Artificial Intelligence
with
Watson
for

UMONS
Université de Mons

Eric Michiels
Technical Advisor
Cognitive Solutions Architect
Eric_Michiels@be.ibm.com
@Eric_Michiels
Master Mathematics and Master Informatics – KU Leuven

IBM

Agenda

1. Artificial Intelligence and Cognitive Computing, an introduction

2. Use Cases (with demonstrations)
    - Cognitive Discovery
    - Cognitive Conversation
    - Cognitive Extend
3. Starting the “Cognitive Journey”
4. IBM Research for AI
5. How to go forward with this technology?

Disruption is upon us

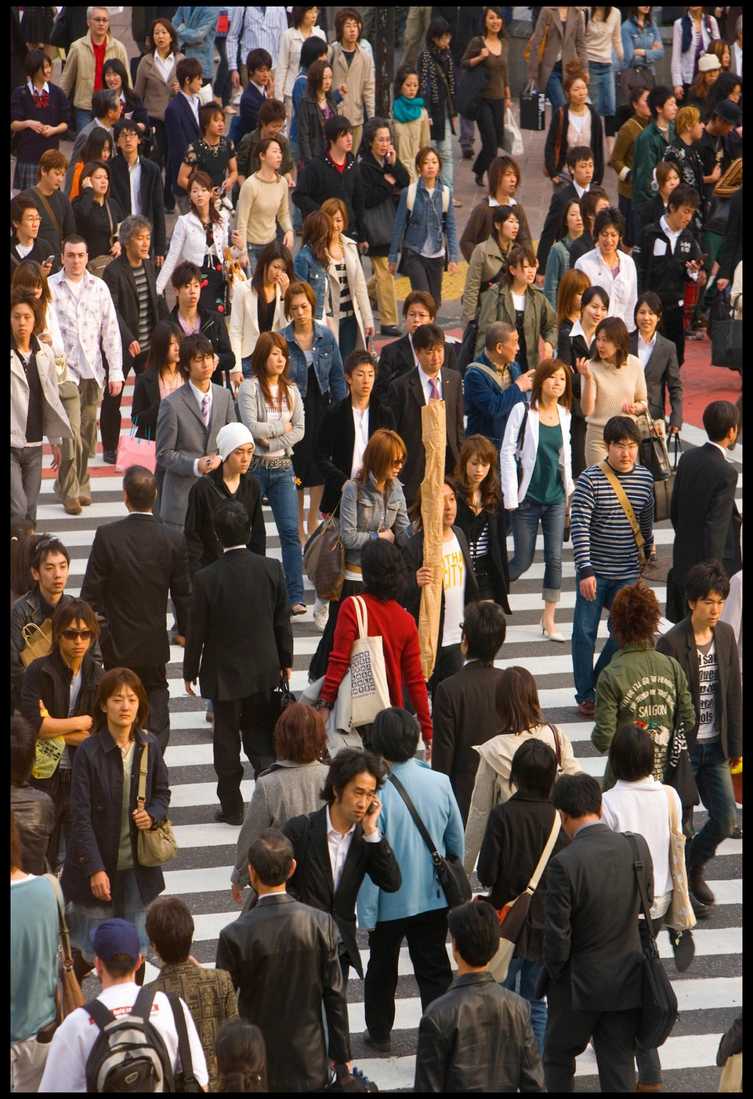
The biggest taxi company
owns no cars.

The largest accommodation company
owns no real estate.

The largest retailer
carries no inventory.

The biggest media company
owns no content.

The **volume**, **variety** and **velocity** of data is creating an unprecedented opportunity.



Expertise matters more today than ever before!

2.5B

Gigabytes of new data are generated every day, 4/5ths of which is unstructured.

IBM

Advances in **natural language processing** and **machine learning** are enabling us to transform expertise and professionals.

1M

Watson can process 500 gigabytes, the equivalent of a million books, per second.

23M

Medical researchers make decisions from a repository of over 23 million articles, updated daily.

150K

150,000 active military use a digital assistant to make important life choices every year.

50x

Pharmaceutical researchers identify and validate proteins to target at 50 times faster than normal.

Bumrungrad International HOSPITAL

USAA®

Baylor College of Medicine

IBM

Watson is creating a new partnership between people and computers that **enhances**, **scales** and **accelerates** human expertise.

Watson through Cognitive **enhances**, **scales**, and **accelerates** human expertise

Understand

Understands data–**structured and unstructured**, text-based or sensory–in context and meaning, at astonishing speeds and volumes.

Reason

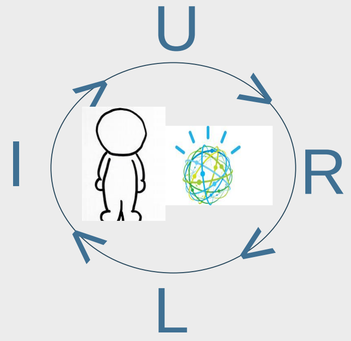
Has the ability to form **hypotheses**, make considered arguments and **prioritize recommendations** to help **humans make better decisions**.

Learn

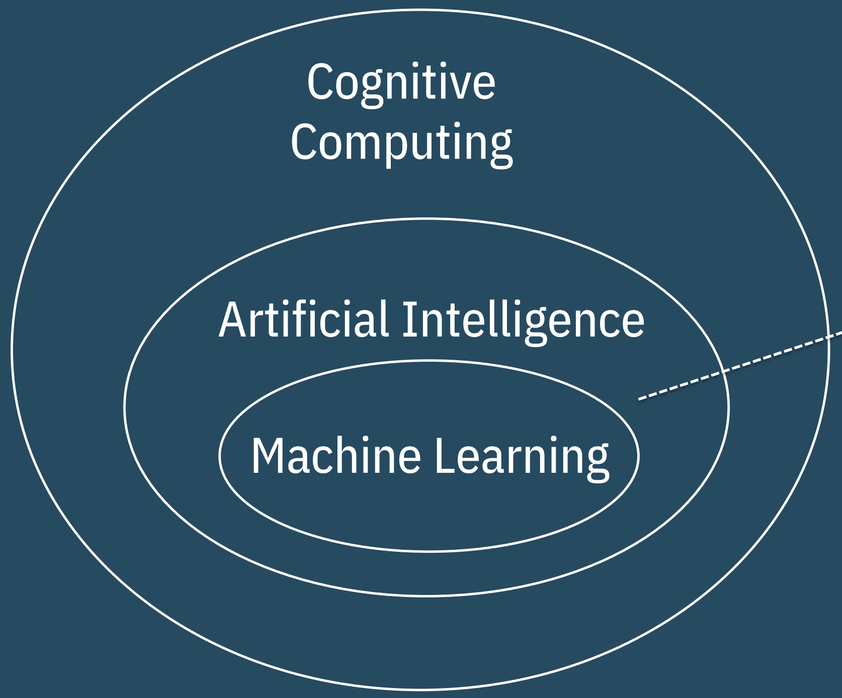
Ingests and **accumulates data and insight from every interaction** continuously. **Is trained, not programmed**, by experts who enhance, scale and accelerate their expertise. Therefore, it gets better over time.

Interact

Responds and communicates with people in a **natural way** that allows cognitive solutions to **see, talk and hear.**



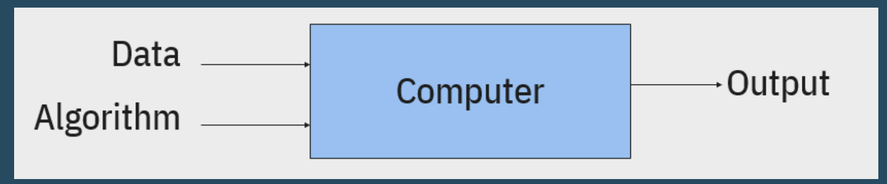
Cognitive Computing, Artificial Intelligence, Machine Learning



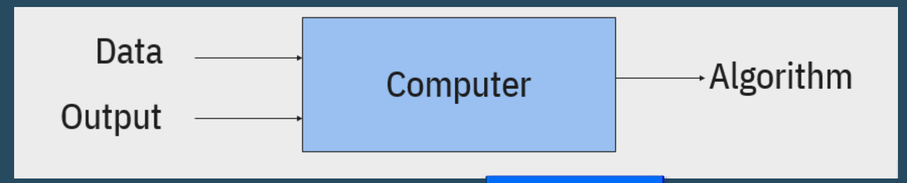
- *Natural Language Processing*
- *Knowledge Representation*
- *Automated Reasoning*
- *Machine Learning*
- *…*
- *Computer Vision*
- *Robotics*

- Artificial = produced by human art or effort, rather than originating naturally
- Intelligence = the ability to acquire knowledge and use it
- AI = part of computer science concerned with the design of computer systems that **exhibit human intelligence**

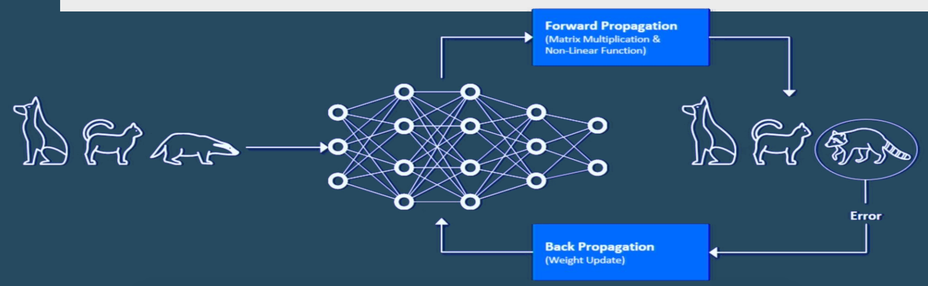
Traditional Programming



Machine Learning



Deep Learning



What is Artificial Intelligence?

	Human	Rational
Thought	Systems that think like humans	Systems that think rationally
Behaviour	Systems that act like humans	Systems that act rationally

Turing Test

?

- *Natural Language Processing*
- *Knowledge Representation*
- *Automated Reasoning*
- *Machine Learning*
- *...*
- *Computer Vision*
- *Robotics*

TECHNOLOGIES #JUSTICE

L'intelligence artificielle est-elle plus impartiale que l'humain ?

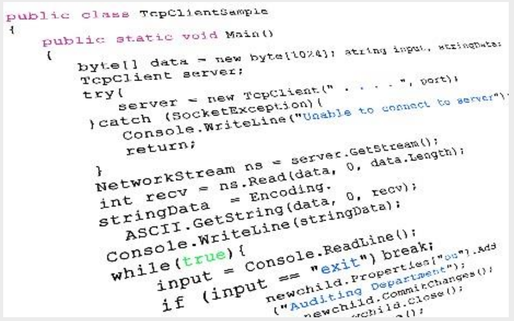
'We moeten eerlijkheid inbakken in AI'

Bias ???

Why Cognitive?

Early adopters see cognitive computing as the key differentiator

Data is transforming industries and professions



The world is being reinvented in code

65%

say adoptive cognitive is very important to their organization's strategy and success

58%

say cognitive computing is essential to digital transformation

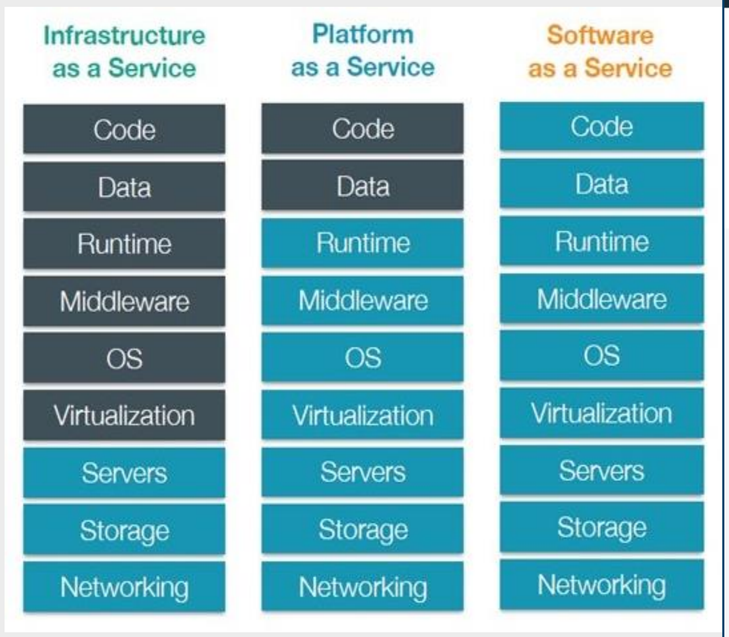
62%

of users say outcomes from cognitive initiatives exceed their expectations

Agenda

1. Artificial Intelligence and Cognitive Computing, an introduction
2. Use Cases (with demonstrations)
    - Cognitive Discovery
    - Cognitive Conversation
    - Cognitive Extend
3. Starting the “Cognitive Journey”
4. IBM Research for AI
5. How to go forward with this technology?

IBM Cloud, a choice of Service and Deployment Models for Innovation

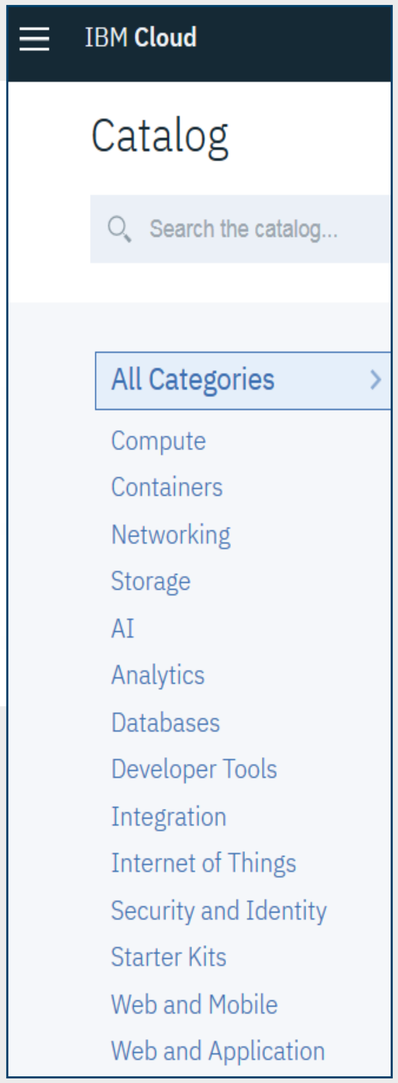


- Customer managed
- Service Provider managed

Cloud 1.0 Cloud 3.0 Cloud 2.0

openstack. CLOUD FOUNDRY docker

The Weather Company An IBM Business



95% of surveyed enterprises are sing some form of Cloud

PUBLIC

Maximize on Cloud Agility and Economics

DEDICATED

Public Cloud benefits, with Dedicated Infrastructure

PRIVATE

Behind the firewall for the most demanding workloads

Seamless Experience
Regardless of which combination you choose, you get a single, seamless experience.

Watson APIs (today ☺)

IBM Cloud Catalog Docs Support Manage Search for resource... 1500867 - IBM

Catalog

Search the catalog... Filter

All Categories
- Compute
- Containers
- Networking
- Storage
- AI
- Analytics
- Databases
- Developer Tools
- Integration
- Internet of Things
- Security and Identity
- Starter Kits
- Web and Mobile
- Web and Application

AI

Watson Assistant (formerly Conversation)
Lite • IBM
Add a natural language interface to your application to automate interactions with your end users. Common applications

AI OpenScale
Lite • IBM
IBM AI OpenScale is an enterprise-grade environment for AI infused applications that provides enterprises with visibility into how

Compare Comply
IBM • Beta
Process governing documents to convert, identify, classify, and compare important elements

Discovery
Lite • IBM
Add a cognitive search and content analytics engine to applications.

Knowledge Catalog
Lite • IBM
Discover, catalog, and securely share enterprise data.

Knowledge Studio
Lite • IBM
Teach Watson the language of your domain.

Language Translator
Lite • IBM
Translate text, documents, and websites from one language to another. Create industry or region-specific translations via

Machine Learning
Lite • IBM
IBM Watson Machine Learning - make smarter decisions, solve tough problems, and improve user outcomes.

Natural Language Classifier
IBM
Natural Language Classifier performs natural language classification on question texts. A user would be able to train their data and

Natural Language Understanding
Lite • IBM
Analyze text to extract meta-data from content such as concepts, entities, emotion, relations, sentiment and more.

Personality Insights
Lite • IBM
The Watson Personality Insights derives insights from transactional and social media data to identify psychological traits

Speech to Text
Lite • IBM
Low-latency, streaming transcription

Text to Speech
Lite • IBM
Synthesizes natural-sounding speech from text.

Tone Analyzer
Lite • IBM
Tone Analyzer uses linguistic analysis to detect three types of tones from communications: emotion, social, and

Visual Recognition
Lite • IBM
Find meaning in visual content! Analyze images for scenes, objects, faces, and other content. Choose a default model off the

Watson Studio
Lite • IBM
Embed AI and machine learning into your business. Create custom models using your own data.

PowerAI
Third Party
The accelerated deep learning platform for enterprise. Built on the IBM PowerAI platform, powered by Nimbix.

FEEDBACK

Use Case Category #1

Cognitive Discovery
Unlock answers

Use Case Category #2

Cognitive Conversation
Scale human interaction

Use Case Category #3

Cognitive Extend
Understand signals in data

Use Case Category #1

Cognitive Discovery

Unlock answers

Customer Service

Social Listening

Research Insights

Use Case #1
Cognitive Discovery – Unlock Answers

What is it?

*Unlock answers and discover new insights by making cognitive connections across **broad bodies of knowledge.***

Selection from…
Watson Services on IBM Cloud
Watson Personality Insights
Watson News Explorer
Watson Discovery Service
Watson Knowledge Studio

"Cognitive Search Delivers The New Generation Of Search And Knowledge Discovery—Knowledge is power. **Cognitive search** is emerging to deliver the immediate, contextual value to users that has long been promised."

- Forrester

Brief: Cognitive Search Is Ready To Rev Up Your Enterprise's IQ, Forrester, May 2, 2016

Research Insights
ROSS Intelligence
Power through legal research

Amplify knowledge, reimagine workflows

The vision
Enable lawyers to perform comprehensive legal research more quickly and effectively than ever before

The disruption
Draw from legislation, case law and secondary sources, answering natural-language queries with citations and recommended reading, monitoring law developments 24x7 and alerting researchers to relevant changes

Entire body of law + IBM Watson Discovery

The result: Reduced research time from hours to seconds, allowing teams to service more clients, with clients seeing lower legal fees

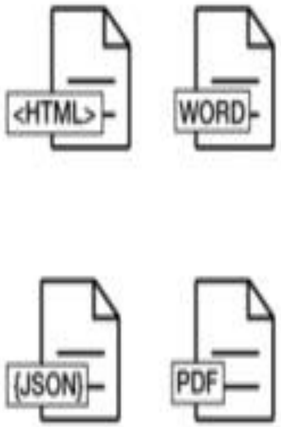
Use Case #1 - Cognitive Discovery

What does the solution look like?

Watson Discovery Service

Data

Private data



Ingestion

Convert and enrich by leveraging Watson APIs to add NLP meta data to your content, making it easier to explore and discover insights

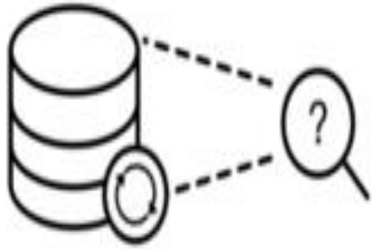
Clean and normalize through an automated processing of NLP results, improving data quality

Storage

Normalized data is **indexed into a collection** as part of your **environment** in the cloud

Query

Understand data faster, create better hypothesis and deliver better outcomes



Output

Actionable insights into your app

IBM Watson Knowledge Studio

Teach Watson to discover meaningful insights in unstructured text without writing any code.

Use Case Category #2

Cognitive Conversation Scale human interaction

Customer Assistant

Conversational Commerce

Employee Productivity

Use Case Category #2 – Cognitive Conversation

What is this?

Add a natural language, intelligent Chatbot to an App, website, device, messaging app or social channel.

Break down the barriers to fast, efficient customer communications, driving improved ***customer engagement.***

Selection from:
Watson Assistant
Watson Tone Analyzer
(Watson Personality Insights)
(Watson Discovery Service)

"Watson helped us immensely and changed the trajectory of the project. The visual tooling around it made everything significantly easier – easier to train Watson on our product catalog and intents, and easier to see where we were having issues. It's fantastic."

- Ian Goodwin, Applied Innovation organization, Staples

STAPLES®

Staples makes customer service easy with Watson Conversation

Using Watson Conversation and other Watson services, Staples has transformed the Easy Button into a cognitive ordering ecosystem. The Staples Easy System now removes friction from the ordering process, enabling office managers to place orders wherever, whenever and however they want.

> We wanted to remove constraints and make the process of ordering supplies as easy as possible.
>
> Ian Goodwin, Lead Product Manager of the Staples Easy System, Staples Inc.

The Benefits

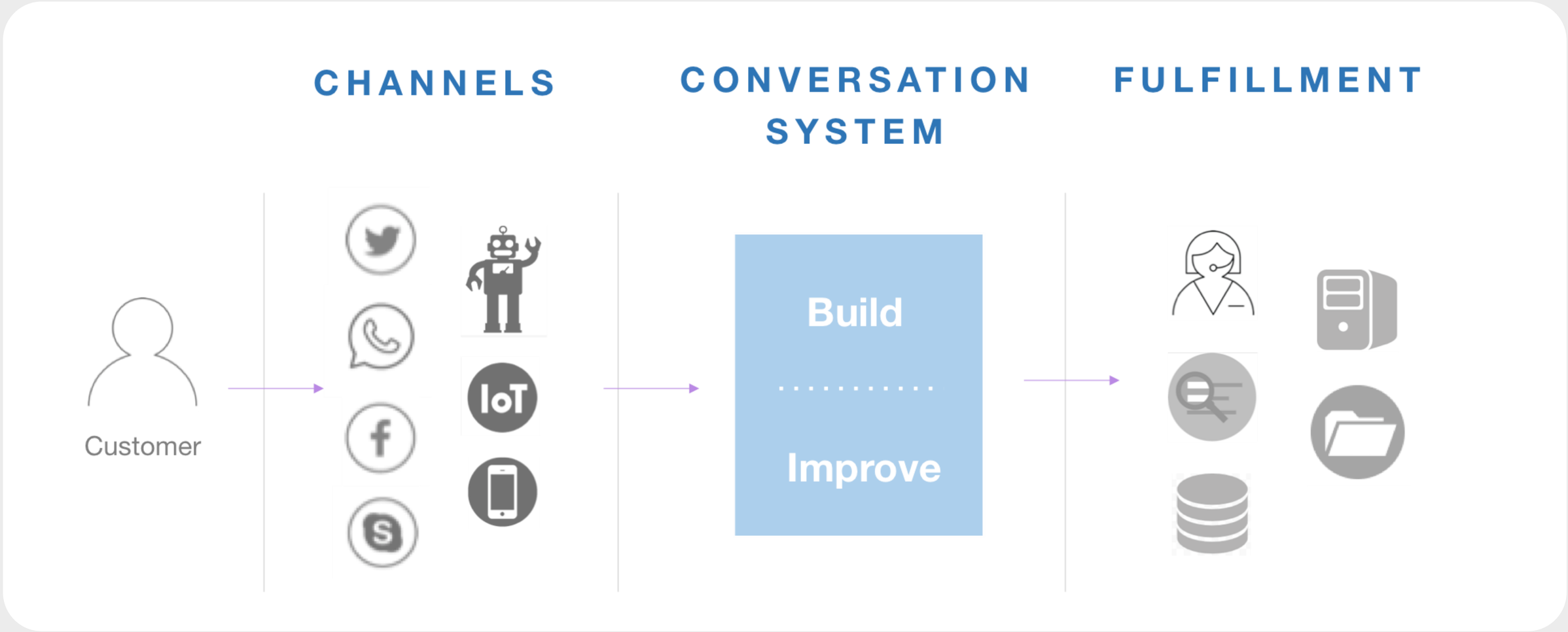
Higher order frequency

Increased order sizes

Improved service scores

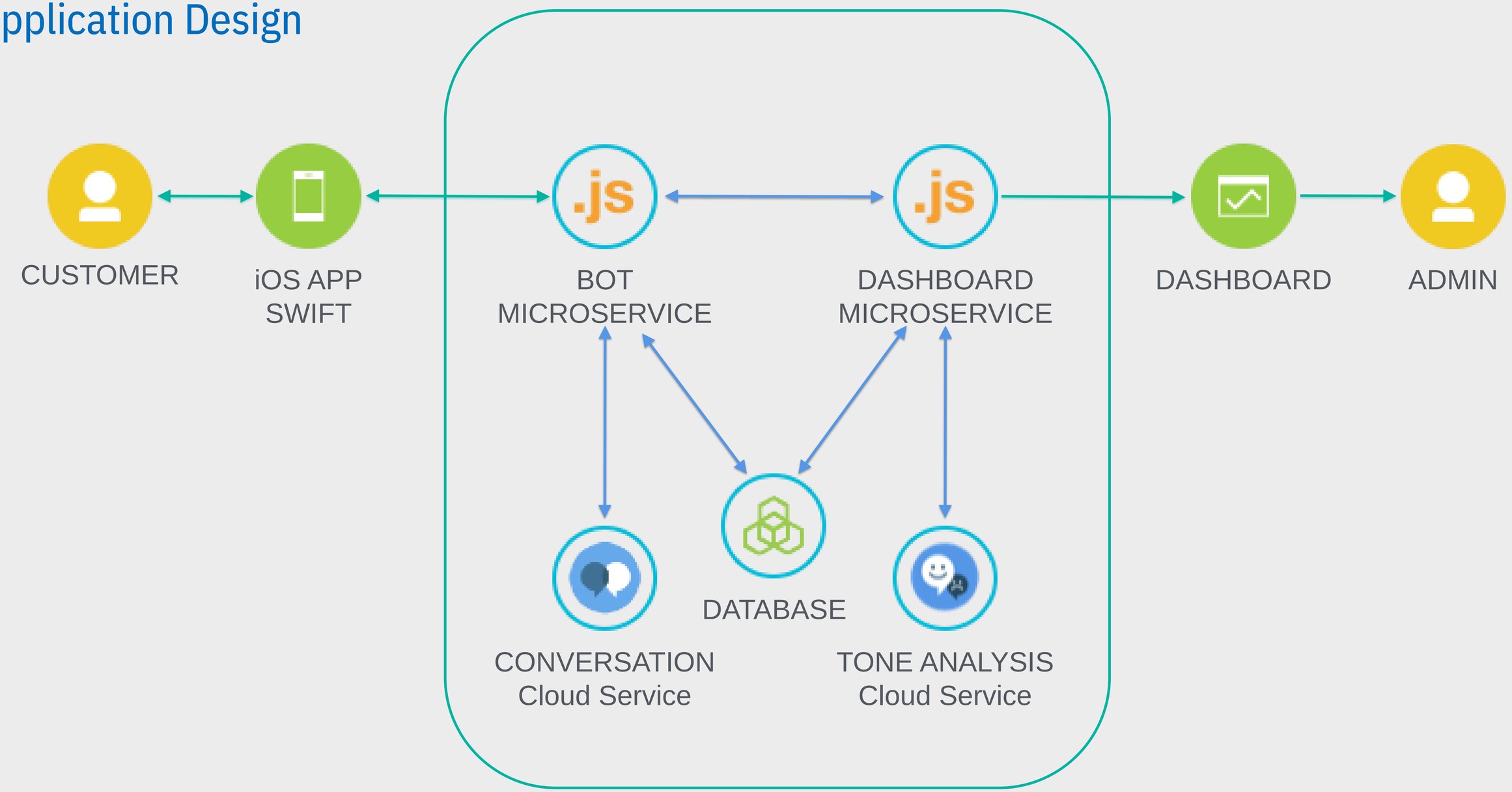
Use Case #2 – Cognitive Conversation

What does the solution look like?

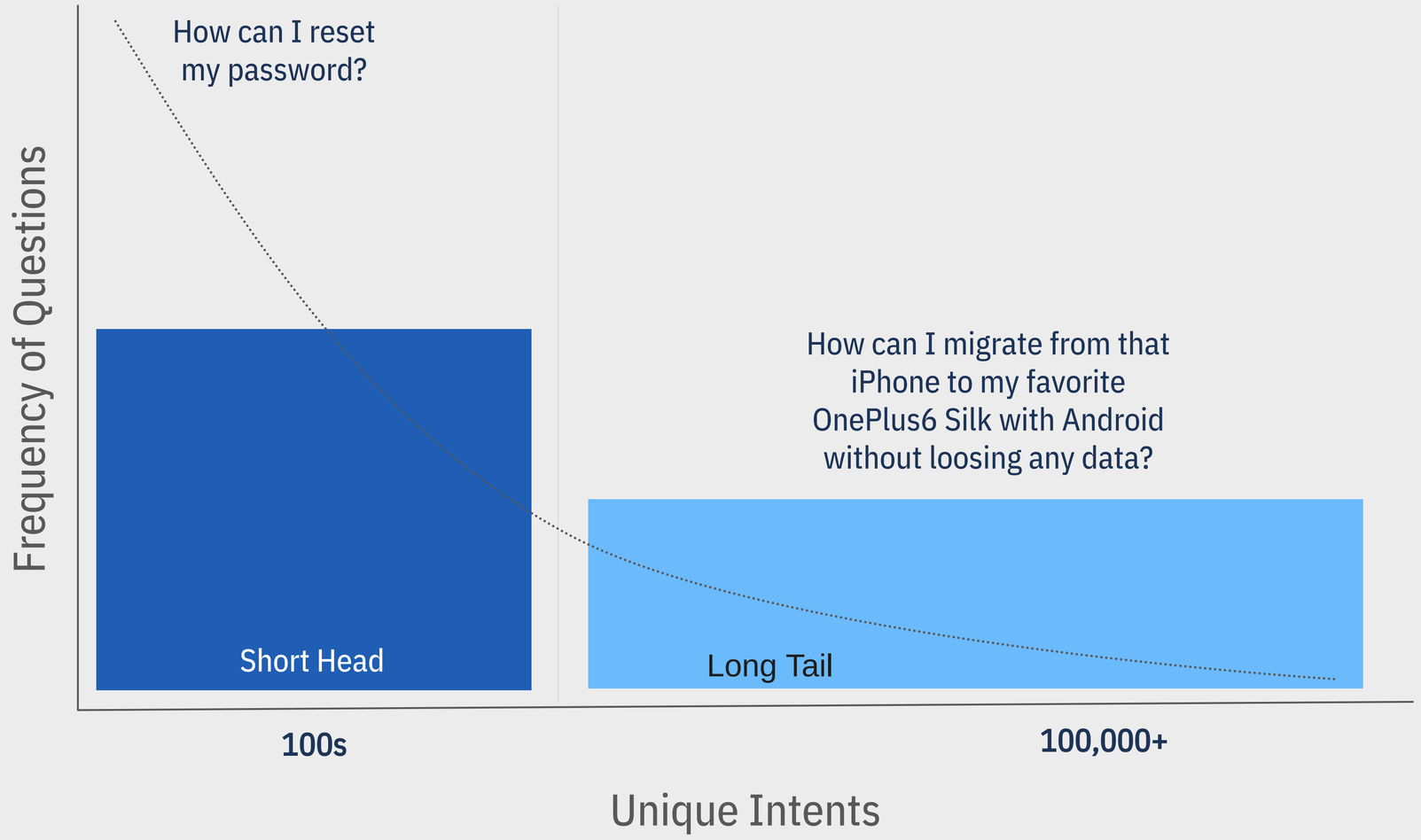


Use Case #2 – Cognitive Conversation

Application Design



Question Distribution



Watson Assistant

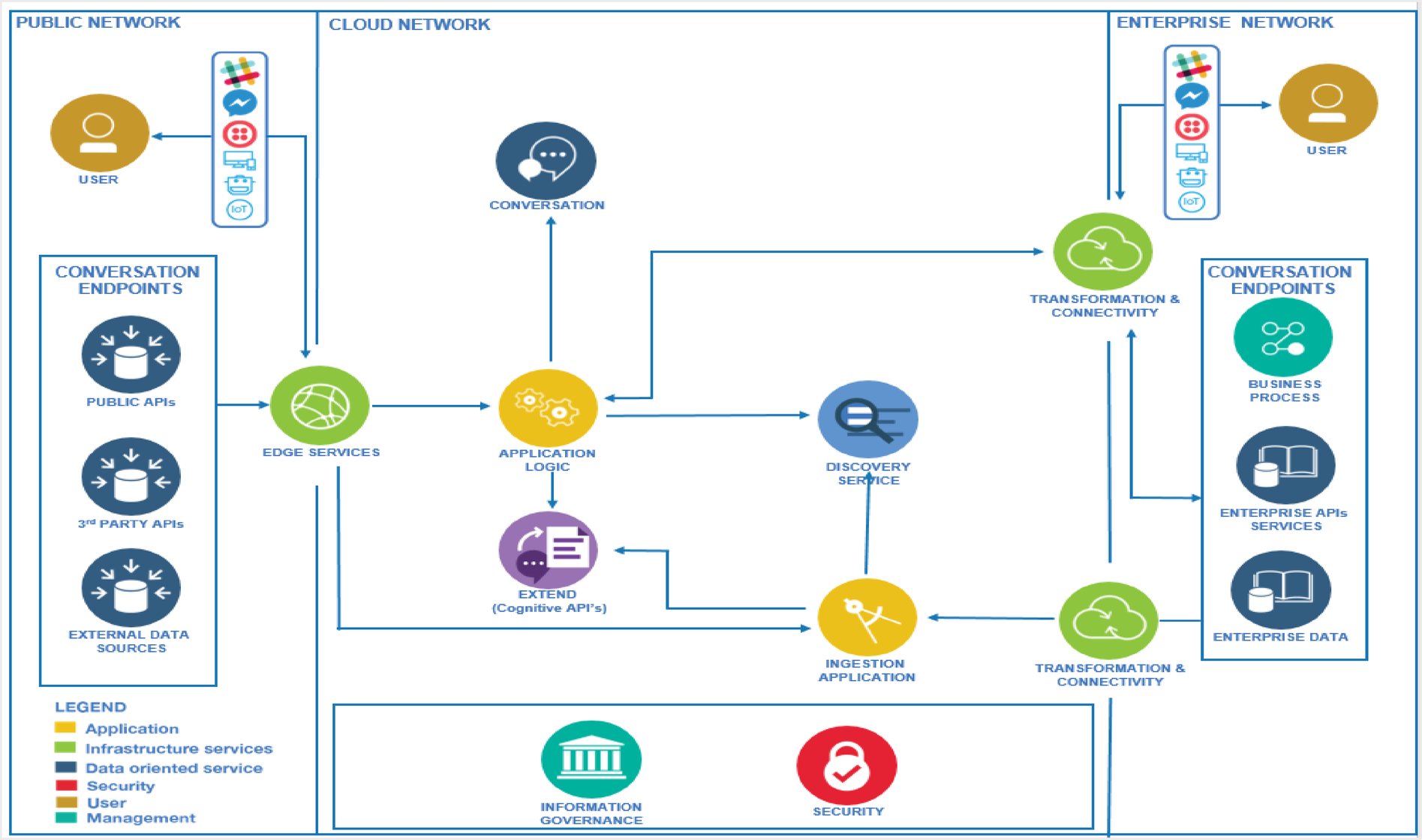
Here Watson uses reasoning strategies that focus on the language and context of the **question**.

Watson Discovery Service

Here Watson uses reasoning strategies that focus on identifying the most appropriate **answer**.

Use Case #2 – Cognitive Conversation

Cognitive Reference Architecture



Use Case Category #3

Cognitive Extend
Understand signals in data

Asset Management

Customer Intelligence

Mobile Application

Use case #3: Cognitive Extend

Enable applications to understand signals (visual, text, audio) in data

What is this?

Understand the meaning of **signals in data**, empowering developers to extend and build **next generation user experiences** in applications that can interact with humans.

Selection from:
Watson Language Translator
Watson Language Classifier
Watson Speech-To-Text
Watson Text-To-Speech
Watson Visual Recognition
Watson Studio (and Machine Learning)
Watson and TED
Cognos Analytics

“ We chose IBM Watson because of the quality of the actual voice-to-text conversion and how well it integrates with our systems.

”Chris Maciejewski, Founder and Technical Director, VoIPstudio

Use Case Category #3: Cognitive Extend

Key Customer Drivers

1. Vision

Understand visual data of any kind

Example: **Personalize advertising b**y offering individualized value

2. Text

Understand text content, in context

Example: monitor competitors moves by **analysing news data**

3. Audio

Accurately transcribe speech to text and back

Example: transcribe call center data for text mining

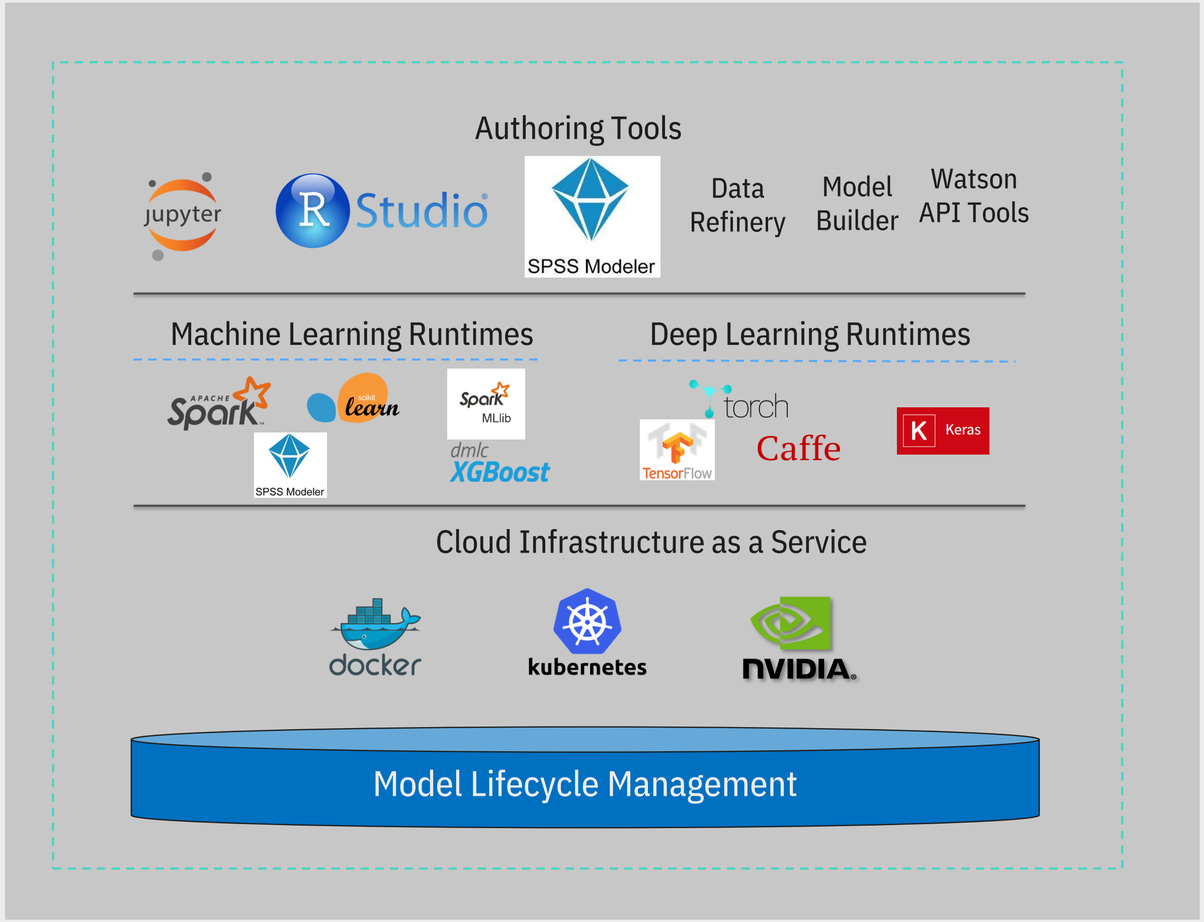
Watson Studio

Comprehensive set of tools for the end-to-end AI workflow

- Create, collaborate, deploy, and monitor
- Best of breed open source & IBM tools
- Code (R, Python or Scala) and no-code/visual modeling tools

- Most popular open source frameworks
- IBM best-in-class frameworks

- Fully managed service
- Container-based resource management
- Elastic pay as you go CPU/GPU power



OmniEarth

"Analyzing things at the parcel-by-parcel level represents a paradigm shift for this industry."

—Chelsea Minton, Senior Sales Engineer, OmniEarth, Inc.

OmniEarth, Inc.

Cognitive computing can show water consumption patterns from earth imagery

Founded in 2014 and headquartered in Arlington, Virginia, OmniEarth, Inc. builds scalable solutions for processing, clarifying and fusing large amounts of satellite and aerial imagery with other data sets. The results have a broad range of applications, from pipeline monitoring to precision agriculture and resource management.

Business challenge

Water conservation is a top concern in drought-stricken California. The state imposed water restrictions to regulate consumption but relied on broad yearly or multiyear averages to understand usage levels, set targets and educate the public. OmniEarth, Inc. knew it could help the state monitor usage through aerial images, but its speed was limited by the fact that humans still had to interpret and tag the images manually before they could be analyzed.

Cognitive transformation

OmniEarth uses cognitive technology to recognize topographical features in unstructured aerial images—including lawns and agricultural zones—giving water districts insight into dynamic patterns of water consumption and the effects of weather and local initiatives. The system was trained to differentiate a pool from a pond, for example, with analysis that **shows how water is used, how much can be saved and where to focus on customer education.**

Business benefits

40x faster

image processing

than was possible using manual methods

Higher capacity

for analyzing terrain

on a massive scale, creating new business opportunities worldwide

Actionable insight

into satellite imagery

on a highly granular scale

Solution components

- IBM Cloud
- IBM Watson™ Developer Cloud
- IBM Watson Visual Recognition

Watson at work in the world

"Thomson Reuters to deploy IBM Watson technology”
- InfoTechLead

"IBM's Watson Lands A Job With KPMG.” -InformationWeek

"How Can I Help You? IBM's Watson Powers Hilton's Robotic Concierge" - Fast Company

"Woodside to tap into IBM's Watson” - CIO

"SoftBank's Pepper robot is getting an intelligence boost from IBM's Watson"- The Verge

"IBM’s Watson Helped Pick Kia’s Super Bowl ‘Influencers’”
- Wall Street Journal

"IBM’s Watson Now Powers AI For Under Armour”
- TechCrunch

"IBM and Apple can put Watson's A.I. insights inside Apple Watch"- ComputerWorld

"The North Face Uses IBM's Watson to Make Online Shopping Smarter" -The Street

"Medtronic, IBM team up on diabetes app to predict possibly dangerous events hours earlier."- The Washington Post

More Cognitive Use Cases

- Deeper human **Engagement**
  - Hospitality, Government
- Cognitive **Products and Services**
  - Media, Games
- Cognitive **Processes and Operations**
  - Manufacturing, Travel
- Elevated **Expertise**
  - Oncology, Engineering, Law
- Intelligent **Exploration and Discovery**
  - Pharmaceutical, Science

Agenda

1. Artificial Intelligence and Cognitive Computing, an introduction

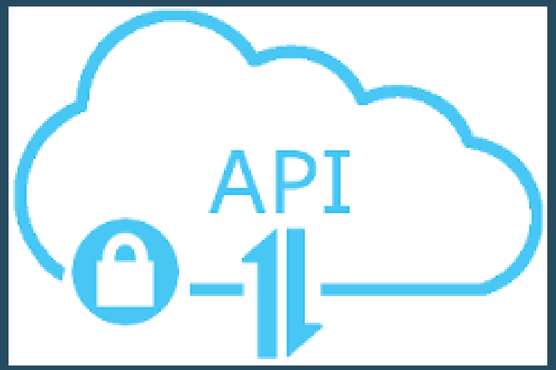
2. Use Cases (with demonstrations)
    - Cognitive Discovery
    - Cognitive Conversation
    - Cognitive Extend
3. Starting the “Cognitive Journey”
4. IBM Research for AI
5. How to go forward with this technology?

Becoming a Cognitive Business is a Journey

Cognitive

Foundation of

Cloud Services optimized for data and Cognitive …



…tuned for Cognitive workloads

Security for a Cognitive Era

When is it “Cognitive”, when is it “just” Business Analytics?

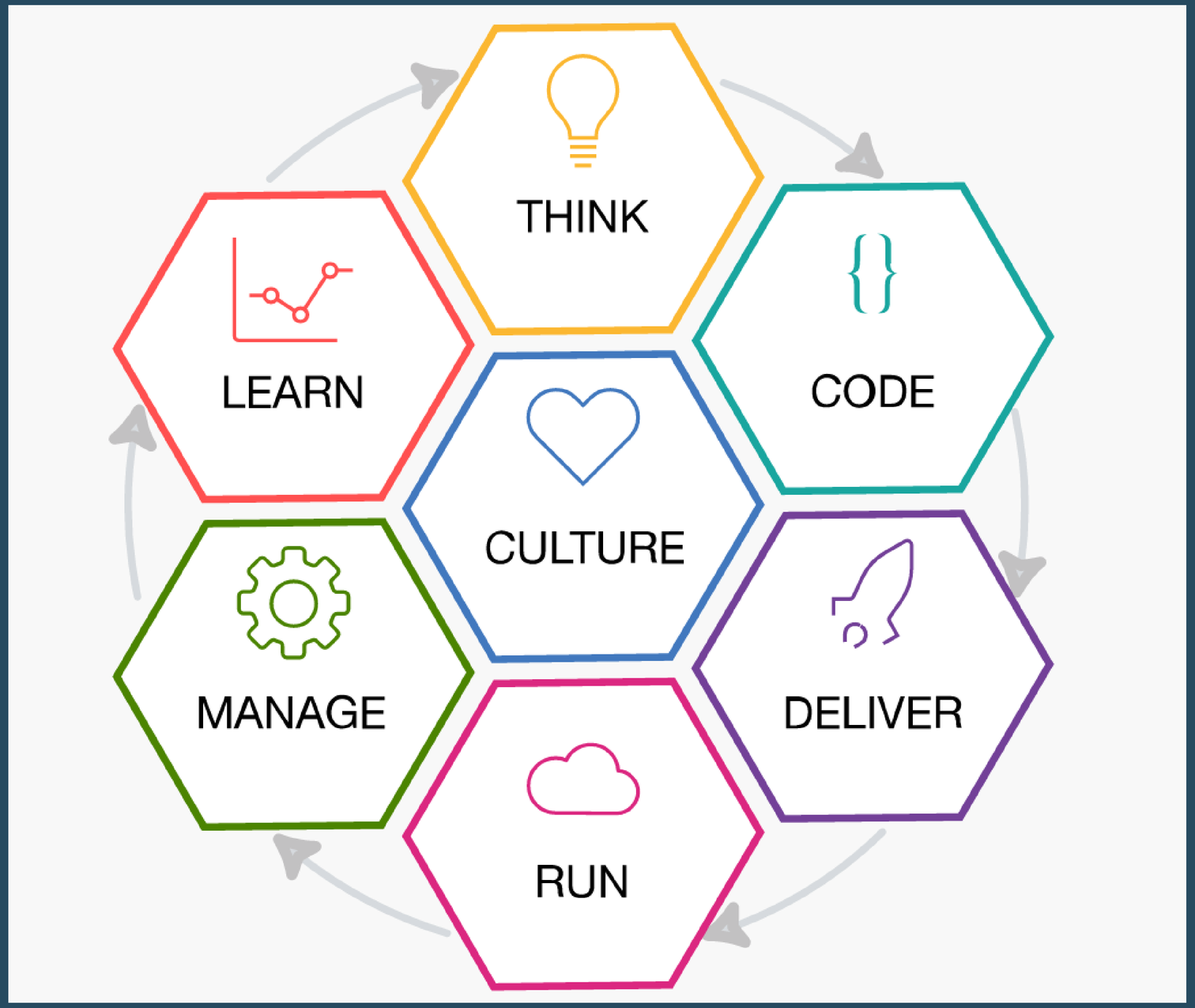
It is Big Data when…	It is Business Intelligence when…	It is Predictive Analytics when…	It is Watson when …
•**Dealing with large complex and dynamic data sets** •Looking to coordinate **structured and unstructured data** •Interest is in streaming data •Looking to find rare events, **common patterns, and outliers** •General focus is on data architecture, extraction, transformation, movement, storage, integration, and governance	•**Need is for reporting, dashboards & scorecards - “Business Intelligence”** •Looking to spot and **analyze trends, patterns and anomalies** •In-memory reporting and analysis is required •Need is to perform end-user **query and analysis** •Requirements are for planning, budgeting and forecasting resources	• **Desire is to leverage predictive/prescriptive outcomes** • **Data mining** is required for deep insights and **pattern recognition** • Interest is in using statistics including logistic regression. • Looking to create predictive scores around key attributes • **Automating decision management processes** leveraging predictive analytics and business rules for optimization.	•**Looking to perform question and answer iterations with confidence based responses** •Need to work with **unstructured data**, leveraging **natural language processing** to deal with **complexity of human speech**. •**Hypothesis generation** and validation is critical to the process •**Evidence based learning** is integral to the solution delivered •Extended **knowledge base** •A lot of **distributed pieces of knowledge**

IBM Garage Method

Also for Watson Services !

Combining industry best practices for **Design Thinking, Lean Startup, Agile Development, DevOps,** and **Cloud** to build and deliver innovative solutions.

To learn more visit:
https://www.ibm.com/devops/method



SUMMARY

- We are experience **a digital disruption** fueled by proliferation of data, the API economy and powerful new capabilities **enabled by Cognitive Computing**.

- Cognitive systems **understand, reason, learn and interact**.

  Cognitive systems **interact** with humans on our terms, not theirs – understanding language, voice, images.

- In a study of over 600 early cognitive adopters, IBM found **organizations already gain major competitive advantage** from cognitive computing

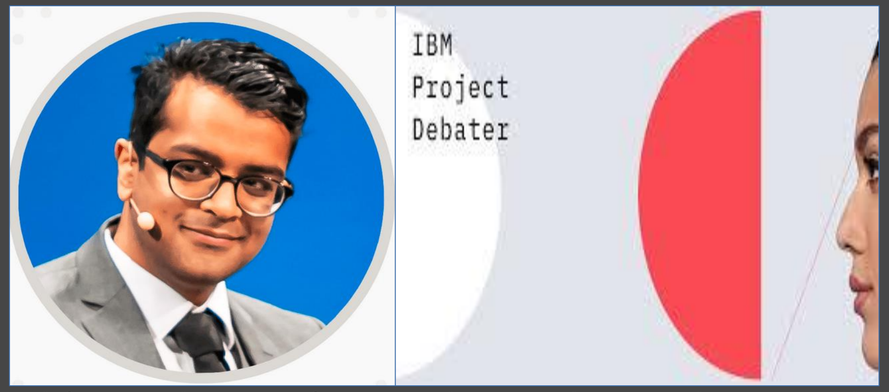
- While Cognitive can be applied to a variety of problem spaces, **start with conversational solutions**, **discovery-based applications**, or **infusing existing applications with cognitive through the foundational services**

Agenda

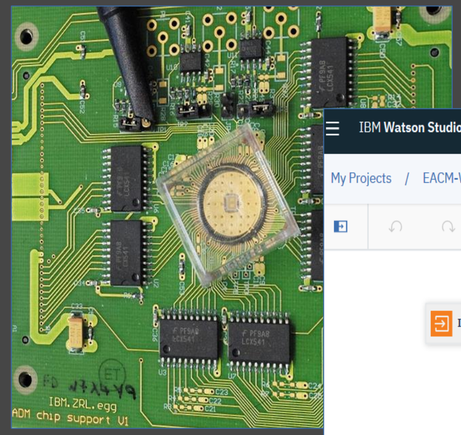
1. Artificial Intelligence and Cognitive Computing, an introduction

2. Use Cases (with demonstrations)
    - Cognitive Discovery
    - Cognitive Conversation
    - Cognitive Extend
3. Starting the “Cognitive Journey”
4. IBM Research for AI
5. How to go forward with this technology?

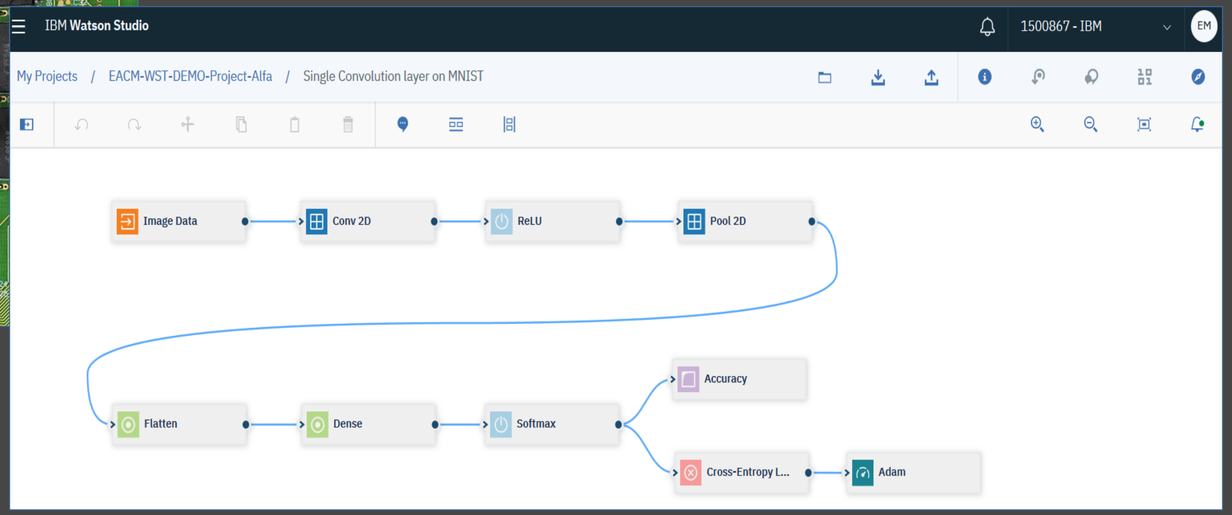
More from IBM Research …



… it's not like IBM's machine, which Harish describes as a "technological marvel", totally failed during the competition. In fact, the differences between debating the machine and debating a human competitor weren't enormous for Harish.



Next Generation AI Hardware



CNN-Cert for certifying the level of Adversarial Robustness

Adversarial Robustness Toolbox (ART v0.6.0)

And of course …

Qiskit Aqua

Algorithms for near-term quantum applications

GitHub

Qiskit Artificial Intelligence

Qiskit Artificial Intelligence (AI) is a set of tools and algorithms that enable experimenting with AI problems via quantum computing. Aqua AI is the only end-to-end software stack that translates AI-specific problems into inputs for one of the Quantum Algorithms in Aqua: A Library of Quantum Algorithms, which in turn uses Qiskit Terra for the actual quantum computation on top a quantum simulator or a real quantum hardware device.

Agenda

1. Artificial Intelligence and Cognitive Computing, an introduction

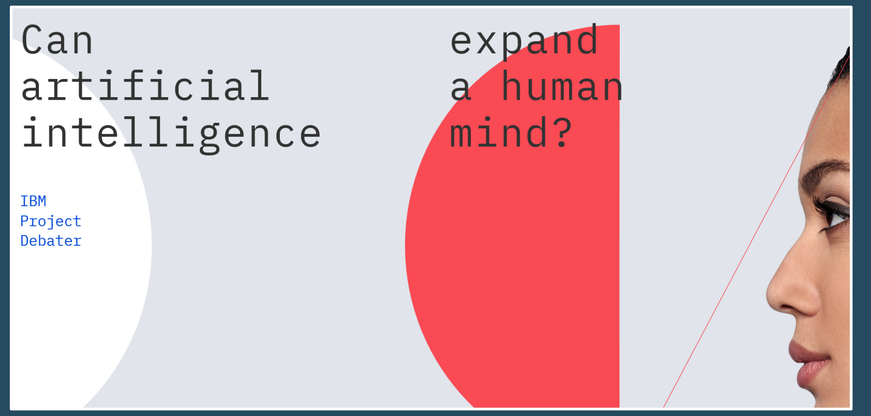
2. Use Cases (with demonstrations)
    - Cognitive Discovery
    - Cognitive Conversation
    - Cognitive Extend
3. Starting the “Cognitive Journey”
4. IBM Research for AI
5. How to go forward with this technology?

Some useful links

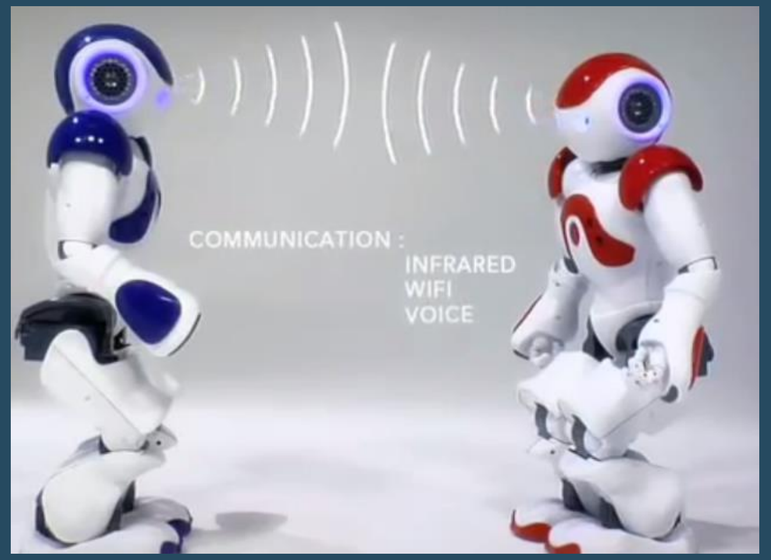
- Watson Academy
  https://www.watson-academy.info/
- IBM Developer
  https://developer.ibm.com/
- Academic Resources
  https://developer.ibm.com/academic/
- IBM Watson Education
  https://www.ibm.com/watson/education
- Watson Use Cases
  https://www.youtube.com/results?search_query=watson+use+cases
- Watson Solution Videos
  https://www.youtube.com/user/IBMWatsonSolutions/videos

- *Workshop with Hands-On Exercises?*
- *Hackathon?*

Robots and Watson ....



Nao the Robot



Pepper the Robot

IBM **Chef Watson**™ with bon appétit

Eric_Michiels@be.ibm.com

THANK YOU FOR YOUR ATTENTION !!