Bringing IBM Watson to Life
Agenda

1. Why the world needs Watson
2. What does Watson do?
3. Why is this hard for a computer?
4. Taking Watson to the marketplace
5. I want to be a Watson developer...
1/ Why the world needs Watson
Transforming how we connect with the world

$20B

in revenue last quarter

Transforming how we consume media

50M subscribers
The volume, variety, velocity and veracity of data is creating an unprecedented opportunity.

2.5B

gigabytes of new data are generated every day, 4/5ths of which is unstructured.
This proliferation of data is driving demand for real-time insights and evidence-based decision making.

1 in 2 CEOs report not having the information they need when making critical decisions.
Advances in natural language processing and machine learning are enabling us to transform expertise and professionals.

12%

Most firms estimate that they only analyze 12% of the data they already have, leaving 88% on the cutting room floor.
2/

What does Watson do?
Watson is ushering in a new era of computing

1900
Tabulating Systems

1950
Programmable Era

2011
Cognitive Era

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Watson is creating a new partnership between people and computers that enhances, scales and accelerates human expertise.
Observe
Every day, our brains process incredible amounts of information without us even realizing we’re doing it.

Watson aids the human cognitive process by reading and storing all public and proprietary knowledge across professions, and making insights contained within instantly available.
Interpret

We interpret the data available to us to make connections and frame our choices.

Watson supports this process by interpreting explicit and implicit relationships and visualizing unexpected patterns within data.
Evaluate
We evaluate connections across knowledge and data to draw conclusions and develop our opinions.

Watson supports this process by testing options against all available evidence, without assumption or bias.
Decide
We make decisions based on experience, new evidence, and the integrity of evaluation that we’ve done.

Watson puts content into context, pairing confidence-weighted responses with supporting evidence and allowing professionals to make informed decisions at the point of impact.
3/
Why is this hard for a computer?
It is Hard For Computers to Understand Humans

If leadership is an art then surely Jack Welch has proved himself a master painter during his tenure at GE.

<table>
<thead>
<tr>
<th>Person</th>
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<td>W. Gates</td>
<td>Microsoft</td>
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It is Hard For Computers to Understand Humans

- Noses that run and feet that smell?
- How can a house can burn up as it burns down?
- Does CPD represent a complex comorbidity of lung cancer?
- What mix of zero-coupon, non-callable, A+ munis fit my risk portfolio?

“"If leadership is an art then surely Jack Welch has proved himself a master painter during his tenure at GE.”

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What is the Difference Between Watson and a Search Engine

Ask Google How Smart it is?

1. **Are You Smarter than a 5th Grader?**
   - U.S. game show ...
   - 5th Grader games are played by a single contestant, who attempts to answer ten ...
   - Gameplay; 2.2 Casting; 2.3 Celebrity Are You Smarter than a 5th Grader?
   - Production - Gameplay - References - External links

2. **Are You Smarter Than a 5th Grader?** - Wikipedia, the free ...
   - en.wikipedia.org/.../Are_You_Smarter_Than_a_5th_Grader%
   - (which is Sally Ride), he "copied" the 5th grader's answer, which was wrong. ..... for iOS devices called "Are You Smarter Than a 5th Grader 2010" in 2009.

Ask Watson How Smart He Is?

Watson is trained much the way a human is taught. It learns from historical question and answer pairs to understand how questions are asked and how the answers can be uncovered in the evidence. Watson than uses sophisticated machine learning algorithms to "get smarter" over time.

Other possible responses

Enter a question
How Watson works: DeepQA architecture

Inquiry/Topic Analysis → Inquiry Decomposition → Hypothesis Generation → Hypothesis and Evidence Scoring → Synthesis → Final Confidence Merging & Ranking

- Primary Search
- Candidate Answer Generation
- Answer Scoring
- Evidence Retrieval
- Deep Evidence Scoring
- Learned Models help combine and weigh the Evidence

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How Watson works: DeepQA architecture

- Inquiry/Topic Decomposition
- Multiple interpretations of a question
- 100’s of possible answers
- 100’s of sources
- 100’s of pieces of evidence
- 100,000’s of scores from many deep analysis algorithms
- Learned Models help combine and weigh the Evidence
- Balance & combine
- Final Confidence Merging & Ranking
- Responses with Confidence

1000’s of scores from many deep analysis algorithms

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In May 1898 Portugal celebrated the 400th anniversary of this explorer’s arrival in India.
In May 1898, Portugal celebrated the 400th anniversary of this explorer's arrival in India. In May, Gary arrived in India after he celebrated his anniversary in Portugal.

This evidence suggests “Gary” is the answer BUT the system must learn that keyword matching may be weak relative to other types of evidence.
Watson leverages multiple algorithms to gather deeper evidence

In May 1898 Portugal celebrated the 400th anniversary of this explorer’s arrival in India.

- celebrated
- Portugal
- May 1898
- 400th anniversary
- arrival in
- India
- explorer

On the 27th of May 1498, Vasco da Gama landed in Kappad Beach

- landed in
- 27th May 1498
- Kappad Beach
- Vasco da Gama

Legend:
- Temporal Reasoning
- Statistical Paraphrasing
- GeoSpatial Reasoning
- Reference Text
- Answer

Stronger evidence can be much harder to find and score…
- Search far and wide
- Explore many hypotheses
- Judge evidence
- Many inference algorithms

…and the evidence is still not 100% certain
Cognitive computing is changing the game

1. Understands natural language and human style

2. Generates and evaluates evidence-based hypothesis

3. Adapts and learns from training, interaction, and outcomes
Taking Watson to the marketplace
Bringing Watson to market

- Transforming industries and professions with services-led engagements.
- Advancing cognitive computing across the enterprise with repeatable solutions.
- Bringing the cognitive experience to market through an ecosystem of partners.
Watson’s Evolution

- **2011**: Jeopardy
  - Single user system
  - 2 - 3 sentence questions
  - 2 - 3 word answers
  - 5+ days to retrain
  - Wikipedia, general corpus

- **2013**: Cognitive Products
  - 1000s of users
  - 20 page questions
  - < 1 day to retrain
  - Medical corpus

- **2014**: Cognitive Ecosystem
  - Millions of users
  - Conversational dialog
  - Few hours to retrain
  - Broad industry corpus
  - 8 cognitive services
  - Watson cloud service
  - Taught at 10 universities

- **2015**: Open Cognitive Platform
  - Thousands of business partners
  - 50+ cognitive services
  - Multi-lingual
  - Scalable cloud platform
  - Taught at 100+ universities

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Watson Engagement Advisor

Transform Customer Experiences

- For brands and their consumers
- Simple to use
- Support answers with evidence
- Dialog with person builds context

- IBM Customers have been Enterprises B2B2C, B2B2E
- Personalization of Interaction
- Call Center Assist, Self Help, eCommerce

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Accelerate Research and Insights

- Test hypotheses
- Find Evidence
- Discover New Facts
- At Scale

Watson Discovery Advisor

- Law Enforcement, Pharma
- Law, Education, Material Discovery
Improve Decisions and outcomes

Practioners

- Let practitioners consult with an expert
- Support a differential diagnosis
- Reason through possible actions
- Evidence-based decisions

- Primary Focus has been chronic disease
  - Oncology
  - Treatment support, not pure diagnosis
  - MSK expertise codified via case studies

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Validate adherence to policy guidelines

- Determine if:
  - Policy adhered to
  - Policy violated
  - More data needed
- Provide supporting evidence

Clinical Trial Matching
- 170,000 active clinical trials worldwide
- Does a patient qualify for one?

Should an Insurance Company pay out?

Is there a potential issue with a medication?
5/
I want to be a Watson developer....
Award-Winning Examples of Watson Applications

- 3 of 50+ Watson Ecosystem Partners
- Built Applications Using Watson Services Platform

**Idea:**

Create the ultimate sales trainer by delivering Watson’s capabilities to employees on the shop floor.

**Idea:**

To create Fang, a cognitive, cuddly plush companion, beneath which IBM Watson powers a customized experience assisting each child develop through a series of contextual interactions.

**Idea:**

Further enhance GenieMD to become an Intelligent Mobile Personal Health Assistant, providing targeted answers to health questions based on the specific medical conditions and demographics of the user.

Train and support sellers in real time by understanding products and customers

Children talk to their toys. This one talks back, teaching and observing

Deliver personalized healthcare recommendations to me


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## Watson Services Platform

### IBM Watson Solutions
- Healthcare
- Financial Services
- Public Sector
- Other...

### IBM Watson Products
- Engagement
- Discovery
- Policy
- Other...

### IBM Watson Platform (built on BlueMix ~ IBM Cloud Foundry)

<table>
<thead>
<tr>
<th>Domain Specialization</th>
<th>Cognitive Services</th>
<th>Perceiving</th>
<th>Reasoning</th>
<th>Relating</th>
<th>Tooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Models</td>
<td></td>
<td>Gaining insight into our world</td>
<td>Inferring new conclusions</td>
<td>Personalizing individual interactions</td>
<td>Assemble</td>
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<tr>
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<tr>
<td>Content</td>
<td></td>
<td>improving insight with experience</td>
<td></td>
<td></td>
<td>Train</td>
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</tbody>
</table>

### Data Lake

### Data Curation

- Requirements
- Inventory
- Prioritization
- Preparation

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Watson Services Platform: Delivered Via the Cloud....

Welcome to Watson

With Watson services, you can build your own cognitive application without needing to build deep natural language, machine learning and ranking algorithms or other core technology skills.

Read about the launch on W3

Jump in & explore!

http://watson.stage1.ng.bluemix.net

Watson provides 6 cognitive services as REST APIs
A Watson Application:
Polylingual Question and Answer for IT

Questions can be asked in either English or Spanish
English questions are answered in English
Spanish questions are answered bilingually
Better or worse answers to a question can be browsed

Welcome to the Polylingual QA Service Powered by Watson4IT

Where I can find the permanent license server DB2 LUW
(where puedo encontrar la licencia permanente de servidor DB2 LUW)

(0.38) If you received installation media such as a CD or DVD, a permanent DB2 LUW license may be included with the installation media if you downloaded the image from the web, a permanent license can be downloaded from Passport Advantage.

Si ha recibido el soporte de instalación como un CD o DVD, una licencia DB2 LUW permanente puede ser que se incluye con el soporte de instalación si ha descargado la imagen de la web, una licencia permanente puede ser descargado desde Passport Advantage.
# EXTRACT THE ANSWERS FROM A WATSON QUERY

```ruby
watsonQuery = JSON.parse(...)['question']
answers = watsonQuery['evidencelist']
answer = answers[@answerIndex]

@answerConfidence = answer['value']
@answerText = answer['text']
@answerValue = answer['value']
```
<table>
<thead>
<tr>
<th>File</th>
<th>Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnswerPage.haml:</td>
<td>36</td>
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<tr>
<td>QueryPage.haml:</td>
<td>20</td>
</tr>
<tr>
<td>AskWatsonQuestionsInLotsaLanguages.rb</td>
<td>180</td>
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Tool set for Watson Question and Answer Service
Welcome to Question Answer

The Question Answer service accepts questions and retrieves answers from within a corpus. Output includes a list of candidate passages, confidence scores, and links to supporting evidence. The current corpus uses Watson for IT, which draws from documents on IBM products.

Watch how Watson interacts with natural language

Tip: Try some sample questions: “How do I install Lotus Notes?” or “How do I change my Notes password?”
Getting started with the Question Answer service

The IBM Watson™ Question Answer (QA) service provides an API, referred to as the QA API, that enables you to add the power of the IBM Watson cognitive computing system to your application. With this service, you can connect to Watson, post questions, and receive responses that you can use in your application.

Applications that use the QA service use a corpus of information that provides domain knowledge based on a specific set of input documents and other information. The default corpus is Watson for IT, which derives cognitive conclusions from documents about IBM products.

You can use the QA service from a variety of runtime environments, such as a servlet in a Java web server, a Node.js application, or a Ruby application in the Sinatra or Rails runtimes. The example code in subsequent sections of this document shows how to do this, and can provide a starting point for your own experimentation.

To see a quick demo of the Question Answer service in action, click here. Some sample questions that you may want to use to see the power of the Question Answer service with its default corpus are:

- How do I install Lotus Notes
- How to I change my Notes password
- What is SmartCloud Control Desk
- What operating systems are supported by Performance Manager
- How do I install Myattachments
- What's the best way to manage my Notes mail

We want to hear from you! Please provide feedback or ask questions about Question Answer in the Watson Beta forums.

The API documentation can be found here.
Watson Goes to University (Teaching Watson)

- 10 Universities in 2014, 100+ in 2015

- Analogous to a familiar senior undergraduate course
  - “build an O/S, Compiler, or Data Management System
  - Content, Training, Testing, Mobile Application Development, Business plan

- Inter-collegiate competition at conclusion:
  - The top 3 individuals/teams from each school compete
    - Grand prize of $100,000 in startup seed money
    - Access to Watson, and support form IBM in getting to market


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