Artificial Intelligence-as-a-Service (AIaaS):

Building AI Business Applications with IBM Bluemix and IBM Watson Developer Cloud (WDC)

ppetro2@uic.edu
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Getting Started with IBM Bluemix

What does IBM Bluemix include?

- IBM Bluemix is an implementation of IBM's Open Cloud Architecture, using Cloud Foundry to enable developers to rapidly build, deploy, and manage their cloud applications, while tapping a growing ecosystem of available services and runtime frameworks. In addition to full-stack components and language support, IBM Bluemix includes the Watson Core Accelerators & Services that form IBM Watson "cognitive "computing" applications.

- The Watson Core Accelerators & Services are an extensive suite of web services for bringing semantic leverage to unstructured materials, such as text, images, and speech. They form the building blocks of Watson "cognitive computing". These services include the following functionality:

Getting Started with IBM Bluemix

What does IBM Bluemix include?

- Natural Language Processing – tone analysis, personality insights, entity recognition, relationship and keyword extraction, text classification and translation
- Discovery Service – Semantic tagging, indexing, and querying of unstructured text
- Conversation Services – for constructing intelligent interactive chat-bot experiences
- Speech to/from Text – Speech to Text and Text to Speech conversion
- Visual Recognition – Feature and facial identification and extraction
- Data & Analytics – Integrate cloud databases and statistical services.
- Internet of Things – Communicate with and consume data from connected devices, sensors, and gateways.
- Mobile Infrastructure – Multi-platform, native, or hybrid apps, with analytics, security, user insight, and continuous delivery support.
- Blockchain – Peer-to-peer distributed ledger technology

See the Bluemix Catalog for the full list of Bluemix Services. (https://console.bluemix.net/catalog/)

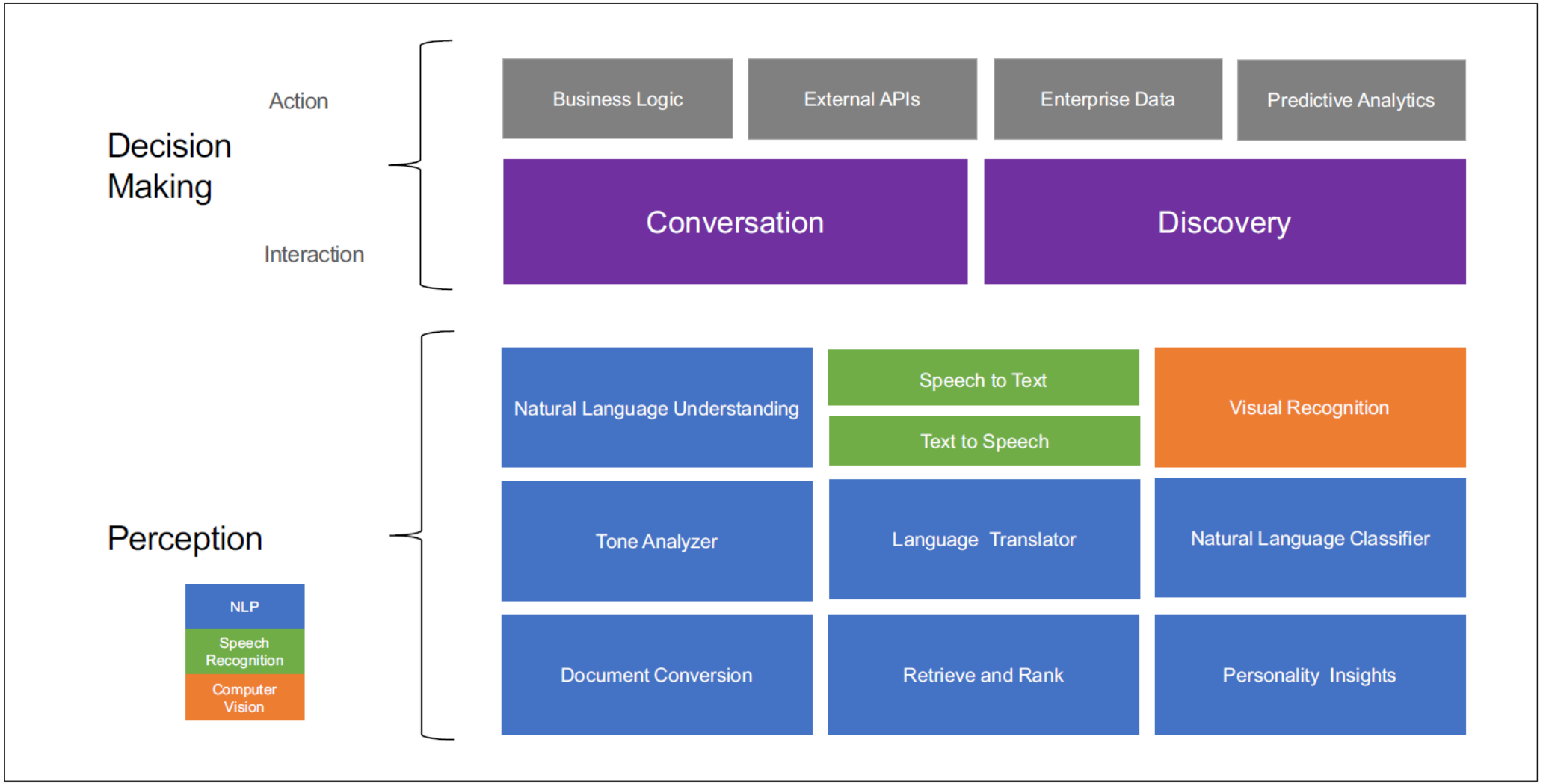
Broad Capability Areas of Cognitive Systems

Cognitive Systems Broadly Enable Capabilities in the Following Areas

Source: IBM

Watson Developer Cloud (WDC) Services

Watson Developer Cloud (WDC) Capabilities as of 2017

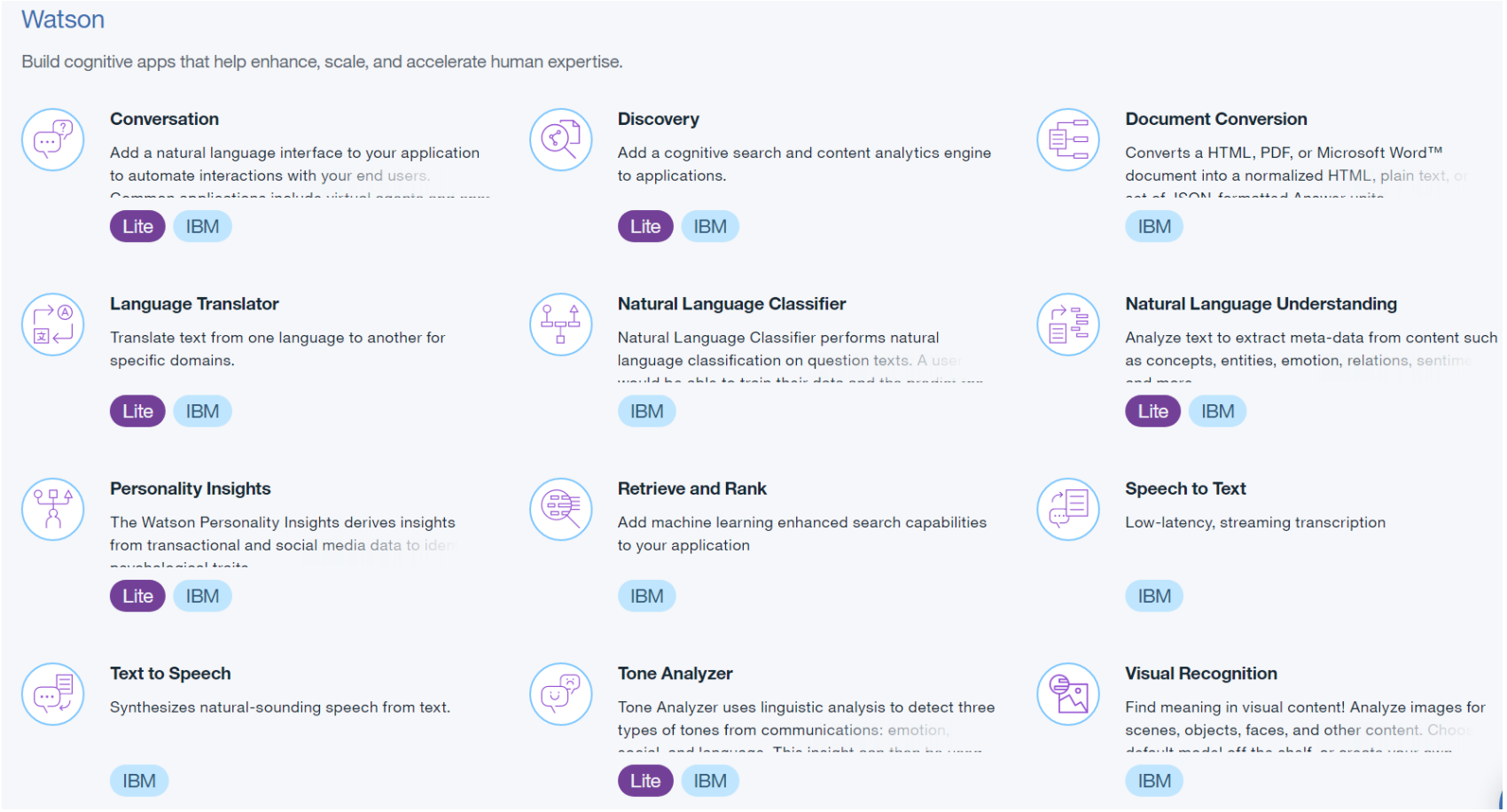


Source: IBM

Getting Started with IBM Watson on IBM Bluemix

IBM Watson capabilities are delivered as services (APIs) on the BlueMix Platform

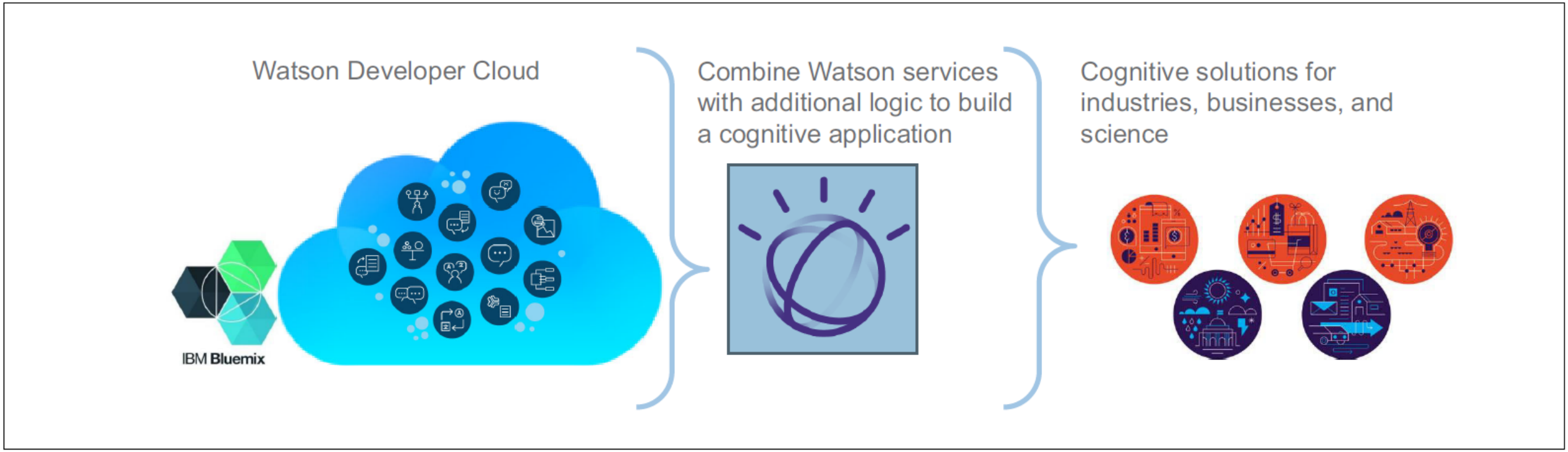
IBM Watson is a leading “AI as a Service” (AIaaS) platform



Source: IBM

Overview of Cognitive Systems

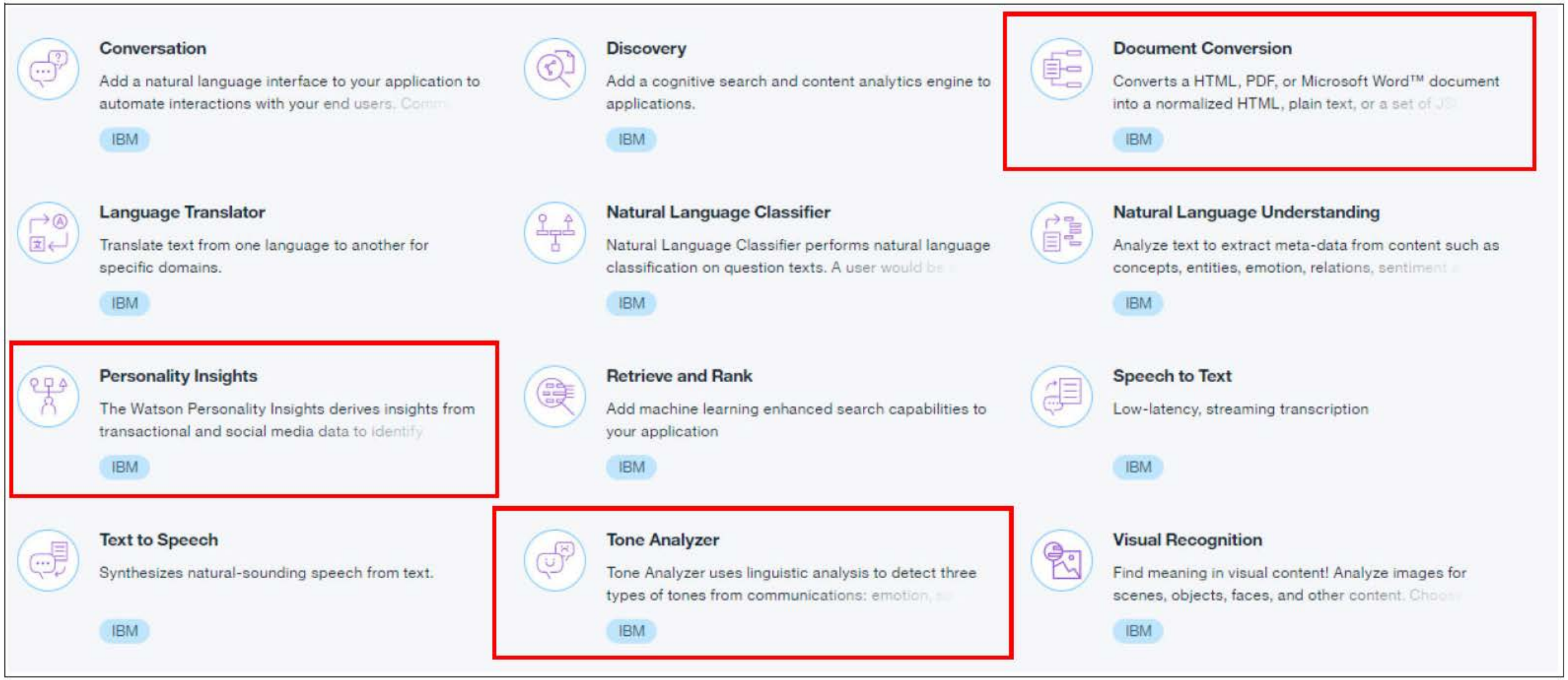
Building Cognitive Applications with IBM Watson Services



Source: IBM

Overview of Building Cognitive Systems with IBM Watson

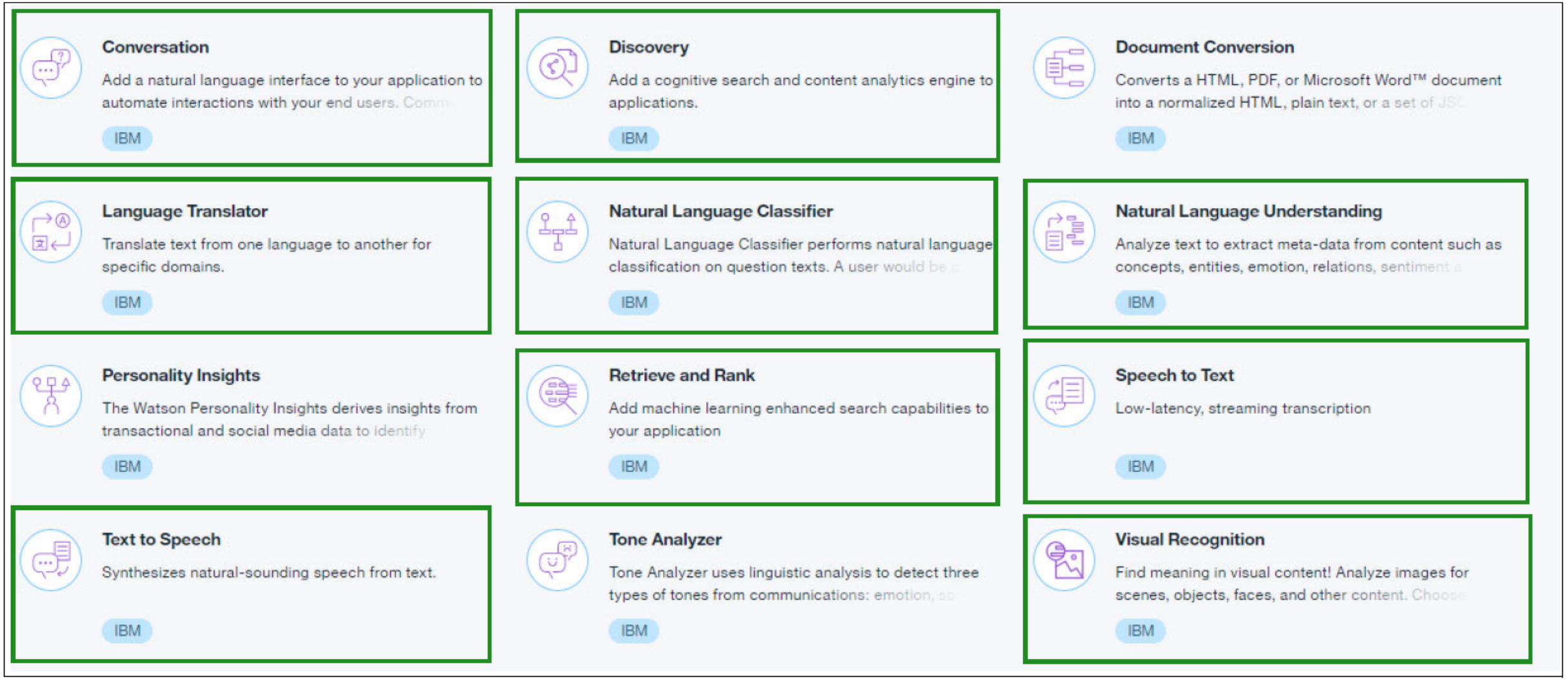
Watson services that cannot be trained by users



Source: IBM

Overview of Building Cognitive Systems with IBM Watson

Watson services that can be trained by users



Source: IBM

Getting Started with IBM Watson on IBM Bluemix

IBM Watson capabilities are delivered as services (APIs) on the BlueMix Platform

https://www.ibm.com/watson/developer/

Conversation

Conversation

Virtual Agent

Discovery

Discovery

Natural Language Understanding

Discovery News

Knowledge Studio

Empathy

Personality Insights

Tone Analyzer

Language

Language Translator

Natural Language Classifier

Document Conversion

Retrieve and Rank

Speech

Speech to text

Text to speech

Vision

Visual Recognition

All Products and Services

Getting Started with IBM Bluemix

- Sign up for a free 30-day account on IBM Bluemix to get started at:
  http://bluemix.net/

- Browse the Catalog
  https://console.bluemix.net/catalog/

- Browse Watson services in the catalog
  https://console.bluemix.net/catalog/?taxonomyNavigation=app-services&category=watson

- Alternative view of Watson Services from Watson Developer Cloud (WDC) page
  https://www.ibm.com/watson/developer/

Getting Started with IBM Bluemix

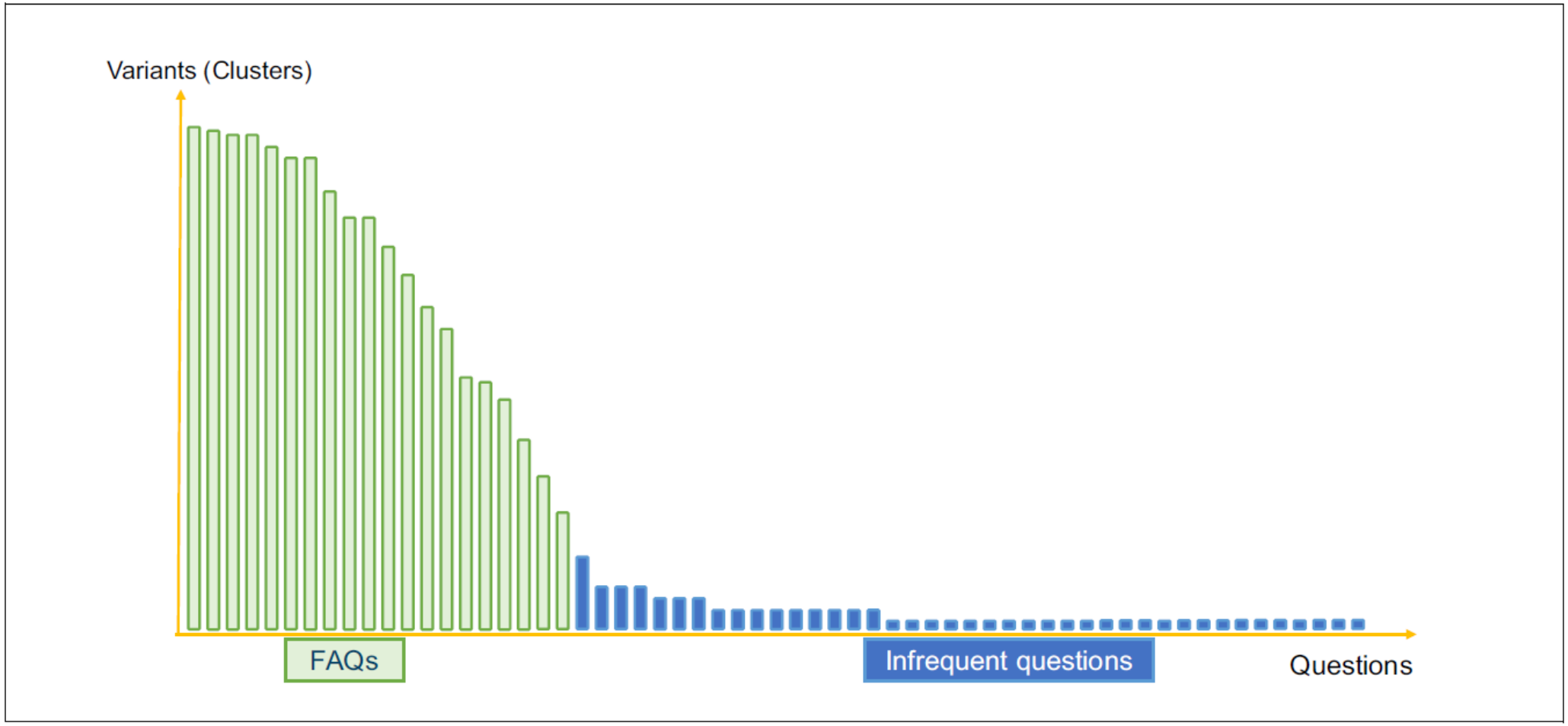
- Explore Watson Conversation:
  https://www.ibm.com/watson/services/conversation/

- View Conversation Service demo
  https://conversation-demo.mybluemix.net/

- Try the Simple Chat App demo
  https://conversation-simple.mybluemix.net/

Watson Conversation Service

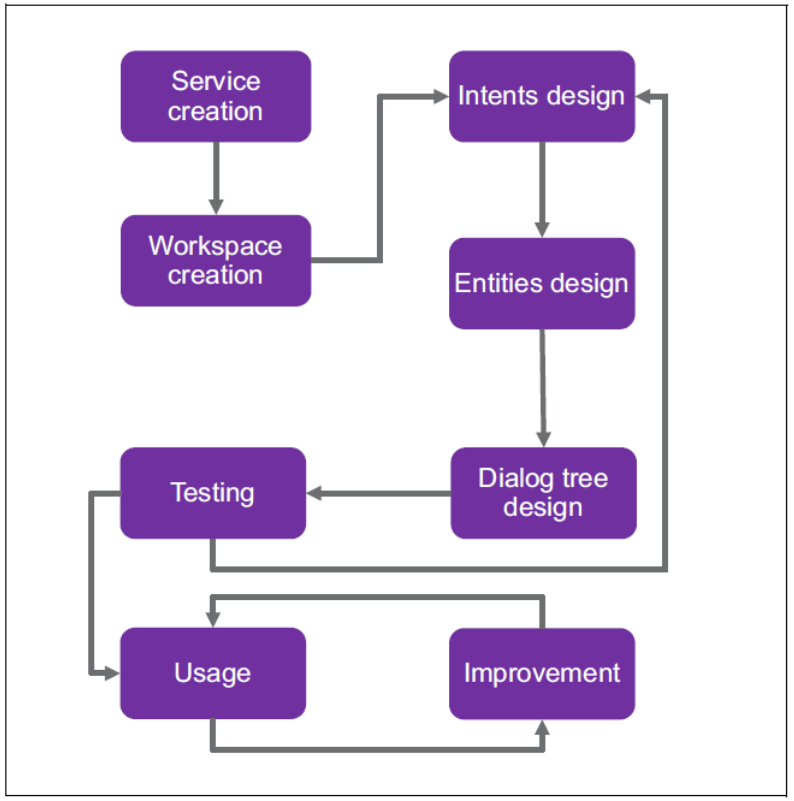
The question distribution from a typical customer service use-case



Source: IBM

Getting Started with Conversation Service

- Create your first Watson service – Watson Conversation:
  https://console.bluemix.net/catalog/?taxonomyNavigation=app-services&category=watson
- View Docs – Getting Started with Conversation Service
  https://console.bluemix.net/docs/services/conversation/getting-started.html#gettingstarted



Steps to Adapt Conversation Service

Source: IBM

Getting Started with Conversation Service

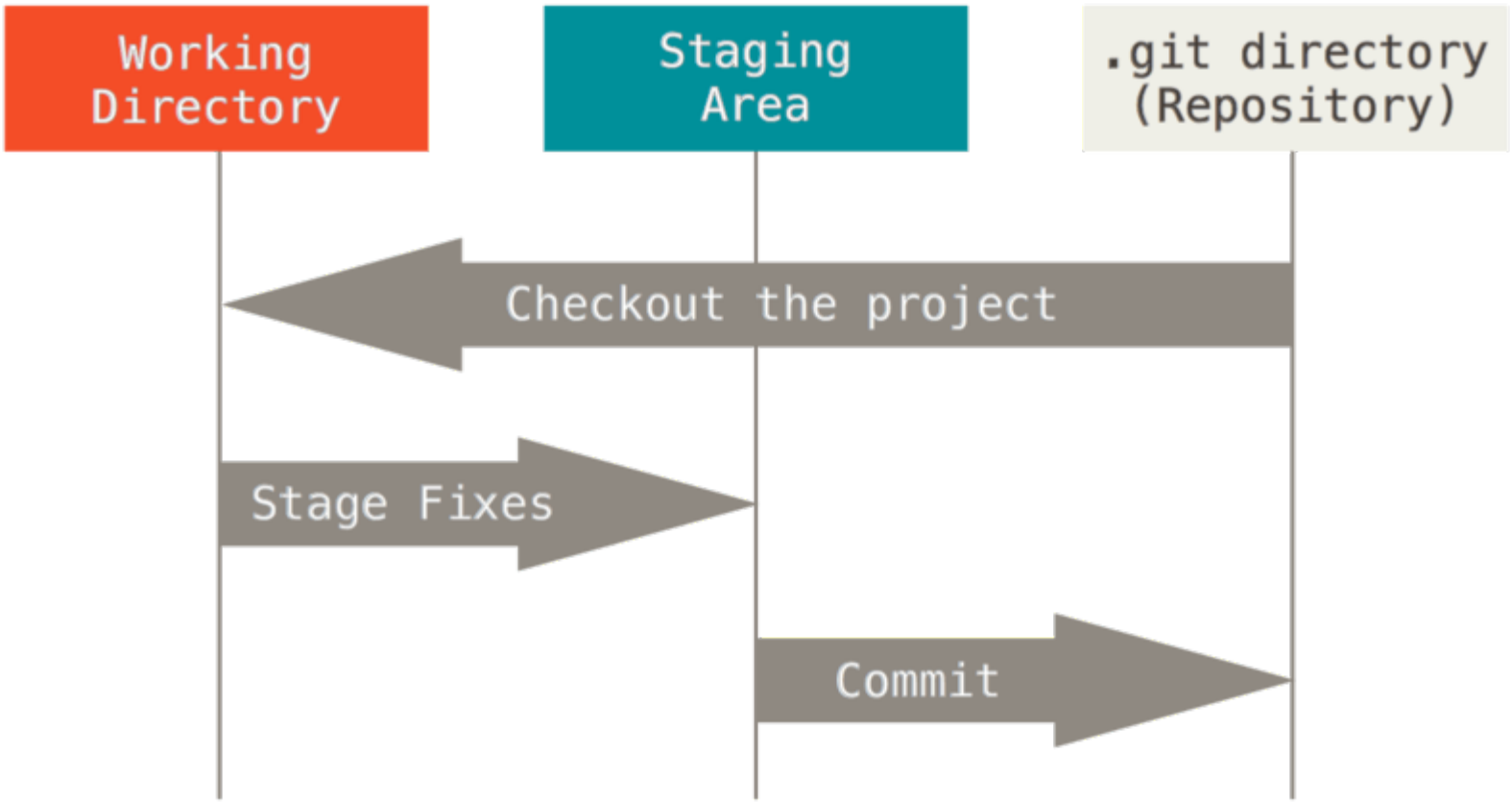
- Create your first Watson service – Watson Conversation:
  https://console.bluemix.net/catalog/?taxonomyNavigation=app-services&category=watson

- View Docs – Getting Started with Conversation Service
  https://console.bluemix.net/docs/services/conversation/getting-started.html#gettingstarted

- Some useful examples
  https://github.com/watson-developer-cloud/community
  https://github.com/watson-developer-cloud/community/tree/master/conversation

Configuration Management with Git and GitHub

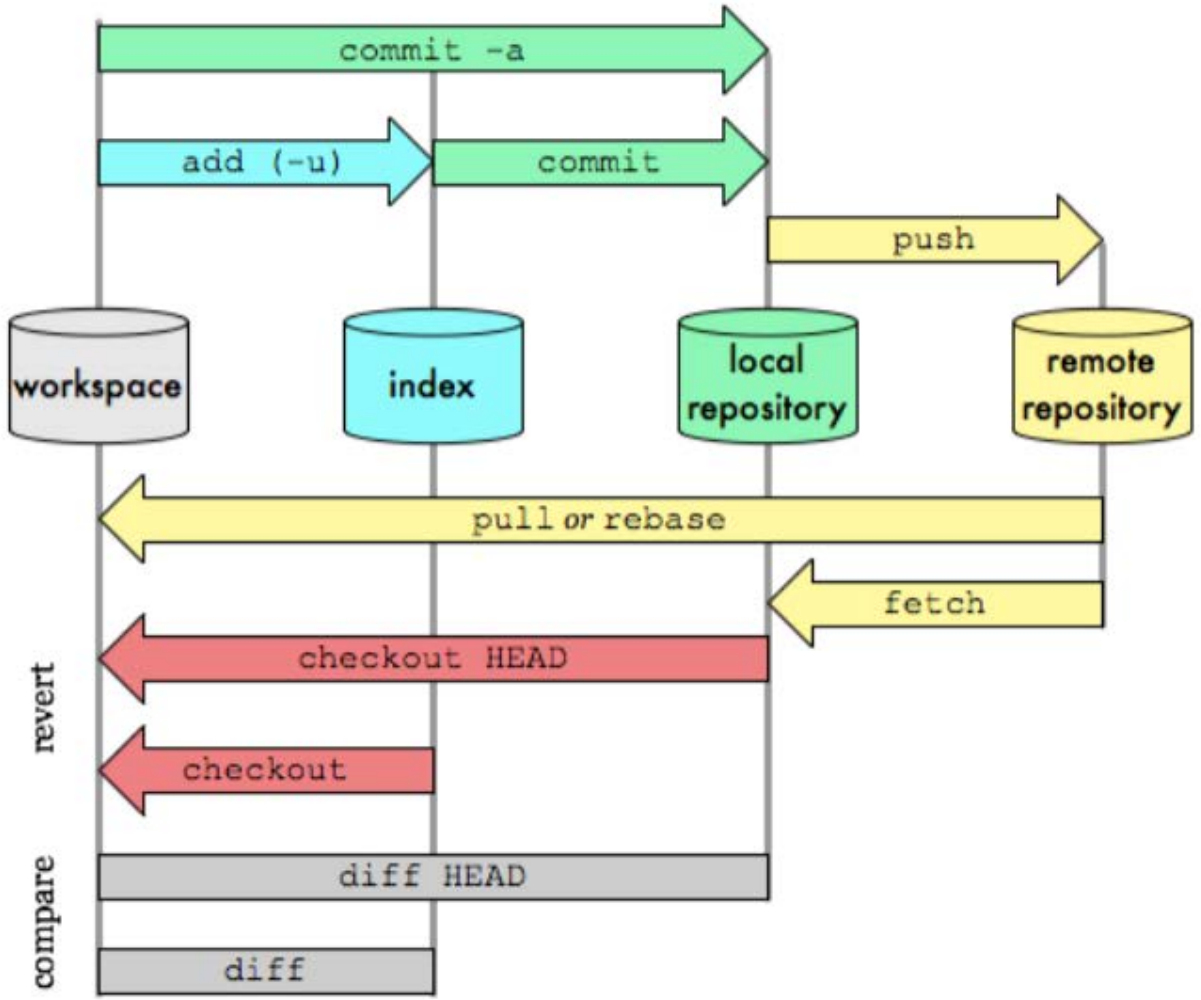
- Working tree, staging area, and Git directory



https://git-scm.com/book/en/v2/Getting-Started-Git-Basics

Configuration Management with Git and GitHub

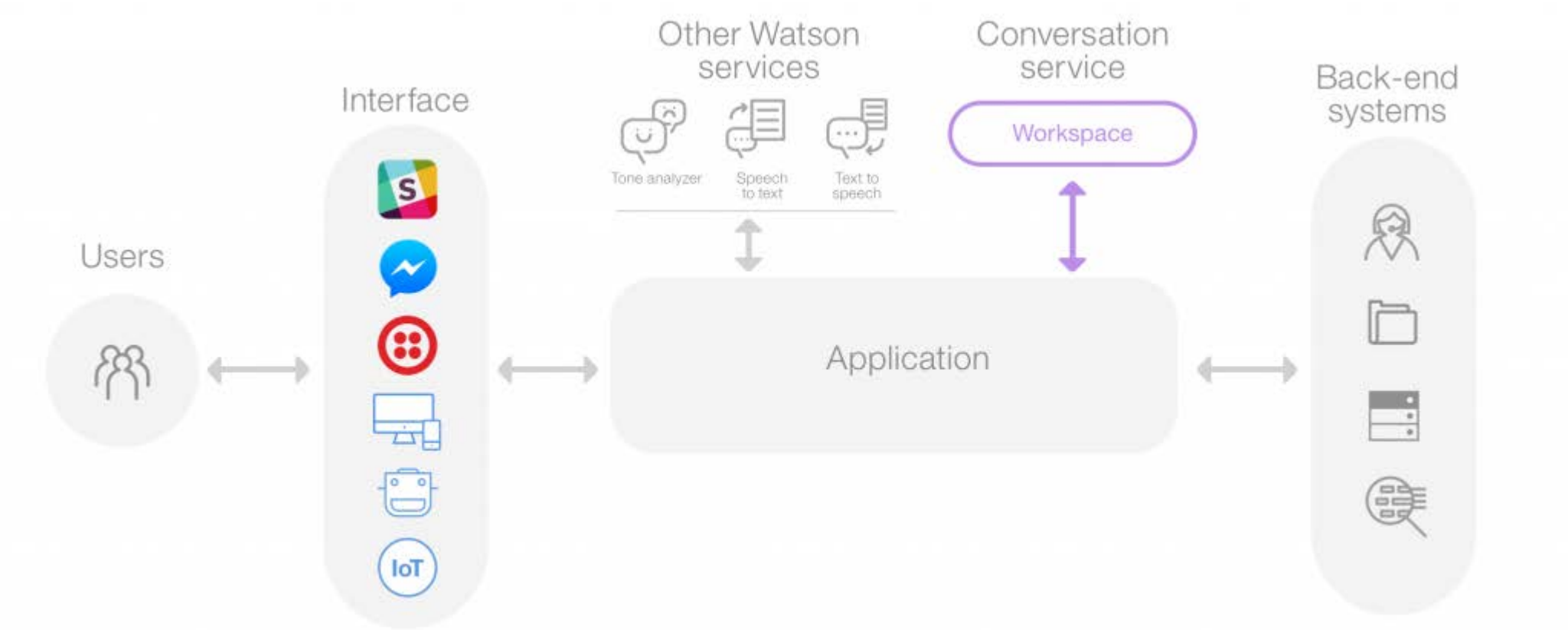
- Introduction to the Git workflow



http://krishnaiitd.github.io/gitcommands/git-workflow/

Watson Conversation Service

- Building a Conversational UI application with IBM Watson Conversation Service



Source: IBM

Getting Environment Set Up for Developing Watson Applications

- Application development using node.js SDK (example)
- IBM Watson provides Software Development Kits (SDKs) for many languages
  https://console.bluemix.net/catalog/?taxonomyNavigation=app-services&category=cf-apps
- Developing a Watson application in Node.js
  https://console.bluemix.net/docs/services/watson/developing-nodejs.html
- Download required software environments
  - Node.js and npm
    https://nodejs.org/en/#download
    https://www.npmjs.com/
- IBM® Bluemix® CLI - command line interface
    https://console.bluemix.net/docs/cli/index.html#downloads
    https://github.com/cloudfoundry/cli#getting-started
    https://console.bluemix.net/docs/cli/reference/bluemix_cli/all_versions.html#bluemix-cli-installer-all-versions
- Watson Developer Cloud SDKs – browse
    https://github.com/watson-developer-cloud

Getting Environment Set Up for Developing Watson Applications

- Application development using node.js SDK (example)
  https://console.bluemix.net/docs/services/watson/developing-nodejs.html
- Use Cloud Foundry command line interface (cf)
  > cf login -a https://api.ng.bluemix.net
  > cf marketplace
- Node.js sample code on GitHub
  https://github.com/watson-developer-cloud/node-sdk
- Clone the Personality Insights code
  https://github.com/watson-developer-cloud/personality-insights-nodejs
- Create Personality Insight Service
  > cf create-service personality_insights lite ppp-personality-insights-bluemix-meetup
  > cf create-service-key ppp-personality-insights-bluemix-meetup pppKey
  > cf service-key ppp-personality-insights-bluemix-meetup pppKey
- Update .env file with credentials and manifest.yml

Building Applications with Watson Conversation Service

- Building a client application with Watson Conversation Service:

  https://console.bluemix.net/docs/services/conversation/develop-app.html#building-a-client-application

- Download and import the workspace

  https://watson-developer-cloud.github.io/doc-tutorial-downloads/conversation/conversation-simple-example.json

Building Applications with Watson Conversation Service

- Building and deploying a simple app

  https://conversation-demo.mybluemix.net/

  https://github.com/watson-developer-cloud/conversation-simple

- Clone the source code from GitHub repository

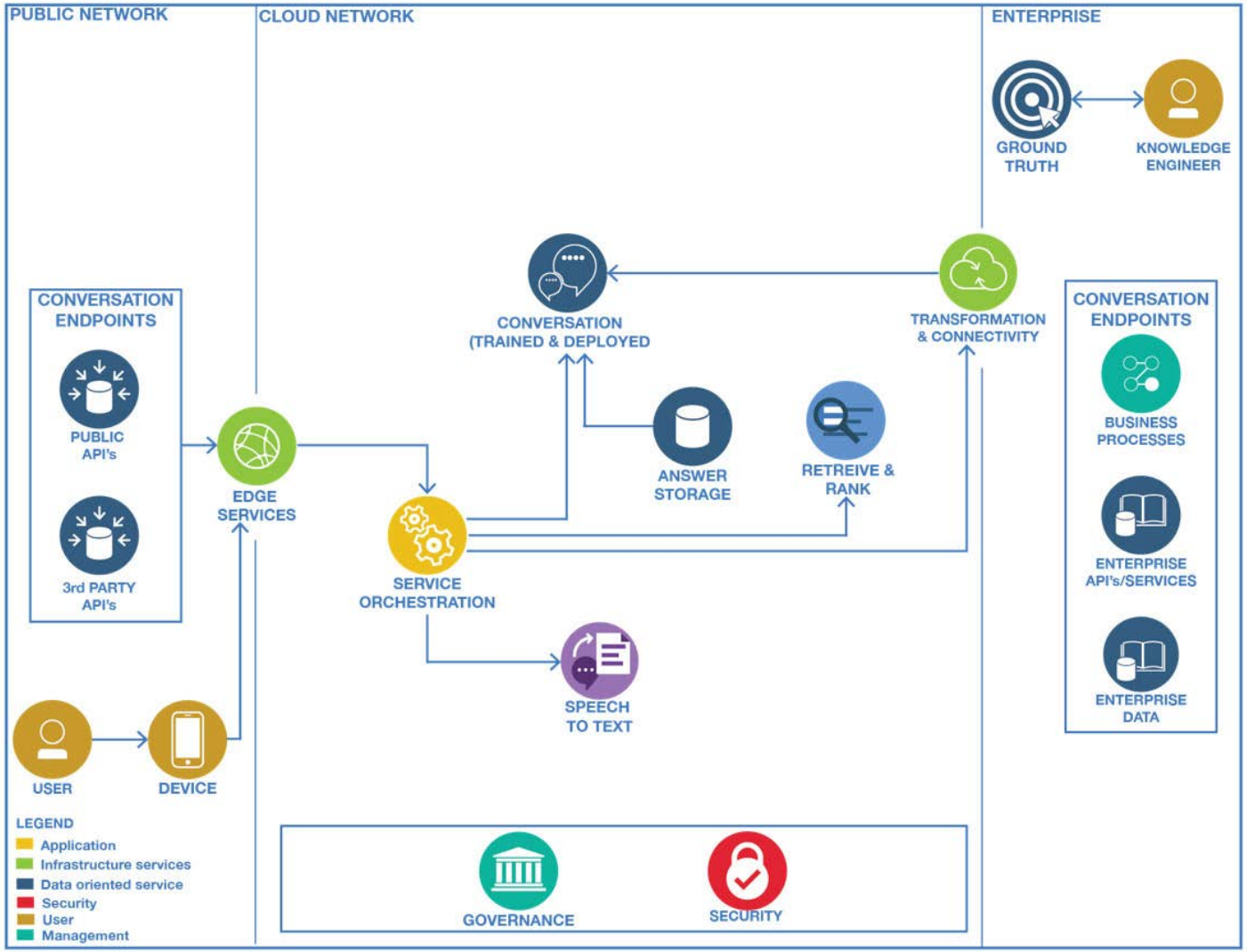
  > git clone https://github.com/watson-developer-cloud/conversation-simple.git

- Import Workspace into Conversation service

- Update .env and manifest.yml files

Watson Conversation Service

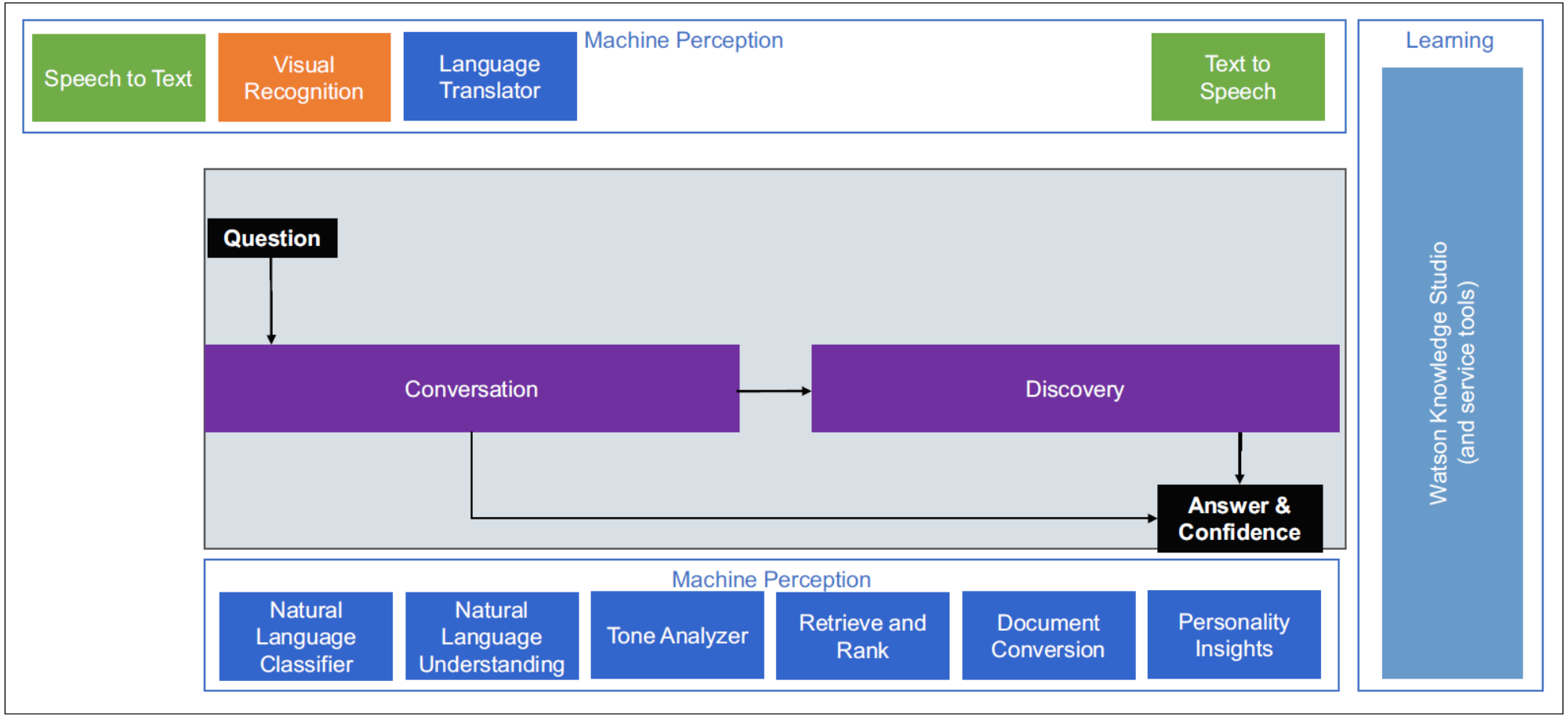
- IBM Watson Conversation Service: Reference Architecture



Source: IBM

Watson Developer Cloud (WDC) Services

Watson Developer Cloud (WDC) Capabilities and DeepQA Pipeline: Summary



Source: IBM

Building Applications with Watson Conversation Service

- More complex capabilities and examples
- Building a Dialog

  https://console.bluemix.net/docs/services/conversation/dialog-build.html#conditions
- Tutorial: Building a Complex Dialog

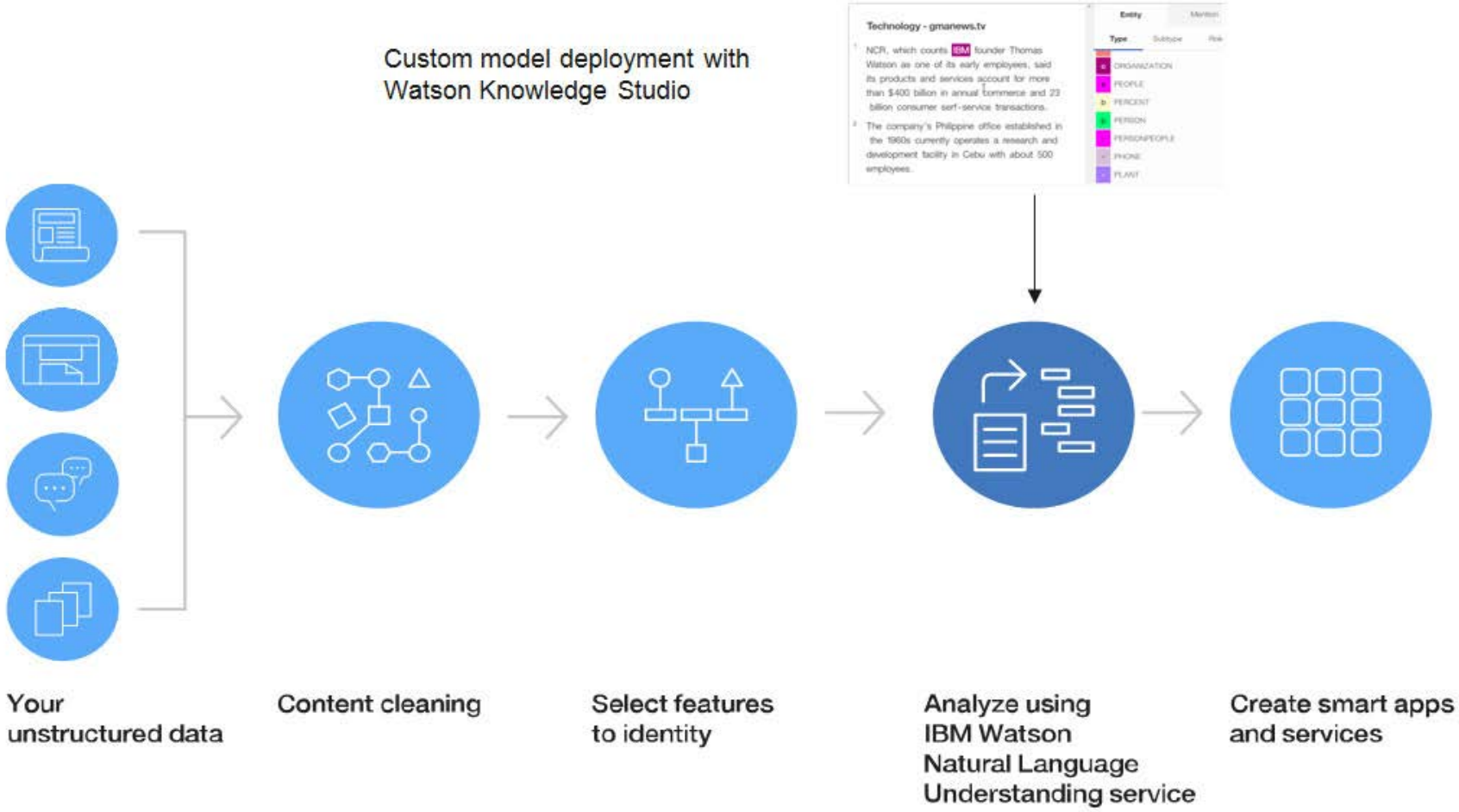
  https://console.bluemix.net/docs/services/conversation/tutorial.html#tutorial

  https://github.com/watson-developer-cloud/conversation-simple
- Clone the source code from GitHub repository

  > git clone https://github.com/watson-developer-cloud/conversation-simple.git
- Import Workspace into Conversation service

Watson Natural Language Understanding (NLU) Service

- Analyzing unstructured data with Watson Natural Language Understanding



Watson Natural Language Understanding (NLU) Service

- Natural Language Processing

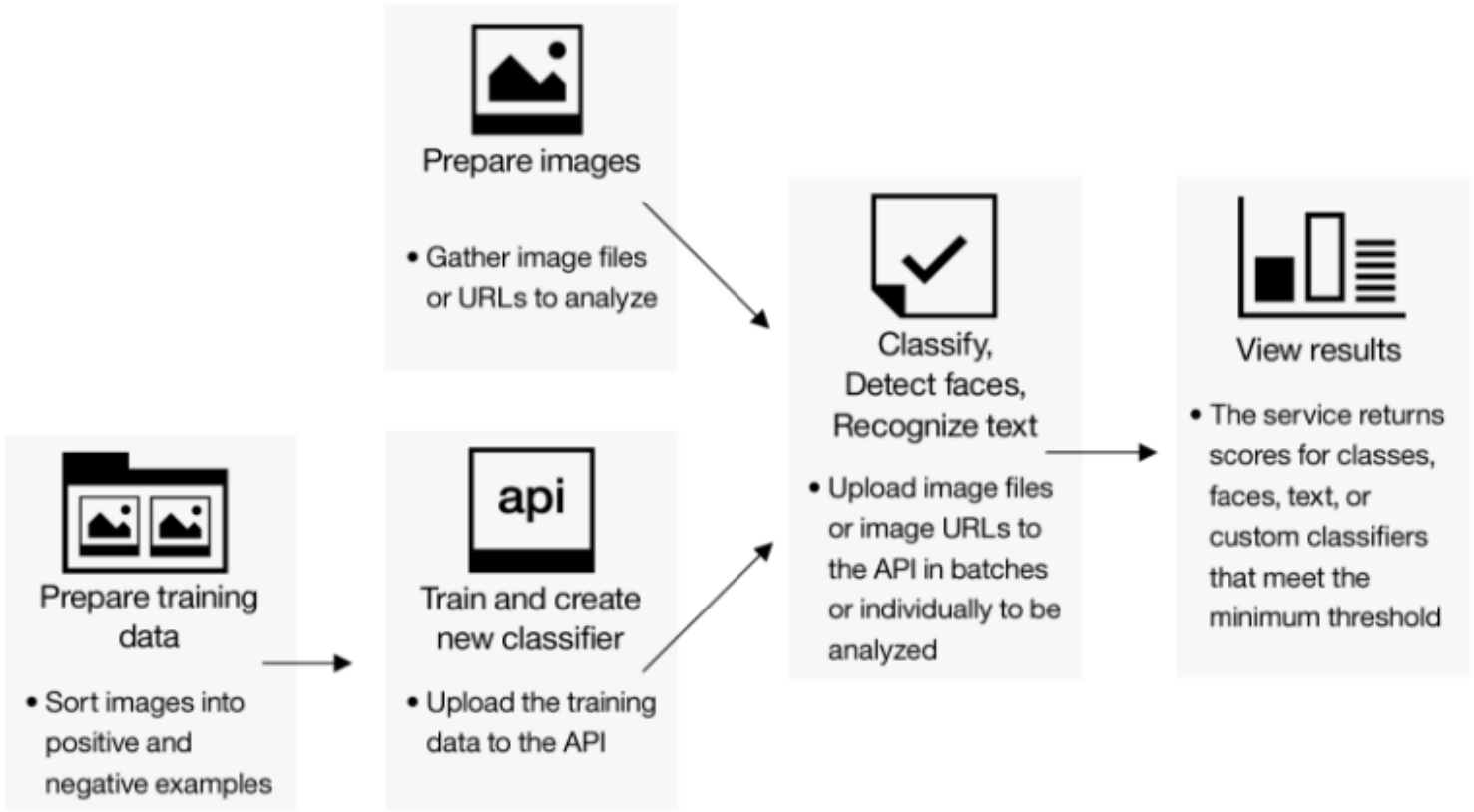
  https://www.ibm.com/watson/services/natural-language-understanding/

- Getting started tutorial

  https://console.bluemix.net/docs/services/natural-language-understanding/getting-started.html

Watson Visual Recognition Service

- Using Watson Visual Recognition Service with a Custom Classifier



Source: IBM

Where Can I Get a Free Academic Access to IBM Bluemix and Watson Developer Cloud (WDC)?

- Using Watson Visual Recognition Service with a Custom Classifier

To get your faculty or student access to IBM Bluemix and Watson Developer Cloud (WDC):

- On The Hub

  https://onthehub.com/ibm/

- UIC Specific Access “On the Hub”

  https://uic.onthehub.com/

Step 1: Create your free 30-day Bluemix account at:

https://bluemix.net/

Note: MUST use your “uic.edu” university email as ID to get access to academic promotion

Step 2: Get your academic promotion access from “On the Hub” (https://uic.onthehub.com/)

Note: MUST use your “uic.edu” university email as ID to get access to academic promotion

renewable access -> 6-month access for students, 12-months for faculty

Step 3: Add the promotion code from “On the Hub” to the PROMO dropdown on https://bluemix.net/

Source: IBM

IBM Watson Natural Language Understanding (NLU)

- Using Watson Visual Recognition Service with a Custom Classifier

Natural Language Processing

https://www.ibm.com/watson/services/natural-language-understanding/

Getting started tutorial

https://console.bluemix.net/docs/services/natural-language-understanding/getting-started.html

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU

Features supported by each language

a. You can build Watson Knowledge Studio custom models for entities and relations in English, French, German, Italian, Portuguese, and Spanish. You can use some of these languages in Natural Language Understanding or you can customize the models.

b. These languages are supported only through custom models in IBM Watson Knowledge Studio.

c. These languages are supported in the public service, but not in Bluemix Dedicated.

	Sentiment	Semantic roles	Relations[a]	Metadata	Keywords	Entities[a]	Emotion	Concepts	Categories
Arabic	X		X	X					X[c]
English	X	X	X	X	X	X	X	X	X
French	X		X[b]	X	X	X			X[c]
German	X		X[b]	X	X	X			
Italian	X		X[b]	X	X	X			X[c]
Japanese			X						
Portuguese	X		X[b]	X	X	X			X[c]
Russian	X			X	X	X			
Spanish	X	X	X	X	X	X		X	X[c]
Swedish				X	X	X			

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Concepts

The NLU Concepts feature identifies high-level concepts that might not be directly referenced in the input text. Concept-related API functions understand how concepts relate. Concepts that are detected typically have an associated link to a *DBpedia* resource. See the following input and response examples.

Input

Text:

Machine learning is the science of how computers make sense of data using algorithms and analytic models.

Response

Concept Tags:

- Computer
- Machine learning
- Artificial intelligence
- Computer science
- Alan Turing
- Scientific method
- Psychology
- Learning

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Emotion

The NLU Emotion feature detects anger, disgust, fear, joy, and sadness implied in text. It can analyze the overall emotional tone of the content or it can analyze emotion conveyed by specific target phrases. You can also enable emotion analysis for entities and keywords that are automatically detected by the service. See the following input and response examples.

Input

A document that includes customer reviews on a new smart device just released to the market.

Response

Emotion keys and score values (0.0 - 1.0), such as these:

- Anger score: 0.639028
- Disgust score: 0.009711
- Fear score: 0.037295
- Joy score: 0.00902
- Sadness score: 0.002552.

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Entities

The NLU Entities feature helps you Identify people, cities, organizations, and many other types of entities in your text. It returns items such as persons, places, and organizations that are present in the input text. Entity extraction adds semantic knowledge to content to help understand the subject and context of the text that is being analyzed. See the following input and response examples.

Input

Text:

IBM is an American multinational technology company headquartered in Armonk, New York, United States, with operations in over 170 countries.

Response

Entities:

- IBM: Company
- Armonk: Location
- New York: Location
- United States: Location

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Keywords

The NLU Keywords feature identifies the important keywords in your content. Important topics in your content that are typically used when indexing data, generating tag clouds, or when searching are identified. The service automatically identifies supported languages in your input content, and then identifies and ranks keywords in that content. The supported languages are: English, French, German, Italian, Portuguese, Russian, Spanish, Swedish.

See the following input and response examples.

Input

A document about the American Civil War:

http://www.historynet.com/civil-war

Response

- Civil war
- Union
- Battle
- Confederate

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Relations

The NLU Relations feature identifies subject, action, and object relations within sentences in the input content. After parsing sentences into subject, action, and object form, the Relations feature can use this information for subsequent processing by other Natural Language Understanding features such as entities, keywords, and so on.

Relation information can be used to automatically identify buying signals, key events, and other important actions. See the following input and response examples.

Input

Text: Bob Dylan won the Nobel Prize in Literature in 2016. Bob Dylan was born in Duluth, Minnesota.

Response

- "affectedBy" relation between “Bob Dylan” and “won”
- "timeOf" relation between “2016” and “won”
- "awardedTo" relation between "Nobel Prize" and "Bob Dylan"
- "bornAt" relation between "Bob Dylan" and "Duluth"
- "locatedAt" relation between "Duluth" and "Minnesota"

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Sentiment

The NLU Sentiment feature identifies attitude, opinions, or feelings in the content that is being analyzed. You can use this feature to analyze the sentiment toward specific target phrases or simply analyze the sentiment toward the document as a whole. You can also get sentiment information for detected entities and keywords by enabling the sentiment option for those features. The supported languages are Arabic, English, French, German, Italian, Portuguese, Russian, Spanish. See the following input and response examples.

Input

Text:

I'm very upset about the quality of this product.

Response

Negative sentiment (score: -0.890748)

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Categories

The NLU Categories feature categorizes input text, HTML, or web-based content into a hierarchical taxonomy using a five-level classification hierarchy. The top three categories are returned. See the following input and response examples.

Input

Text:

Machine learning is the science of how computers make sense of data using algorithms and analytic models.

Response

These are the responses:

- /science/computer science/artificial intelligence; score: 0.398614
- /science/; score: 0.386026
- /science/mathematics/geometry; score: 0.229613

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Language Detection

Basic language detection is included in every request with the Natural Language Understanding service; it is *not* a separate feature. It detects the natural language in which input text, HTML, or web-based content is written. Language identification functions can identify English, German, French, Italian, Portuguese, Russian, Spanish, and Swedish. These functions enable applications to categorize or filter content based on the language in which it was written. See the following input and response examples.

Input

Input is from a web page or text, such as the following page, in a supported language and any Natural Language Understanding feature, for example, Concepts:

https://www.ibm.com/ar-es/

Source: IBM

IBM Watson Natural Language Understanding (NLU)

NLU Language Detection

Response

Here is the response:

{
"retrieved_url": "https://www.ibm.com/ar-es/",
"concepts": [
{
"text": "IBM",
"relevance": 0.965628,
"dbpedia_resource": "http://es.dbpedia.org/resource/IBM"
}
],
"**language": "es"**

Use case example: Document language detection

Automatically identify the natural language that documents are written in and cluster documents based on their language.

Source: IBM

Appendix

- Appendix