

# IBM Watson

## Advances in Artificial Intelligence

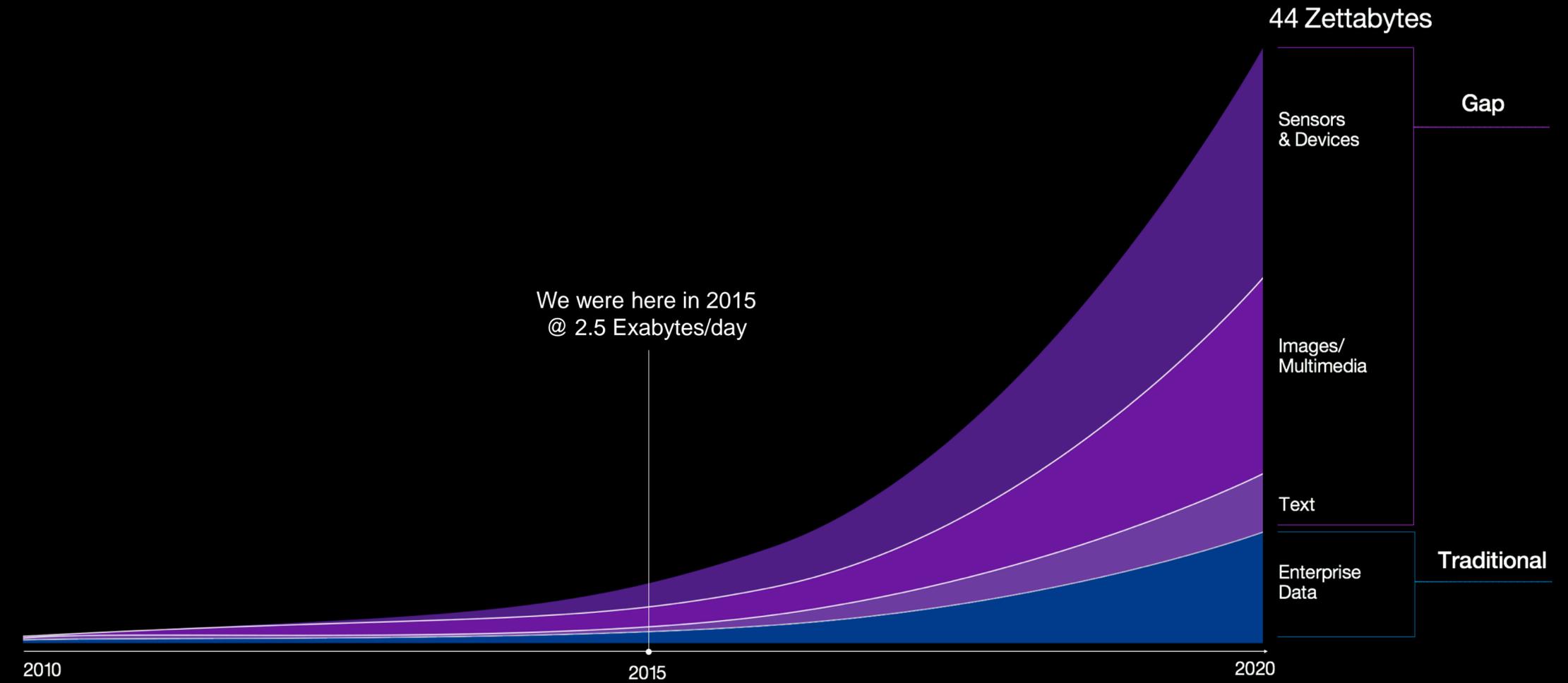
Rob High, Jr.  
IBM Fellow, Vice President  
Chief Technology Officer  
IBM Watson

Watson was Introduced to Jeopardy! Audiences in Feb 2011



Cognitive systems amplify human cognition.

What is driving the need for Cognitive Computing?



## What is Cognitive Computing?

- Cognitive systems are able to learn their behavior through *education*
- That support forms of *expression* that are more natural for human interaction
- Whose primary value is their *expertise*; and
- That continue to *evolve* as they experience new information, new scenarios, and new responses



... and does so at enormous scale.

## The Watson Cognitive Computing Evolution

- **2011:** Jeopardy ... introduced a Factoid Pipeline for use with general domain knowledge
- **2012:**
  - Watson Discovery Advisor ... leverages the Factoid Pipeline around specific domains to 'help find the questions you're not thinking to ask'
  - Healthcare ... Utilization Management, Oncology Treatment Advisor, Clinical Trial Manager
- **2013:** Watson Engagement Advisor ... Introduced a Passage and then FAQ pipeline
- **2014:**
  - Expanded Watson Discover Advisor ... to include knowledge extraction and graph visualization
  - Introduced Watson Explorer ... combined with Watson Content Analytics
  - Watson Ecosystem ... made the (WEA) Passage and FAQ pipeline available as a service
- **2015:** Watson Developer Cloud ... dramatically expanded the set of cognitive services and made them openly available on Bluemix
- **2016:** Enhanced Human Engagement ... focusing on emotion detection and expression, Robotics

Watson Platform built on Bluemix



- Build your application using callable Watson Service APIs at [ibm.com/bluemix](http://ibm.com/bluemix)
  - AlchemyLanguage
  - AlchemyVision
  - AlchemyNews
  - Concept Expansion
  - Concept Insights
  - Language Identification
  - Language Translation
  - Natural Language Classifier
  - Personality Insights
  - Relationship Extraction
  - Speech to Text
  - Text to Speech
  - Tradeoff Analytics
- Can be combined with the 100s of other available services on Bluemix

Fluid  
working with The North Face

Changing the on-line shopping  
experience

REVIEW OUR  
CONVERSATION  
→

BASED ON WHAT YOU'VE TOLD ME ABOUT YOUR TRIP TO **HAWAII** I HAVE SELECTED JACKETS THAT  
ARE DESIGNED FOR **HIKE** × **COLD** × **LIGHT WIND** × **MAN** ×



MEN'S MOMENTUM  
JACKET  
\$99.00



MEN'S DENALI JACKET  
\$179.00



MEN'S THERMOBALL™ FULL  
ZIP JACKET  
\$199.00



MEN'S THERMOBALL™ HOODIE  
\$220.00



MEN'S THERMOBALL™  
PULLOVER  
\$160.00

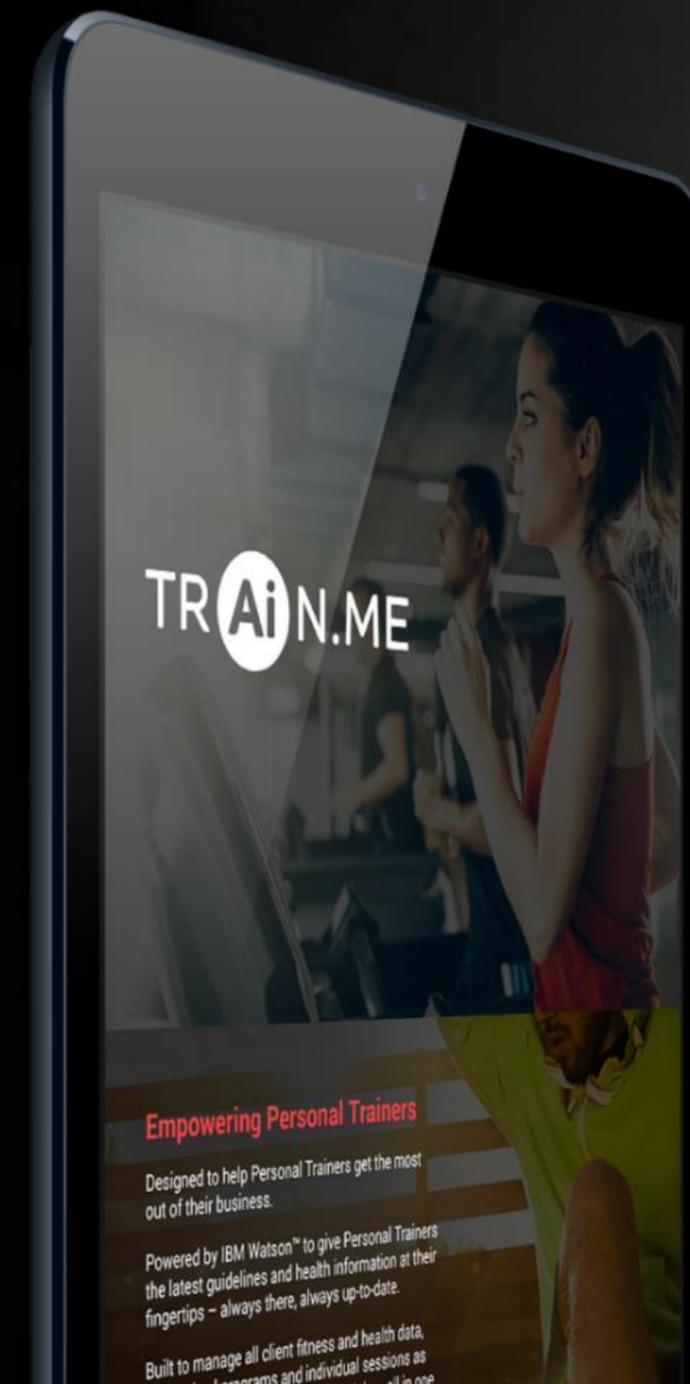


MEN'S ANDEN  
TRICLIMATE® JACKET  
\$199.00

DO YOU EXPECT IT TO RAIN OR SNOW?

Bright Minded

*Changing how amateur and professional athletes train*



Elemental Path

*Changing the child education  
experience*



CogniToy  
Elemental  
Path

CHEF BLENDS MY CART: 0 ITEMS **bear naked** Custom Made GRANOLA SIGN-IN/REGISTER **GET STARTED**



← 1 2 3 4 →

**STEP 2: CHOOSE YOUR INGREDIENTS**  
*All of our ingredients are Non-GMO Project Verified.*



**Banana Chips**  
✓ X

We added coconut oil to the most well-known tropical fruit to give it a mild and crunchy texture that you'll love. Our sweetened banana chips are perfect if you want to add delicious banana flavor and crunchy texture to your granola



**Lavender**  
✓ X

Lavender is an edible flower and one of the most fragrant and highly versatile herbs, commonly used as an ingredient for baked goods. Native to the Mediterranean, lavender lends a floral and slightly sweet flavor to your granola



**Walnuts**  
✓ X

Walnuts are a classic snack that will add texture and richness to your favorite granola blend, pairing well with olives, ginger and dark chocolate. Fun fact about walnuts: their sapling will not be mature enough for harvesting until five to

 SYNERGY

If you'd prefer to skip Chef Watson's pairing recommendations and see a list of all available ingredients, [click here](#) »



®, ™, © 2015 Kellogg NA Co.

## Dialog

*Why should Watson carry on a Conversation?*

- Not everything is just a question
- Engage in personalized, context-aware interactions
- Provide product suggestions and decision support
- Perform tasks and make transactions
- Drive a user through a step-by-step process
- Connect with external systems
- Show personality and have humanized interaction
- Navigate users through websites and provide links
- Provide interactive problem resolution
- Disambiguate inquiries

The screenshot displays a chat interface on the left and a data panel on the right. The chat shows a sequence of messages: a system message asking for pickup or delivery preference, a user response 'deliver it to my house', and a system confirmation of a 'Medium Chicken & apples pizza' for delivery. The data panel on the right shows the JSON representation of this conversation, including dialog and conversation IDs, client ID, and a profile object with attributes like size, toppings, and delivery method.

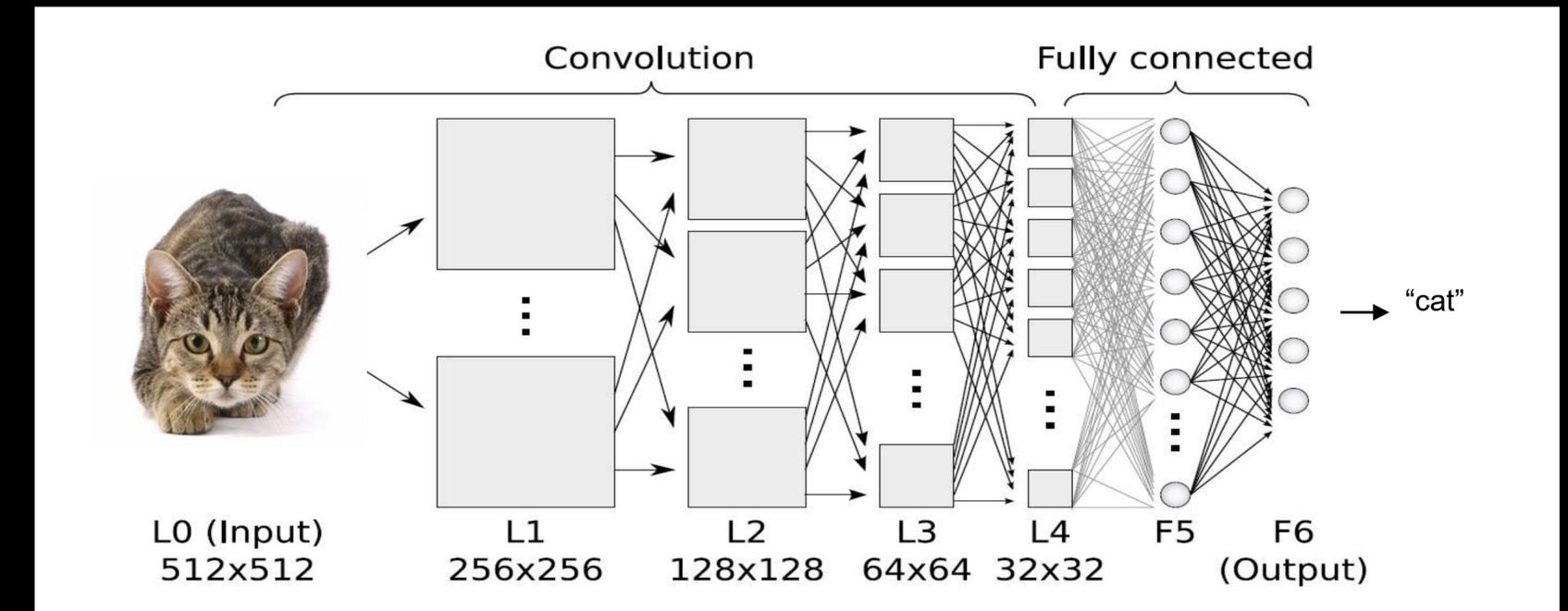
**Data**    **JSON**

**Information**  
Dialog ID: **9feb4449-bf69-43e6-bbd3-82b317e2ff31**  
Conversation ID: **79048**  
Client ID: **73247**

**Profile**  
size: **Medium**  
topping1: **Chicken**  
topping2: **apples**  
method: **delivery**

## Evolving Machine Learning Techniques with Deep Learning

- Learning representations of data by modeling high-level abstractions
- Uses model architectures with multiple layers of non-linear transforms
- Overcomes challenges of designing hand-crafted features for tasks



### Online Dating Profile

I'm a hard working adventurous, very talented man who's been caring and helpful throughout my life, I like to travel, play my guitar, dance, and cook, I love the beach, sailing my boat, and the outdoors.

I raised two great kids and now I'm starting a new chapter in my life.

Thanks.

What I'm doing with my life

Working toward a new goal, keeping fit, helping others, and traveling whenever i get a chance.

I'm really good at Listening, enjoying the moment, and many other things.

The six things I could never do without

Family, the ocean, intimacy, friends, adventure, music, love.

On a typical Friday night I am

Meeting with friends, listening to a band or playing my guitar, dancing or just staying home with someone special and enjoying each other.

You should message me if

You're looking for a relationship with someone that likes to sail his boat, ride bicycles, travel, swim, go to the beach, listen to music and enjoy everyday pleasures together.

Tone Analyzer understands and helps fine tune your message

Uses psycholinguistics, emotion analysis and language analysis to assess Tone



#### Output

The tone API analyzes text at the document level and the sentence level for 3 categories of tones: Emotion, Language, and Social. It produces 2 levels of scores, at the document-level, and the sentence-level.

#### Document-level

Quickly assess the ways your text is or is not making the right impression. Learn how to interpret these graphs for your use case in the [Documentation](#).

##### Emotion Summary

##### Language Summary

##### Social Summary

Tone	Score
Anger	0.23
Disgust	0.10
Fear	0.19
Joy	0.37
Sadness	0.10

#### Tones

- Emotion
  - Anger
  - Disgust
  - Fear
  - Joy
  - Sadness
- Language
  - Analytical
  - Confident
  - Tentative
- Social
  - Openness
  - Conscientiousness
  - Extraversion
  - Agreeableness
  - Emotional Range

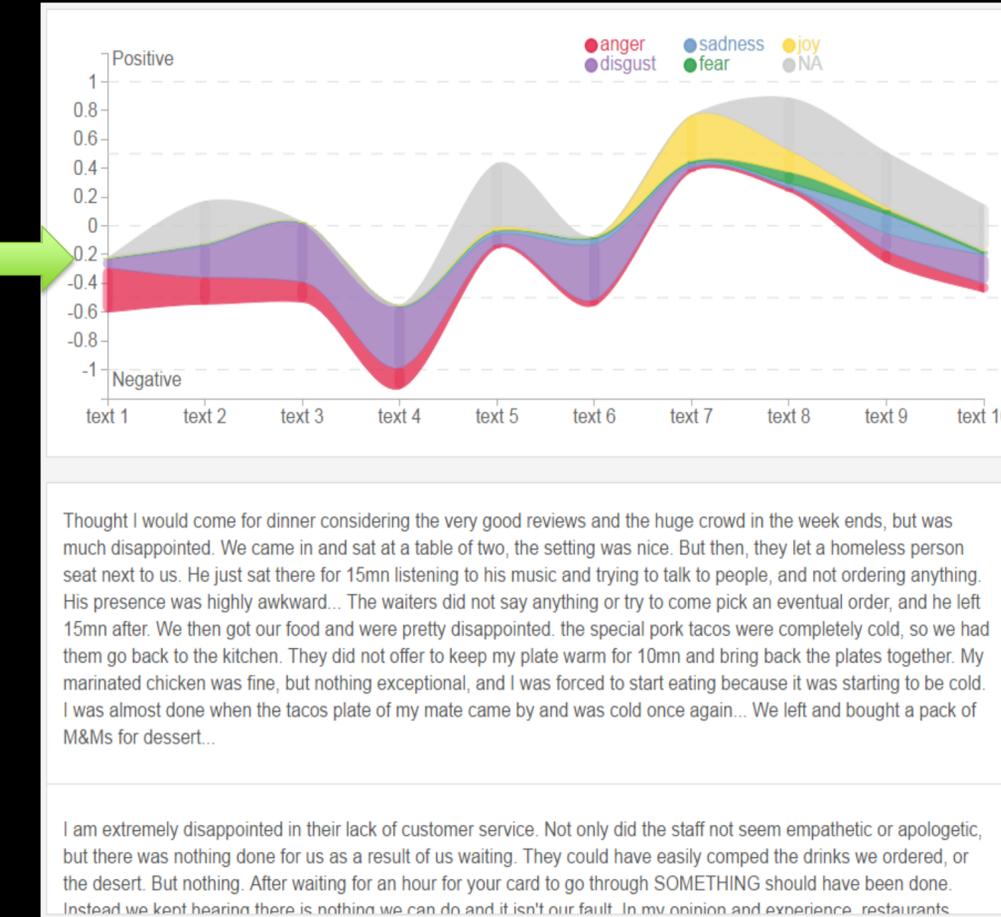
In `sentences_tone`, each `sentence_id` receives a `raw_score` for each tone in a category. Understand how to normalize raw scores or customize thresholds for your use case in the [Documentation](#).

★ ★ ★ ★ ★ 7/24/2011 · Updated review  
 I decided to give Botto another try recently and unfortunately it was not a good experience. Service is pretty terrible. It's like they don't care about their customers. Pass.

Was this review ...?

💡 Useful 11
😄 Funny 3
❄️ Cool 2

Emotion	Score
anger	0.131946
disgust	0.656356
fear	0.031761
joy	0.003071
sadness	0.165626



Emotional Analysis helps build empathetic systems

Uses state-of-the-art machine learning models and feature engineering techniques to predict emotion labels

## Personality Insights

### It's Hard to Build a Thinking Machine—But Worth the Effort

By Rob High  
Chief Technology Officer  
IBM Watson Solutions

Let me take you back to February 2011—a moment that I think marked a significant turning point in world of computing; a moment that harkened the new era of the role the computers will play in our everyday lives. During a special session of the TV quiz show *Jeopardy!* IBM's Watson computer defeated two of the grand champions of the show in a contest of sheer cerebral arm-wrestling. To achieve this Watson, like its human counterparts, had to tease apart the idioms, idiosyncrasies, nuances, misdirection and puns thrown at it as a set of clues and dig deep into its vast recall of literature and trivia to find answers. And, in keeping with the rules of the game, those answers had to be presented in the form of a question.

One of the vanquished human contestants, Ken Jennings, good-humoredly held up a placard upon which he had written: "I, for one, welcome our new computer overlords." It was a reference to an episode of *The Simpsons* where one of the characters mistakenly believes a master race of giant space ants is about to take over Earth, and he surrenders pre-emptively.

Jennings' tongue-in-cheek abdication was considerably premature, as well. While Watson, one of the earliest examples of a cognitive computer, had proven capable of defeating two exceptionally intelligent people in a highly structured mind game, its understanding of how the world works was, in human terms, infantile – well, perhaps a more appropriate analogy would be of a *toddling prodigy*. Watson is remarkable in its ability to understand human language. To get to the underlying meaning of what we say, Watson has to deeply examine the linguistic features of our statements, and then combine that with as much context as possible. It is very similar to how we understand each other.

Since the victory on Jeopardy, teams of scientists, mathematicians and software programmers at IBM have been working with experts in fields ranging from health care to financial services to enable Watson to help solve complex problems in specific domains of knowledge. We are feeding Watson with literature, papers,

### Summary

You are shrewd, skeptical and tranquil.

You are philosophical: you are open to and intrigued by new ideas and love to explore them. You are empathetic: you feel what others feel and are compassionate towards them. And you are self-controlled: you have control over your desires, which are not particularly intense.

You are motivated to seek out experiences that provide a strong feeling of prestige.

You are relatively unconcerned with both taking pleasure in life and tradition. You prefer activities with a purpose greater than just personal enjoyment. And you care more about making your own path than following what others have done.

[How did we get this?](#)

### You are likely to \_\_\_\_\_

- Click on an ad
- Follow on social media
- Buy healthy foods

### You are unlikely to \_\_\_\_\_

- Reply on social media
- Buy eco-friendly
- Treat Yourself

### Personality \*% = percentile

Openness ▼ 98%

Conscientiousness ▼ 69%

Emotional range ▼ 26%

Introversiion/Extraversion ▼ 16%

Agreeableness ▼ 9%

### Consumer Needs \*% = percentile

Challenge 69%

Self-expression 51%

Love 48%

Practicality 46%

Harmony 41%

[See more](#)

### Values \*% = percentile

Helping others 93%

Achievement 86%

Stimulation 67%

Tradition 5%

Taking pleasure in life 2%

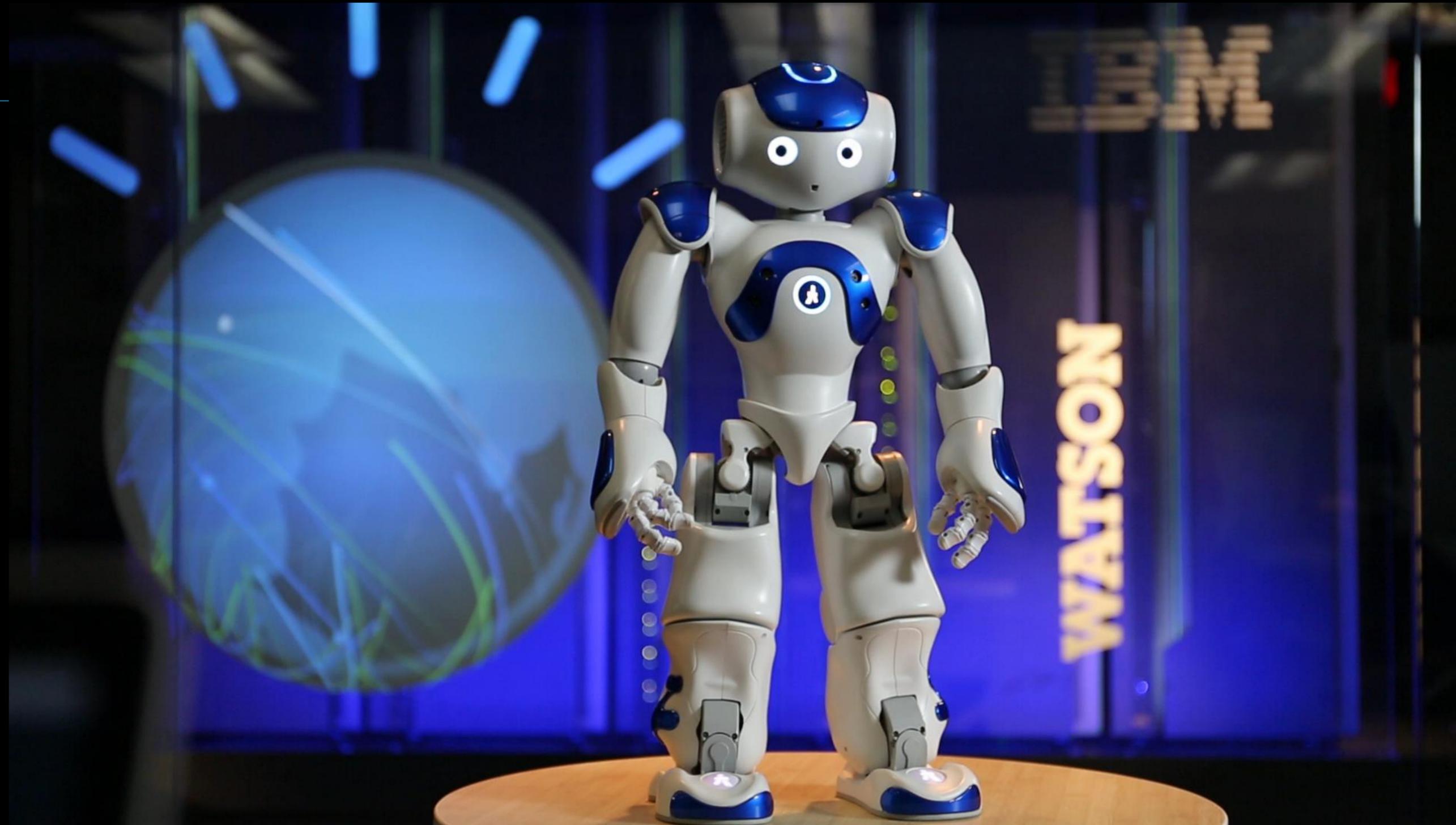
Watson Robotics  
*Empowering human-machine interaction*

- Experiments on integrating Watson with Aldebaran NAO robots (<http://www.aldebaran.com/en>)
- Anthropomorphic animation
- Vocal/auditory interactions
- Responses augmented with anatomical gesturing to punctuate key points



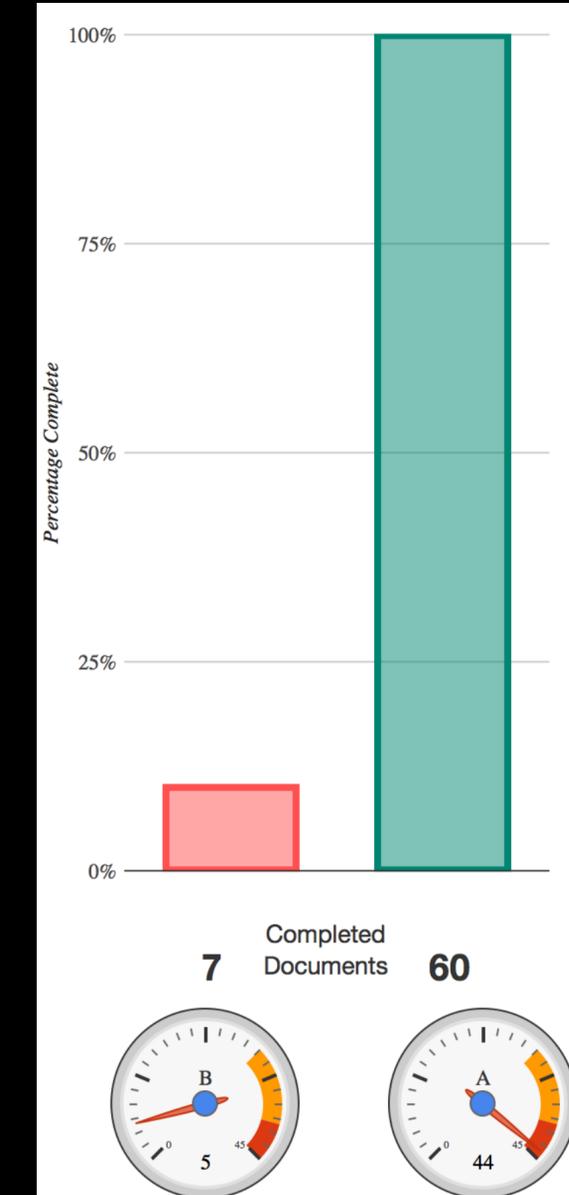
IBM Watson

IBM



To achieve Cognitive Computing we need bigger, faster, cheaper compute power

- Using OpenPower, we have improved inferencing throughput 40x
- Using GPUs we have improved training time 8.5x



Other things that should get your attention this week

- Watson GPU and Robot demos, IBM Booth
- IBM Watson Developers Lab, Hilton Santa Clara Room
- OpenPower Summit talks of potential interest:
  - IBM Research “Machine and Deep Learning on Power Systems” (Ruchir Puri)
  - IBM Systems “Innovations in the areas of Machine Learning, Security, Video Analytics, Genomics, Big Data, and Image Processing” (Bruce Wile)
  - IBM Systems “OpenPOWER and the Roadmap Ahead” (Brad McCredie)
- IBM talks @ GTC:
  - IBM Research “S6280 - Accelerating Spark Workloads Using GPUs” (Rajesh Bordawekar)
  - IBM Research “6211 - CuMF: Large-Scale Matrix Factorization on Just One Machine with GPUs” (Wei Tan)
  - IBM Systems “S6825 - The OpenPOWER Foundation: Revolutionizing Data-Centric Transformation” (Sumit Gupta)
  - IBM SoftLayer “S6543 - IBM Cloud Services (SoftLayer) Enables End-to-End HPC, Machine Learning, and Graphics Infrastructure in the Cloud” (Jerry Gutierrez)
  - IBM Research “S6346 - Easy and High Performance GPU Programming for Java Programmers: (Kazuaki Ishizaki)
  - IBM Research “S6513 - GPU Optimization of the Kripke Neutral-Particle Transport Mini-App” (David Applehans)

OpenPOWER  
DEVELOPER CHALLENGE

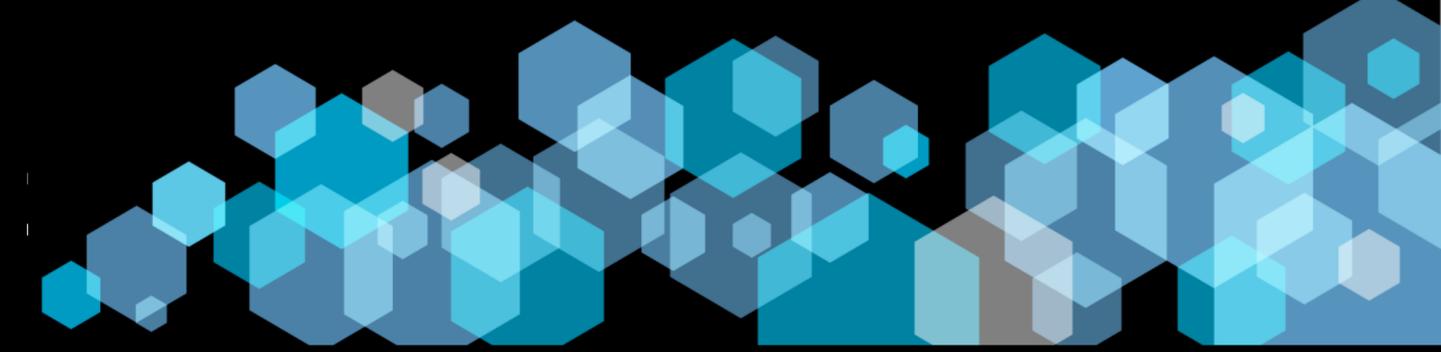
**Two tracks to challenge and win:**

**1. The Open Road Test**

- Port and optimize for OpenPOWER
- Go faster with accelerators (*optional*)

**2. The Spark Rally**

- Train an accelerated DNN and recognize objects with greater accuracy
- Show you can scale with Spark



**Key Dates**

Register today

[openpower.devpost.com](http://openpower.devpost.com)

**Sun May 1<sup>st</sup>:**

Submission periods opens

**Tue Aug 2<sup>nd</sup>:**

Submission period closes

**Grand prizes include a trip to Supercomputing 2016**

**Other prizes include iPads, Apple Watches**



Join the conversation at  
**#OpenPOWERSummit**

<sup>less than</sup>  
In 10 years, cognitive systems will be to computing what  
^ transaction processing is today

- Amplify human creativity
  - Inspiring us to new alternatives to decision options
  - Bringing the breadth of all human knowledge to the tip of our tongue
- Learn their behavior through formal and informal training processes
- Interact with humans on our terms – in the language of humans
- Demonstrate their expertise through trust and depth of character
- Evolve strategies of success – adapting to ever changing knowledge and understanding
- Establish transformative relationships between humans and machines

# IBM Watson Group