Lecture 1

Intelligent Systems Introduction

COMP 474/6741, Winter 2021

René Witte
Department of Computer Science
and Software Engineering
Concordia University

Outline

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Outline

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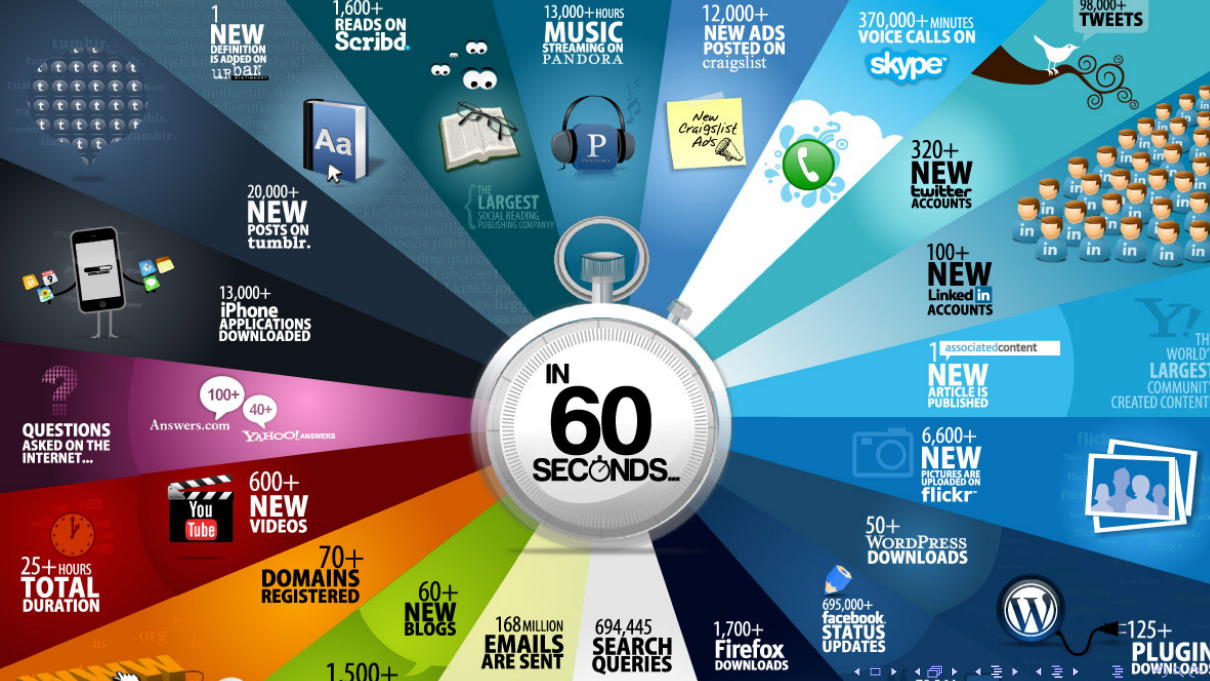
1 NEW DEFINITION IS ADDED ON urban dictionary
1,600+ READS ON Scribd.
13,000+ HOURS MUSIC STREAMING ON PANDORA
12,000+ NEW ADS POSTED ON craigslist
370,000+ MINUTES VOICE CALLS ON skype
98,000+ TWEETS
20,000+ NEW POSTS ON tumblr.
THE LARGEST SOCIAL READING PUBLISHING COMPANY!
New Craigslist Ads
320+ NEW twitter ACCOUNTS
13,000+ iPhone APPLICATIONS DOWNLOADED
100+ NEW Linked in ACCOUNTS
IN 60 SECONDS..
associatedcontent
1 NEW ARTICLE IS PUBLISHED
THE WORLD'S LARGEST COMMUNITY CREATED CONTENT
QUESTIONS ASKED ON THE INTERNET...
100+
Answers.com
40+
YAHOO! ANSWERS
6,600+ NEW PICTURES ARE UPLOADED ON flickr
600+ NEW VIDEOS
50+ WordPress DOWNLOADS
25+ HOURS TOTAL DURATION
70+ DOMAINS REGISTERED
60+ NEW BLOGS
168 MILLION EMAILS ARE SENT
694,445 SEARCH QUERIES
1,700+ Firefox DOWNLOADS
695,000+ facebook STATUS UPDATES
125+ PLUGIN DOWNLOADS
1,500+

Architecture 1.0

Knowledge Worker **Documents**

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Towards Intelligent Systems

- Text Mining
- Knowledge Graphs
- Personalization
- Recommender Systems
- Intelligent Agents

Why ‘search’ is not enough

Baseline Technology

Full-text search engine (Information Retrieval)

- Apache Lucene, Solr, Elastic Search, . . .

Task I

Please find all documents and sentences mentioning “Steve Jobs”

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Why ‘search’ is not enough

Baseline Technology

Full-text search engine (Information Retrieval)

- Apache Lucene, Solr, Elastic Search, . . .

Task I

Please find all documents and sentences mentioning “Steve Jobs”

Task II

Please find all *Persons* mentioned in our documents

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Why ‘search’ is not enough

Baseline Technology

Full-text search engine (Information Retrieval)

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Task I

Please find all documents and sentences mentioning “Steve Jobs”

Task II

Please find all *Persons* mentioned in our documents

What you need

Requires Information Extraction (IE) – an example for a Text Mining task

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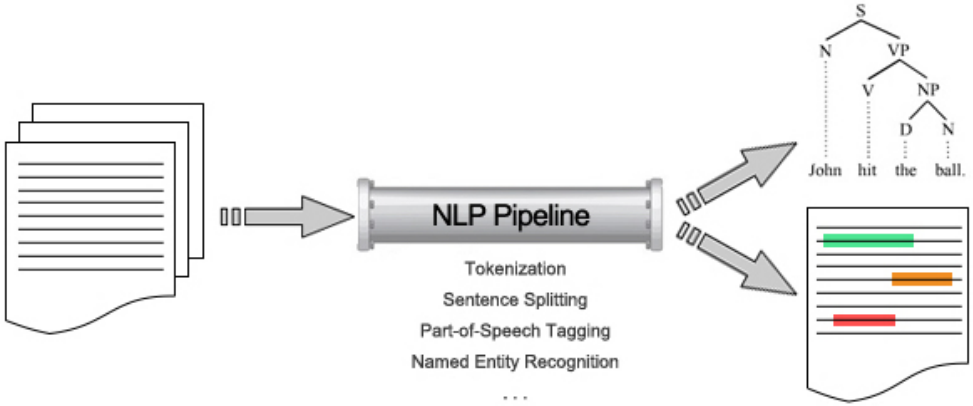
Natural Language Processing (NLP)

Definition

A branch of Artificial Intelligence (AI) that uses various techniques to process content written in a natural language, e.g., English or French.



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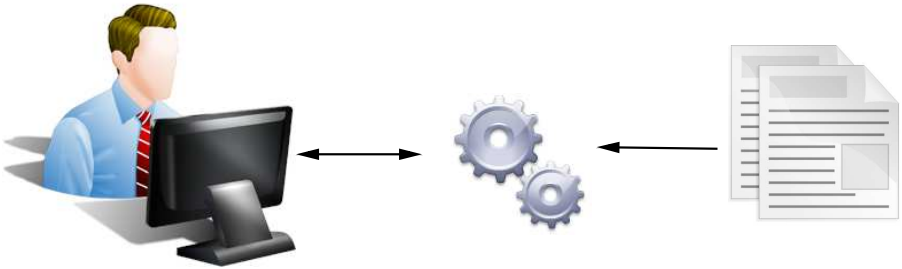
Architecture 2.0



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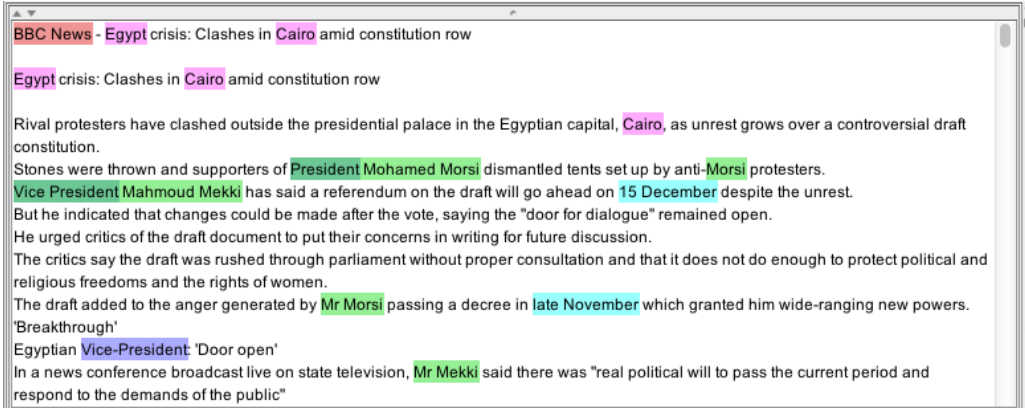
Text Mining

- NLP tools (e.g., UIMA, GATE)
- SaaS (e.g., Amazon Comprehend, Refinitiv)



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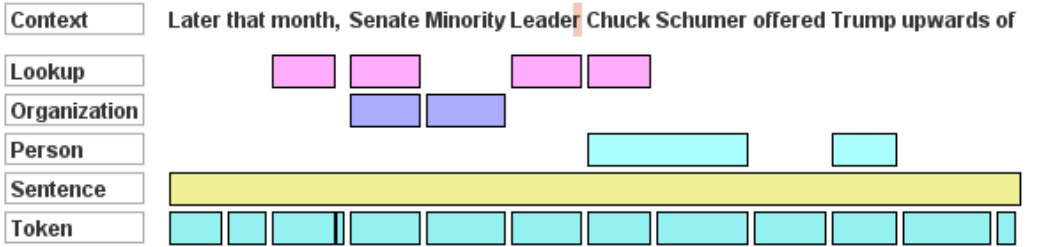
Named Entity Recognition (Information Extraction)

NLP Pipeline

- Sequence of components
- Custom or off-the-shelf
- Rule-based and/or Machine Learning

Selected Processing resources

!	Name	Type
●	Document Reset PR	Document Reset PR
●	ANNIE English Tokeniser	ANNIE English Tokeniser
●	ANNIE Gazetteer	ANNIE Gazetteer
●	ANNIE Sentence Splitter	ANNIE Sentence Splitter
●	ANNIE POS Tagger	ANNIE POS Tagger
●	ANNIE NE Transducer	ANNIE NE Transducer
●	ANNIE OrthoMatcher	ANNIE OrthoMatcher



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TEXT ANALYTICS SERVICE

Intelligent Tagging

Making data smarter: using natural language processing, text analytics, and data-mining technologies, Intelligent Tagging turns large amounts of unstructured data into precise advantage.

Request product details

Intelligent Tagging enables quicker and smarter search of information that is important and relevant to your business

Overview | Features & benefits | Deployment options | Find out more

Why choose **Intelligent Tagging?**

Intelligent Tagging uses natural language processing, text analytics and data-mining technologies to **derive meaning from vast amounts of unstructured content**. It's the fastest, easiest and most accurate way to tag the people, places, facts and events in your data, and then assign financial topics and themes to increase your content's value, accessibility and interoperability.

Connecting your data consistently with Intelligent Tagging helps you to **search smarter, personalize content recommendations and generate alpha**.

Intelligent Tagging supports a comprehensive list of metadata types in English. Non-English is supported in a few key concepts (for example, company extraction) in Chinese, Japanese, German,

USEFUL LINKS

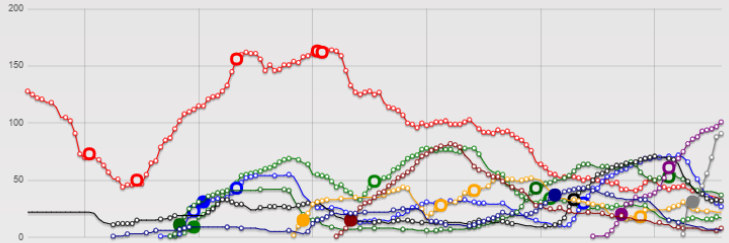
- Live demo →
- Developer support →
- Developer documentation →
- Intelligent Tagging fact sheet ↓
- Intelligent Tagging for research ↓

Main Menu
Top Stories
24 Hours Overview
Events Detection
Most Active Themes
Help about EMM
Overview
Advanced Search
Sources list
Web Site Map

EU Focus

EU Policy Areas
Agriculture and Rural Development
Better Regulation, Inter-Institutional Relations, the Rule of Law and the Charter of Fundamental Rights
Budget and Human Resources
Climate Action and Energy
Competition
Digital Economy and Society
Economic and Financial Affairs, Taxation and Customs
Education, Culture, Youth and Sport
Environment, Maritime Affairs and Fisheries

Biggest 10 Stories Over Last 24h
Language: en Period: Nov 6, 2018 12:20 AM - Nov 7, 2018 12:20 AM



Oil prices drop over one percent on Iran sanctions waivers
Articles : 1527 | Last update : Nov 6, 2018 11:22:00 PM | Start : Nov 4, 2018 10:53:00 PM | Sources : 352

Oil market cautious as US punitive sanctions on Iran become effective
mercopress Tuesday, November 6, 2018 10:03:00 PM CET | info [other]

Oil prices were mixed on Monday after a steep five-day fall, as the United States formally imposed punitive sanctions on Iran but granted eight countries temporary waivers allowing them to keep buying oil from the Islamic Republic. The sanctions are part of U.S....

More articles...

Facebook blocks 115 accounts ahead of US midterm elections
Articles : 211 | Last update : Nov 7, 2018 12:18:00 AM | Start : Nov 6, 2018 5:12:00 AM | Sources : 165

Facebook blocks 115 accounts ahead of US midterm elections

Tools
Wednesday, November 7, 2018 12:48:00 AM CET
RSS | MAP
Facebook
manage
info

Languages
Select top stories in other languages.
ar bg cs da de el
en es et fi fr hr
hu it lt lv mt nl
pl pt ro ru sk sl
sv sw tr zh
Show additional languages
Interface: en - English

Legend

Main Menu

News Summary
About EMM NewsExplorer

News language and date

Language or country:
en - English

Date:
Nov 2018

Mo	Tu	We	Th	Fr	Sa	Su
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Analysis over time

Timeline
Timeline [en] for 11/2018

Angela Merkel

Information about this person was last updated on Monday, January 23, 2017.

Names

Angela Merkel (Eu,vi)
Frau Merkel (da,tr)
Ангела Меркел (bg,tg)
Ангела Меркель (cv,ru)
أنجيلا: ميركل (ar)
آنگلا: مرکل (fa)
Ángela Merkel (es,pt)
Ângela Merkel (es,pt)
Angel Merkel (da,sv)
Chancellor Merkel (en,sv)
Angela Markel (da,sw)
Angela Merckel (da,sl)
Angela Dorothea Merkel (da,sw)
Niemiec Angela Merkel (pl)
Angelika Merkel (de)
Angelas Merkel (da,sv)
أنجيلا: ميركل (ar)
Angela Merken (da,de)
Angela Dorothea Kasner (en,tr)
Niemiec Angelą Merkel (pl)
Angela Márkel (es)

Key Titles and Phrases

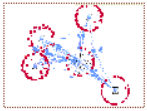
bundeskanzlerin (de - 11387)
kanzlerin (de - 3579)
german chancellor (en - 1584)
kanzlerkandidatin (de - 1419)
chancelière allemande (fr - 1269)
chanceler alemã (pt - 907)
chefin (de - 1402)
chancelière (fr - 651)
chancellor (de,en - 820)
duitse bondskanselier (nl - 483)
deutsche bundeskanzlerin (de - 269)
bondskanselier (nl - 303)
tedesco (it - 441)
herausforderin (de - 197)
vorsitzende (de - 428)
- bundeskanzlerin (de - 83)
chanceler (pt - 190)
deutsche kanzlerin (de - 72)
parteichefin (de - 139)

External resources

Image obtained automatically from Wikipedia
Information about this image.

Read Wikipedia entry

Explore Relations



Related People

François Hollande (867)
Barack Obama (759)
Vladimir Putin (675)
Recep Tayyip Erdogan (656)
Donald Trump (567)
Donald Tusk (499)
Sigmar Gabriel (472)
Frank-Walter Steinmeier (456)
Jean-Claude Juncker (448)
David Cameron (421)
Horst Seehofer (380)
Matteo Renzi (364)
Thomas de Maizière (316)
Ahmet Davutoglu (312)
Martin Schulz (305)
Hillary Rodham Clinton (278)
Bashar Assad (266)
Viktor Orban (258)
Theresa May (238)
John Kerry (213)
Wolfgang Schäuble (212)

Latest Clusters - English

[de] [ru] [hu] [pt] [fr] [bg] [no] [sv] [sl] [da] [it] [ro] [es] [nl] [tr] [ar] [sw] [fa] [pl]

Marine Le Pen Extols Far Right During Speech in

Saraki, Mimiko, others for Nigerian Youth

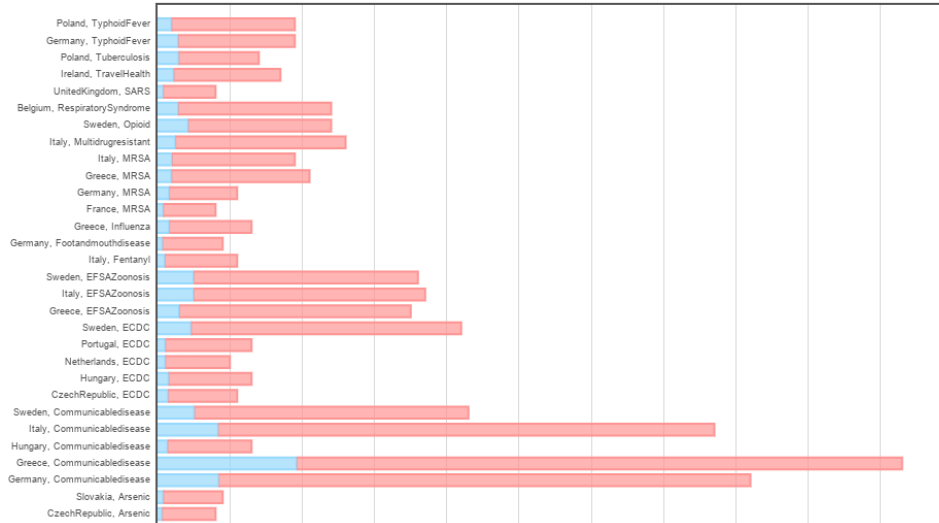
MEDISYS

Search

advanced search

- Top Stories
- Event Extraction
- Recent Disease Incidents
- Alert Statistics
- Communicable Diseases
- Symptoms
- Bioterrorism
- Nuclear
- Chemical
- ECDC
- EFSA
- EMCDDA
- ENV_RISKS
- Food Security
- SAM
- Medical Devices
- Vaccination
- Other
- Continents
- Official Sources
- Sources List

Today's Alert Statistics for European Union



Recommender Systems and Collaborative Filtering

amazon.ca

Hello Rene Witte. We have recommendations for you. (Not Rene?)

Rene's Store | Deals Store | Gift Certificates

Shop All Departments | Search All Departments

Your Store | Page You Made | Recommended For You | Rate These Items | Improve Your Recommendatio

Rene, Welcome to Your Amazon.ca (If you're not Rene Witte, click here.)

Today's Recommendations For You

Here's a daily sample of items recommended for you. Click here to see all recommendations. Page 1 of 44

Clean Code: A Handbook of Ag... (Paperback) by Robert C. Martin

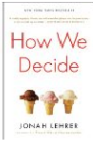
★★★★½ (7) CDN$ 39.43

Fix this recommendation

Why Does E=mc2?: (And Why Should We... (Paperback) by Brian Cox

★★★★★ (2) CDN$ 14.44

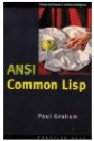
Fix this recommendation



How We Decide (Paperback) by Jonah Lehrer

★★★★½ (10) CDN$ 13.68

Fix this recommendation



ANSI Common LISP (Paperback) by Paul Graham

★★★★☆ (18) CDN$ 96.95

Fix this recommendation

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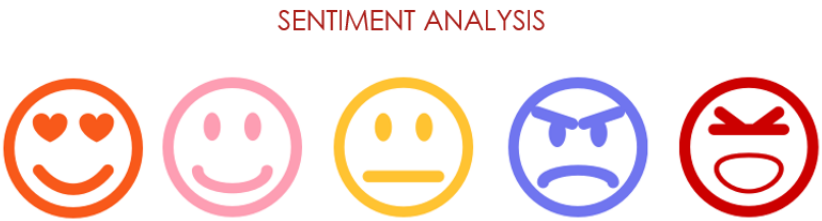
Sentiment Analysis (a.k.a. Opinion Mining)



Discovering people opinions, emotions and feelings about a product or service

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Example using ‘Amazon Comprehend’

Example: In this example, a customer is posting his feedback on a pair of shoes. The API identifies the sentiment expressed by the customer along with a confidence score.

Sample Text: I ordered a small and expected it to fit just right but it was a little bit more like a medium-large. It was great quality. It's a lighter brown than pictured but fairly close. Would be ten times better if it was lined with cotton or wool on the inside.

Sentiment	Score
Mixed	0.89
Positive	0.09
Negative	0.01
Neutral	0.00

WestJet's compassionate and confused chatbot sends happy customer to suicide prevention site

The last thing a satisfied WestJet customer expected to hear when she sent the company a glowing review...

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October 11, 2018

Amazon Scraps Secret AI Recruiting Engine that Showed Biases Against Women

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Summary I

“Data is the new oil”

Organizations have invaluable (adj. 无价的) knowledge “hidden” in documents:

- Products, inventions, solutions, techniques, experiences, insights, . . .

NLP/Text Mining can unlock this knowledge

What do you need?

- Need business vision to drive adoption (n. 采用；收养；接受)
- Technology is mature (adj. 成熟的) and foundations (基础) are open source
  E.g., IBM’s UIMA or University of Sheffield’s GATE

Risks

- Increasing legal (法律) and ethical (道德的) concerns
  E.g., *Ethical AI, Responsible AI, Explainable AI*

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Outline

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Motivation

Common Issue

- Data in Information Silos
  Documents, databases, spreadsheets, emails, . . .
- Disconnected, missing knowledge

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Motivation

Common Issue

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  Documents, databases, spreadsheets, emails, . . .
- Disconnected, missing knowledge

Knowledge Integration

- Connect silo-ed knowledge
- Leverage existing, external Knowledge Bases
- Freely available, many domains
- Continuously updated

WIKIDATA

Main page
Community portal
Project chat
Create a new item
Create a new lexeme
Recent changes
Random item
Query Service
Nearby
Help
Donate

Tools
What links here
Related changes
Special pages
Permanent link
Page information

Item | Discussion

support vector machine (Q282453)

set of methods for supervised statistical learning
SVM | support vector machines

in more languages

Statements

instance of	algorithm 0 references
subclass of	supervised learning 1 reference

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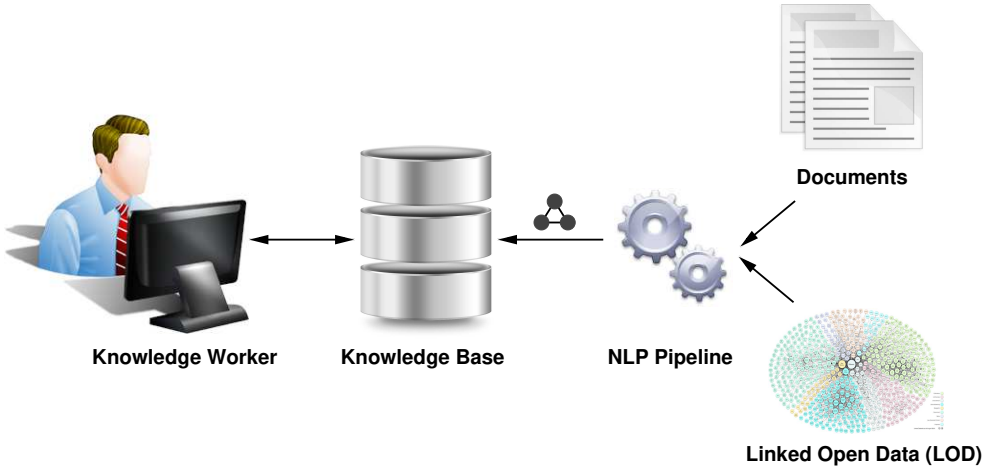
Architecture 3.0



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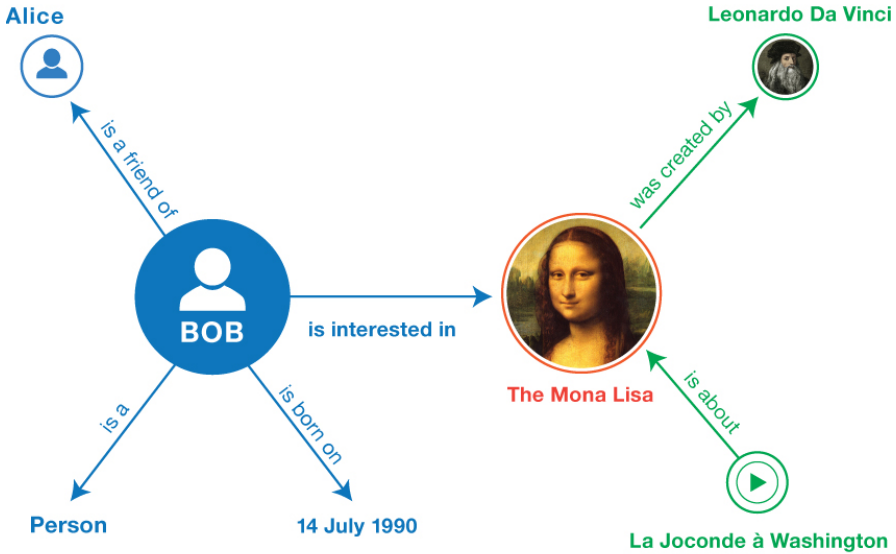
Knowledge as Graphs



https://www.w3.org/TR/rdf11-primer/

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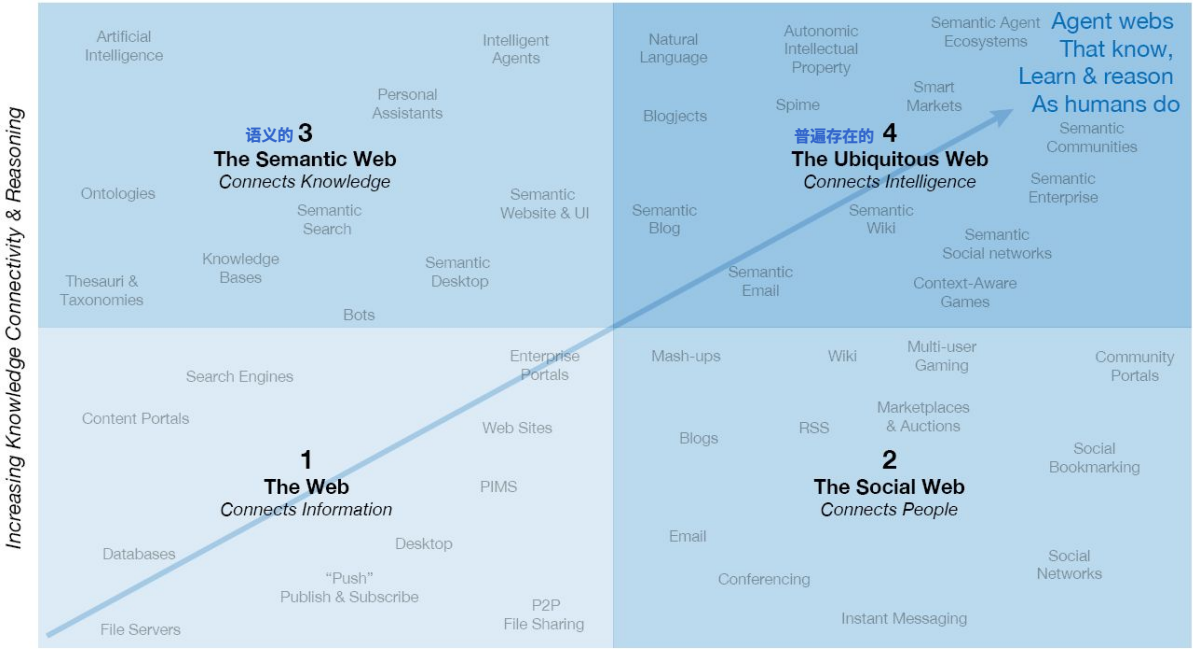
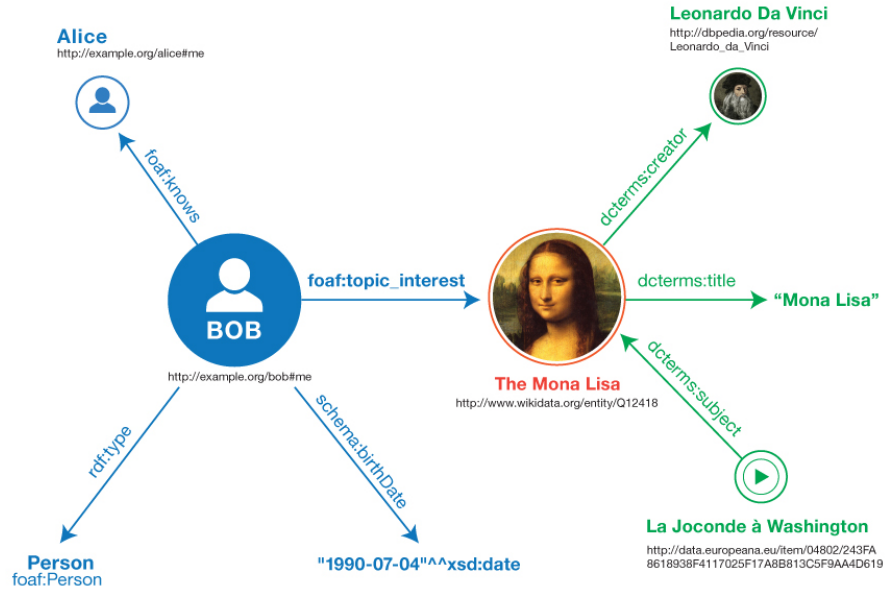

Increasing Knowledge Connectivity & Reasoning
Increasing Social Connectivity
Artificial Intelligence
Intelligent Agents
Personal Assistants
语义的 3
The Semantic Web
Connects Knowledge
Ontologies
Semantic Search
Semantic Website & UI
Knowledge Bases
Semantic Desktop
Thesauri & Taxonomies
Bots
Natural Language
Autonomic Intellectual Property
Semantic Agent Ecosystems
Agent webs That know, Learn & reason As humans do
Spime
Smart Markets
Blogjects
普遍存在的 4
The Ubiquitous Web
Connects Intelligence
Semantic Communities
Semantic Enterprise
Semantic Blog
Semantic Wiki
Semantic Social networks
Semantic Email
Context-Aware Games
Search Engines
Enterprise Portals
Content Portals
Web Sites
1
The Web
Connects Information
PIMS
Databases
Desktop
"Push" Publish & Subscribe
P2P File Sharing
File Servers
Mash-ups
Wiki
Multi-user Gaming
Community Portals
Marketplaces & Auctions
Blogs
RSS
Social Bookmarking
2
The Social Web
Connects People
Email
Social Networks
Conferencing
Instant Messaging

The ‘Semantic Web’



https://www.w3.org/TR/rdf11-primer/

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Now in RDF

```
BASE <http://example.org/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema>
PREFIX schema: <http://schema.org/>
PREFIX dcterms: <http://purl.org/dc/terms/>
PREFIX wd: <http://www.wikidata.org/entity/>

<bob#me>
   a foaf:Person ;\\
   foaf:knows <alice#me> ;
   schema:birthDate "1990-07-04"^^xsd:date ;
   foaf:topic\_interest wd:Q12418 .

wd:Q12418
   dcterms:title "Mona␣Lisa" ;
   dcterms:creator <http://dbpedia.org/resource/Leonardo_da_Vinci> .

<http://data.europeana.eu/item/04802/243FA8618938F4117025F17A8B813C5F9AA4D619>
   dcterms:subject wd:Q12418 .
```

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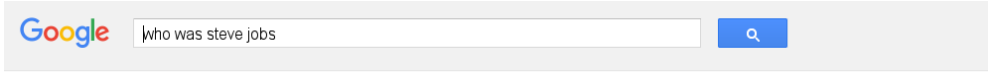

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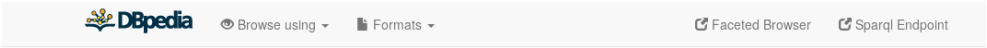
DBpedia



About: Steve Jobs

An Entity of Type : person, from Named Graph : http://dbpedia.org, within Data Space : dbpedia.org

Steven Paul "Steve" Jobs (/ˈdʒɒbz/; February 24, 1955 – October 5, 2011) was an American information technology entrepreneur and inventor. He was the co-founder, chairman, and chief executive officer (CEO) of Apple Inc.; CEO and majority shareholder of Pixar Animation Studios; a member of The Walt Disney Company's board of directors following its acquisition of Pixar; and founder, chairman, and CEO of NeXT Inc. Jobs is widely recognized as a pioneer of the microcomputer revolution of the 1970s and 1980s, along with Apple co-founder Steve Wozniak. Shortly after his death, Jobs's official biographer, Walter Isaacson, described him as a "creative entrepreneur whose passion for perfection and ferocious drive revolutionized six industries: personal computers, animated movies, music, phones, tab

Property	Value
dbo:abstract	■ Steven Paul "Steve" Jobs (/ˈdʒɒbz/; February 24, 1955 – October 5, 2011) was an American information technology entrepreneur and inventor. He was the co-founder, chairman, and chief executive officer (CEO) of Apple Inc.; CEO and majority shareholder of Pixar Animation Studios; a member of The Walt Disney Company's board of directors following its acquisition of Pixar; and founder, chairman, and CEO of NeXT Inc. Jobs is widely recognized as a pioneer of the microcomputer revolution of the 1970s and

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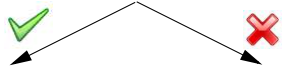
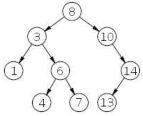
Entity Linking

"The proposed approach takes advantage of both
the efficient computation of the tree architecture ..."



http://dbpedia.org/resource/Tree_(data structure)

http://dbpedia.org/resource/Tree



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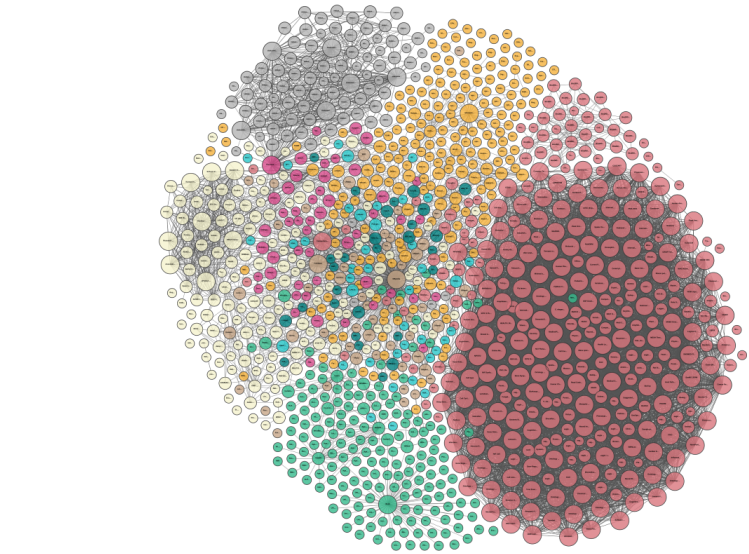
The Linked Open Data Cloud



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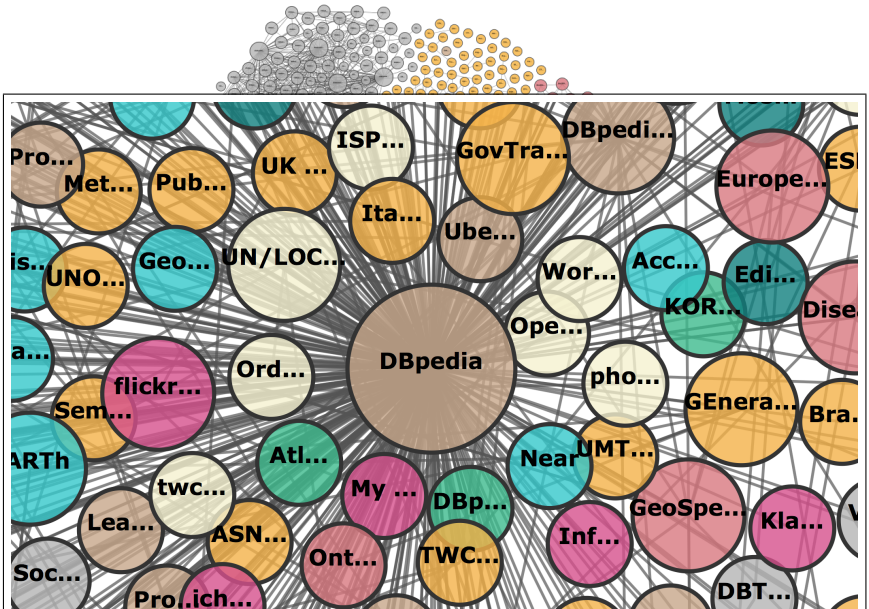
The Linked Open Data Cloud



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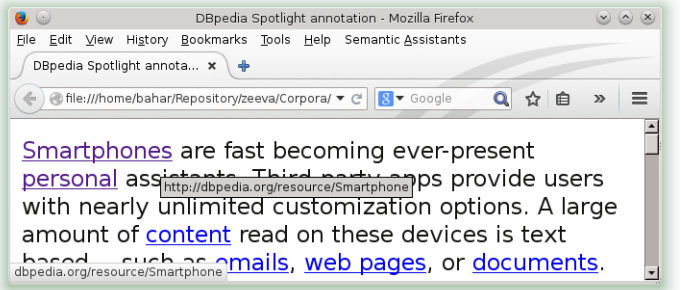
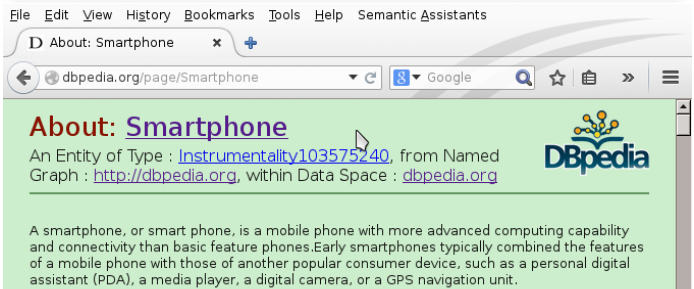
Linking Documents with Knowledge Graphs





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About: Linked data

An Entity of Type : genre, from Named Graph : http://dbpedia.org, within Data Space : dbpedia.org

dcterms:subject	category:Data_management
	category:Distributed_computing_architecture
	category:Internet_terminology
	category:Semantic_Web
	category:World_Wide_Web
	category:Hypermedia
	category:Cloud_standards

About: Controlled vocabulary

An Entity of Type : Object100002684, from Named Graph : http://dbpedia.org, within Data Space : dbpedia.org

dcterms:subject	category:Controlled_vocabularies
	category:Information_science
	category:Knowledge_representation
	category:Library_cataloging_and_classification
	category:Library_science
	category:Ontology_(information_science)
	category:Semantic_Web
	category:Technical_communication

About: Semantic Web

An Entity of Type : Concept, from Named Graph : http://dbpedia.org, within Data Space : dbpedia.org

DBpedia

Property	Value
dbpedia-owl:wikiPageID	18014783 (xsd:integer)
dbpedia-owl:wikiPageRevisionID	601308308 (xsd:integer)
rdf:type	skos:Concept
rdfs:label	Semantic Web

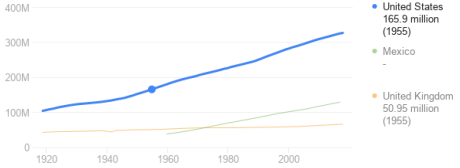
what was the US population when bill gates was born

All News Images Videos Shopping More Settings Tools

About 14,300,000 results (0.74 seconds)

United States / Population (1955)

165.9 million (1955)



Explore more

Sources include: World Bank, ONS UK

Feedback

People also ask

How much does Bill Gates make a second?

How many children do Bill and Melinda Gates have?

What do Bill Gates children do?

How did Bill Gates start his business?

Feedback

United States

Country in North America

The U.S. is a country of 50 states covering a vast swath of North America, with Alaska in the northwest and Hawaii extending the nation's presence into the Pacific Ocean. Major Atlantic Coast cities are New York, a global finance and culture center, and capital Washington, DC. Midwestern metropolis Chicago is known for influential architecture and on the west coast, Los Angeles' Hollywood is famed for filmmaking.

Related statistics

Gross domestic product	19.39 trillion USD (2017)
Life expectancy	78.69 years (2016)
Unemployment rate	3.6% (Oct. 2019)

Population elsewhere

Canada	37.59 million (2019)
California	13.13 million (1955)

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What would you like to know?

What time is it at Concordia University? ? answer

What time is it at Concordia University?

Share this: Rate this answer: vote up vote down *report abuse*

Concordia University

February 10th 2011, 16:31:09 EST is the local time in Concordia University.

website wikipedia

What is the current local time and date in Concordia University, the large, urban university in Montreal, Quebec, Canada?

▼ How do we know this? Analyse this question

facts... See reasoning...

I used the following facts to provide this answer:

Concordia University has been in Montreal since at least January 13th 2009	agree	disagree	edit
the EST/EDT region is a time zone area	agree	disagree	edit
'is the time zone area for' is permanent	agree	disagree	edit
Eastern Standard Time has been the time zone for the EST/EDT region between November 7th	agree	disagree	edit

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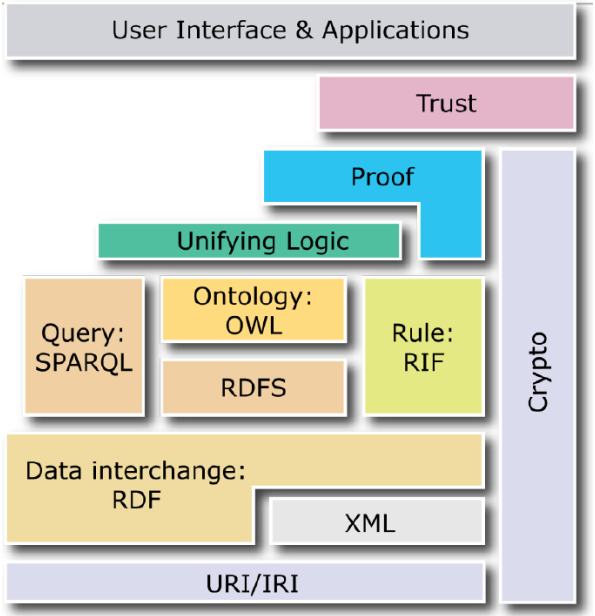
The W3C “Layer Cake”



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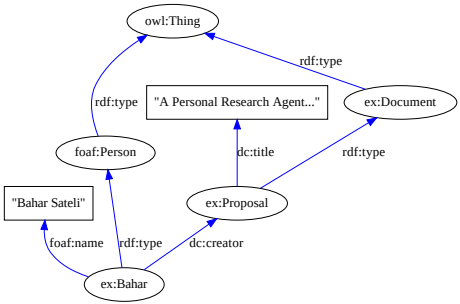
Semantic Web

- Enriching content with machine-readable metadata
- Resource Description Framework (RDF) as a formal language
- Every statement is a *triple*: <subject, predicate, object>
- Offers SPARQL query language




```
SELECT (?name AS ?Name)
       (?title AS ?Title) WHERE {
 ?person rdf:type foaf:person .
 ?person foaf:name ?name .
 ?person dc:creator ?proposal .
 ?proposal dc:title ?title
}
```

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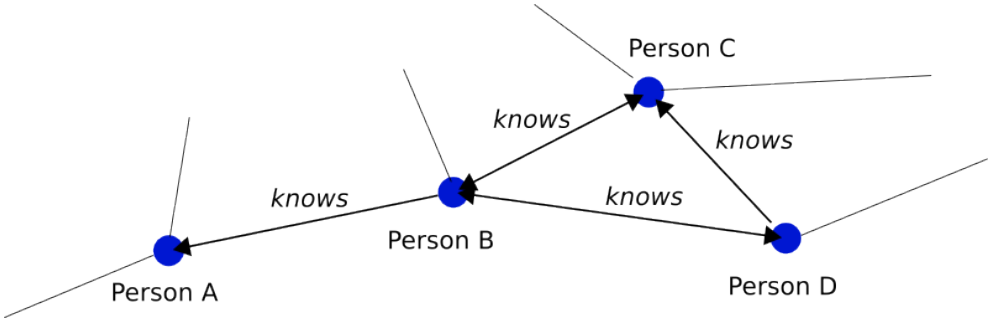
FOAF (Friend-of-a-Friend) Ontology

FOAF

Model people and their connections in a social network.

```
<foaf:Person>
    <foaf:name>Rene Witte</foaf:name>
    <foaf:mbox_shalsum>
        5d5705ff1b2142d62a38061f804f766ffaf806ef
    </foaf:mbox_shalsum>
</foaf:Person>
```



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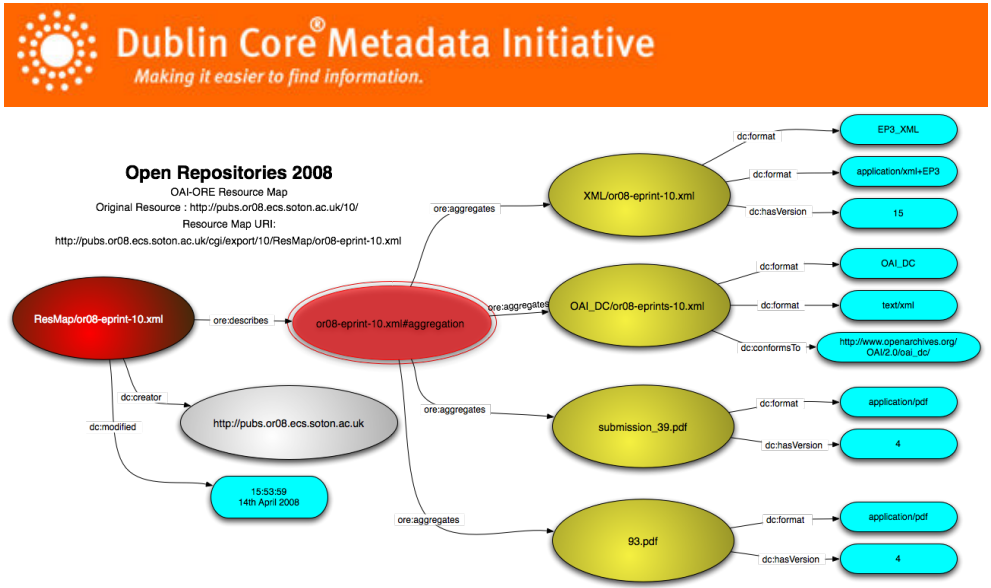
Dublin Core



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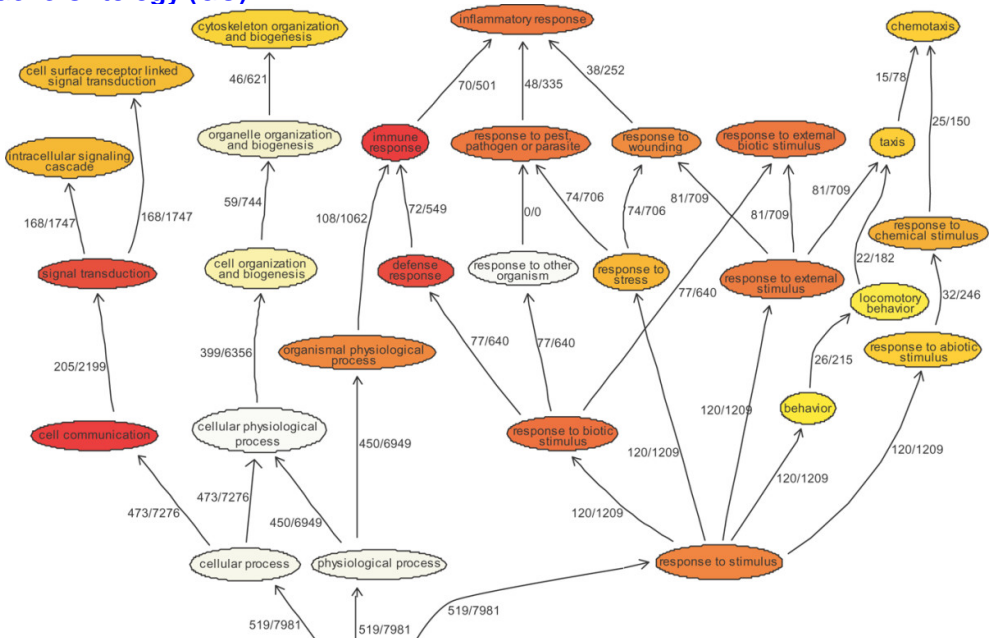
Gene Ontology (GO)



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Summary II

知识图可以集成组织内的不同来源(全文、数据库、电子表格等)

自动管理组织的知识;通过结合多个来源发现新颖的见解

Overcoming Information Silos

外部知识库，进一步丰富数据

- Knowledge Graphs can integrate different sources within an organization (full text, databases, spreadsheets, etc.)
- Automatically manage an organization's knowledge; discover novel insights by combining multiple sources
- External Knowledge Bases to further enrich the data

What do you need?

- State-of-the-art technology: graph databases, triple stores, reasoning engines, etc.
- Reasonably mature technology (open source & commercial), many SAAS vendors

最先进的技术:图形数据库、三重存储、推理引擎等。

技术相当成熟(开源和商业化)，许多SAAS供应商

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Outline

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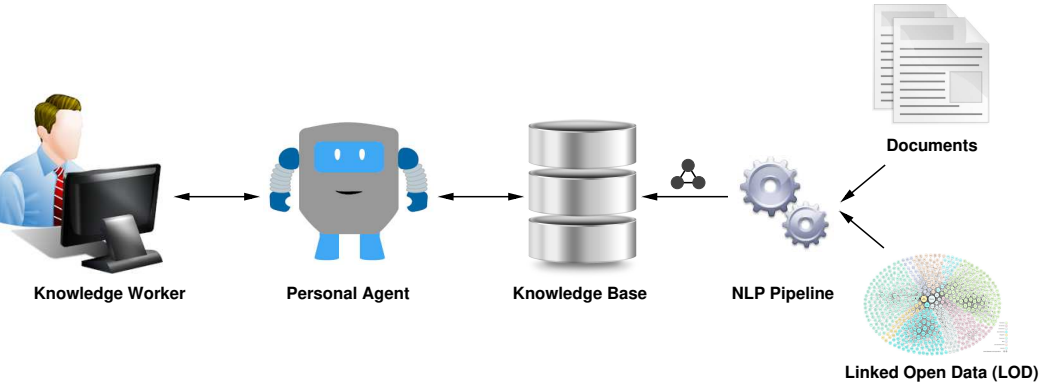
Architecture 4.0



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Intelligent Conversational Agents

- A software program that can interpret and respond to statements made by users in a natural language

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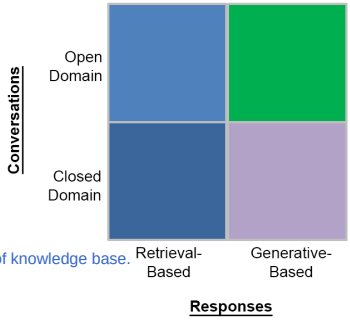
Intelligent Conversational Agents

- A software program that can interpret and respond to statements made by users in a natural language
- Different types of chatbots
  - Generic vs. Goal-oriented
  - Retrieval vs. Generative (Deep Learning)



retrieves all the answers it needs from a kind of knowledge base.

So this is the first difference and as you can imagine, generative. Ai is way more complex and complicated than retrieval based Ais. open domain is a lot more complicated to implement than close domain.

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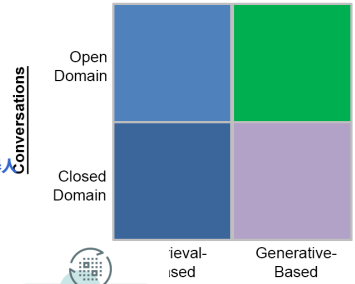
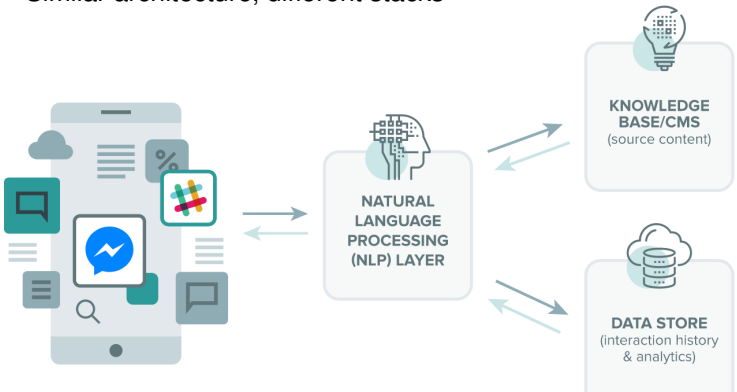
Intelligent Conversational Agents

- A software program that can interpret and respond to statements made by users in a natural language
- Different types of chatbots
  - Generic vs. Goal-oriented 通用型机器人vs面向目标型机器人
  - Retrieval vs. Generative (Deep Learning) 检索型机器人vs生成型机器人
- Similar architecture, different stacks





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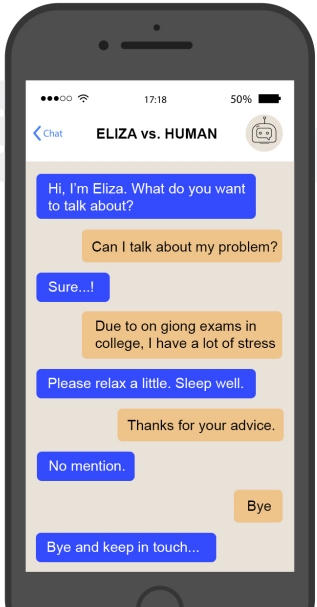
Brief History of Chatbots

Turing Test: “A truly intelligent machine would be indistinguishable from a human” (A. Turing, 1950)

Early chatbots were developed by scientists:

- MIT **Eliza** (1966), the psychotherapist bot



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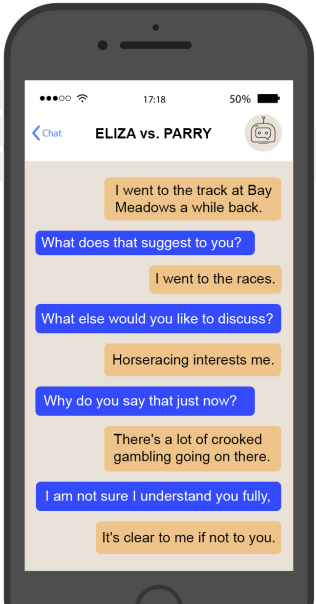

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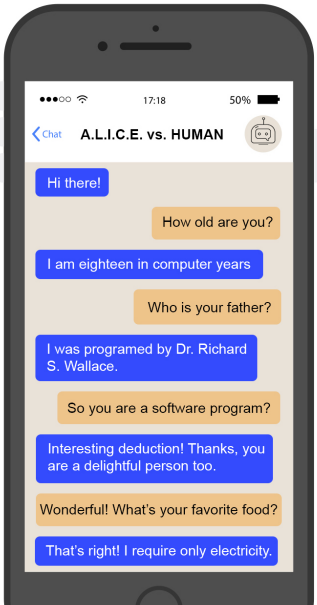
- **A.L.I.C.E** (1995), the companion AI

A way more advanced chat bot was Alice, which could talk about all kinds of questions.
This was one of the bots that was developed for challenges where people would compete against each other using bots.
So sort of an implementation of the Turing test.
And this was a bot that did quite well, but did not fool anyone that it's human.
But it was one of the more advanced bots, a lot more advanced than these early ones.



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Brief History of Chatbots (cont.)

Tech companies join the bot development:

Apple **Siri** (2010)

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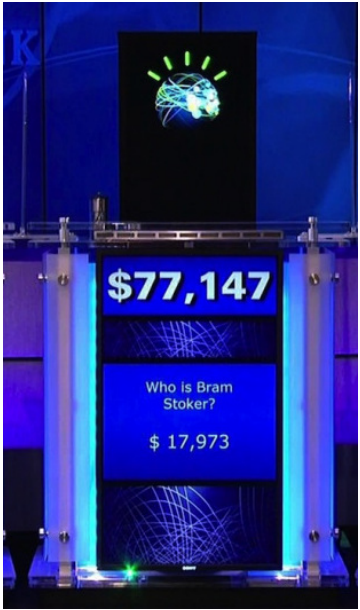

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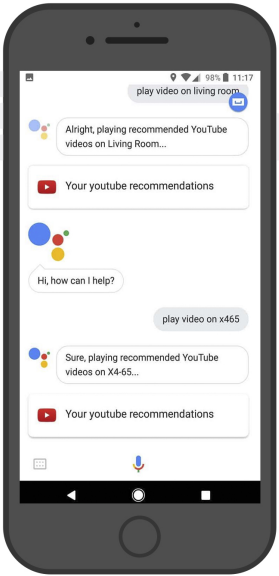

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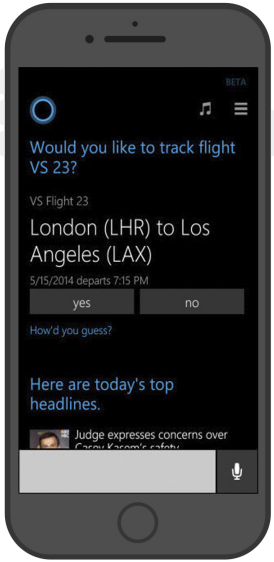

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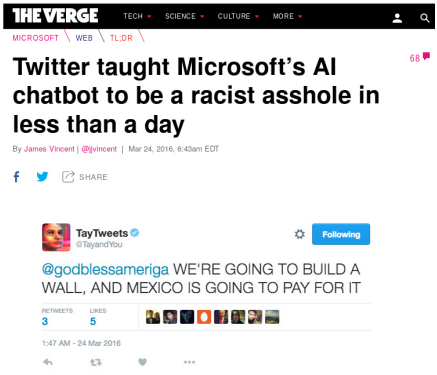
Microsoft **Tay** (2016)



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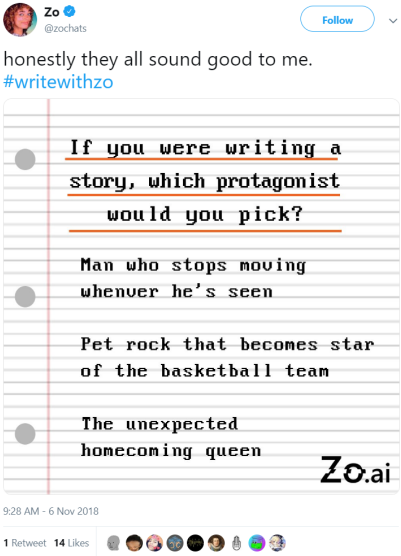
Microsoft **Tay** (2016)

Microsoft **Zo** (2016)



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Eliza (1966)

How does Eliza work?

See Weizenbaum's paper at:
http://www.csee.umbc.edu/courses/331/papers/eliza.html

> *"Input sentences are analyzed on the basis of decomposition rules which are triggered by key words appearing in the input text. Responses are generated by reassembly rules associated with selected decomposition rules."*

根据输入文本中出现的关键词所触发的分解规则对输入句子进行分析。响应由与选定的分解规则相关联的重组规则生成。

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Eliza Example

Eliza + DOCTOR script

If the input sentence is:

I am very unhappy these days.

Eliza's response will be:

How long have you been very unhappy these days?

Processing

Keyword:

I am

Eliza as a bot doesn't really understand anything.
It doesn't have any concept. It doesn't understand your conversation.
We just blindly apply these string matching patterns.

Decomposition pattern:

I am <whatever>

There are a few more sophisticated rules and it doesn't always pick the same pattern.
You can have multiple decomposition patterns so that it doesn't get always the same response. And also multiple reassembly pattern.

Reassembly Pattern:

How long have you been <whatever>?

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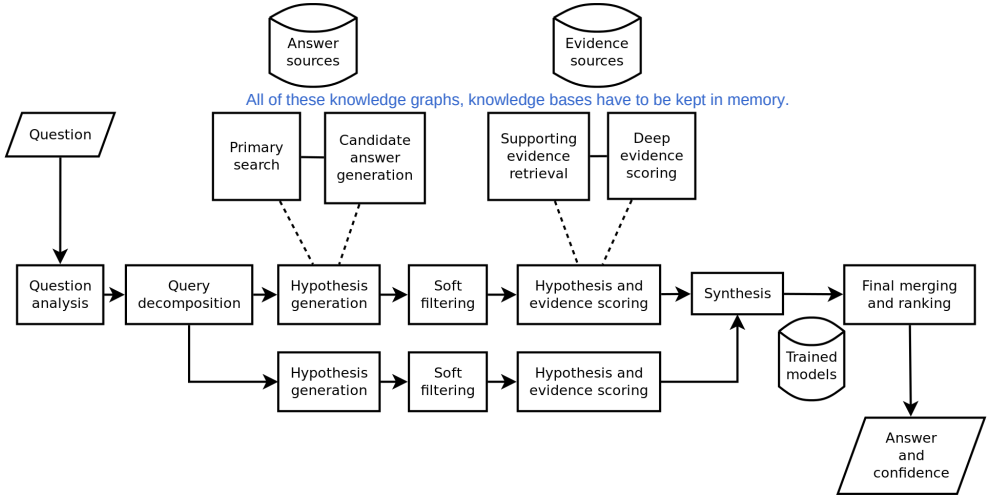
IBM Watson

Watson is a type of question-answering (QA) system, first developed 2006–2011



2011 *Jeopardy!* competition: 2,880 POWER7 threads and 16 terabytes of RAM

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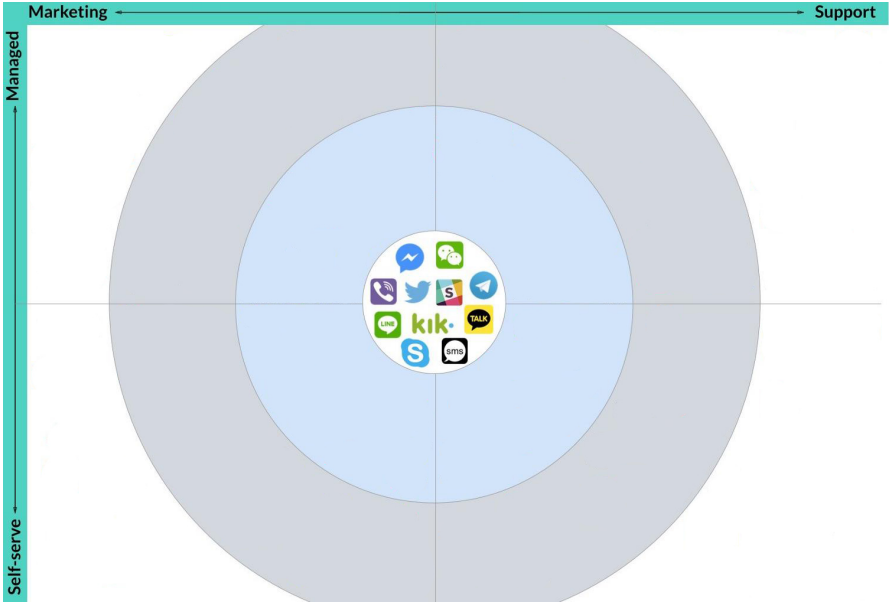
The Chatbots Landscape



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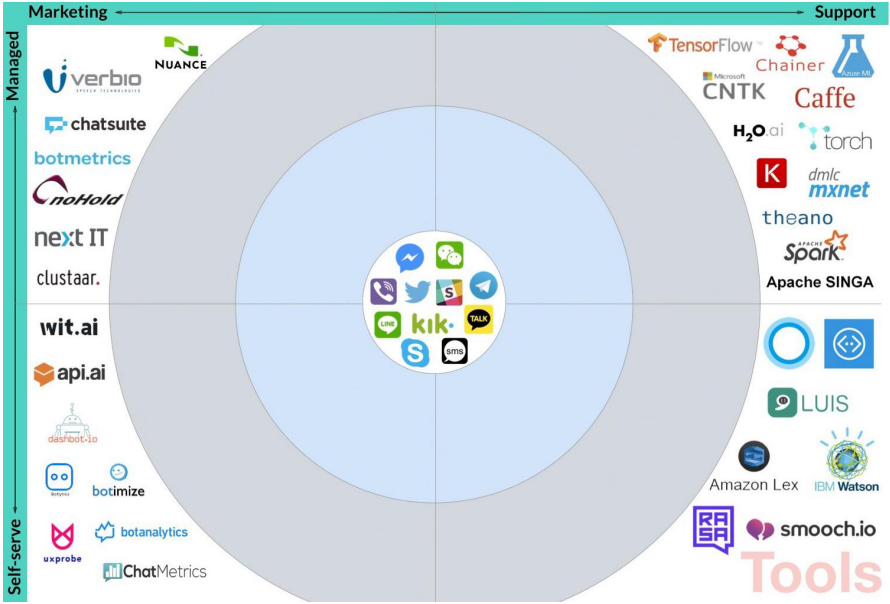
The Chatbots Landscape



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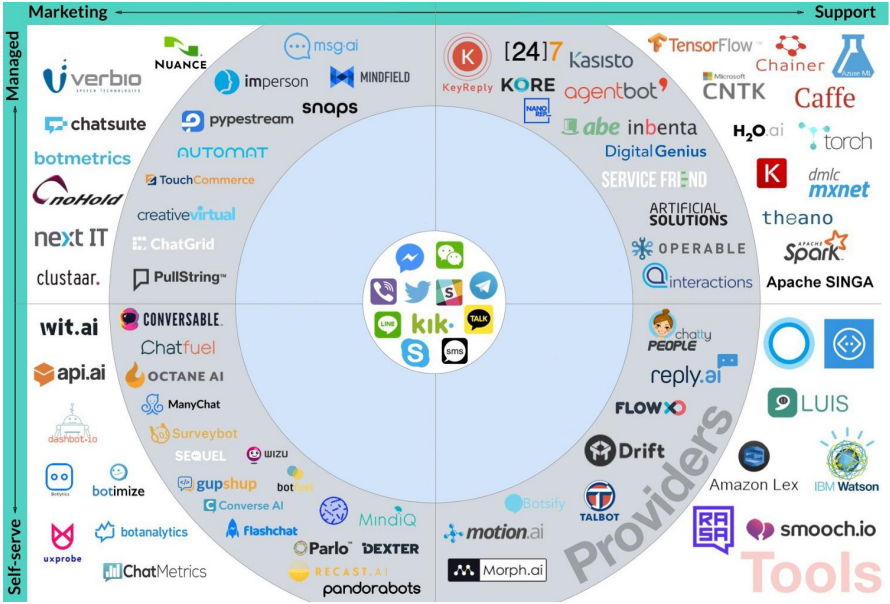
The Chatbots Landscape



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The Chatbots Landscape

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Perceived Business Benefits

- “Top 5 Emerging Technologies in 2018” (Gartner)
- Global Market to reach $1-3B by 2025, CAGR of 25-40%

gartner.com

Gartner

Gartner Says 25 Percent of Customer Service Operations Will Use Virtual Customer Assistants by 2020

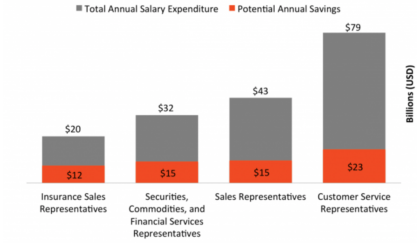
businessinsider

BUSINESS INSIDER

80% of businesses want chatbots by 2020

Business Insider Intelligence Dec. 14, 2016, 10:15 AM

Potential Annual US Salary Savings Created By Chatbots



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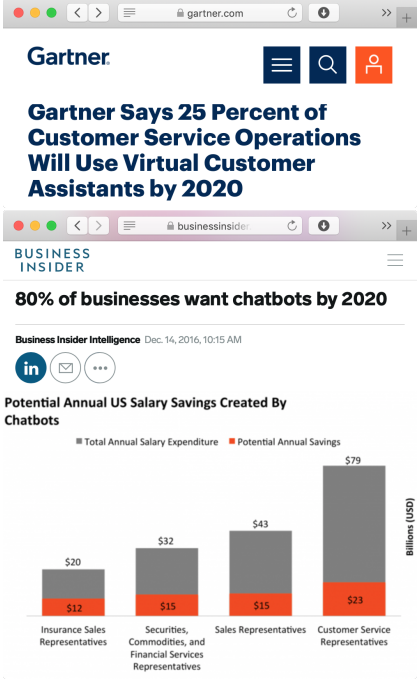
Perceived Business Benefits

- "Top 5 Emerging Technologies in 2018" (Gartner)
- Global Market to reach $1-3B by 2025, CAGR of 25-40%
- Huge benefits across the value chain:
  - Sales & Marketing
  - HR & Operations
  - Service & Payment
  - Retention & Growth



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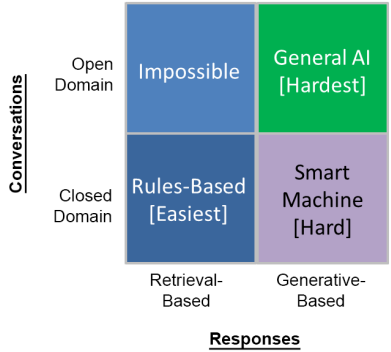
Chatbots: The Business Case

What do you need?

- Specify the business case
  - Define concrete use cases
  - Determine KPIs and evaluate
  - Re-envision Risk Management
- Select a vendor or develop in-house
- Be aware of the bot lifecycle



Summary

- "Hot" business topic, emerging after decades of research
- Huge difference in scope (simple rules vs. sophisticated reasoning)
- Again, new legal and ethical issues
  E.g., bots pretending to be human, political campaigning, medical advice

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Outline

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Reading Material

Required

- Introduction to Artificial Intelligence, https://plato.stanford.edu/entries/artificial-intelligence/
- Eliza, https://en.wikipedia.org/wiki/ELIZA
- IBM Watson, https://en.wikipedia.org/wiki/Watson_(computer)

Supplemental

- 155 chatbots in this brand new landscape. Where does your bot fit? https://venturebeat.com/2017/06/26/bot-analytics-platform-releases-new-chatbot-landscape/
- Ultimate Guide to Leveraging NLP & Machine Learning for your Chatbot, https://chatbotslife.com/ultimate-guide-to-leveraging-nlp-machine-learning-for-you-chatbot-531ff2dd870c
- The AI Behind Watson, http://www.aaai.org/Magazine/Watson/watson.php

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