

IBM Watson Technologies

A workshop over 6 days and 9 hours

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Aims

Walk out of here knowing:

- that this thing exists
- what you can expect from it
- more or less how you can use it
- how to find more information about it
- something about Natural Language Processing

Organization of the workshop

- None
- We don't know much about it
 - (Olivier knows more than me)
- Most IBM people don't know too much either
- I also hope to learn something
- Interrupt whenever you wish
 - French or English understood/spoken

The name

- Source of endless confusion within IBM
- TJ Watson is the name of the first two CEOs
- IBM names most things after them
- I worked 2 years at the IBM TJ Watson Research Labs (NY, USA)
- Now they have a Watson Division in NYC
- "Watson" was born at the TJ Watson labs

What is it?

- Difficult to answer
- Best answer: "it's an **ecosystem**"
- *Whenever some Watson researcher/engineer codes some new cool program, it becomes part of that "ecosystem"*
- It is an attempt to **have computers deal with natural language**

Languages for computers

- A programming language is a formal language
- Formal languages have unambiguous grammars
- Sentences can be automatically verified to be part of the language or not ("syntactically valid")
- Interpretations ("semantics") of formal languages are also unambiguous

Languages for people

- The language we use is a natural language
 - syntactically ambiguous
 - semantically ambiguous
 - multi-media: communication occurs by
 - writing, speaking (uttering)
 - looking, touching, moving
 - even not saying something sometimes has meaning
- Hence the misunderstandings
- Link between language and emotions

Natural Language Processing

- Why can't my mum work a computer?
 - She'd try and talk to it using her natural language
 - The computer wouldn't even turn itself on
- Challenge: can we program a computer to "understand" natural language?
- Algorithms for "understanding" natural language: NLP

Understanding

- Can we even define "understanding"?
 - **Functional definition:** *the interconnections of all neurons of the brain, with their set of weights and thresholds*
 - Not descriptive – even if we have the right neuron graph, weights and thresholds
- As with all philosophical questions, a complete and fully satisfactory answer is impossible
- Aim at partial answers

My own definition

You need to state your goal and narrow the definition to that goal

For example:

- recognize **named entities** from text (Delta:COMPANY, JFK:AIRPORT, FlightStats:WEBSITE)
- extract **relations** from text (*subj IN obj, subj DOES obj, ...*)
- find the correct **parsing tree** (we'll discuss this later)
- for a text about *x*, decide whether it states a positive or negative opinion (**sentiment analysis**)
- supply correct answers to natural language questions similar to a list of questions on a list (**questions & answers**)
- win a Jeopardy! game

A long-term challenge

- A conversations between people:
 - may have one or many goals
 - they may change dynamically
 - it may not have any goal whatsoever
- Watson cannot do this (yet)
- Computers still need to be *supplied goals* by humans
- Define "understanding" according to goal

Texts have purposes

- Text could be:
 - a body of laws
 - company policies
 - a novel
 - ...
- Watson aims to be a commercial product
- Don't expect it to be good at parsing *The Lord of the Rings* (speaking by experience here...)

How IBM sells this

- Domain focus
 - healthcare (diagnostics)
 - tourism (travel advice)
 - finance (investment advice)
- General tools
 - engagement advisor
 - discovery advisor
 - data explorer
- Internationalization:
 - Chinese, Spanish, some French

What's in Watson for you?

- **If you go work for IBM Watson:**
 - research in cognitive computing
 - broader definitions of "understanding"
 - automated goal decisions
 - development
 - software using Watson services
 - sales/commercial
 - new broad application fields
- **If you go work elsewhere:**
 - many firms want Watson NOW
 - few know what it is or how to use it
 - make yourself indispensable

Demos (some possible goals)

- **Concept expansion** [watson-ce-demo.mybluemix.net]
- **Language identification** [ibmlaser.mybluemix.net/liddemo.html]
- **Machine translation** [ibmlaser.mybluemix.net/mtdemo.html]
- **Message resonance** [watson-mr-demo.mybluemix.net]
- **Questions and answers** [watson-qa-demo.mybluemix.net]
- **Relationship extraction** [ibmlaser.mybluemix.net/siredemo.html]
- **User modelling** [watson-um-demo.mybluemix.net]



Concept Expansion

The [Watson Concept Expansion service](#) learns by context and by determining which words are currently the most popular to use, refining its analyses as word popularity changes over time.

Try the service

Label:

drugs

Corpus:

- Medical Transcriptions
<http://www.mtsamples.com>
- Social Media - WARNING: Might take a couple of minutes depending on seed list

Seeds:

motrin
tylenol
aspirin

Clear

Submit

Status:

Job: GLIMPSEUN.12270557049435275914#1

Status: **Done**

Output:

Prevalence	Result
24	multivitamin daily, aspirin
19	tracor 145 mg daily, aspirin
14	penicillin
14	abilify 5 mg daily, motrin
12	venom-bee/ wasp
12	adhesive tape
10	aspirin, plavix
10	aspirin one tablet daily, tylenol
9	hydrocodone/ acetaminophen tablets and motrin
7	insulin sliding scale, tylenol



Language Identification

The Watson Language Identification service analyzes UTF-8 encoded text, detects the language used in that text, and displays the associated 5-letter ISO language code.

Try the service

To test language identification, please enter 3 or more unique words (this requirement is for Latin-1 languages only).

Je m'en fiche

Clear Input

Submit

Output

fr-FR



Machine Translation

The Watson Machine Translation (MT) service provides an API that enables you to translate text from one language to another.

Try the service

Enter or paste some text to translate

Ce service de traduction, c'est pas terrible

Select translation language:

French to English

Clear Input

Submit

Output

This translation service, is not terrible



Message Resonance

The [Watson Message Resonance service](#) analyzes the popularity of a given word within a specific community. By using this ranking system it is possible to recommend more resonant words to use when crafting messages targeted at specific audiences.

Try the service

Enter or paste text to analyze

In telecommunications, a communications protocol is a system of digital rules for data exchange within or between computers. Communicating systems use well-defined formats (protocol) for exchanging messages.

Select Audience:

Cloud Computing

[See an example](#)

Analyze

Output

Each term was quantitative measured and combined in a simple score of 0-99, where a larger number is better for the given audience.

Resonance

0-10

11-20

21-30

31+

Message

In telecommunications, a communications protocol is a system of digital rules for data exchange within or between computers. Communicating systems use well-defined formats (protocol) for exchanging messages.

Feedback

Please rate the quality of the results

Bad 1 2 3 4 5 Good



Question and Answer

The [Watson Question and Answer \(QA\) service](#) interprets and answers user questions directly based on primary data sources (brochures, web pages, manuals, records, etc.) that have been selected and gathered into a body of data or 'corpus'. The service returns candidate responses with associated confidence levels and links to supporting evidence. The current corpora that are available in Bluemix focus on the Travel and Healthcare industries. Cognitive services learn and improve through training. This beta-level service has no training but shows representative (if not always highly accurate) output.

Try the service

Select corpus:

Healthcare

Who is at risk for diabetes?

Ask

[Try an example question](#)

Answers and Confidence

Who Is at Risk for Diabetic Heart Disease? . People who have type 1 or type 2 diabetes are at risk for diabetic heart disease (DHD). Diabetes affects heart disease risk in three major ways. First, diabetes alone is a very serious risk factor for heart disease.

Confidence: 88%

Was this answer relevant?

[Yes](#) | [No](#) | [Partial](#)

Other Risk Factors : Risk Factors You Can't Control . Age. As you get older, your risk of heart disease and heart attack rises. In men, the risk of heart disease increases after age 45. In women, the risk increases after age 55.

Confidence: 29%

Was this answer relevant?

[Yes](#) | [No](#) | [Partial](#)

Other Risk Factors . Other factors also can raise the risk of coronary heart disease (CHD) in people who have diabetes and in those who don't. You can control most of these risk factors, but some you can't.

Confidence: 23%

Was this answer relevant?

[Yes](#) | [No](#) | [Partial](#)

Almost everyone who develops type 2 diabetes has prediabetes first.

Confidence: 16%

Was this answer relevant?

[Yes](#) | [No](#) | [Partial](#)

Of note, in one study of the quality of life of long-term survivors of skeletal LCH, the quality-of-life scores were not significantly different from healthy control children and adults.[1] In addition, the quality-of-life scores were very similar between those with and without permanent sequelae. In another study of 40 patients who were carefully screened for late effects, adverse quality-of-life scores were found in more than 50% of patients.[2] Seventy-five percent of patients had detectable long-term sequelae - hypothalamic/pituitary dysfunction (50%), cognitive dysfunction (20%), and cerebellar involvement (17.5%) being the most common. Children with low-risk organ involvement (skin, bones, lymph nodes, or pituitary gland) have an approximately 20% chance of developing long-term sequelae.[3] Patients with diabetes insipidus are at risk for panhypopituitarism and should be monitored carefully for adequacy of growth and development.

Confidence: 7%

Was this answer relevant?

[Yes](#) | [No](#) | [Partial](#)



Relationship Extraction

The Watson Relationship Extraction service makes sense of large unstructured data sets. It enables browsing of large collections of data via predefined sets of concepts and relations among them. We offer two APIs: one for English and one for Spanish news models.

Try the service

For example, if you are a news agent researching a person, you can input his or her blogs, emails, tweets, etc into the text window below and see all the places and events that he or she talked about (a location is represented by the label GPE, which stands for Geo Political Entities)

Sixty-five hundred flights on the east coast were allegedly reported cancelled by FlightAware: and that must be an understatement, since my own flight was cancelled but didn't appear on FlightAware. Ten dozen people out in the snow yesterday in front of WholeFoods Union Square were only the tail of the longest queue (US translation: "line") my wife had ever seen there. I can only imagine that similar apocalyptic scenes went on throughout the east coast.

Clear Input

Submit

Output

Select the type of entity you want to see in the output (after clicking submit):

ALL

WholeFoods Union Square	ORGANIZATION
US	GPE
east coast	LOCATION
people	PEOPLE
wife	PERSON
reported	EVENT_COMMUNICATION
Ten dozen	CARDINAL
yesterday	DATE
my	PERSON
hundred	MEASURE



User Modeling

The Watson User Modeling service uses linguistic analytics to extract a spectrum of cognitive and social characteristics from the text data that a person generates through text messages, tweets, posts, and more.

Try the service

Call me Ishmael. Some years ago-never mind how long precisely-having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off-then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it, almost all men in their degree, some time or other, cherish

Clear

Analyze

Output

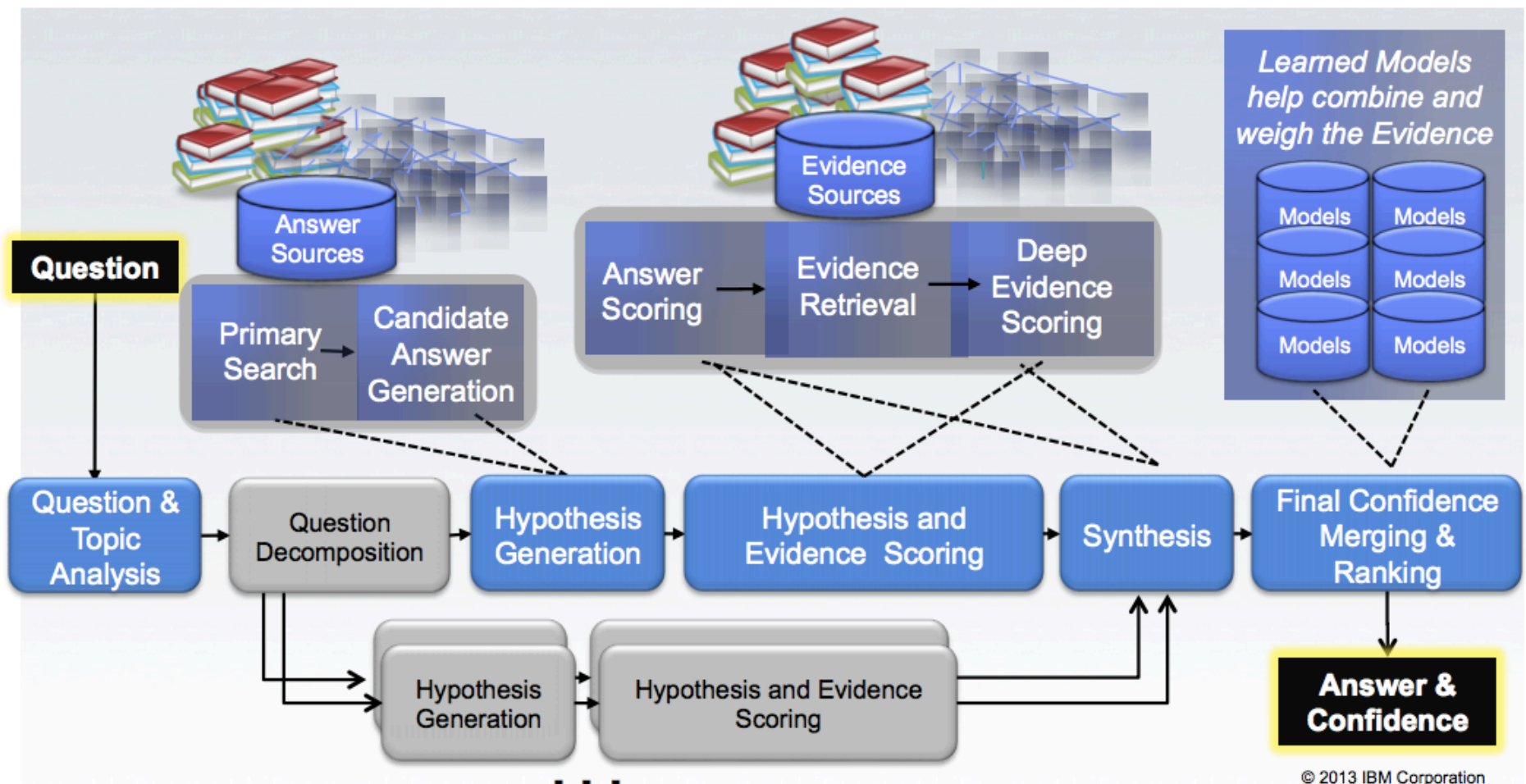
Big 5	
Openness	94%
Adventurousness	72%
Artistic interests	19%
Emotionality	32%
Imagination	93%
Intellect	94%
Authority-challenging	93%
Conscientiousness	48%
Achievement striving	41%
Cautiousness	98%
Dutifulness	21%
Orderliness	28%
Self-discipline	13%
Self-efficacy	88%
Extraversion	17%
Activity level	4%
Assertiveness	12%
Cheerfulness	11%

Algorithmics for NLP

- **Frequency analysis**
 - words in sentences
 - words in paragraphs
 - tuple of words
- **Parsing**
 - recursive syntactical analysis
 - semantics from combinatorial structure
- **Machine Learning**
 - neural networks
 - classifiers
 - efficient optimization methods

The NLP pipeline

A flowchart describing how the basic algorithms are put together



How to use Watson Services

- **Watson Engagement Advisor**
 - web interface
 - Java API
- **BlueMix**
 - NodeRed
 - Java
 - ...

How to set up your workstation

- Get an IBM ID
 - www.ibm.com, "Register"
- Get a month-long Bluemix trial
 - bluemix.net, "Sign Up"
- Download and install Python 2.7.9
 - <https://www.python.org/downloads/>
- Download and install NLTK 3.0
 - <http://www.nltk.org/>
- Download and install pattern/CLiPS
 - <http://www.clips.ua.ac.be/pattern>

Announcement

- Workshop with IBM, HEC and Ecole42
 - 21/22 march 2015
 - competition + prizes
 - good showcase for your coding abilities