.go.com/disneychannel/hannahmontana

- Hannah Montana Games
Disney Channel Games
Good Luck Charlie
Sonny With A Chance TV Shows
Phineas & Ferb
Fish Hooks

Sponsored sites

- Watch TV Shows at Bing
Hannah Montana
Hannah Montana Items

RELATED PEOPLE

- Billy Ray Cyrus
Aaron Kelly

Entertainment News: hannah montana
Billy Ray Cyrus: 'Hannah Montana' destroyed family
NASHVILLE, Tenn. (AP) -- Billy Ray Cyrus says the Disney TV show 'Hannah Montana' destroyed his family, causing his divorce and sending daughter Miley Cyrus spinning out of...

RELATED MUSIC

- Miley Cyrus: Soundtrack 2009
Taylor Swift: Our Song 2010

Hannah Montana - Wikipedia, the free encyclopedia
Production · Cast · Episodes · Films
Hannah Montana is an American television series, which debuted on March 24, 2006 on Disney Channel, and also airs Saturday mornings on ABC as part of the a;

RELATED VIDEOS

- Miley Cyrus Performs At Idol

Character Bios | Hannah Montana Forever | Disney Channel
Meet Miley, Lilly, Oliver, Rico, and the rest of the gang from Disney Channel's Hannah Montana Forever!
tv.disney.go.com/disneychannel/hannahmontana/characters/index.html

The screenshot shows a Bing search results page for the query "hannah montana". The search bar at the top contains "http://www.bing.com/search?q=hannah" and "hannah montana - Bing". Below the search bar are navigation tabs for "Web", "Images", "Videos", "Shopping", "News", "Maps", and "More", along with "MSN" and "Hotmail" links. The main content area is divided into several sections:

- Shopping:** A result for "Hannah Montana Girl Talk Game" is highlighted with a green arrow. The product is priced at \$8.25 on Amazon.com. The description says: "Grab your girlfriends and take center stage in this fun, interactive game! Spin the wheel to answer a question, tell a secret or perform a silly skit just like Hannah Montana would. Ask each other fun questions and see what you know about the Hannah... more..."
- RELATED PRODUCTS:** Includes "Girl Talk Game", "Hannah Montana Dress", and "Kids Rock Guitar".
- RELATED PEOPLE:** Lists "Billy Ray Cyrus", "Aaron Kelly", "Miley Cyrus Soundtrack 2009", and "Taylor Swift Our Song 2010".
- RELATED VIDEOS:** Includes "Miley Cyrus Performs At Idol".

Other search results visible include a Facebook profile for Billy Ray Cyrus and a Wikipedia entry for Hannah Montana. A green box on the right side of the page contains the text "Big Wins" and a list of three bullet points:

- Typed relations
- User Interface accesses structured data
- Click through experience can now leverage strongly-typed identifier

At the bottom of the page, there is a footer with "Internal preview" and "Help improve Bing" buttons.

Big Wins

- Typed relations
- User Interface accesses structured data
- Click through experience can now leverage strongly-typed identifier

... says the Disney TV show "Hannah Montana" is the result of his divorce and sending daughter Miley Cyrus to live in Los Angeles - 10 hours ago

Montana.BradfordExchange.com

From Hannah Montana
Compare Choices and Prices. Everything You Want and Need!
Shopzilla.com

Hannah Montana Slur Entertainmentwise
Hannah Montana Myspace, HBO shows and Hannah Montana

Hannah Montana Wigs
15,000 Costumes - All Sizes & Styles. Low Prices & Same Day Shipping!
www.BuyCostumes.com

... encyclopedia

... which debuted on March 24, 2006 on Disney Channel as part of the "Hannah Montana" series

See your message here

en.wikipedia.org/wiki/Hannah_montana · Mark as spam

[Character Bios](#) | [Hannah Montana Forever](#) | [Disney Channel](#)

Meet Miley, Lilly, Oliver, Rico, and the rest of the gang from Disney Channel's Hannah Montana Forever!

tv.disney.go.com/disneychannel/hannahmontana/characters/index.html · Mark as spam

http://www.bing.com/search?q=hannah montana - Bing

Web Images Videos Shopping News Maps More | MSN Hotmail Sign in Redmond, Washington Preferences

bing MS Beta br1011 hannah montana

Web Videos News TV Shopping

RELATED PRODUCTS ALL RESULTS

Girl Talk Game **Add to Amazon cart**

Hannah Montana Doll

Kids Rock Guitar

RELATED PEOPLE

Billy Ray Cyrus **Connect on Twitter**

Aaron Kelly

RELATED MUSIC

Miley Cyrus: Soundtrack **Play track**

Taylor Swift: Our Song

RELATED VIDEOS

Miley Cyrus Performs At Idol

Hannah Montana Forever | Disney Channel

Explore the Hannah Montana Forever home page for bios, games, photos, downloads, music, and more! tv.disney.go.com/disneychannel/hannahmontana

Hannah Montana Games Sonny With A Disney Channel TV Shows Games Phineas & Fe Good Luck Charlie Fish Hooks Show more results from tv.disney.go.com

Entertainment News: Hannah Montana

Billy Ray Cyrus: 'Hannah Montana' de NASHVILLE, Tenn. (AP) -- Billy Ray Cyrus says the Disney TV show "Hannah Montana" destroyed his family, causing his divorce and sending daughter Miley Cyrus spinning out of... Yahoo Finance - 10 hours ago

Miley Cyrus Angry With Dad Over Hannah Montana Slur Entertainmentwise

Popversations: Lady Gaga at the Grammys, HBO shows and Hannah Montana Florida Times-Union

Hannah Montana - Wikipedia, the free encyclopedia

Production · Cast · Episodes · Films

Hannah Montana is an American television series, which debuted on March 24, 2006 on Disney Channel, and also airs Saturday mornings on ABC as part of the a; en.wikipedia.org/wiki/Hannah_montana · Mark as spam

Character Bios | Hannah Montana Forever | Disney Channel

Meet Miley, Lilly, Oliver, Rico, and the rest of the gang from Disney Channel's Hannah Montana Forever! tv.disney.go.com/disneychannel/hannahmontana/characters/index.html · Mark as spam

Montana.BradfordExchange.com

From Hannah Montana Compare Choices and Prices. Everything You Want and Need! Shopzilla.com

Hannah Montana Wigs 15,000 Costumes - All Sizes & Styles. Low Prices & Same Day Shipping! www.BuyCostumes.com

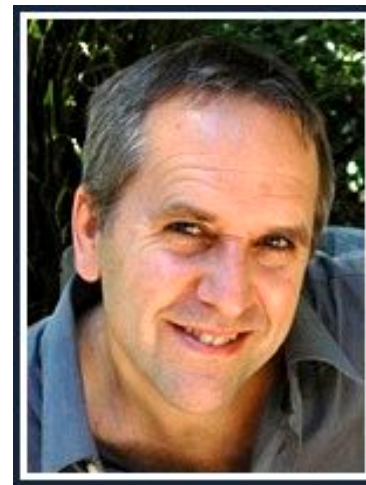
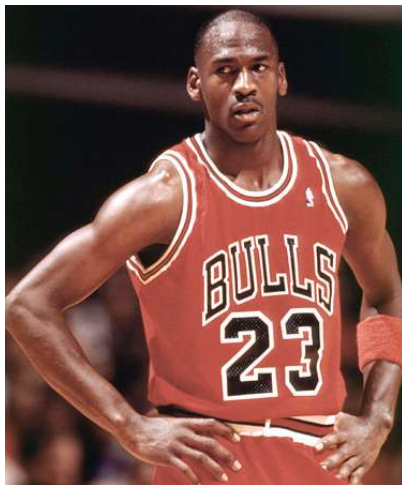
See your message here

Internal preview Help improve Bing

- ### Big Wins
- Typed relations
 - User Interface accesses structured data
 - Click through experience can now leverage strongly-typed identifier
 - **Brokered Actions (one click conversions)**

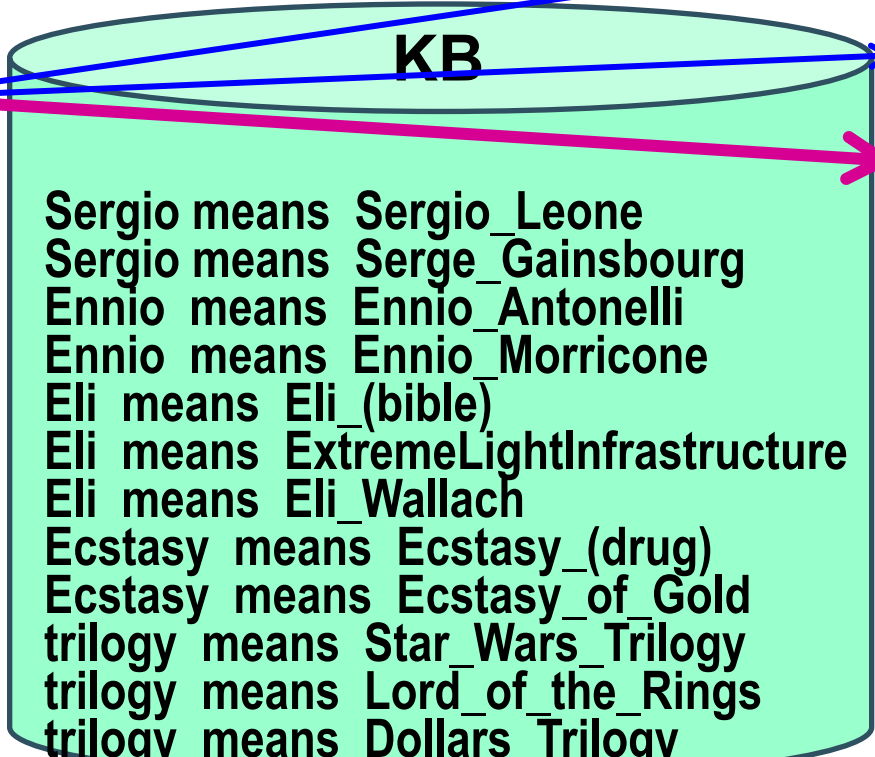
Entity disambiguation and linking

- Key requirement is that entities get identified
 - Named entity recognition (e.g., Stanford NER!)
- and disambiguated
 - Entity linking (or sometimes “Wikification”)
 - e.g., Michael Jordan the basketballer or the ML guy



Mentions, Meanings, Mappings [G. Weikum]

Sergio talked to
Ennio about
Eli's role in the
Ecstasy scene.
This sequence on
the graveyard
was a highlight in
Sergio's **trilogy**
of western films.



- Eli (bible)
- Eli Wallach
- Ecstasy (drug)
- Ecstasy of Gold
- Star Wars Trilogy
- Lord of the Rings
- Dollars Trilogy

Mentions
(surface names)

Entities
(meanings)

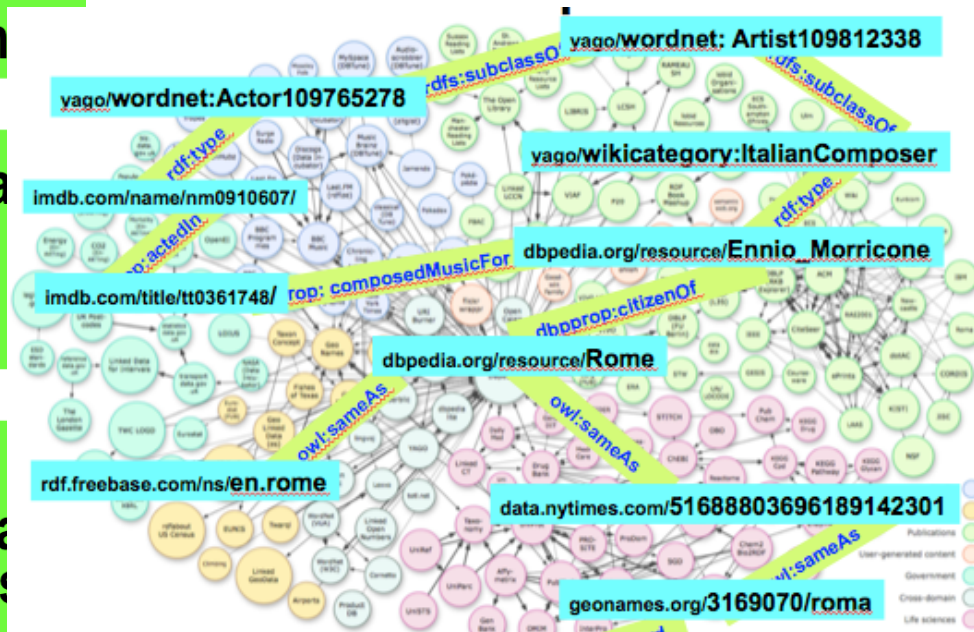


- and linked to a canonical reference
 - Freebase, dbPedia, Yago2, (WordNet)

http://.../wiki/Dollars_Triology
http://.../wiki/The_Good,_the_Bad,
http://.../wiki/Clint_Eastwood
http://.../wiki/Honorary_Academ

http://.../wiki/The_Good,_the_Ba
<http://.../wiki/Metallica>
[http://.../wiki/Bellagio_\(casino\)](http://.../wiki/Bellagio_(casino))
http://.../wiki/Ennio_Morricone

http://.../wiki/Sergio_Leone
http://.../wiki/The_Good,_the_Ba
http://.../wiki/For_a_Few_Dollars
http://.../wiki/Ennio_Morricone



Understanding questions

The screenshot shows a Google search interface. The search bar contains the text "third prime minister of australia". The search results show "About 34,400,000 results (0.34 seconds)". A knowledge panel for Chris Watson is displayed, including a portrait, his title "The 3rd Prime Minister of Australia", and a brief biography. Below the knowledge panel, there are search results for "Chris Watson - Wikipedia, the free encyclopedia" and "List of Prime Ministers of Australia - Wikipedia, the free ...". The browser's taskbar at the bottom shows several open files: "Socher-MVRNN-D12-....pdf", "MarcPPT.pptx", and "Larry-Emmott-Social....pptx".

Google

third prime minister of australia

manning@stanford.edu

Web News Images Videos Shopping More Search tools

About 34,400,000 results (0.34 seconds)

Chris Watson
The 3rd Prime Minister of Australia



Feedback

Chris Watson
Former Prime Minister of Australia

John Christian Watson, commonly known as Chris Watson, was a Chilean Australian politician who served as the third Prime Minister of Australia. [Wikipedia](#)

Born: April 9, 1867, Valparaíso, Chile
Died: November 18, 1941, Sydney, Australia
Party: [Australian Labor Party](#)
Previous offices: Member of the Australian Parliament (1906–1910), [More](#)

Chris Watson - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Chris_Watson - Wikipedia

3rd Prime Minister of Australia ... He was the first prime minister from the Australian Labour Party, and the first prime minister from the labour movement in the ...
[Early life - Union activities and colonial ...](#) - [Federation - Prime Minister in 1904](#)

List of Prime Ministers of Australia - Wikipedia, the free ...

Socher-MVRNN-D12-....pdf MarcPPT.pptx Larry-Emmott-Social....pptx Show All

2017 ...

The screenshot shows a Google search interface. The search bar contains the text "australia's third prime minister". The search results are displayed below the search bar, showing three results. The first result is "Chris Watson - Wikipedia, the free encyclopedia" with a snippet: "3rd Prime Minister of Australia ... He was the first prime minister from the Australian Labour Party, and the first prime minister from the labour movement in the ...". The second result is "List of Prime Ministers of Australia by time in office - Wikipe..." with a snippet: "This is a list of Prime Ministers of Australia by time in office. The basis of ... Rank: No: Prime Minister: Portrait: Party: District: Assumed Office 3rd, Chris Watson". The third result is "List of Prime Ministers of Australia - Wikipedia, the free ..." with a snippet: "Below is a list of Prime Ministers of the Commonwealth of Australia. The parties shown are those to which ... 17 February 1917, 9 February 1923, —, 3rd Hughes. Edmund Barton - Protectionist Party - Longest serving Prime Ministers".

https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=australia's+third+pri...

Google australia's third prime minister

Web News Images Videos Shopping More Search tools

About 2,550,000 results (0.41 seconds)

Chris Watson - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Chris_Watson - Wikipedia
3rd Prime Minister of Australia ... He was the first **prime minister** from the **Australian** Labour Party, and the first **prime minister** from the labour movement in the ...
Early life - Union activities and colonial ... - Federation - Prime Minister in 1904

List of Prime Ministers of Australia by time in office - Wikipe...
en.wikipedia.org/.../List_of_Prime_Ministers_of_Australia_by... - Wikipedia
This is a list of **Prime Ministers** of **Australia** by time in office. The basis of ... Rank:
No: **Prime Minister**: Portrait: Party: District: Assumed Office **3rd**, Chris Watson

List of Prime Ministers of Australia - Wikipedia, the free ...
en.wikipedia.org/wiki/List_of_Prime_Ministers_of_Australia - Wikipedia
Below is a list of **Prime Ministers** of the Commonwealth of **Australia**. The parties shown are those to which ... 17 February 1917, 9 February 1923, —, **3rd** Hughes.
Edmund Barton - Protectionist Party - Longest serving Prime Ministers

Socher-MVRNN-D12-....pdf MarcPPT.pptx Larry-Emmott-Social....pptx Show All

2017 ...

Google search for "australia's 3rd prime minister". The search results show about 712,000 results in 0.50 seconds. The top result is a table snippet from Wikipedia titled "List of Prime Ministers of Australia by time in office - Wikipedia".

| | | | | |
|-----|-----|-----------------------------|-------|---------------------------|
| 24. | 3rd | Chris Watson (1867–1941) | Labor | Bland, NSW (1901–1906) |
|-----|-----|-----------------------------|-------|---------------------------|

36 more rows, 5 more columns

[List of Prime Ministers of Australia by time in office - Wikipedia](#)
en.wikipedia.org/.../List_of_Prime_Ministers_of_Australia_by_ti... Wikipedia ▾

Feedback

[Chris Watson - Wikipedia, the free encyclopedia](#)
en.wikipedia.org/wiki/Chris_Watson ▾ Wikipedia ▾

3rd Prime Minister of Australia ... He was the first **prime minister** from the **Australian Labour Party**, and the first **prime minister** from the labour movement in the ...

Early life - Union activities and colonial ... - Federation - Prime Minister in 1904

[List of Prime Ministers of Australia by time in office - Wikipe](#)

Taskbar: Socher-MVRNN-D12-....pdf, MarcPPT.pptx, Larry-Emmott-Social....pptx, Show All

2019

The image shows a screenshot of a web browser displaying a Google search result. The search query is "australia's third prime minister". The search results show "Prime Minister of Australia (3)" with a large portrait of Chris Watson. Below this, there is a section titled "People also search for" with six smaller portraits and names: Andrew Fisher, Arthur Fadden, George Reid, Frank Forde, Billy Hughes, Edmund Barton, and Joseph Cook. A "View 15+ more" link is also present. At the bottom, there is a "More about Chris Watson" link with a downward arrow icon.

Google

australia's third prime minister








All News Images Videos Maps More Settings Tools


About 11,000,000 results (0.83 seconds)

Prime Minister of Australia (3)

Chris Watson

People also search for [View 15+ more](#)

-  Andrew Fisher
-  Arthur Fadden
-  George Reid
-  Frank Forde
-  Billy Hughes
-  Edmund Barton
-  Joseph Cook

 More about Chris Watson

2019

The image shows a screenshot of a Google search page. The search bar contains the text "australia's 3rd prime minister". Below the search bar, the results are displayed under the heading "Prime Minister of Australia (3)". The top result is for "Chris Watson", with a portrait image to the right. Below this, there is a section titled "People also search for" which includes a row of six smaller portrait images with names: Andrew Fisher, Arthur Fadden, George Reid, Frank Forde, Billy Hughes, Edmund Barton, and Joseph Cook. A "View 15+ more" link is to the right of this row. At the bottom of the results area, there is a downward-pointing chevron icon and the text "More about Chris Watson". The browser's address bar shows the URL "https://www.google.com/search?ei=WE3vXLwQx536BIW5jYAJ&q=australia%27s+3rd+prime+minister&oq=australia%2...".

australia's 3rd prime minister

All News Images Maps Videos More Settings Tools

About 1,560,000 results (0.92 seconds)








Prime Minister of Australia (3)


Chris Watson



People also search for

[View 15+ more](#)

- 
[Andrew Fisher](#)
- 
[Arthur Fadden](#)
- 
[George Reid](#)
- 
[Frank Forde](#)
- 
[Billy Hughes](#)
- 
[Edmund Barton](#)
- 
[Joseph Cook](#)

 [More about Chris Watson](#)

3 approaches to question answering: Knowledge-based approaches (Siri)

- Build a semantic representation of the query
 - Times, dates, locations, entities, numeric quantities
- Map from this semantics to query structured data or resources
 - Geospatial databases
 - Ontologies (Wikipedia infoboxes, dbPedia, WordNet, Yago)
 - Restaurant review sources and reservation services
 - Scientific databases
 - Wolfram Alpha

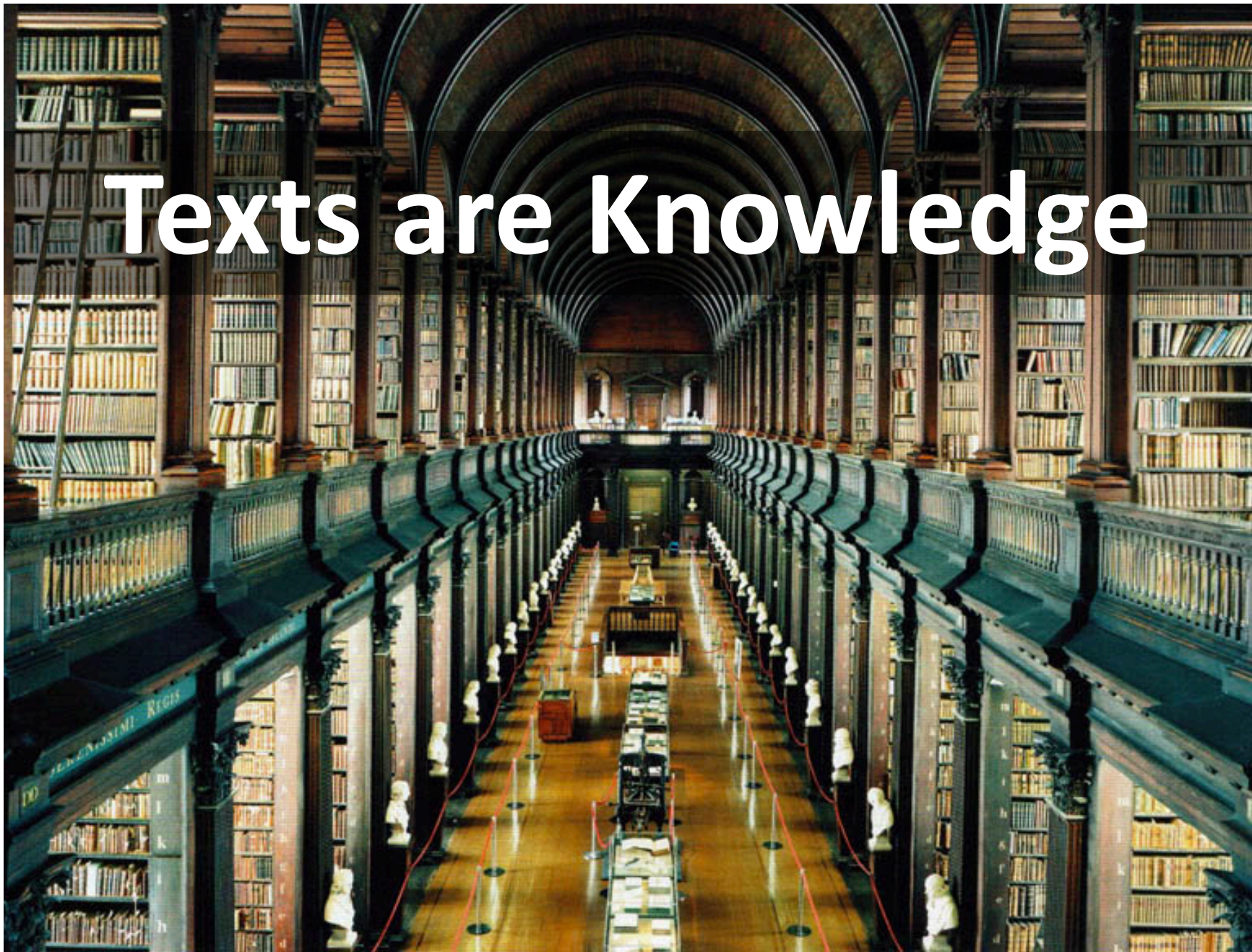
Text-based (mainly factoid) QA

- QUESTION PROCESSING
 - Detect **question type**, **answer type**, focus, relations
 - Formulate queries to send to a search engine
- PASSAGE RETRIEVAL
 - Retrieve ranked documents
 - Break into suitable passages and rerank
- ANSWER PROCESSING
 - Extract candidate answers (as named entities)
 - Rank candidates
 - using evidence from relations in the text and external sources

Hybrid approaches (IBM Watson)

- Build a shallow semantic representation of the query
- Generate answer candidates using IR methods
 - Augmented with ontologies and semi-structured data
- Score each candidate using richer knowledge sources
 - Geospatial databases
 - Temporal reasoning
 - Taxonomical classification

Texts are Knowledge



Knowledge: Jeremy Zawodny says ...



Is the goal to go from language to knowledge bases?

- For humans, going from the largely unstructured language on the web to actionable information is effortlessly easy
 - But for computers, it's rather **difficult!**
 - This has suggested to many that if we're going to produce the next generation of intelligent agents, which can make decisions on our behalf
 - Answering our routine email
 - Booking our next trip to Fiji
- then we still first need to construct **knowledge bases**
- To go *from languages to information*
 - But should we rather just have computers work with language?



Knowledge: Not just semantics but pragmatics

Pragmatics = taking account of context in determining meaning
A natural part of language understanding and use

Search engines are great because they inherently take into account pragmatics (“associations and contexts”)

- [the national] → The National (a band)
- [the national ohio] → The National - Bloodbuzz Ohio – YouTube
- [the national broadband] → www.broadband.gov

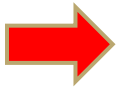


Who won the best actor Oscar in 1973?



Lemmon was awarded the [Best Supporting Actor Oscar](#) in 1956 for [Mister Roberts](#) (1955) and the [Best Actor Oscar](#) for [Save the Tiger](#) (1973), becoming the first actor to achieve this rare double...

Source: Jack Lemmon -- Wikipedia



Jack Lemmon



www.imdb.com

John Uhler "Jack" Lemmon III was an American actor and musician. He starred in more than 60 films including Som... +
en.wikipedia.org

[Jack Lemmon - Wikipedia, the free encyclopedia](#)

Who won the best actor Oscar in 1973?



American actor and musician. He starred in more than 60 films including ...

[Jack Lemmon - IMDb](#)

www.imdb.com/name/nm0000493



Born Feb 08, 1925 · Died Jun 27, 2001 · [News](#) · [341 photos](#) · [Biography](#)
Actor: [The Apartment](#) (1960) · [Some Like It Hot](#) (1959) · [Glengarry Glen Ross](#) (1992) · [Grumpy Old Men](#) (1993). **Jack Lemmon's** father was the ...

Spouse: [Felicia Farr](#) (1962 - 2001) · [Cynthia Stone](#) (1950 - 1956)

Children: [Chris Lemmon](#) · [Courtney Lemmon](#)

Buried: [Westwood Village Memorial Park Cemetery](#)

Awards: [Academy Award for Actor in a Leading Role](#) +

[Images of jack lemmon](#)

bing.com/images



Word Alignment for Question Answering

TREC QA (1999-2005)

What is the fastest car in the world?

The Jaguar XJ220 is the dearest, fastest and most sought after car on the planet.

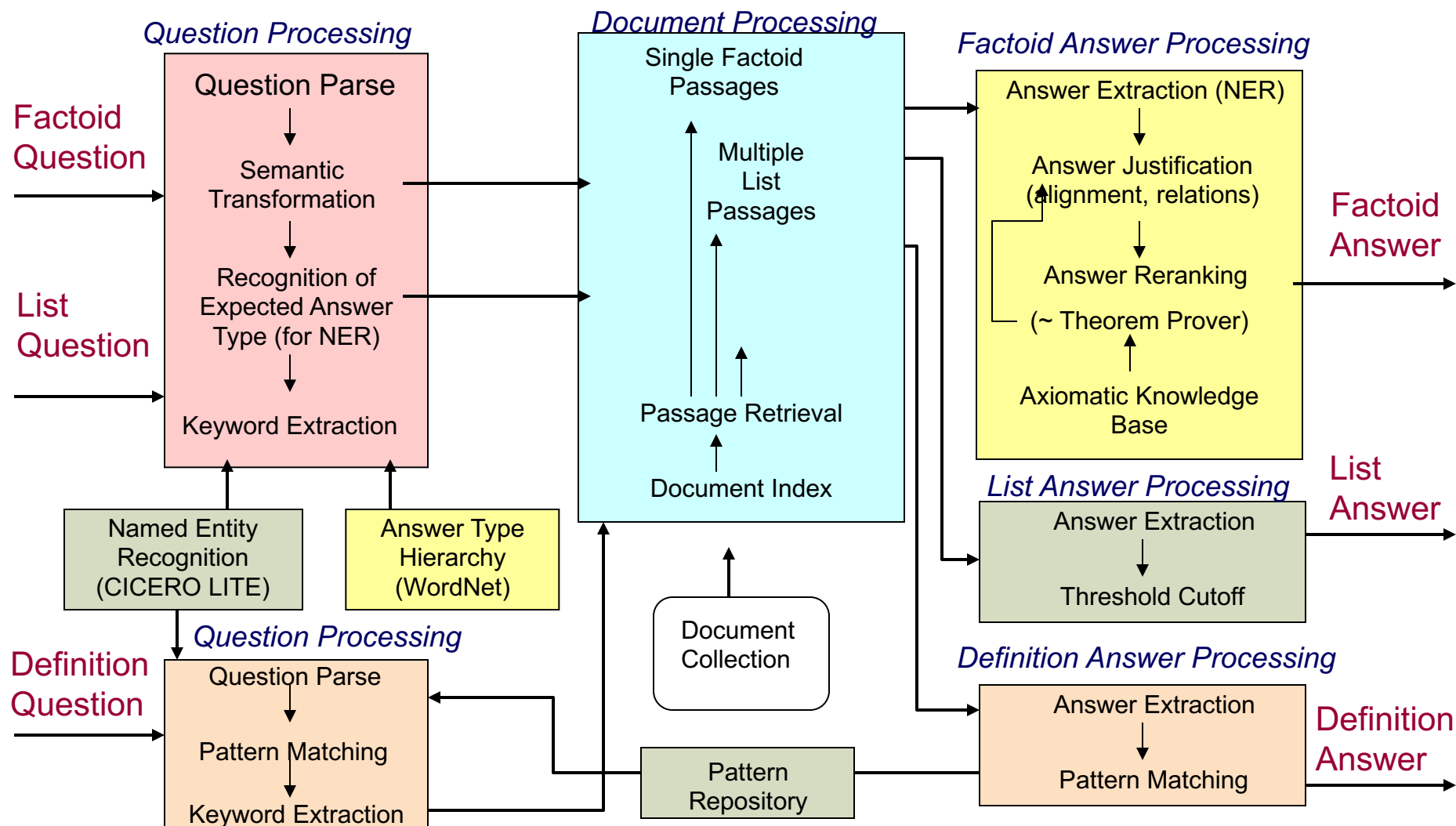
[Harabagiu & Moldovan, 2001]

- Assume that there is an underlying alignment
 - Describes which words in and can be associated

See if the (syntactic/semantic) relations support the answer

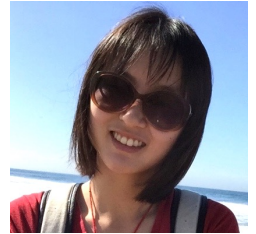
Full NLP QA: LCC (Harabagiu/Moldovan)

[below is the architecture of LCC's QA system circa 2003]



DrQA: Open-domain Question Answering

(Chen, et al. ACL 2017) <https://arxiv.org/abs/1704.00051>



ask me
anything

Open-domain Question Answering

SQuAD

Q: How many of Warsaw's inhabitants spoke Polish in 1933? **A:** 833,500

TREC

Q: What U.S. state's motto is "Live free or Die"? **A:** New Hampshire

WebQuestions (Berant et al, 2013) 

Q: What part of the atom did Chadwick discover? **A:** neutron

WikiMovies (Miller et al, 2016)

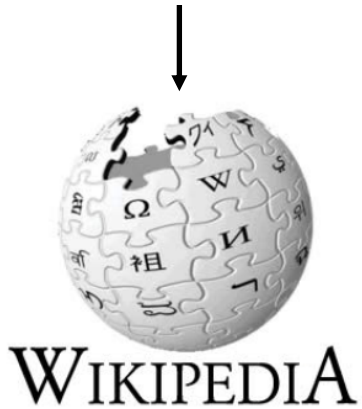
Q: Who wrote the film Gigli? **A:** Martin Brest

OMDb

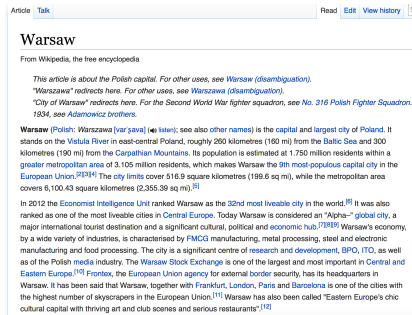


WIKIPEDIA

Q: How many of Warsaw's inhabitants spoke Polish in 1933?



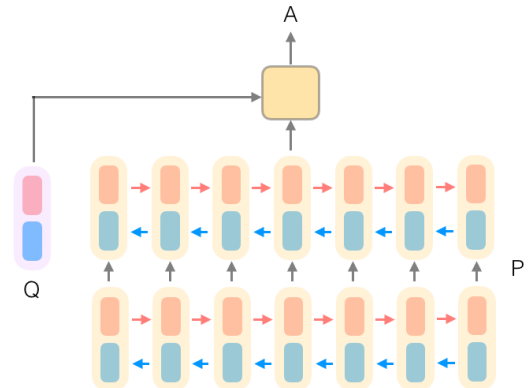
Document
Retriever



Document
Reader



833,500



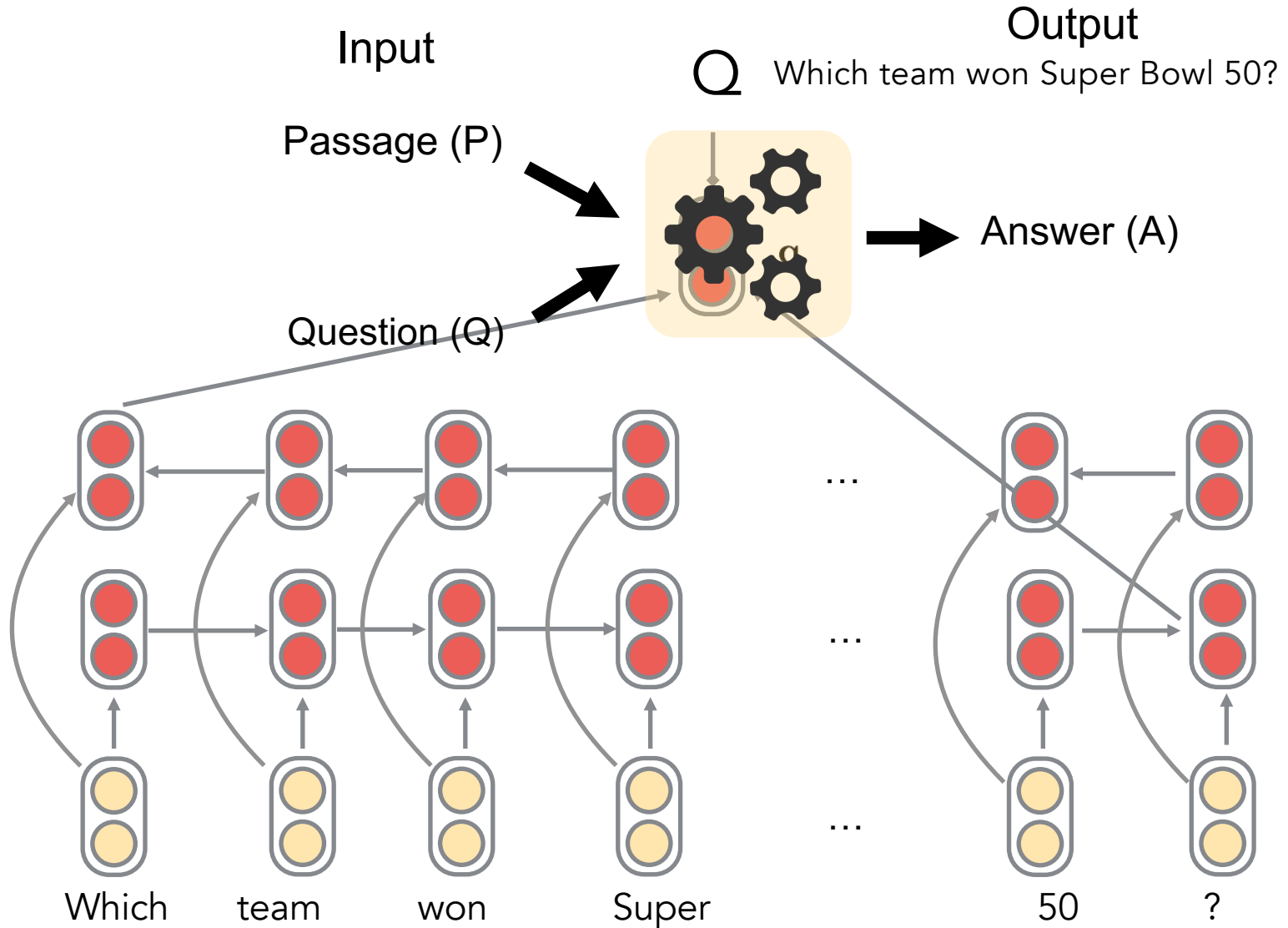
Document Retriever

| Dataset | Wiki Search | Doc. plain | Retriever +bigrams |
|----------------|--------------------|-------------------|---------------------------|
| SQuAD | 62.7 | 76.1 | 77.8 |
| CuratedTREC | 81.0 | 85.2 | 86.0 |
| WebQuestions | 73.7 | 75.5 | 74.4 |
| WikiMovies | 61.7 | 54.4 | 70.3 |

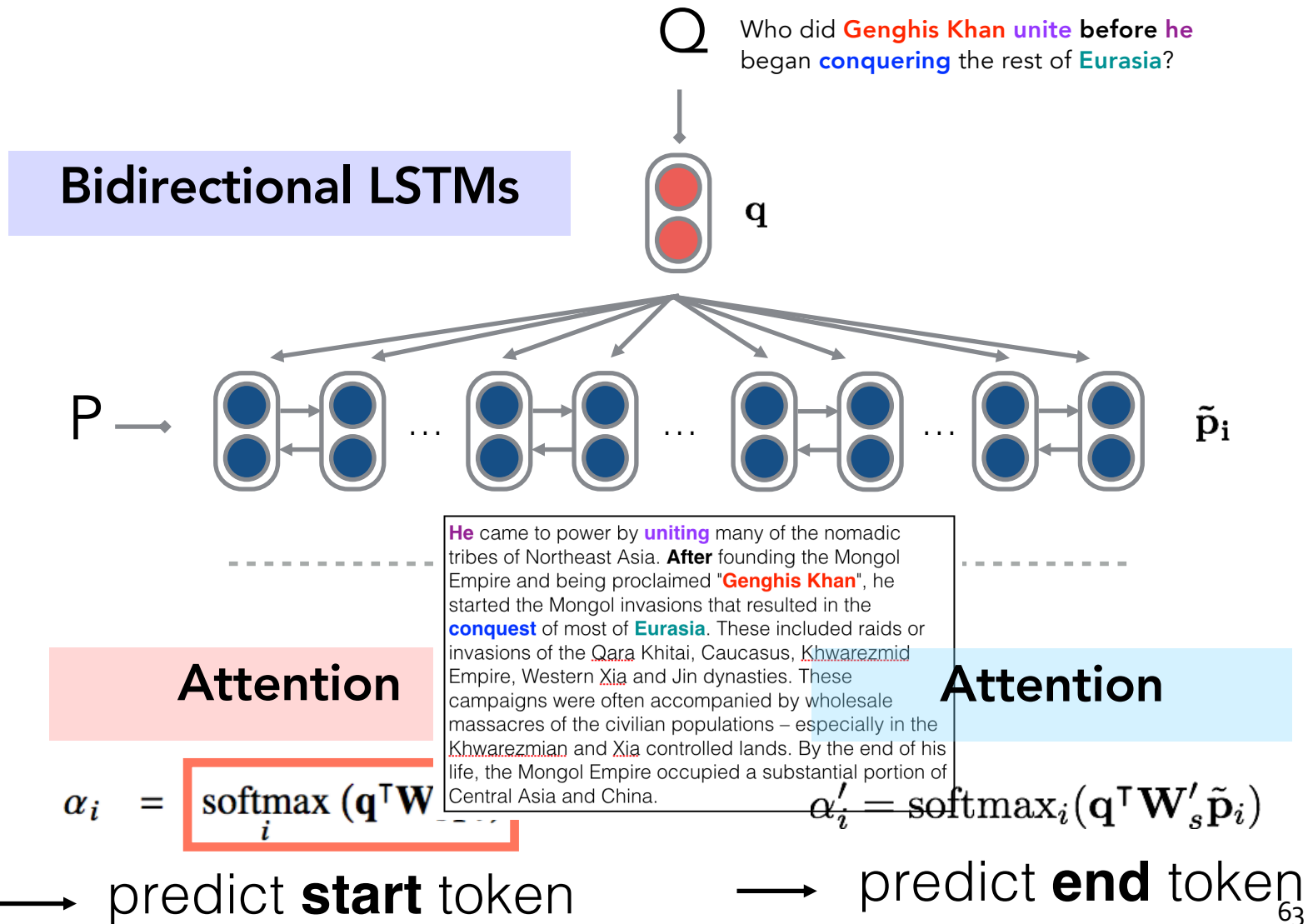
Traditional
tf.idf
inverted
index +
efficient
bigram
hash

70-86% of questions we have that the answer segment appears in the **top 5 articles**

Stanford Attentive Reader



Stanford Attentive Reader



SQuAD Results (single model)

| | F1 |
|--|------|
| Logistic regression | 51.0 |
| Fine-Grained Gating (Carnegie Mellon U) | 73.3 |
| Match-LSTM (Singapore Management U) | 73.7 |
| DCN (Salesforce) | 75.9 |
| BiDAF (UW & Allen Institute) | 77.3 |
| Multi-Perspective Matching (IBM) | 78.7 |
| ReasoNet (MSR Redmond) | 79.4 |
| DrQA (Chen et al. 2017) | 79.4 |
| r-net (MSR Asia) [Wang et al., ACL 2017] | 79.7 |
| Human performance | 91.2 |

General questions

Combined with **Web search**, we can answer **57.5%** of **trivia questions** correctly



Q: The Dodecanese Campaign of WWII that was an attempt by the Allied forces to capture islands in the Aegean Sea was the inspiration for which acclaimed 1961 commando film?

A: The Guns of Navarone

Q: American Callan Pinckney's eponymously named system became a best-selling (1980s-2000s) book/video franchise in what genre?

A: Fitness

Demo

Hi!



Hello! Please ask a question.

What is question answering?



a computer science discipline within the fields of information retrieval and natural language processing

Who was the winning pitcher in the 1956 World Series?



Don Larsen

What is the answer to life, the universe, and everything?



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