

IBM Watson

# Watson Services

IBM

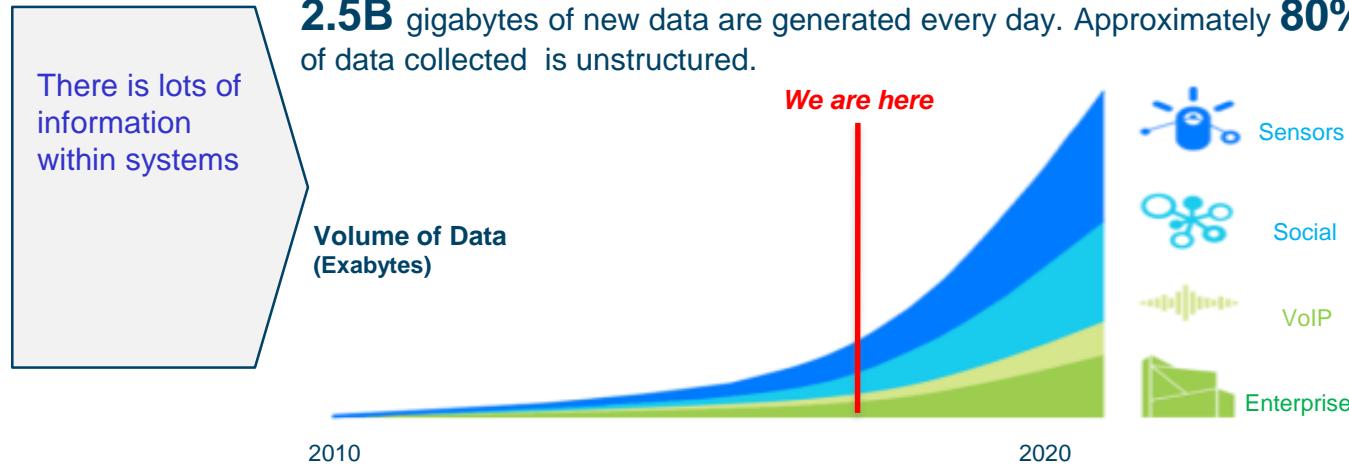


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# Agenda

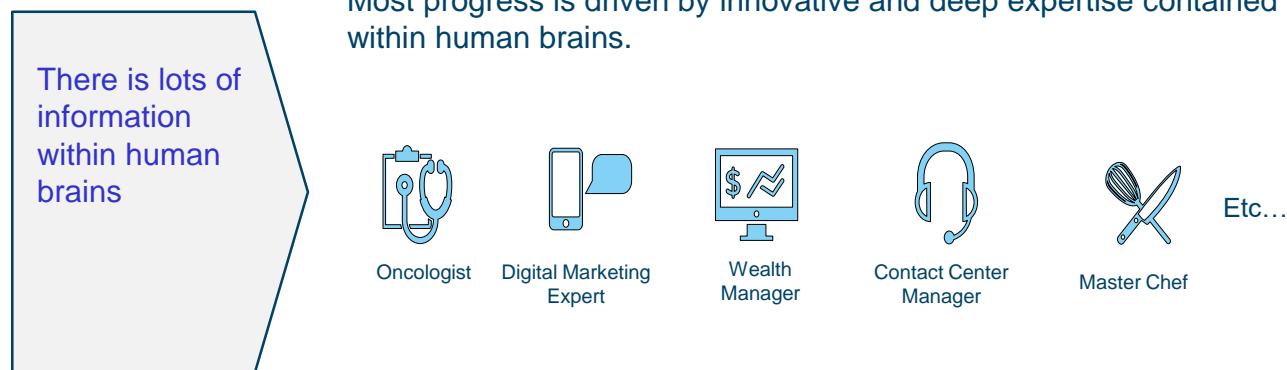
- Introduction
- Cognitive Capabilities
- Watson Services
- Watson Products/Solutions
- Cognitive Use cases
- Q & A

# Enterprises continue to struggle, to quickly find and apply the right insights from the available data



There is an enormous amount of **undiscovered insight contained within unstructured data** (text, images, video, audio, etc.)

The 4 V's (**volume, variety, velocity, and veracity**) related to this data makes it challenging to find the information within the data.



Innovative expertise tends to stay in **relatively few heads** (low levels of transference)

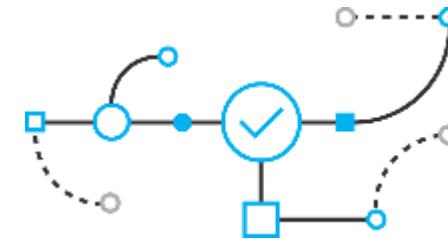
This expertise is **not captured well** by traditional computer systems – traditional rules-oriented programming techniques are challenged

# Three capabilities differentiate cognitive systems from traditional programmed computing systems...



## Understanding

Cognitive systems understand like humans do.



## Reasoning

They reason. They understand underlying ideas and concepts. They form hypothesis. They infer and extract concepts.



## Learning

They never stop learning getting more valuable with time. Advancing with each new piece of information, interaction, and outcome. They develop “expertise”.

.... allowing them to interact with humans.

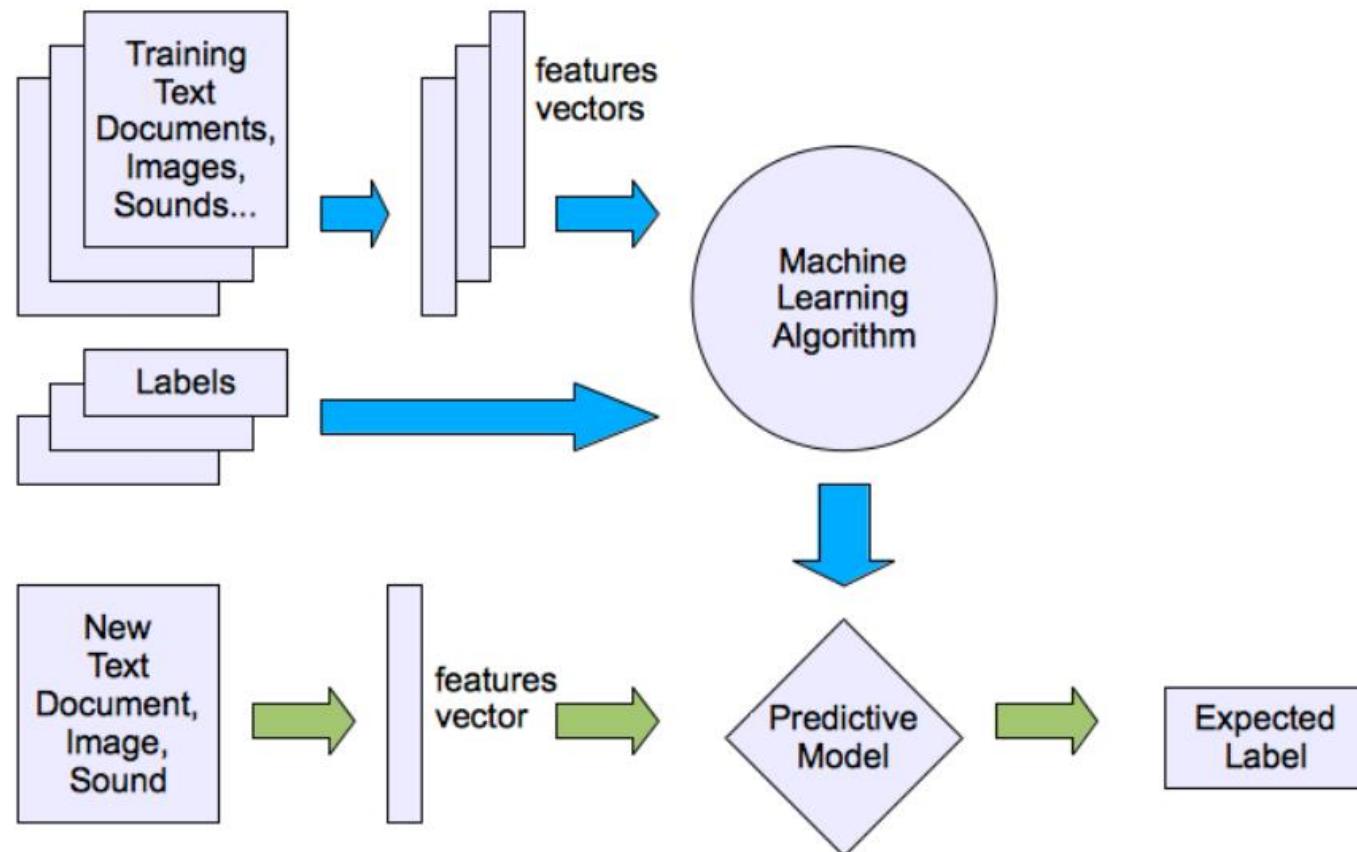
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# Machine Learning

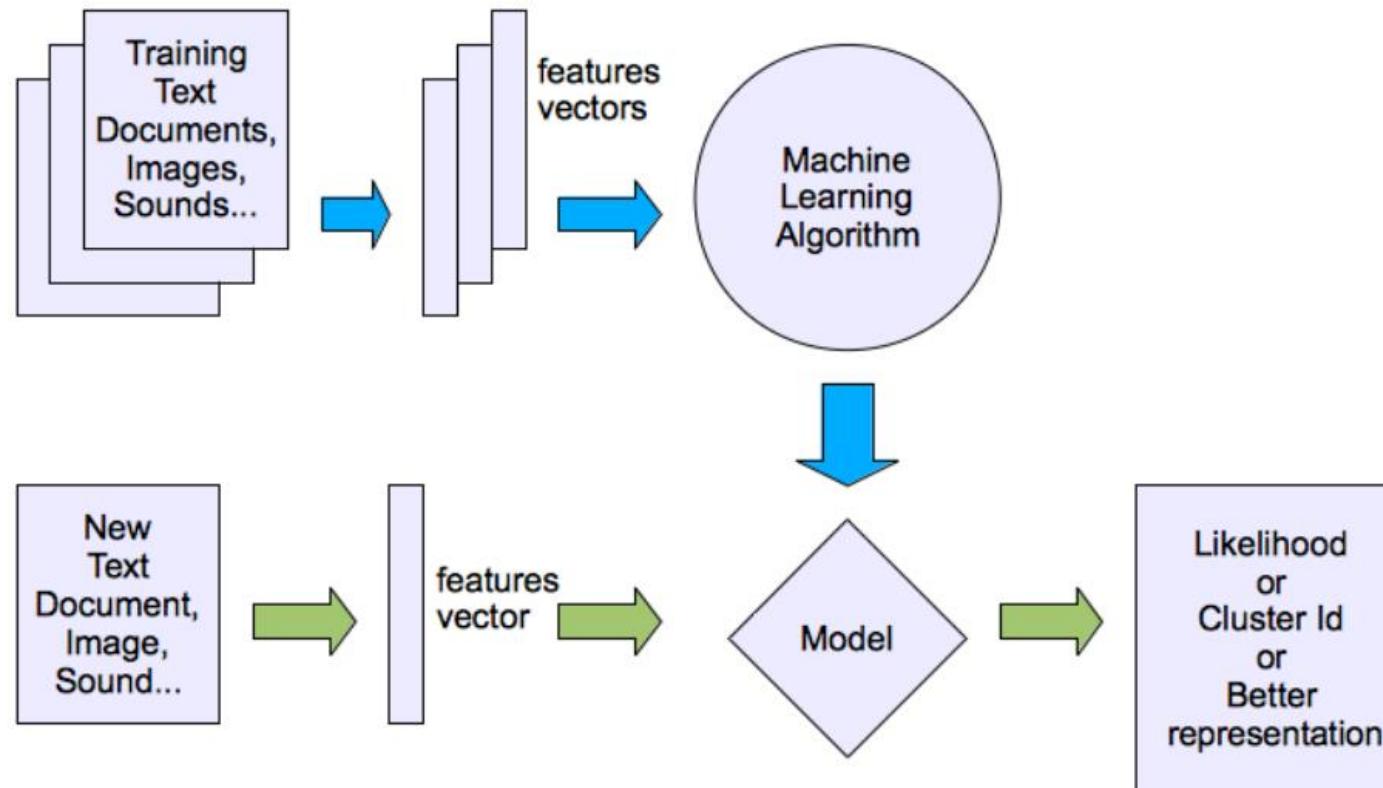
**gives "computers the ability to learn without being explicitly programmed." - Arthur Samuel**

- Capability of a system to understand, reason and learn and evolve behaviors based on empirical data
- Supported by algorithms that continuously learn and evolve from data and make predictions on data
- Understanding existing knowledge based on existing entities, relations and overall domain model is a critical step in machine learning. Intelligence requires knowledge.

# ML Supervised Learning



# ML Unsupervised Learning



# Machine Learning Algorithms/Concepts

## Regression:

1. Simple Linear Regression
2. Multiple Linear Regression
3. Polynomial Regression
4. Decision Tree Regression
5. Random Forest Regression

## Classification:

1. Logistic Regression
2. Naive Bayes
3. Support Vector Machine

## Recommender Systems:

1. Apriori Algorithm

## Natural Language Processing:

1. Natural Language Toolkit (NLTK)

## Dimensionality Reduction:

1. Principle Component Analysis
2. Latent Dirichlet Allocation

Deep Learning(Computer System mimic the way information processed by human brain):

1. Artificial Neural Network
2. Convolution Neural Network
3. Recurrent Neural Network

## Clustering:

1. K-Means Clustering

## Ensemble Learning:

1. Boosting

## Reinforcement Learning

# ML Platforms

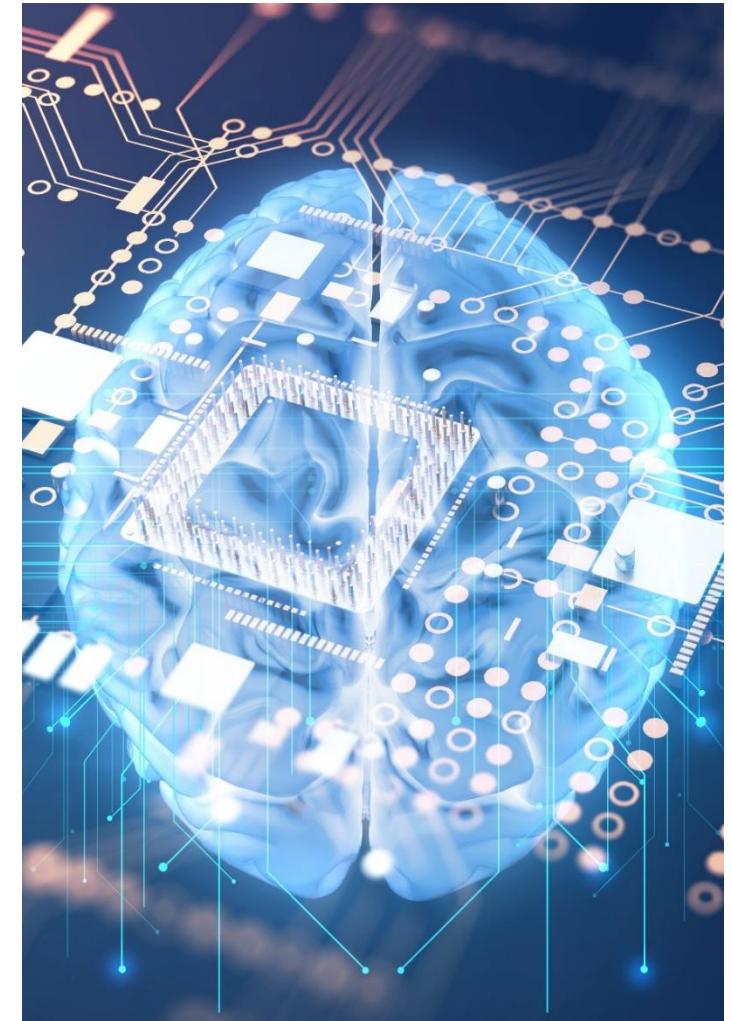
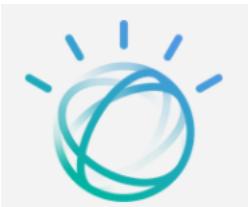
- Free and open-source software



- Proprietary software with free and open-source editions



- Commercial Products



# Machine Learning SDLC

## Collecting data:

1. raw data from excel, access, text files, database etc.
2. this step (gathering past data) forms the foundation of the future learning
3. Better the variety, density and volume of relevant data, better the learning prospects for the machine becomes

## Preparing the data:

1. Any analytical process thrives on the quality of the data used
2. One needs to spend time determining the quality of data and then taking steps for fixing issues such as missing data and treatment of outliers

## Training a model:

1. This step involves choosing the appropriate algorithm and representation of data in the form of the model
2. The cleaned data is split into two parts – train and test
3. First part (training data) is used for developing the model. The second part (test data), is used as a reference

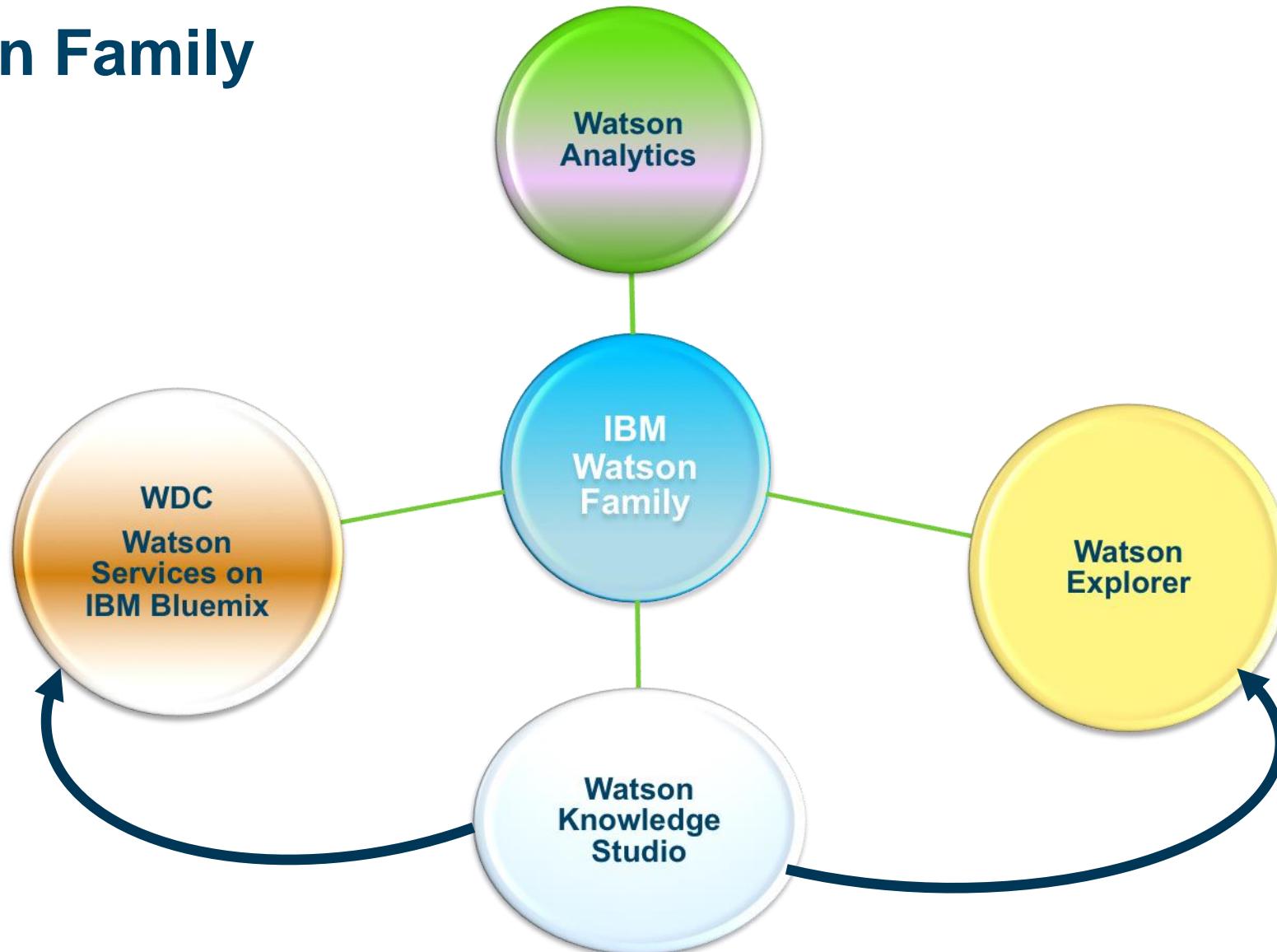
## Evaluating the model:

1. To test the accuracy, the second part of the data (holdout / test data) is used
2. This step determines the precision in the choice of the algorithm based on the outcome. Typical Parameters are Precision, Accuracy, recall and F1 Score
  - Precision =  $TP / (TP+FP)$
  - Recall =  $TP / (TP+FN)$
  - Accuracy =  $(TP + TN) / (TP + TN + FP + FN)$
  - F1 score =  $2*((precision*recall)/(precision+recall))$
3. A better test to check accuracy of model is to see its performance on data which was not used at all during model build

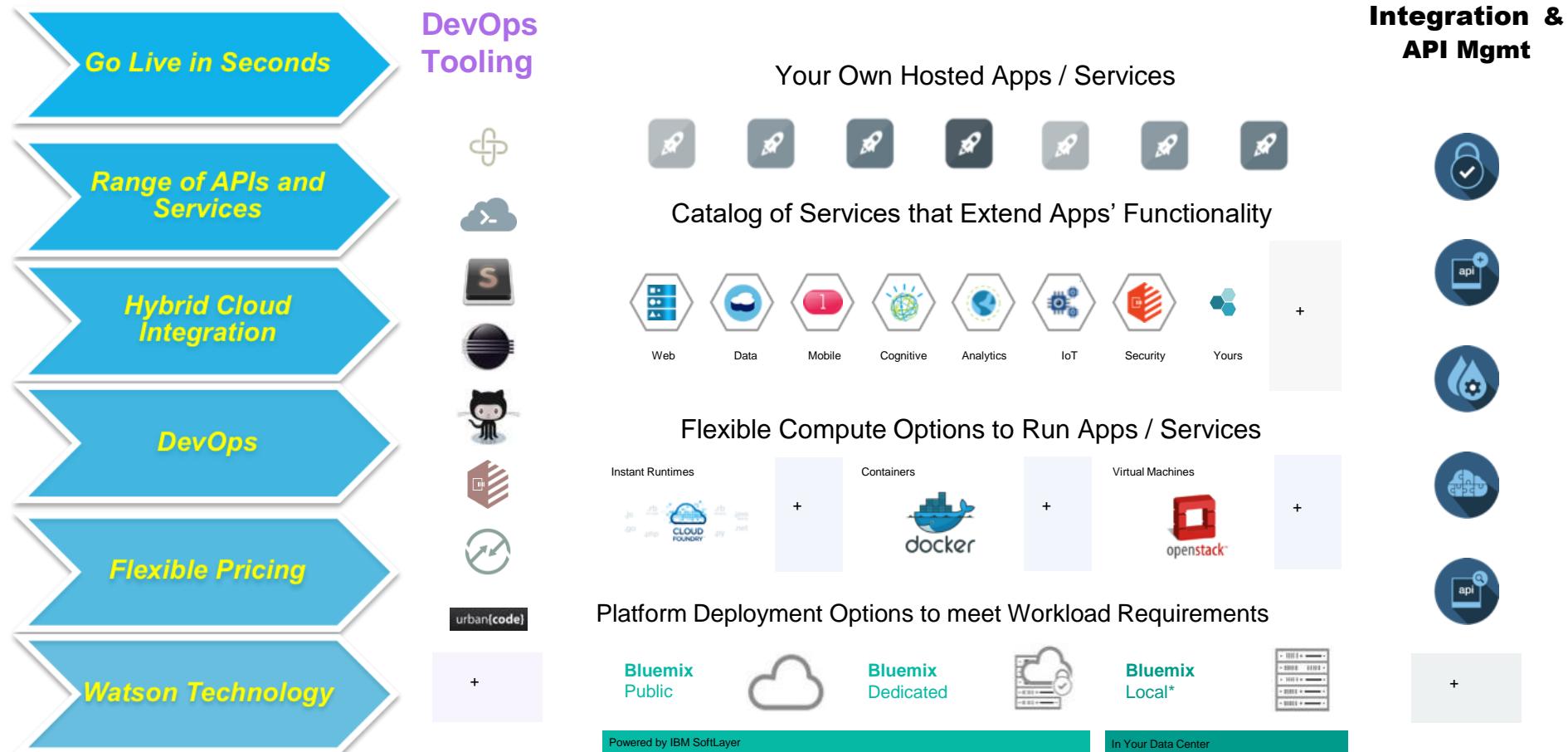
## Improving the performance:

1. This step might involve choosing a different model altogether or introducing more variables to augment the efficiency.
2. That's why significant amount of time needs to be spent in data collection and preparation.

# IBM Watson Family



# IBM Cloud – PaaS Platform for innovation



# Watson Services

## Conversation



[Conversation/Assistant](#)

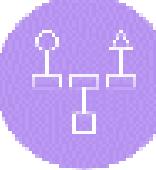


[Natural Language Classifier](#)

## Discovery Service



[Discovery](#)



[Natural Language Understanding](#)



[Knowledge Studio](#)

## Signal Services



[Visual Recognition](#)

### Speech Services



[Text to Speech](#)



[Speech to Text](#)



[Tone Analyzer](#)



[Personality Insights](#)



[Language Translator](#)

# Natural Language Classification

## What is it?

Interpret and classify natural language with confidence. The service enables developers without a background in machine learning or statistical algorithms to create natural language interfaces for their applications.

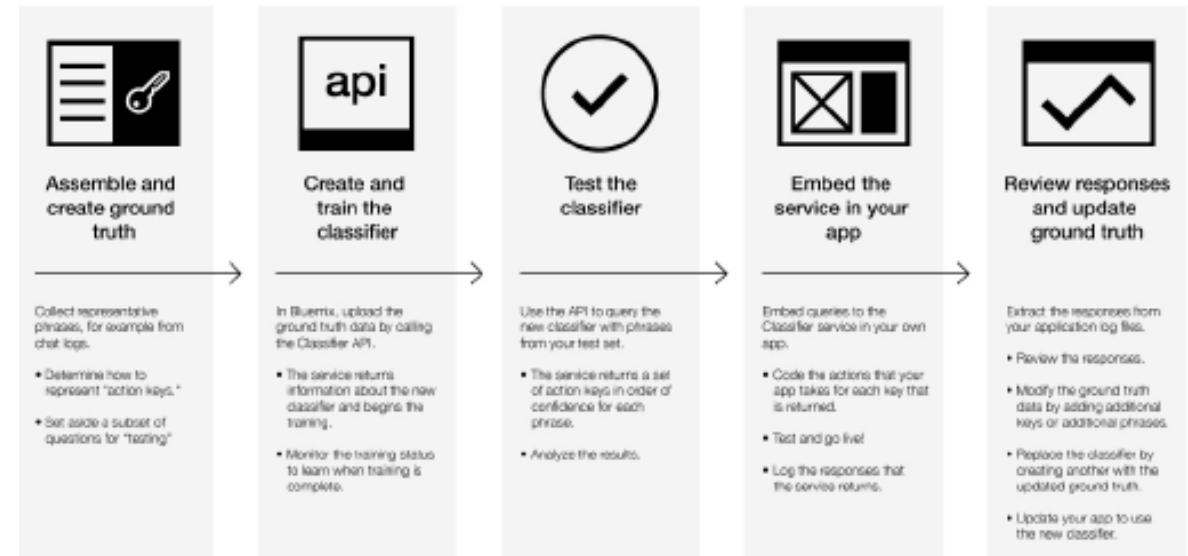
## How does it work?

This service applies deep learning algorithms to text classification. It understands the intent behind the text and returns the corresponding classification associated with confidence levels. This service is tuned and trained to short texts (1000 characters or less) and can be trained to function in any domain or application. This service is well-read in the context of Wikipedia and can still return classes for text not seen during the training.

## Where to use?

- Assist the support staff to answer customer's questions quickly and accurately
- Understand customer's question and route it to the correct person in real-time
- Classify tweets into categories like events, news, opinions
- Categorize text messages into personal, Work, Promotions
- Analyze text from social media and identify if positive, negative or neutral

Demo : <http://natural-language-classifier-demo.mybluemix.net>



will there be hail storm today

Ask

## Output

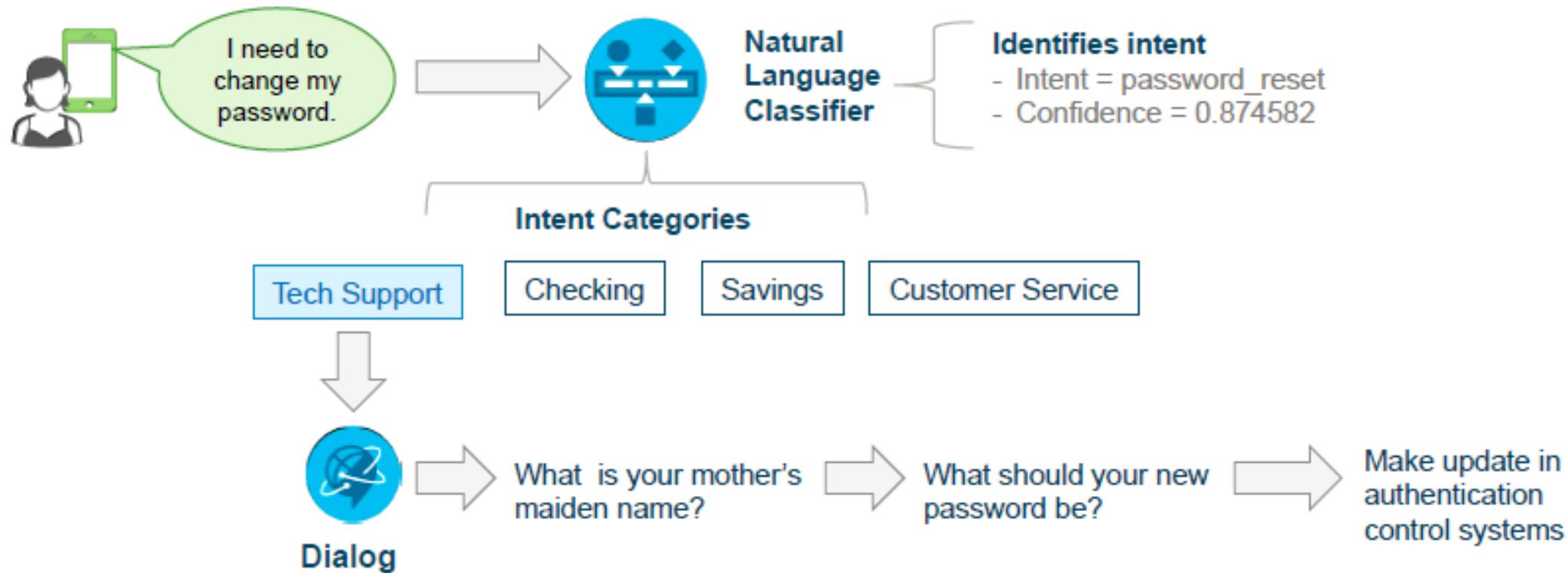
Natural Language Classifier is 98% confident that the question submitted is talking about 'conditions'.

Classification: conditions

Confidence: 98%

# Natural Language Classification

Your task? Build a voice-enabled online banking solution. For example, how would you allow a customer to request a password change? First train the NLC to identify the various intent categories such as Tech Support, Checking, Savings, and Customer Service. When a password change request arrives, the NLC would identify this and your system would recognize the need to first authenticate the user. The Watson Dialog service could be configured to perform the back-forth to obtain the user's authentication details and request the password reset from your bank's authentication system.



# Natural Language Understanding

Natural Language Understanding enables advanced text analysis through natural language processing. The service analyzes unstructured text to extract metadata such as entities, general concepts, keywords, categories, relations, sentiment, and emotion

**Categories** : Categorize your content using a five-level classification hierarchy

**Concepts**: Identify high-level concepts that aren't necessarily directly referenced in the text

**Emotion**: Analyze emotion conveyed by specific target phrases or by the document as a whole. You can also enable emotion analysis for entities and keywords that are automatically detected by the service

**Entities**: Find people, places, events, and other types of entities mentioned in your content. View the complete list of entity types and subtype

**Keywords**: Search your content for relevant keywords

**Metadata**: For HTML and URL input, get the author of the webpage, the page title, and the publication date

**Relations**: Recognize when two entities are related, and identify the type of relation

**Semantic Roles**: Parse sentences into subject-action-object form, and identify entities and keywords that are subjects or objects of an action

**Sentiment**: Analyze the sentiment toward specific target phrases and the sentiment of the document as a whole. You can also get sentiment information for detected entities and keywords by enabling the sentiment option for those features

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# Natural Language Understanding Extracts

- Sentiment
- Emotion
- Keywords
- Entities
- Categories
- Concepts
- Semantic roles
- Relations
- MetaData

Demo - <https://natural-language-understanding-demo.mybluemix.net/>

# SENTIMENT

- Analyze the sentiment (positive/negative) toward specific target phrases and the sentiment of the document as a whole.
- You can also get sentiment information for detected entities and keywords by enabling the sentiment option for those features. For example:
  - Input

text: "Thank you and have a nice day!"
  - Response

Positive sentiment (score: 0.91)

# EMOTION

- Analyze emotions (joy, anger, disgust, sadness, fear) conveyed by specific target phrases or by the document as a whole.
- You can also enable emotion analysis for entities and keywords that are automatically detected by the service.

For example:

- Input
  - text: "I love apples, but I hate oranges."
  - targets: "apples", and "oranges"

- Response
  - "apples": joy
  - "oranges": anger

# KEYWORD

- Keywords

Search your content for relevant keywords.

For example:

- Input

url: "http://www-

03.ibm.com/press/us/en/pressrelease/5149

3.wss"

- Response

Australian Open

Tennis Australia

# ENTITIES

- Find people, places, events, and other types of entities mentioned in your content. View the complete list of entity types and subtypes [here](#). For example:
- Input

text: "IBM is an American multinational technology company headquartered in Armonk, New York, United States, with operations in over 170 countries."
- Response
  - IBM: Company
  - Armonk: Location
  - New York: Location
  - United States: Location

# CATEGORIES

- Categorize your content using a five-level classification hierarchy. View the complete list of categories [here](#). For example:
- Input
  - url: "www.cnn.com"
- Response
  - /news
  - /art and entertainment
  - /movies
  - /news

# CONCEPTS

- Identify high-level concepts that aren't necessarily directly referenced in the text. For example:
- Input

text: "Natural Language

Understanding uses natural language processing to analyze text."

- Response

Linguistics

Natural language processing

Natural language understanding

# SEMANTIC ROLES

- Parse sentences into subject-action-object form, and identify entities and keywords that are subjects or objects of an action. For example:

- Input

text: "In 2011, Watson competed  
on Jeopardy!"

- Response

Subject: Watson

Action: competed

Object: on Jeopardy

# RELATIONS

- Recognize when two entities are related, and identify the type of relation. For example:

- Input

text: "The Nobel Prize in Physics  
1921 was awarded to Albert Einstein."

- Response

"awardedTo" relation between  
"Nobel Prize in Physics" and "Albert  
Einstein"

"timeOf" relation between "1921"  
and "awarded"

# METADATA

- For HTML and URL input, get the author of the webpage, the page title, and the publication date. For example:

- Input

url:

<https://www.ibm.com/blogs/think/2017/01/cognitive-grid/>

- Response

Author: Stephen Callahan

Title: Girding the Grid with

Cognitive Computing - THINK Blog

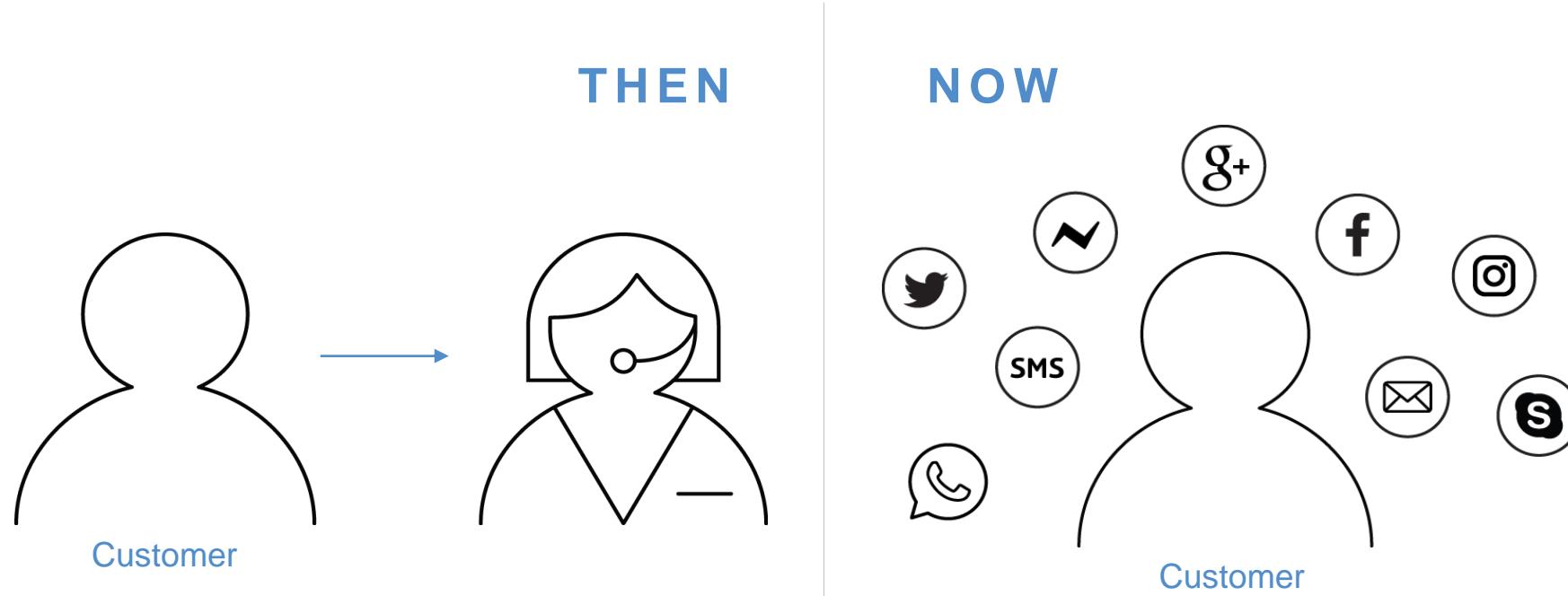
Publication date: January 31, 2017

# Common use cases

- Identify the causes behind negative and positive reviews
- Track important industry events
- Tailor recommended content and advertisements to the page content

# Watson Assistant

# Customers are Shifting from Traditional Channels



- Highly demanding of seamless and frictionless experience
- Less loyal to singular brand
- Have omni-channel expectations
- Social media gives individual voices great power

# Customer engagement challenges driving new business needs

## Omni-Channel Experience

*“How do I give my customers an engaging experience where they want, when they want?”*

## Easily Integrated

*“I need a solution that can easily integrate into my front-end and back-end systems.”*

## Enterprise-ready

*“I need a solution that supports my enterprise requirements.”*

## Speed to Market

*“I need to get a solution to market quickly to stay ahead of my competition.”*

## Predictive Analytics

*“How can I delivery the right offer to my customers at the right time in this new paradigm?”*

## Ease of Use

*“I need a system that is simple to learn, build and maintain.”*

## Data Ownership Control

*“My customer data is my competitive advantage. How can I be sure it’s not benefitting others?”*

## Resource Utilization

*“I need a cost-effective way to better use my available resources.”*

# Assistant

## What is it?

- Watson combines a number of cognitive techniques to help you build and train a bot - defining intents and entities and crafting dialog to simulate conversation
- Watson Conversation provides an easy-to-use graphical environment to create natural conversation flows between your apps and your user

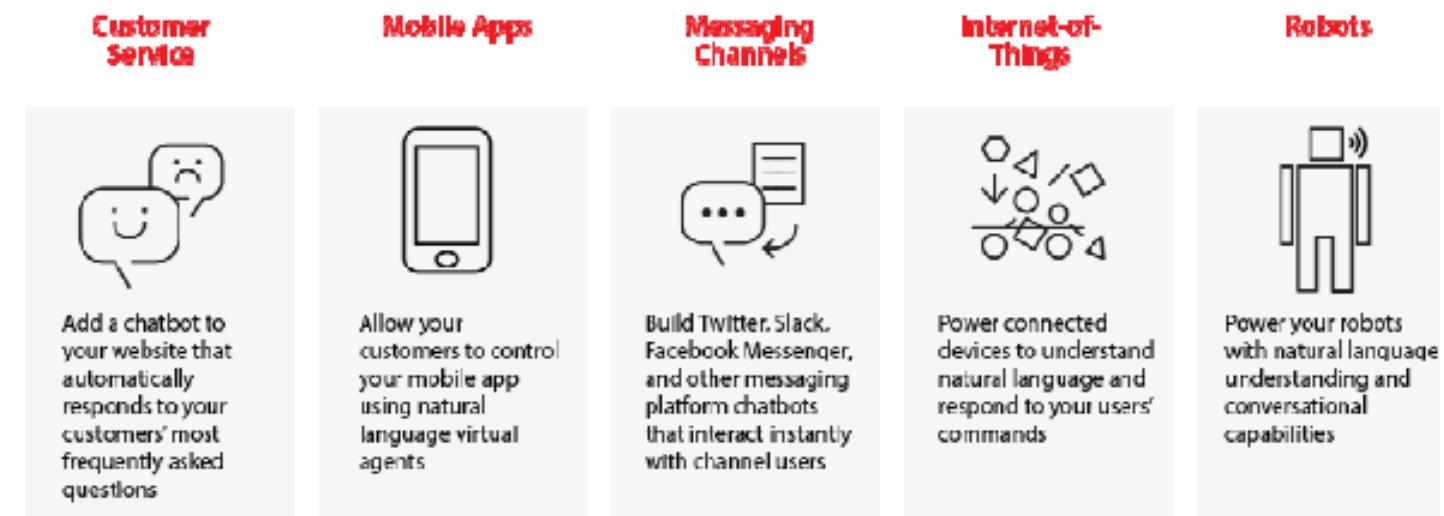
## How does it work?

Conversation input can be in Spanish, Brazilian Portuguese, French, and Italian, as well as English. The bot uses natural language understanding and machine learning to extract meaning from the user's input.

## Where to use?

With the IBM Watson™ Conversation service you can create virtual agents and bots that combine machine learning, natural language understanding, and integrated dialog tools to provide automated customer engagements

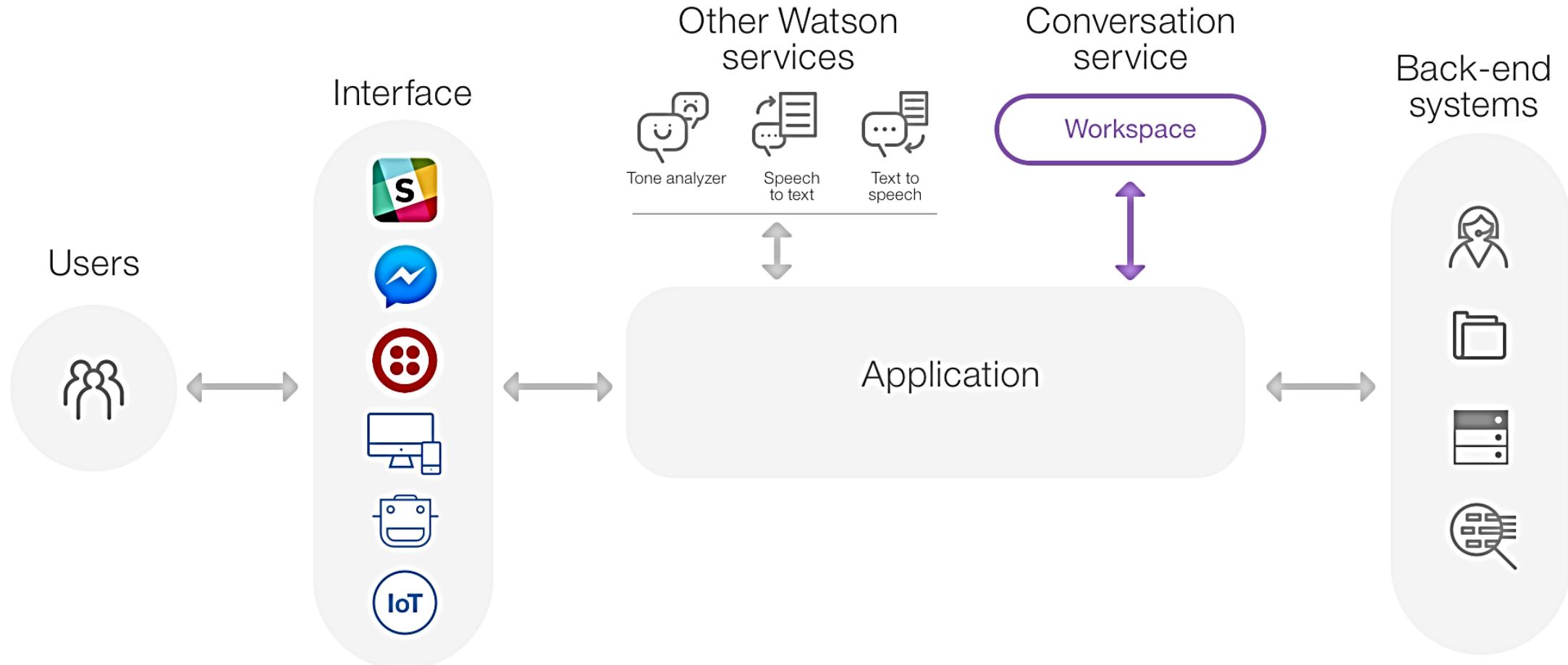
## Uses for the Conversation Service



Demo : [https://conversation-demo.mybluemix.net/?cm\\_mc\\_uid=&cm\\_mc\\_sid\\_50200000=](https://conversation-demo.mybluemix.net/?cm_mc_uid=&cm_mc_sid_50200000=)

Demo : <https://conversation-demo.mybluemix.net/>

# How to use the service



# Conversation Tool

- Create /configure Workspace
- Create intents
- Create Entities
- Build a dialog
- Test

Workspaces

Create  

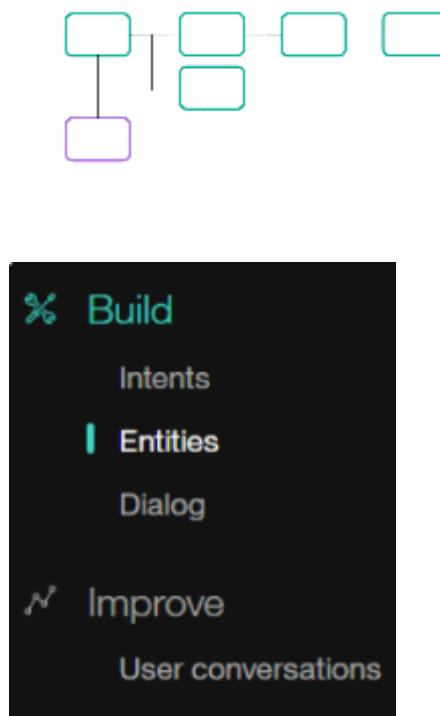
Car\_Dashboard\_Current

Cognitive Car Dashboard workspace which allows multi-turn conversations to perform tasks in the car.

English (U.S.)

Last modified: 13 hours ago

Get started



#greetings

+ Add a new user example...

aloha

bonjour

buenas dias

buenos dias

ciao

feeling bit low

g'day

good

Good afternoon.

good day

good evening

good how are you

Try it out 

Hello, my name is Watson! What is your name?

Jazmin 

#place\_recommendation 

Hi Jazmin!

As your hotel concierge, how can I help you?

Where is the pool? 

#place\_location 

@hotel\_amenity:pool

The pool is on the second floor.

Enter something to test your bot

# Conversation API

<https://www.ibm.com/watson/developercloud/conversation/api/v1/>

The IBM Watson™ Conversation service combines machine learning, natural language understanding, and integrated dialog tools to create conversation flows between your apps and your users.

## workspaces

		Show/Hide   List Operations   Expand Operations
GET	/v1/workspaces	List workspaces
POST	/v1/workspaces	Create workspace
DELETE	/v1/workspaces/{workspace_id}	Delete workspace
GET	/v1/workspaces/{workspace_id}	Get information about a workspace
POST	/v1/workspaces/{workspace_id}	Update workspace

## message

		Show/Hide   List Operations   Expand Operations
POST	/v1/workspaces/{workspace_id}/message	Get a response to a user's input

## counterexamples

		Show/Hide   List Operations   Expand Operations
GET	/v1/workspaces/{workspace_id}/counterexamples	Get counterexamples
POST	/v1/workspaces/{workspace_id}/counterexamples	Create counterexample
DELETE	/v1/workspaces/{workspace_id}/counterexamples/{text}	Delete counterexample
GET	/v1/workspaces/{workspace_id}/counterexamples/{text}	Get counterexample
POST	/v1/workspaces/{workspace_id}/counterexamples/{text}	Update counterexample

## intents

		Show/Hide   List Operations   Expand Operations
GET	/v1/workspaces/{workspace_id}/intents	List intents
POST	/v1/workspaces/{workspace_id}/intents	Create intent
DELETE	/v1/workspaces/{workspace_id}/intents/{intent}	Delete intent
GET	/v1/workspaces/{workspace_id}/intents/{intent}	Get intent
POST	/v1/workspaces/{workspace_id}/intents/{intent}	Update intent

## intents

		Show/Hide   List Operations   Expand Operations
GET	/v1/workspaces/{workspace_id}/intents	List intents
POST	/v1/workspaces/{workspace_id}/intents	Create intent
DELETE	/v1/workspaces/{workspace_id}/intents/{intent}	Delete intent
GET	/v1/workspaces/{workspace_id}/intents/{intent}	Get intent
POST	/v1/workspaces/{workspace_id}/intents/{intent}	Update intent

# Watson Discovery

Many data scientists spend as much as **80 percent\*** of their time on so-called “data janitor” work – collecting, cleaning and organizing data sets.



## Watson Discovery

**Developers** face **numerous barriers** that slow them down when building applications to leverage unstructured data:

- Massive amounts of diverse and dispersed unstructured content
- NLP APIs are difficult to integrate
- Analysis requires complex queries and manual filtering.

Watson Discovery **packages cognitive technologies together** in an easy-to-use end-to-end system to focus on specific business problems.

It **simplifies** the infrastructure, scale and algorithm challenges associated with enriching and analyzing large data sets.

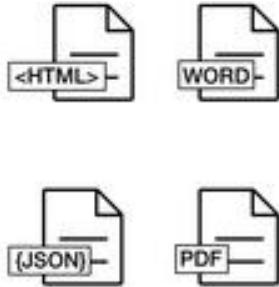
# Watson Discovery

Rapidly build a cognitive search and content analytics engine and add it to existing applications with minimal effort

- Discovery unlock actionable insights hidden in unstructured data including your own proprietary data, as well as public and third-party data

## 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

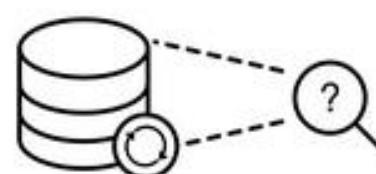
## Storage

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



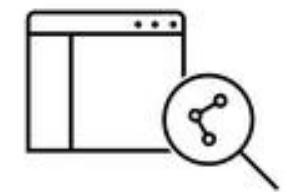
## Query

Understand data faster, create better hypothesis and deliver better outcomes



## Output

Actionable insights into your app



IBM Watson Discovery brings together a functionally rich set of integrated, automated Watson APIs to:

- Crawl, convert, enrich and normalize data.
- Securely explore your proprietary content as well as free and licensed public content.
- Apply additional enrichments such as concepts, relations, and sentiment through natural language processing.
- Simplify development while still providing direct access to APIs.

## Apply cognitive enrichments to your data and extract insights using a powerful and flexible query language in real time

### Automated Data Ingestion

Automate ingestion using the APIs, web upload, or data crawler, and feed through Document Conversion to deal with multiple file types.

### Integrated Enrichment

Rapidly setup advanced Natural Language Processing steps and custom models to extract entities, relations, keywords, sentiment, etc.

### Diverse Content Sources

Create one-of-a-kind applications that leverage data from the pre-enriched news sources and private content from across the enterprise.

### Simplified Query Language

Perform multiple query types including Boolean, filter, and aggregation queries to discover patterns, trends, and answers.



# Watson Discovery - Where to use

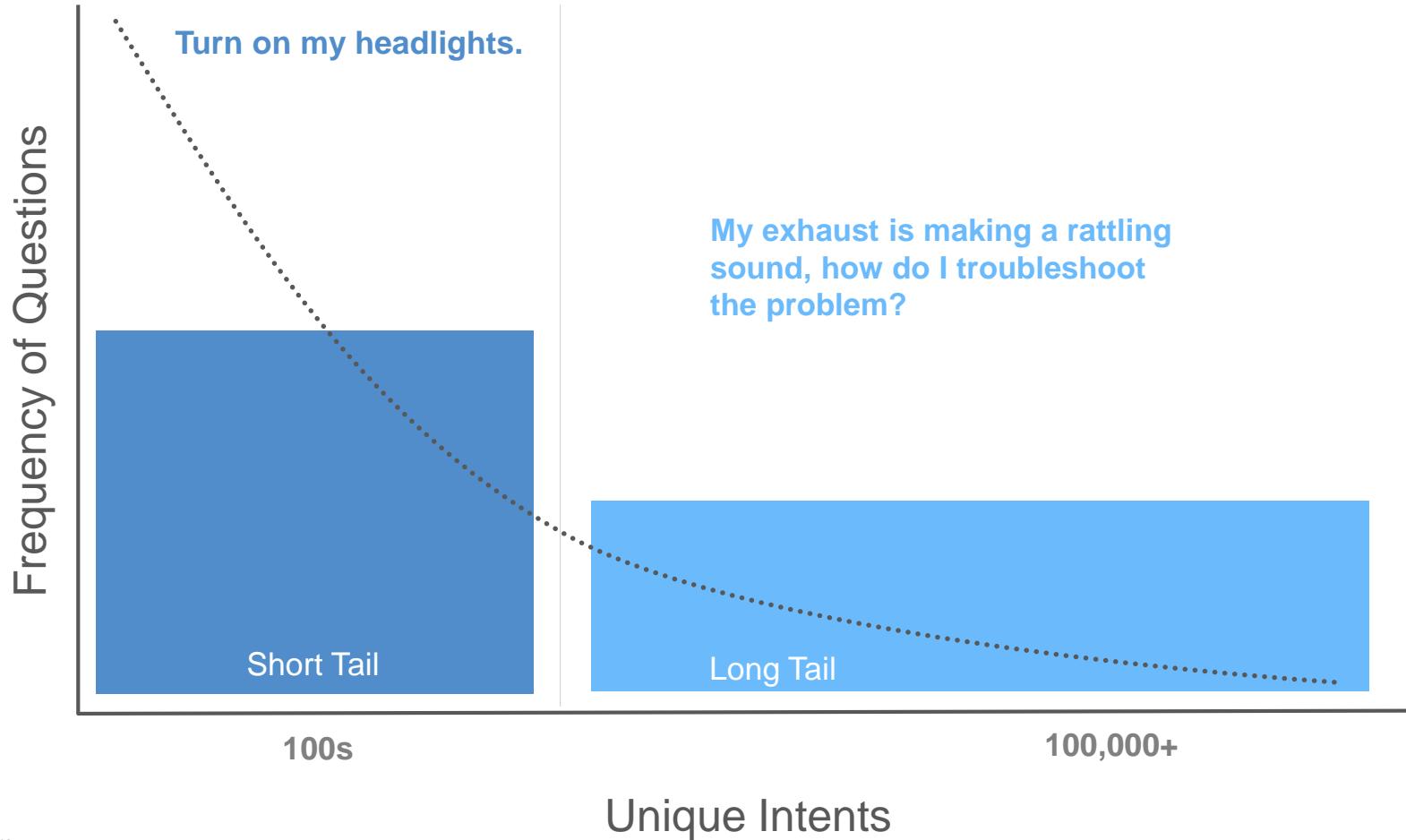
Watson News, a public data set that has been pre-enriched with cognitive insights, is also included with Discovery

Integrate a custom model from Watson Knowledge Studio with the Discovery service to provide custom enrichments

- Help a customer service team decrease support times, find hidden insights on customer pain points, behaviors and needs, and improve agent productivity
- Enable market research teams to extract the latest research and insights from journals, newsletters, press releases and blogs to provide consolidated industry and domain-specific insights for research teams
- Empower field service teams to locate hard-to-find answers in manuals, FAQ documents, collaboration sites, and so on
- Augment a chat bot or other application created with the Watson Conversation service to provide possible responses to complex questions without modeling intents

Demo: <https://discovery-news-demo.mybluemix.net/>

# Combine Watson Discovery with Watson Conversation for question distribution



## Watson Conversation



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.

# Watson Discovery API

<http://www.ibm.com/watson/developercloud/discovery/api/v1/>

The IBM Watson™ Discovery Service is a cognitive search and content analytics engine that you can add to applications to identify patterns, trends and actionable insights to drive better decision-making. Securely unify structured and unstructured data with pre-enriched content, and use a simplified query language to eliminate the need for manual filtering of results.

Environments		
<a href="#">GET</a>	/v1/environments	<a href="#">List environments</a>
<a href="#">POST</a>	/v1/environments	<a href="#">Add an environment</a>
<a href="#">DELETE</a>	/v1/environments/{environment_id}	<a href="#">Delete environment</a>
<a href="#">GET</a>	/v1/environments/{environment_id}	<a href="#">List environment info</a>
<a href="#">PUT</a>	/v1/environments/{environment_id}	<a href="#">Update an environment</a>
Test your configuration on a document		
<a href="#">POST</a>	/v1/environments/{environment_id}/preview	<a href="#">Test configuration</a>
Configurations		
<a href="#">GET</a>	/v1/environments/{environment_id}/configurations	<a href="#">List configurations</a>
<a href="#">POST</a>	/v1/environments/{environment_id}/configurations	<a href="#">Add configuration</a>
<a href="#">DELETE</a>	/v1/environments/{environment_id}/configurations/{configuration_id}	<a href="#">Delete a configuration</a>
<a href="#">GET</a>	/v1/environments/{environment_id}/configurations/{configuration_id}	<a href="#">List configuration details</a>
<a href="#">PUT</a>	/v1/environments/{environment_id}/configurations/{configuration_id}	<a href="#">Update a configuration</a>

Collections		
<a href="#">GET</a>	/v1/environments/{environment_id}/collections	<a href="#">List collections</a>
<a href="#">POST</a>	/v1/environments/{environment_id}/collections	<a href="#">Create a collection</a>
<a href="#">DELETE</a>	/v1/environments/{environment_id}/collections/{collection_id}	<a href="#">Delete a collection</a>
<a href="#">GET</a>	/v1/environments/{environment_id}/collections/{collection_id}	<a href="#">List collection details</a>
<a href="#">PUT</a>	/v1/environments/{environment_id}/collections/{collection_id}	<a href="#">Update a collection</a>
<a href="#">GET</a>	/v1/environments/{environment_id}/collections/{collection_id}/fields	<a href="#">List unique fields</a>
Collections		
<a href="#">GET</a>	/v1/environments/{environment_id}/collections	<a href="#">List collections</a>
<a href="#">POST</a>	/v1/environments/{environment_id}/collections	<a href="#">Create a collection</a>
<a href="#">DELETE</a>	/v1/environments/{environment_id}/collections/{collection_id}	<a href="#">Delete a collection</a>
<a href="#">GET</a>	/v1/environments/{environment_id}/collections/{collection_id}	<a href="#">List collection details</a>
<a href="#">PUT</a>	/v1/environments/{environment_id}/collections/{collection_id}	<a href="#">Update a collection</a>
<a href="#">GET</a>	/v1/environments/{environment_id}/collections/{collection_id}/fields	<a href="#">List unique fields</a>

# Visual Recognition

## What is it?

This service enables you to analyze images or video frames to understand their contents. It is unique in its approach to automatically annotating images based on visual content alone, processing the pixels of an image.

## How does it work?

This service uses semantic classifiers built with machine-learning technology to recognize visual entities such as settings, objects, and events based on content such as color, texture, shape, and edges. If the service does not provide a classifier specific to your needs, the service can learn from images you provide. You can upload sets of images to train new custom classifiers that can serve you better.

The service is based on the **IBM Multimedia Analysis and Retrieval System**, or IMARS. The service is tuned to recognize photographic images and works best with JPEG images. Use images with at least 200 X 200 pixels resolution.

## Where to use?

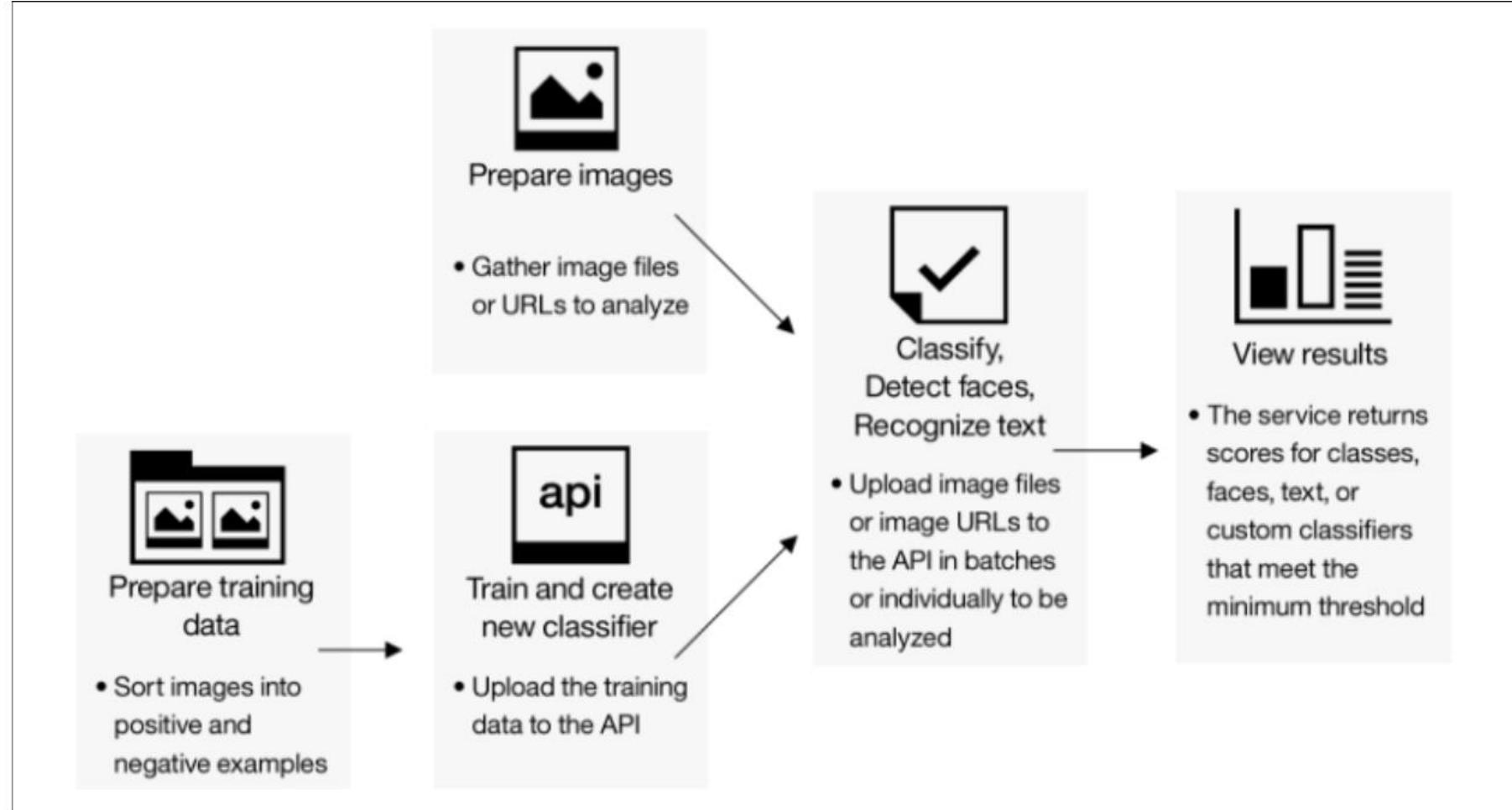
- Organize image libraries into categories
- Segment user interests from social media pictures
- Find great images with specific content faster
- Recognize custom content from images
- Identify matching images- recognition to detect a dress type in retail, identify spoiled fruit in inventory,

## Results



- The Visual Recognition service currently provides hundreds of classifiers. The collection of classifiers strikes a balance between descriptive breadth and specificity.
- A key element of the technology is that creating new classifiers is relatively easy.
- You can provide images to create and train a custom classifier. Images can be in **.jpg, .png, or .gif format** and do not need to be high resolution.
- Upload an equal number of positive and negative images.
- Positive images correspond to what you want the service to recognize.
- Negative images are similar to positive images but have subtle differences.
- Classifiers that are trained on more images will be more accurate than classifiers that are trained on fewer images.

# Working of Visual Recognition Service



# Visual Recognition API

<http://www.ibm.com/watson/developercloud/visual-recognition/api/v3/>

The IBM Watson™ Visual Recognition service uses deep learning algorithms to identify scenes, objects, and faces in images you upload to the service. You can create and train a custom classifier to identify subjects that suit your needs. You can create and add images to a collection and then search that collection with your own image to find similar images. Note: To use this Explorer to test calls to the API, for the collections and custom classifiers methods below, you must provide the API key from your Bluemix service instance.

visual-recognition	
<a href="#">Show/Hide</a>   <a href="#">List Operations</a>   <a href="#">Expand Operations</a>	
<a href="#">GET</a>	/v3/classify Classify an image
<a href="#">POST</a>	/v3/classify Classify images
<a href="#">GET</a>	/v3/detect_faces Detect faces in an image
<a href="#">POST</a>	/v3/detect_faces Detect faces in an image
<a href="#">GET</a>	/v3/classifiers Retrieve a list of custom classifiers
<a href="#">POST</a>	/v3/classifiers Create a classifier
<a href="#">DELETE</a>	/v3/classifiers/{classifier_id} Delete a custom classifier
<a href="#">GET</a>	/v3/classifiers/{classifier_id} Retrieve information about a custom classifier
<a href="#">POST</a>	/v3/classifiers/{classifier_id} Update a classifier
<a href="#">GET</a>	/v3/collections List all custom collections - beta
<a href="#">POST</a>	/v3/collections Create a new collection - beta
<a href="#">DELETE</a>	/v3/collections/{collection_id} Delete a collection - beta

<a href="#">GET</a>	/v3/collections/{collection_id}	Retrieve collection details - beta
<a href="#">GET</a>	/v3/collections/{collection_id}/images	List 100 images in a collection - beta
<a href="#">POST</a>	/v3/collections/{collection_id}/images	Add images to a collection - beta
<a href="#">DELETE</a>	/v3/collections/{collection_id}/images/{image_id}	Delete an image - beta
<a href="#">GET</a>	/v3/collections/{collection_id}/images/{image_id}	List image details - beta
<a href="#">DELETE</a>	/v3/collections/{collection_id}/images/{image_id}/metadata	Delete image metadata - beta
<a href="#">GET</a>	/v3/collections/{collection_id}/images/{image_id}/metadata	List image metadata - beta
<a href="#">PUT</a>	/v3/collections/{collection_id}/images/{image_id}/metadata	Add metadata to an image - beta
<a href="#">POST</a>	/v3/collections/{collection_id}/find_similar	Find similar images - beta

# Personality Insights

## What is it?

Personality profiling to help engage users on their own terms.

## How does it work?

The user Modeling service uses linguistic analytics to extract a set of personality and social traits from the way a person communicates. The service can analyze any communication the user makes available such as their text messages, tweets, posts, email, and more. Users of the service can understand, connect, and communicate with people on a more personally tailored level by analyzing personality and social traits

## Use Cases-

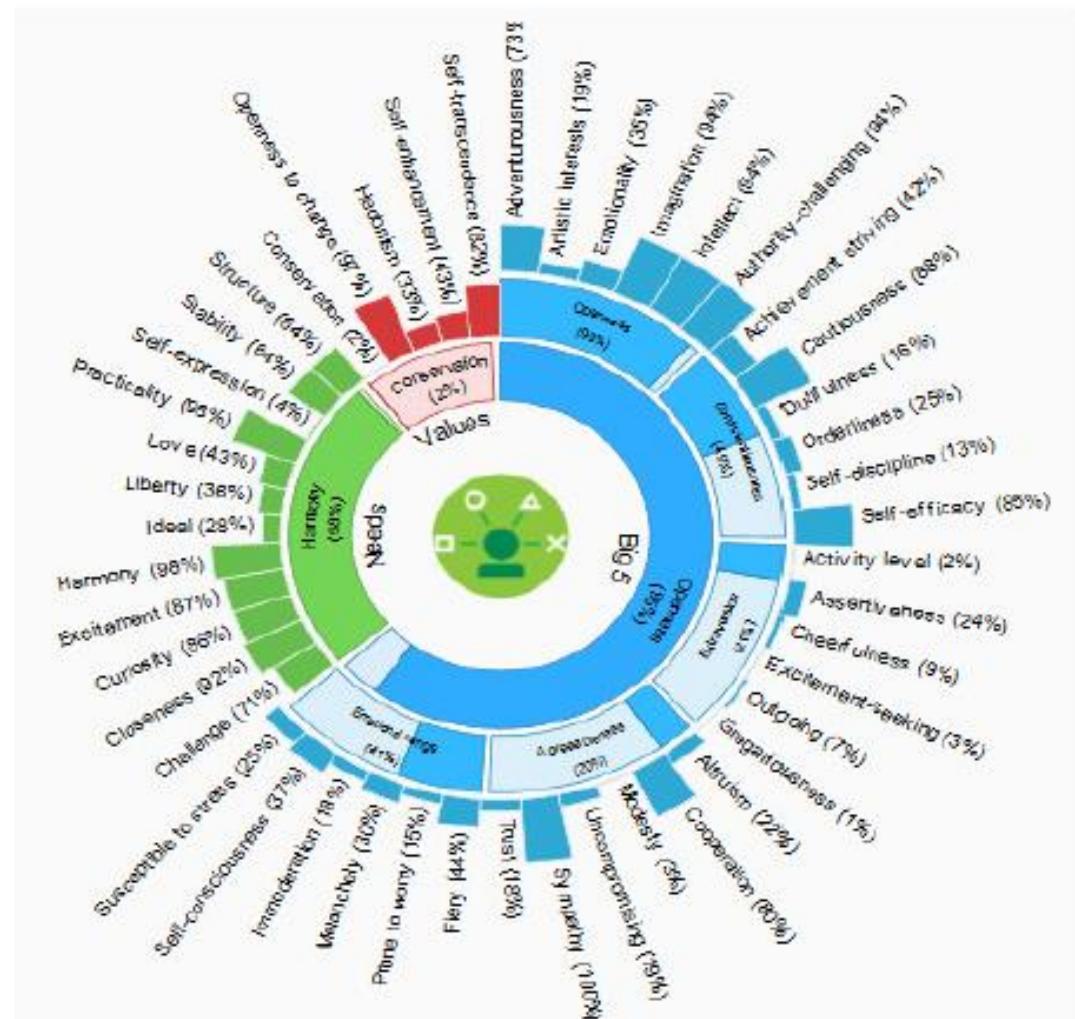
The service can analyze text based on a customer's twitter stream to help a travel agency decide between leading with a budget or luxury trip offer

Anywhere improving a customer engagement can help create an organization differentiate itself.



# Personality Insights

- Enables applications to derive insights that reflect personality and social characteristics of people
  - Uses social media or other digital communication of the person as input
  - Uses **linguistic analytics techniques** to derive the insights
  - This service can help businesses understand their customers at a deeper level
  - Every business has a need to understand their customers better
  - The possibilities are innumerable



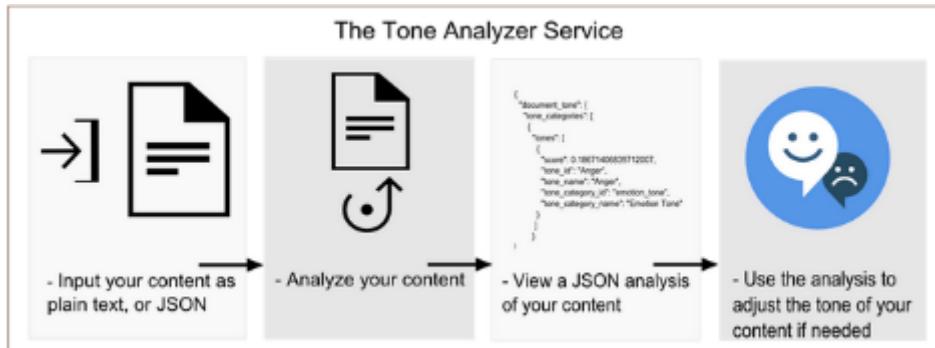
Demo : <https://watson-pi-demo.mybluemix.net>

# Common use cases

- Businesses can use these insights to
  - improve client acquisition, retention, and engagement
  - guide highly personalized engagements and interactions to better tailor their products, services, campaigns, and communications for individual clients.

# Tone Analyser

People show various language tones, such as joy, sadness, anger, and agreeableness, in daily written communications. Such tones can impact the effectiveness of communication in different contexts. Tone Analyzer leverages cognitive linguistic analysis to identify such tones for better communication.



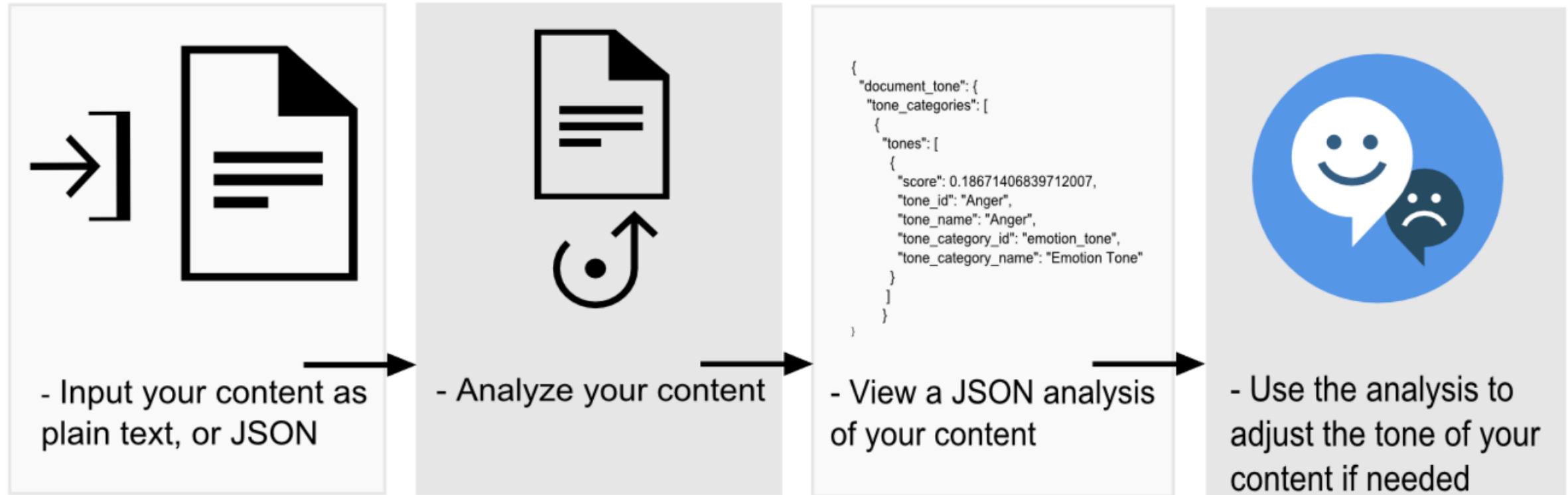
It detects three types of tones, including

- **Emotion** (anger, disgust, fear, joy and sadness),
- **Social propensities** (openness, conscientiousness, extraversion, agreeableness, and emotional range)
- **Writing styles** (analytical, confident and tentative) from text

This service enables people to discover and understand, and revise the impact of tone in their content. It uses linguistic analysis to detect and interpret emotional, social, and language cues found in text.

Common uses for the Tone Analyzer service include Personal and business communication, Market Research, Self-branding, automated Contact Center agent

Demo : <https://tone-analyzer-demo.mybluemix.net>



Tone Analyzer service can be used with additional IBM Watson services, such as IBM Watson™ Conversation or IBM® Speech to Text, to analyze user input.

# Tone Analyzer Service

## Tones

## Emotion

Anger

Disgust

Fear

Joy

Sadness

## Language

Analytical

Confident

Tentative

## Social Tendencies

Openness

Conscientiousness

Extraversion

Agreeableness

Emotional Range

# Speech To Text

## What is it?

This service provides speech to text transcription capabilities to your applications.

## How does it work?

To transcribe the human voice accurately, the service leverages machine learning to combine information about grammar and language structure with the knowledge of composition of the audio signal. The service provides both WebSockets interface as well as HTTP interface. Supports both responsive real-time applications of audio like live-speech as well as audio derived from telephone conversations. The service automatically adjusts according to the incoming sampling rate.

## Where to use?

- Voice control of applications. Embedded devices and so on
- Transcribing meetings and conferences
- Dictating content like notes, emails etc
- Transcribing speech to text in order to perform text analytics. Numerous use cases are plausible after converting speech to text

The screenshot shows the IBM Watson Speech-to-Text API interface. At the top, there are dropdown menus for 'Voice Model' (set to 'US English broadband model (16kHz)') and 'Keywords to spot' (containing 'sense of pride, watson, technology, changing the world, round, whirling velocity'). Below these are checkboxes for 'Detect multiple speakers' (unchecked) and 'Language detection' (unchecked). There are four buttons: 'Record Audio' (microphone icon), 'Upload Audio File' (up arrow icon), 'Play Sample 1' (play icon), and 'Play Sample 2' (play icon). A tab bar at the bottom includes 'Text' (selected), 'Word Timings and Alternatives', 'Keywords (2/7)', and 'JSON'. The main text area displays the transcription result: "In a severe gale like this while the ship is but a tossed shuttlecock to the blast. It is by no means uncommon to see the needles in the coppice it's at intervals go round and round at almost every shock that Holmes men had not failed to notice the whirling velocity. With which they rely".

The screenshot shows the 'Keywords' tab of the IBM Watson Speech-to-Text API interface. The tab bar includes 'Text', 'Word Timings and Alternatives', 'Keywords (2/7)' (selected), and 'JSON'. The results table lists keywords with their status:

- ⊗ **sense of pride**: Not spotted.
- ⊗ **watson**: Not spotted.
- ⊗ **technology**: Not spotted.
- ⊗ **changing the world**: Not spotted.
- ✓ **round**: Spotted - 11.39-11.86s (100%), 12.15-12.59s (100%)
- ✓ **whirling velocity**: Spotted - 16.38-17.74s (79%)
- ⊗ **unwanted emotion**: Not spotted.

Demo: <https://speech-to-text-demo.mybluemix.net/>

# Common use cases

- Analyze communications to improve message effectiveness
- Understand and route call center customers based on their tone
- Fine tune writing to reflect a specific personality or style

# Text to Speech

## What is it?

This service uses IBM's speech-synthesis capabilities to convert written text to natural-sounding speech that is streamed back to the client with minimal delay

Multiple voices, both male and female, are available across Brazilian Portuguese, English, French, German, Italian, Japanese, and Spanish

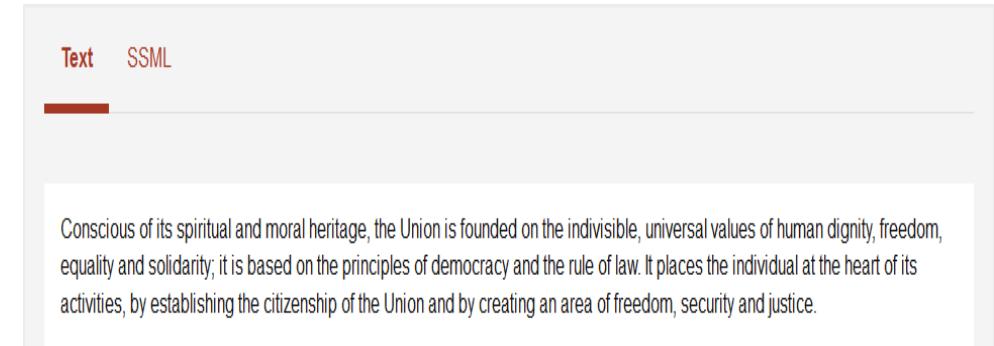
The Text to Speech service now enables developers to control the pronunciation of specific words

## How does it work?

The Text to Speech service is a concatenative system that relies on acoustic models based on decision trees.

## Where to use?

- Assistance tools for vision-impaired
- Home automation solutions
- Reading text and email aloud to drivers
- Education tools with voice interface



Conscious of its spiritual and moral heritage, the Union is founded on the indivisible, universal values of human dignity, freedom, equality and solidarity; it is based on the principles of democracy and the rule of law. It places the individual at the heart of its activities, by establishing the citizenship of the Union and by creating an area of freedom, security and justice.



Demo: <https://text-to-speech-demo.mybluemix.net/>

# Language Translator

<https://youtu.be/bYtVaQxJ994>

## Translate and publish content in multiple languages

The Watson Language Translation service provides domain-specific translation utilizing Statistical Machine Translation techniques. Currently, three domains are available that provide translation among a total of seven languages. For best results, a domain that matches the content to be translated should be chosen.

- **Conversational Domain**

English to/from Brazilian Portuguese, French, Modern Standard Arabic, or Spanish

- **News Domain**

English to/from Brazilian Portuguese, French, Italian or Modern Standard Arabic; Spanish to/from English or French

- **Patent Domain**

Brazilian Portuguese, Chinese, Korean, or Spanish to English

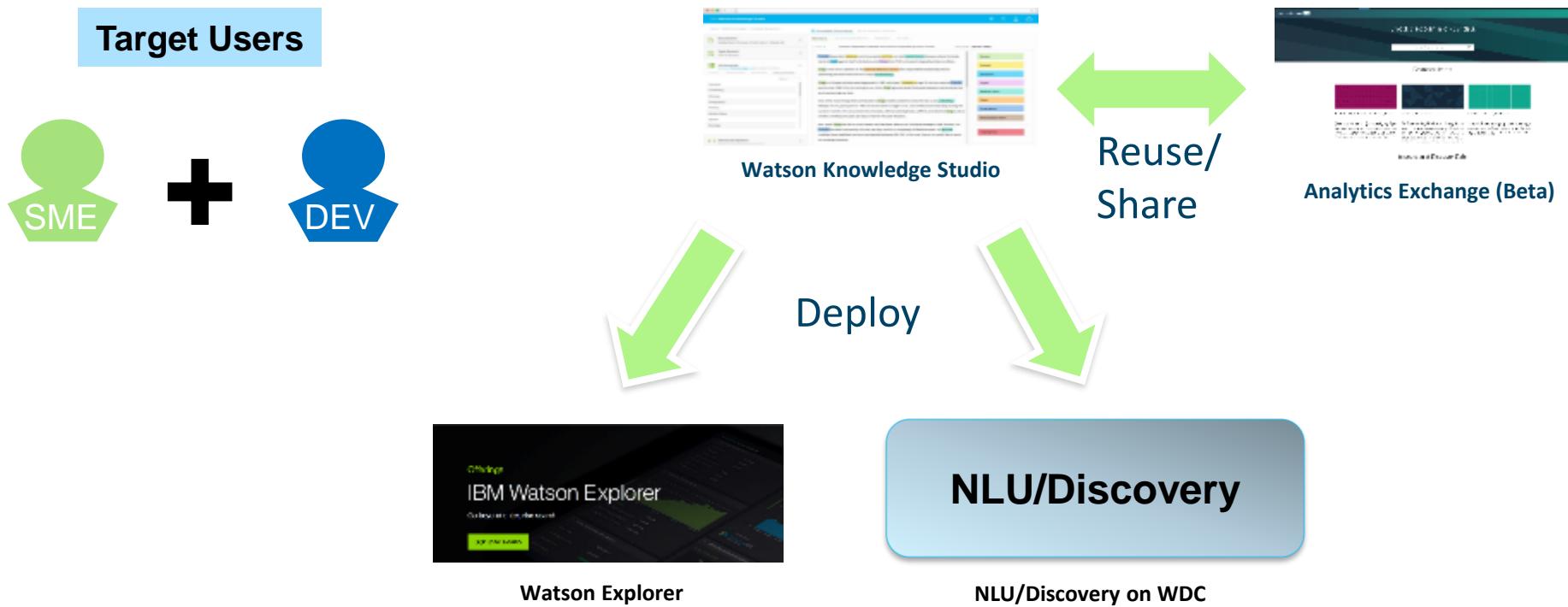
- **Intended Use**

- Enable an English-speaking help desk representative to assist a Spanish-speaking customer through chat
- A French news website can source news from across the globe and present it to users in their chosen language
- A US patent attorney can effectively discover prior art based on invention disclosures made in Korean with the Korean Patent Office

**View Demo :** <http://language-translation-demo.mybluemix.net/>

# IBM Watson Knowledge Studio (WKS)

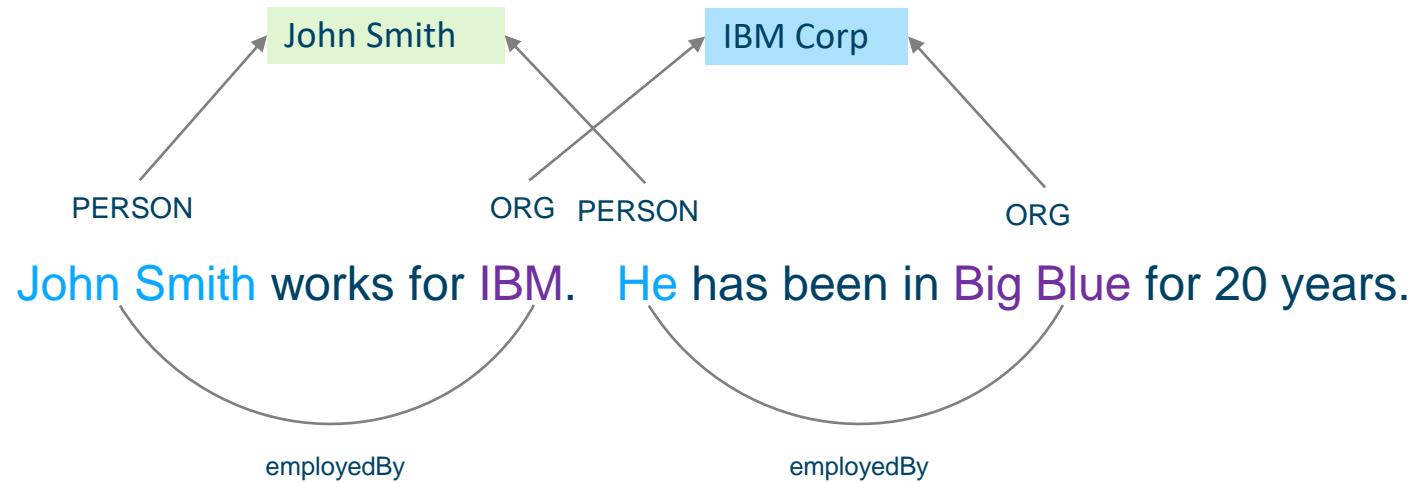
End-to-end system that enables developers and subject matters experts to teach Watson the linguistic nuances of industries and knowledge domains.



Create, reuse & share custom text annotators built with WKS can be leveraged with Watson and, in future, other IBM offerings!

# Understanding information extraction

“Information extraction is the method of distilling structured data from unstructured data.”



# Various approaches for information extraction

## Rules-Based

- Uses rules to perform natural language analysis
- Easy to get started with small corpus
- Easy to trace and debug
- Requires humans to program rules with significant learning curve
- Difficult to maintain as the complexity grows

## Machine Learning

- Uses inferences and statistical models to perform natural language analysis
- Taught by examples without the need to write code
- Better approach where large volume of growing data is involved
- Somewhat opaque to the developer and can be more difficult to debug
- Requires creating ground truth

## Hybrid

- Combination of both rule-based and ML approaches
- Easy to get started with RB and scale over time using ML
- Use rules to accelerate training and improve precision of ML models
- Requires a solution to integrate both approaches

Watson Explorer Content Analytics Studio

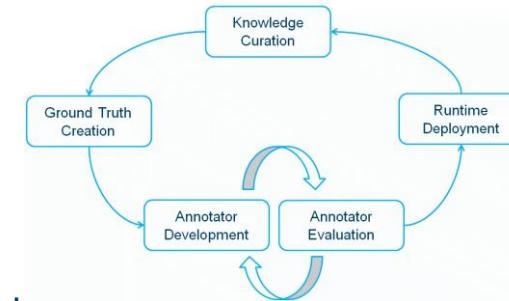
Watson Knowledge Studio

Watson Knowledge Studio

# Create your own Machine Learning Model

Create a machine-learning model that understands the linguistic nuances, meaning, and relationships specific to your industry

## Annotator Development Life Cycle



### Knowledge curation

Selecting, collecting, preserving, and maintaining content relevant to a specific domain

### Ground truth generation

Produce a collection of vetted data that can be used to adapt a Watson solution to a particular domain

### Annotator component development

Use of Watson Knowledge Studio tools to create an annotator component

### Annotator component evaluation

Use of Watson Knowledge Studio tools to refine the annotator component and improve performance

### Annotator component deployment

Exporting components that enable the annotator to run in machine-learning runtime environments and making the annotator component accessible to other Watson cognitive applications

# Cognitive Usecases

# Use Case 1: Conversation Agent

Business Challenge / Opportunity	Solution	
<ul style="list-style-type: none"> <li>Clients cannot find solutions without calling on an agent</li> <li>Interaction with Digitally-savvy customers are not personalized</li> <li>Virtual agents must know where to search for answers – which is hard in corpus consisting of many documents (manuals, policies, call logs, knowledge base, defects base, user groups)</li> <li>Keyword-based algorithms often fail at finding answers as they lack the semantic analysis required to understand a question</li> </ul>	<ul style="list-style-type: none"> <li>The Watson service-powered solution helps clients find many solutions on their own.</li> <li>For questions requiring a deeper investigation, customer service agents can use the Watson-powered cognitive system to identify a solution quickly from a large corpus of knowledge base, by interacting in plain natural language with the solution.</li> <li>The solution allows virtual Agents to better understand and serve client needs by better understanding the client's context.</li> <li>The solution enables advisors to understand client needs better to offer evidence based advise</li> <li>Watson Services used: Conversation</li> </ul>	
Target Audience	Client Examples	Benefits
<p>• Customers</p> <p>• Technical Support Executives</p> <p><b>Buyers</b></p> <ul style="list-style-type: none"> <li>CMO</li> <li>LOB</li> </ul>	<p>• <b>Bank in Malaysia</b> Automate, streamline and improve its contact center processes. Trained with unstructured data from its CRM knowledge base and structured customer account data, the solution can answer more than 80 percent of customer queries automatically. The same pattern intelligence enables agents to make pinpoint cross-selling recommendations</p>	 <b>Customer satisfaction</b> 24hr service and first time problem resolution leads to increase in Customer Sat rating  <b>Higher yielding customers</b> Resolving problems quickly and allowing customers to take the next step easily allows cross-sell and up-sell opportunities  <b>New business</b> : More satisfied customers more likely to recommend to others, resulting in a higher Net Promoter Score  <b>A more efficient operation</b> Strip cost out of your business with effective levels of automation

## Links

<https://www.hlb.com.my/main/assets/files/ibm-partners-hlb-to-introduce-cognitive-banking.pdf>

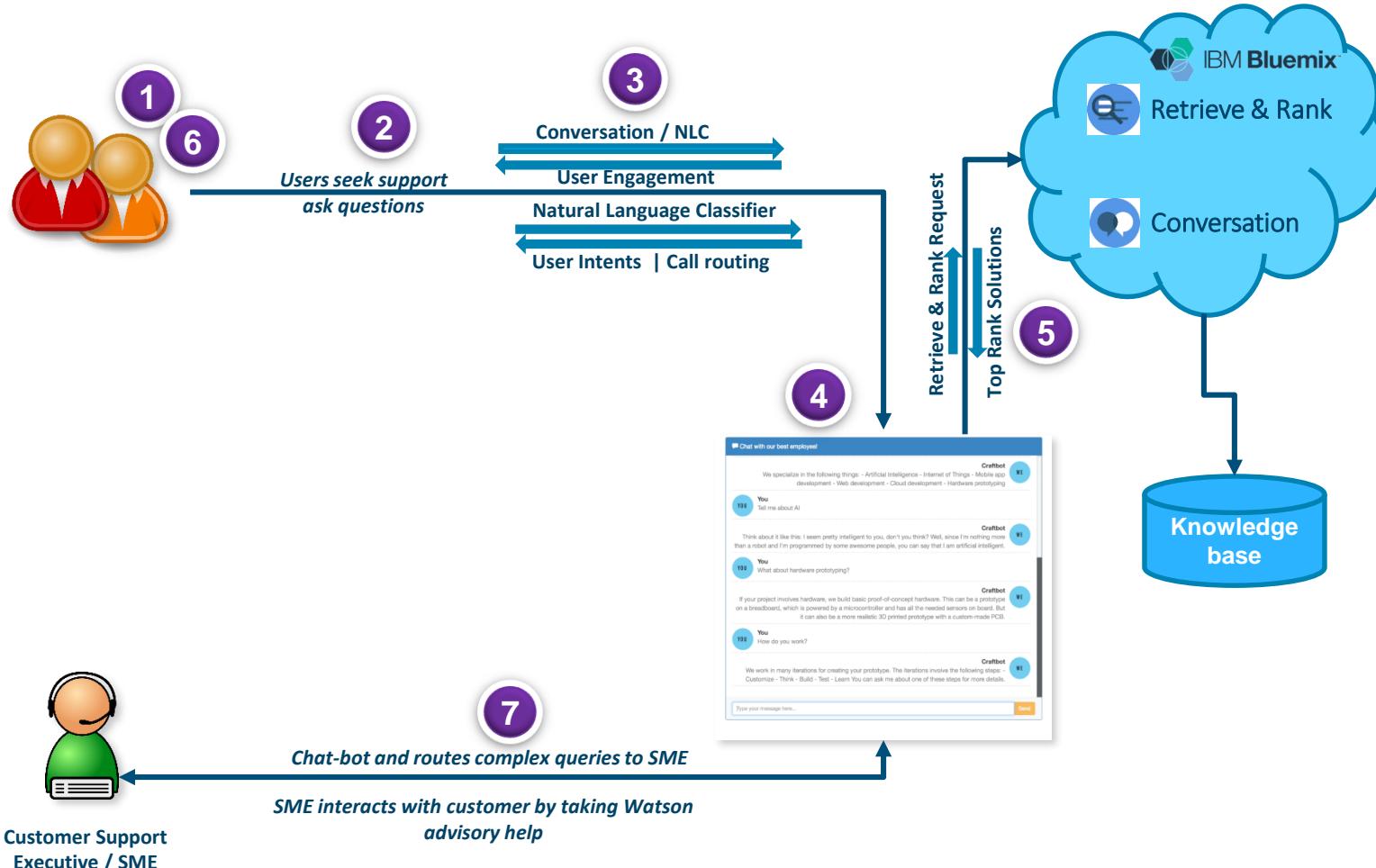
<https://www-03.ibm.com/press/us/en/pressrelease/44431.wss>

## Demo

<http://conversation-simple.mybluemix.net/>

[https://www.youtube.com/watch?v=l\\_L\\_g6bt4v0](https://www.youtube.com/watch?v=l_L_g6bt4v0)

# Customer Service – Virtual Agents



John is a existing customer of Insurance Company offers all kinds of Insurance products . Watson has already populated customer details and his policy information

1. John accesses the conversational agent application through a browser interface
2. John inquires about theft/damage insurance coverage for his new Rolex watch while he is on travel
3. The conversation service orchestrates the conversation with John, asks for age of the watch, estimated value and confirms that his watch is already covered in his parents policy. However Watson identifies that John recently moved his own apartment and he is not living with his parents
4. Watson Natural Language Classifier (NLC) service interprets the text infer the intent of the question. Watson asks John if he is interested to know about insurance product that cover his apartment and personal belongings.
5. Watson routes the call to Insurance agent giving brief about the summary of discussion with recommendation on products and advised to check about his belongings like computer or Stereo under 35k limit
6. Insurance agent responds back to Watson with details
7. Watson suggests Extended Electronic Equipment Endorsement with a limit of 35k and suggests to give 5% discount being a long term customer.

## UseCase 2: A leading financial services group in Asia helps Wealth managers in providing higher quality, bespoke investment advice to customers



### NEED

A leading financial services group in Asia operating in 15 countries wanted to enable Wealth managers to provide better quality investment advice to clients

### SOLUTION

Cognitive enables relationship managers to gain relevant market and client insights through analysis of structured and unstructured data, and through interaction in conversational language

### BENEFIT

Wealth managers are able to offer improved, bespoke service and investment advice to affluent clients

## Use Case 2: Wealth Management Advisor

Business Challenge / Opportunity	Solution	
<ul style="list-style-type: none"> <li>Need to drive personal client experience in the digital savvy and well informed client</li> <li>Adopt new business models for higher customer value and capture the next generation of wealth</li> <li>Wealth Advisors are challenged with matching the large number of investment options, corpus of investment knowledge in research reports/events to the needs of the clients</li> </ul>	<p>Dynamically segmenting clients by their behaviors, predicting life and financial events, predicting client attrition, identifying product opportunities, and delivering tailored news and alerts.</p> <p>A virtual agent with set of services for wealth advisor to</p> <ul style="list-style-type: none"> <li>Respond to Natural language request that understands investment domain</li> <li>Discover relevant details from deluge of investment knowledge base</li> <li>Understand clients preferences based on social data</li> </ul> <p>Build this capability using the Watson Cognitive services on Bluemix using Natural Language Classifier, Personality insights, Alchemy API and Trade of Analytics</p>	
Target Audience	Client Examples	Benefits
<ul style="list-style-type: none"> <li>Wealth Manager / Investment Advisor</li> <li>Banking Customers</li> </ul>	<ul style="list-style-type: none"> <li><b>ANZ</b> Give our advisors that ability to harness information and make smarter, faster financial recommendations – enabling a customer experience that is simple, safe and steeped in data-informed insights.</li> <li><b>DBS</b> Applying IBM Watson's capabilities will enable DBS professionals to take control of a 'data deluge' and arm them with data-driven insights that can personalize the client experience.</li> </ul>	<ul style="list-style-type: none"> <li>Facilitate a personalized experience to clients with well tailored solutions to clients</li> <li>Well informed discussions with clients on various investment options and comparative services</li> <li>Make insight-driven recommendations during customer interactions aligning to their investment goals</li> </ul>

### Links

DBS: <http://www-03.ibm.com/press/us/en/pressrelease/42868.wss>

ANZ: <http://asmarterplanet.com/blog/2013/05/advice.html>

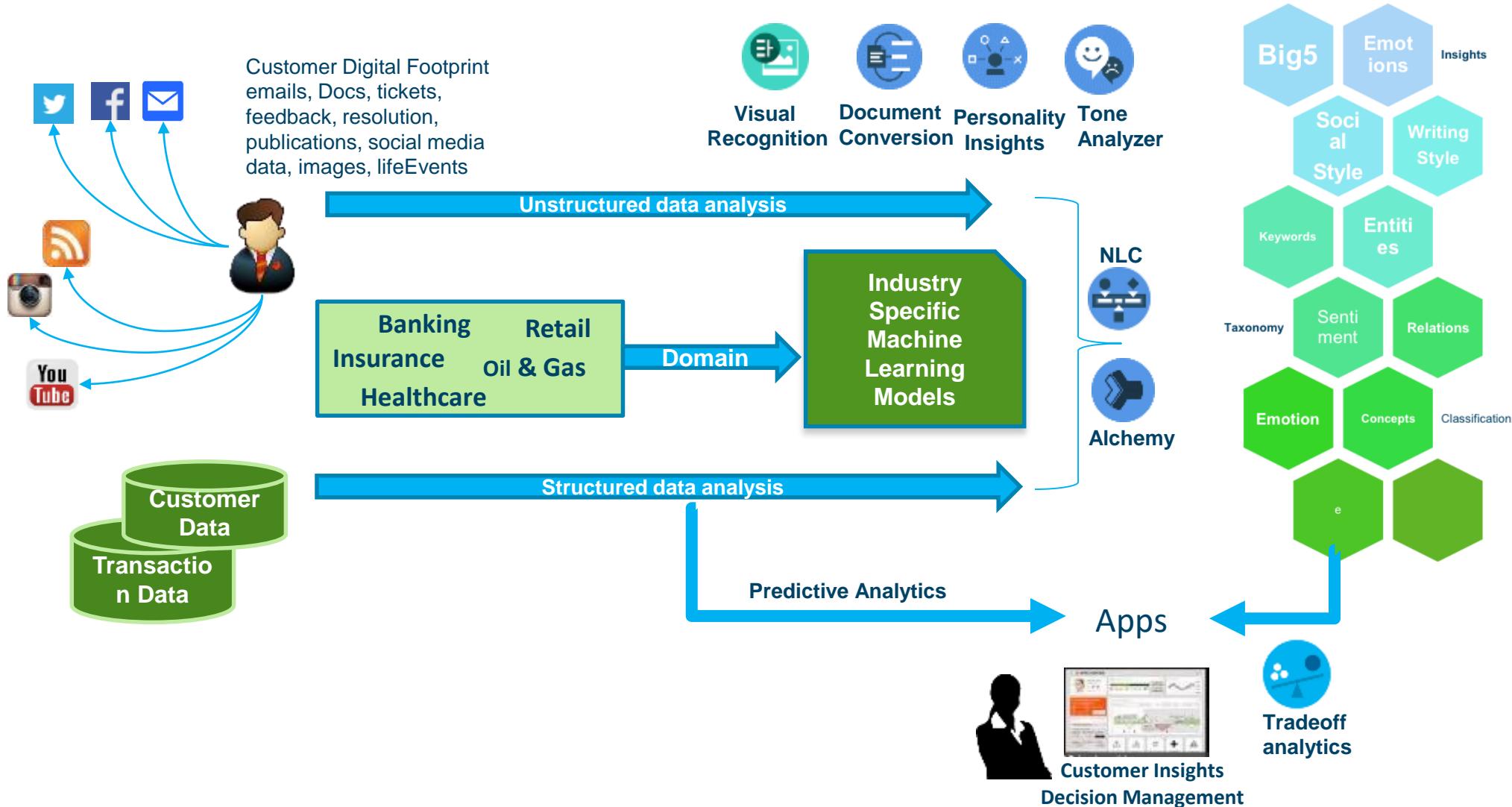
Demo: <http://investment-advisor.mybluemix.net/>

Video : <https://www.youtube.com/watch?v=bHaJNM7PV6c>

# Deeper Understanding of Customer – Wealth Advisor

#	Generating Leads	Customer Acquisition	Servicing Customer
How Watson can Help?	Quick understanding of dynamics of market and leveraging vast content available on public domain on wealth products, financial statements etc.,	Offering services better tailored to customer personality traits and life events to bring more personalized customer experience	Quicker adoption and better comparison of best performing products meeting individual customer investment goals and priorities
Enabling Customer touchpoints with Cognitive capabilities	<p>Explores document repository, various publications, articles, related to literature and prospective customer</p> <p>Document Conversion</p> <p>Gather Business intelligence reports and comparative/competitive information</p> <p>Alchemy API</p>	<p>Understands personality traits like risk bearing capacity, willingness to explore new opportunities etc., of high net-worth Customers</p> <p>Personality Insights</p>	<p>Sentiment</p> <p>Understand the customer Tone/Mood based on conversation or various sources of information like Feedback, Tweets, FB posts etc.,</p> <p>Tone Analyzer</p> <p>Alert WA or Support Team on customer moods, unhappy customer</p> <p>Analyze Customer product portfolio Advise best investment strategy</p> <p>Trade-off analytics</p>
Wealth Manager Action	<ul style="list-style-type: none"> <li>Analyze the propensity to buy products</li> <li>Deeper Understanding of Customer</li> <li>Gather prospects about Customer</li> </ul>	<ul style="list-style-type: none"> <li>Rollout personalized offers and messages</li> <li>Linking Life Events, hobbies</li> <li>Analyze the propensity to buy products</li> </ul>	<ul style="list-style-type: none"> <li>Actionable Insights</li> <li>Enhance their ability to deliver high-quality advice</li> <li>Rollout personalized offers to unhappy customers</li> </ul>
Customer Experience	<ul style="list-style-type: none"> <li>Better experience in connecting with right Wealth Managers</li> <li>Personalized offers, alerts and messages about products</li> </ul>	<ul style="list-style-type: none"> <li>Interactive chat experience on a wealth management</li> <li>Knowledge on Regulatory Compliance</li> <li>Enhanced client experience</li> </ul>	<ul style="list-style-type: none"> <li>Insight -driven recommendations align to investment goals</li> </ul>

# Usecase - Deeper Understanding of Customer



## Use Case 3: Personalized Shopping Companion

Business Challenge / Opportunity	Solution	
<ul style="list-style-type: none"><li>Need to Identify individual customers' buying preferences and offer personalized in-store shopping experience</li><li>Understanding individual shopper preferences and intent by engaging customer instead of asking complicated questions or surveys</li><li>Limited engagement with digitally-savvy customers who demand personalized and interactive experiences on-the-go</li></ul>	<ul style="list-style-type: none"><li>Analyzes social and blog content to understand consumer demographics, affinities, and personality types..</li><li>Input questions in natural language about product assortment, services and facilities and receive a customized response to the inquiry</li><li>A set of services enabling advisors to understand client needs, engage with clients and provide evidence based advice.<ul style="list-style-type: none"><li>NLC, Conversation, Personality Insights</li></ul></li></ul>	
Target Audience	Client Examples	Benefits
<ul style="list-style-type: none"><li>Retail Customer</li><li>Retail Business Outlets</li></ul>	<ul style="list-style-type: none"><li><b>Macy's:</b> Macy's "On Call", a mobile web tool allows customers to input questions in natural language about each participating store's unique product assortment, services and facilities and then receive a customized response to the inquiry</li></ul>	<ul style="list-style-type: none"><li>Personalized shopping experience. Helps consumers evaluate purchasing decisions, and influences another, equally important aspect of the in-store experience - ease of use in locating products, facilities and services</li><li>Improve customer satisfaction through better accuracy and responsiveness of its support center operation</li><li>Enable the brands and marketers to understand intrinsic needs and values of their customers</li></ul>

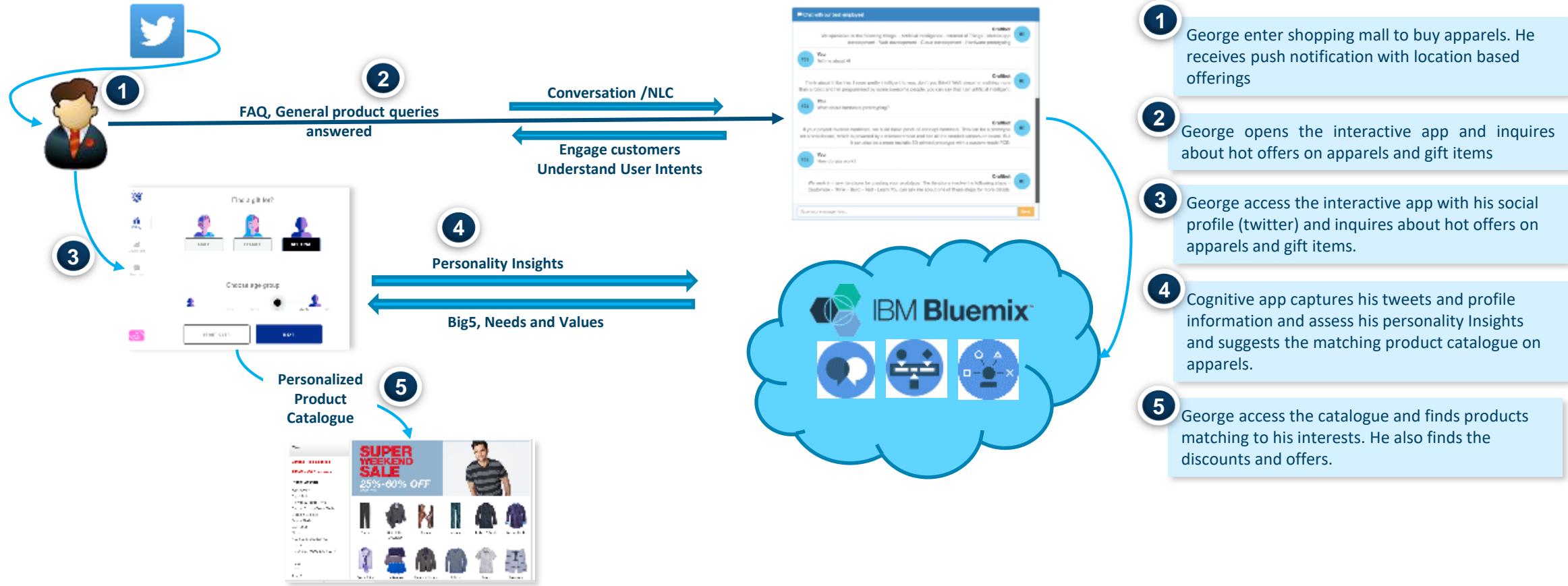
### Links

**Macy's**  
<https://www-03.ibm.com/press/us/en/pressrelease/50212.wss>

### Demo

<http://outthink-ui.mybluemix.net/>  
<https://www.youtube.com/watch?v=uNW9xhQvKI8&rel=0>

# Retail – Personalized Shopping Companion



# Developer Tools

# Watson Developer Cloud

**Watson Developer Cloud is a platform that provides developers easy access to expertise via a collection of REST APIs & SDKs**

**APIs :** Detailed API documentation to each of the Watson services on Bluemix.  
Supported languages are Java, Nodejs, Python etc...

**Docs:** Service level detailed documentation

**Developer Tools :** Access to SDKs for Node, Java, Python, Swift, .net and Unity

**Access to Watson Developer's Community**

[Watson Developer Cloud](#)  
[Watson Documentation](#)

# Watson Accelerators

- Proof of Technology** : Makes Watson come to life for clients by showing how Watson works. Helps clients understand the power of cognitive.
- The Art of the Possible** : Illustrates some of the exciting ways we can combine Watson APIs to solve business problems. Business narratives included to facilitate meaningful conversations.
- Conversation Starter** : Begins the client journey on the Watson Platform

Link:

<https://watsonaccelerators.mybluemix.net/home>  
Login using your Bluemix Id and password

# IBM Code

- Roadmaps for solving complex programming challenges.
- Patterns give you a 360-degree view of the underlying code, including overviews, architecture diagrams, process flows, repo pointers, and additional reading.

<https://developer.ibm.com/code/patterns/>

# Starter Kits

Get a jumpstart building your cognitive app with code examples that combine multiple services for common use cases

**Answer Retrieval:** Find and surface the most relevant responses to natural language queries from a large set of unstructured data

**Services Used :** [Retrieve and Rank](#)

This sample application provides a generic approach to ingest documents & train a ranker using Retrieve & Rank. Additionally the starter kit shows developers how to improve the results of the machine learning algorithm through feature engineering.

[Launch app](#) | [View on GitHub](#)

**News Intelligence:** Build applications that uncover insights from pre-enriched news content. Use a dashboard to visualize the latest connections and trends for companies mentioned in the news.

**Services Used:** [Discovery](#)

This sample application demonstrates how to query news content to understand what people are saying or feeling about important topics

[Launch app](#) | [View on GitHub](#)

# Starter Kits

## Voice of the Customer

Analyze consumer reviews and extract valuable insights.

### Services Used

[Discovery](#)

This starter kit provides an approach to implementing an application that uses the Discovery service to gain valuable insights from customer opinions. The source data for the application is Amazon reviews

[Launch app](#) | [View on GitHub](#)

---

## Knowledge Base Search

Use cognitive search to uncover the best answers to natural language questions by taking advantage of the Discovery Service's embedded natural language processing and powerful query language

### Services Used

[Discovery](#)

This sample application provides a generic approach for how to improve the results of the Discovery Service's search by ingesting and enriching documents with natural language processing and querying with these enrichments.

[Launch app](#) | [View on GitHub](#)

# Demo

## Demo: Discovery Search

[https://knowledge-base-search.mybluemix.net/?cm\\_mc\\_uid=09221484923715034527239&cm\\_mc\\_sid\\_50200000=1504608641&cm\\_mc\\_sid\\_52640000=1504499853](https://knowledge-base-search.mybluemix.net/?cm_mc_uid=09221484923715034527239&cm_mc_sid_50200000=1504608641&cm_mc_sid_52640000=1504499853)

## Discovery with Conversation

Demo:

[https://conversation-with-discovery-within-ui.mybluemix.net/?cm\\_mc\\_uid=09221484923715034527239&cm\\_mc\\_sid\\_50200000=1504608641&cm\\_mc\\_sid\\_52640000=1504499853](https://conversation-with-discovery-within-ui.mybluemix.net/?cm_mc_uid=09221484923715034527239&cm_mc_sid_50200000=1504608641&cm_mc_sid_52640000=1504499853)

Github:

[https://github.com/watson-developer-cloud/conversation-with-discovery?cm\\_mc\\_uid=09221484923715034527239&cm\\_mc\\_sid\\_50200000=1504608641&cm\\_mc\\_sid\\_52640000=1504499853](https://github.com/watson-developer-cloud/conversation-with-discovery?cm_mc_uid=09221484923715034527239&cm_mc_sid_50200000=1504608641&cm_mc_sid_52640000=1504499853)

## Visual Recognition

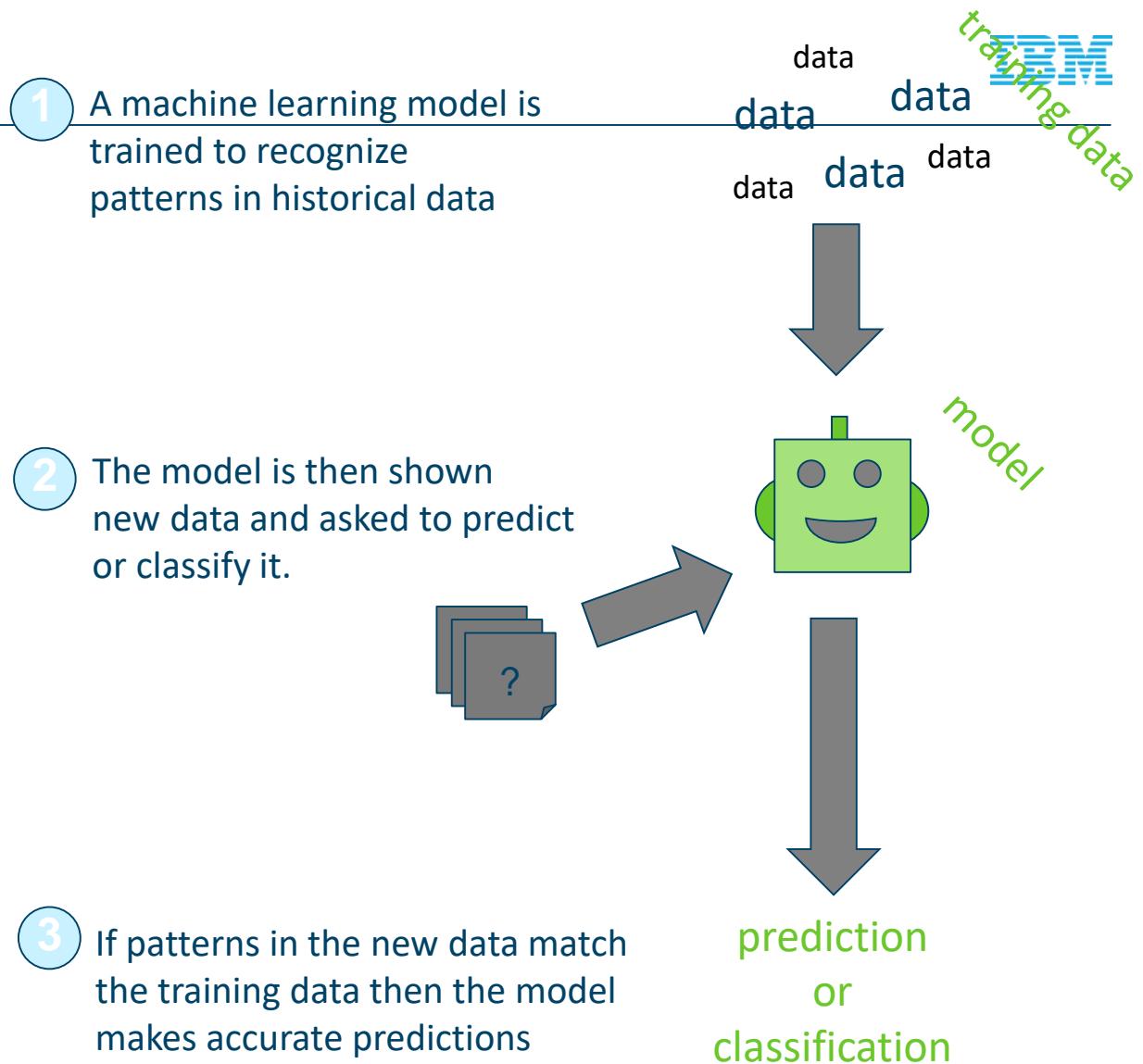
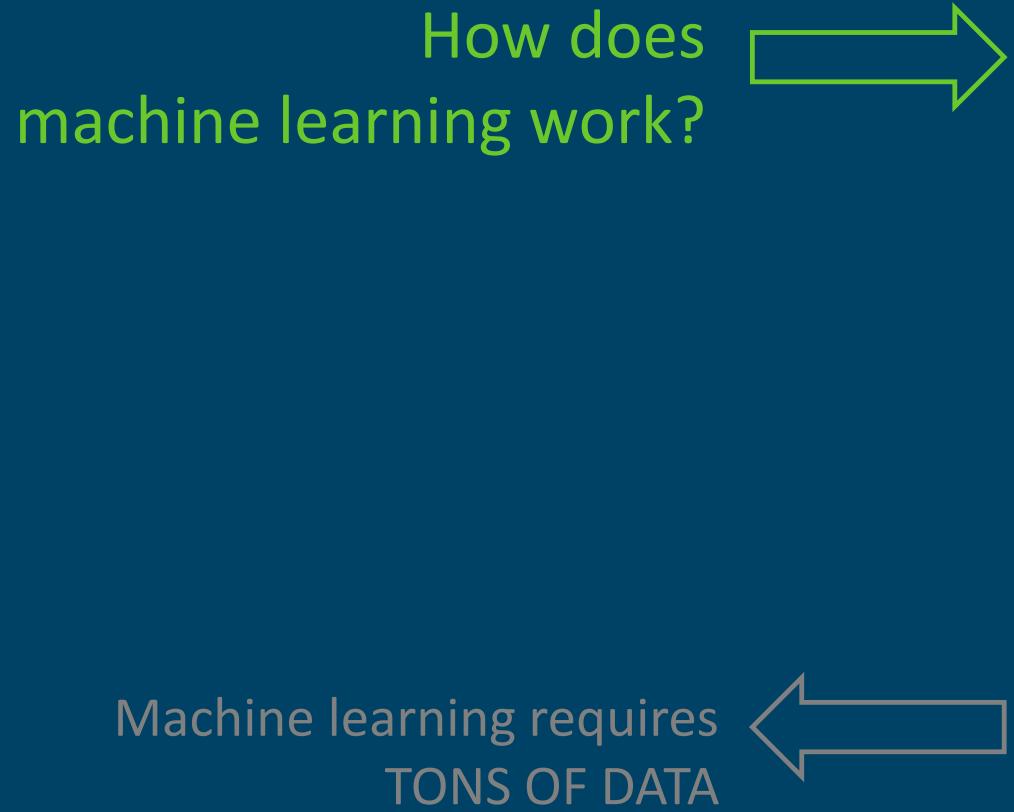
<https://watsonaccelerators.mybluemix.net/ibm/accelerator/productclassification>

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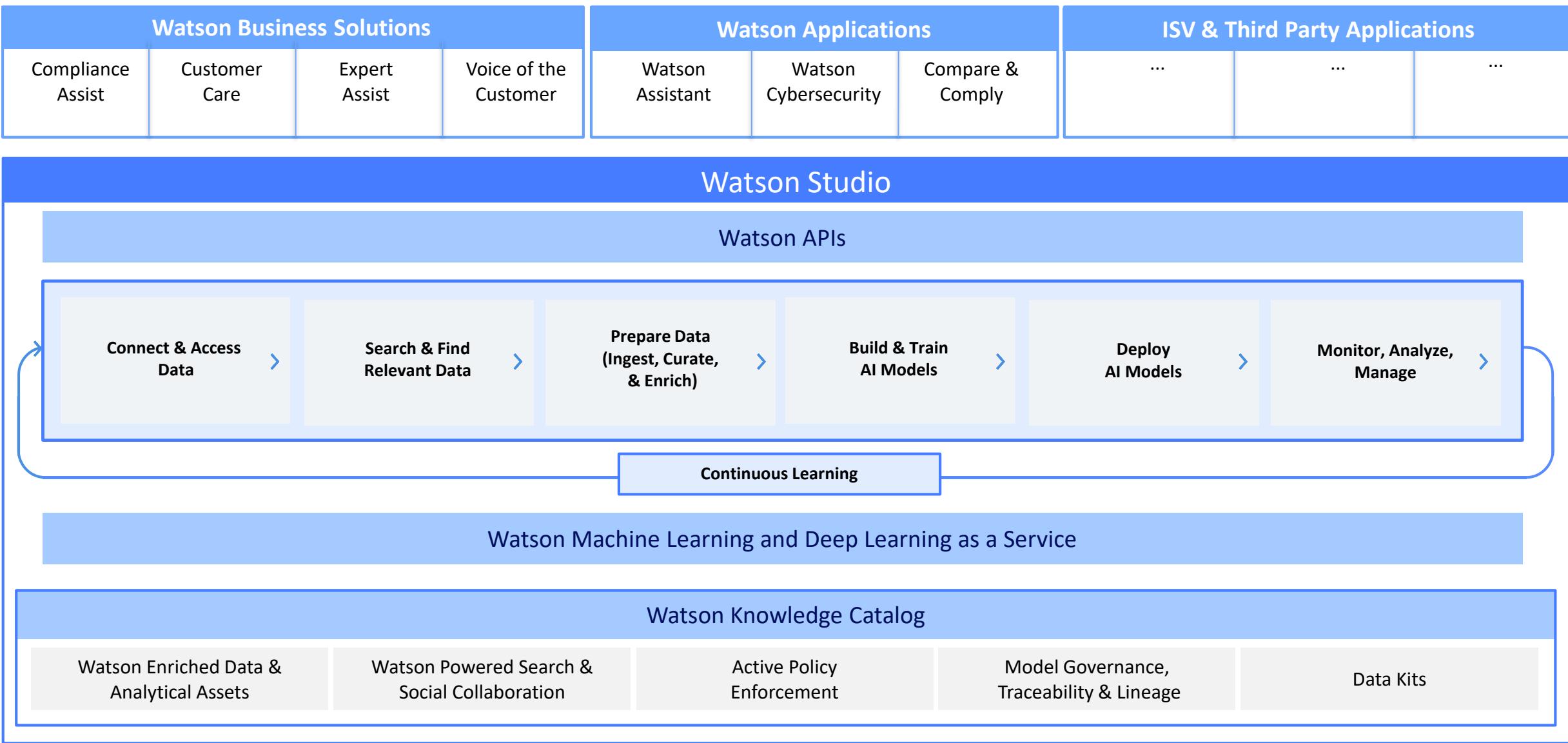
# Additional References

[Cognitive Concepts 101 - IBM Cloud Garage Method](#)

# Watson Studio



# Watson: AI for Smarter Business



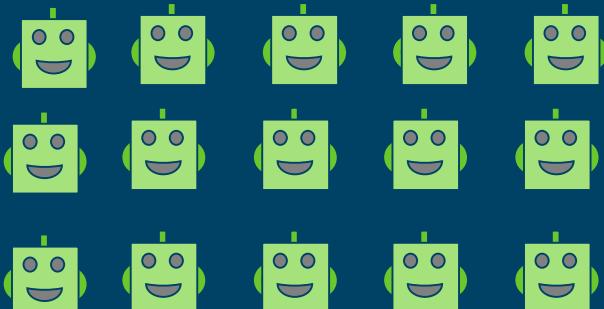
Learns from Small data

Enterprises generate TONS OF DATA



Data that requires governance

...that must be hosted and monitored



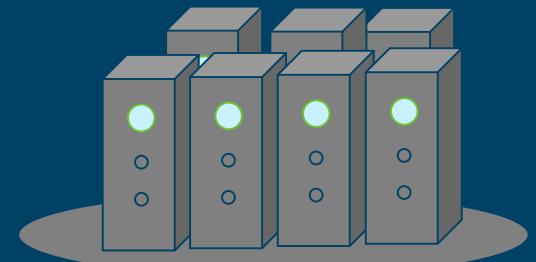
To select an optimal model...

Which must be cleaned and shaped for training

...then models must be designed



...and trained on high performance compute



# Watson Studio

## Supporting the end-to-end AI workflow

Connect & Access Data

Search and Find Relevant Data

Prepare Data for Analysis

Build and Train ML/DL Models

Deploy Models

Monitor, Analyze and Manage

**Connect** and discover content from multiple data sources in the cloud or on premises. Bring **structured** and **unstructured** data to one toolkit.

**Find** data (structured, unstructured) and AI assets (e.g., ML/DL models, notebooks, Watson Data Kits) in the **Knowledge Catalog** with intelligent search and giving the right access to the right users.

Clean and prepare your data with **Data Refinery**, a tool to create data preparation pipelines visually. Use popular open source libraries to prepare unstructured data.

**Democratize** the creation of ML and DL models. Design your AI models **programmatically** or **visually** with the most popular **open source** and IBM ML/DL frameworks or leverage transfer learning on **pre-trained** models using **Watson tools** to adapt to your business domain. Train at scale on **GPUs** and **distributed** compute

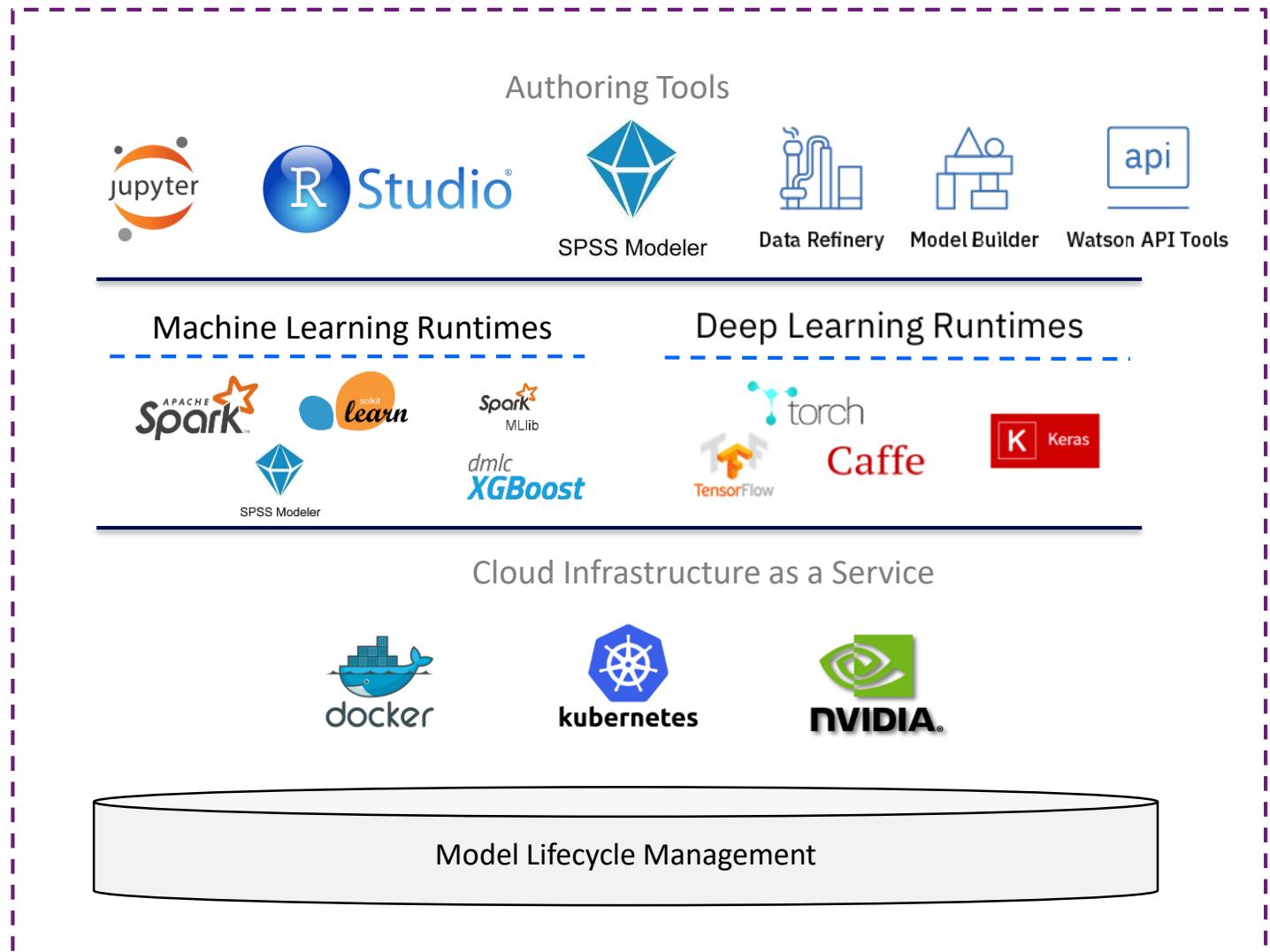
Deploy your models easily and have them **scale automatically** for online, batch or streaming use cases

Monitor the performance of the models in production and trigger automatic retraining and redeployment of models. Build **Enterprise Trust** with Bias Detection, Mitigation Model **Robustness** and Testing Service Model **Security**.

# Watson Studio

## Tools for supporting 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



## Additional References

[Watson Studio](#)

[Watson Data Lab](#)

ThanQ