

The Azure AI Platform

CHECKERS
CHESS
POKER
FIGHTER COMBAT
GUERRILLA ENGAGEMENT
DESERT WARFARE
AIR-TO-GROUND ACTIONS
THEATERWIDE TACTICAL WARFARE
THEATERWIDE BIOTOXIC AND CHEMICAL WARFARE
GLOBAL THERMONUCLEAR WAR



Artificial Intelligence

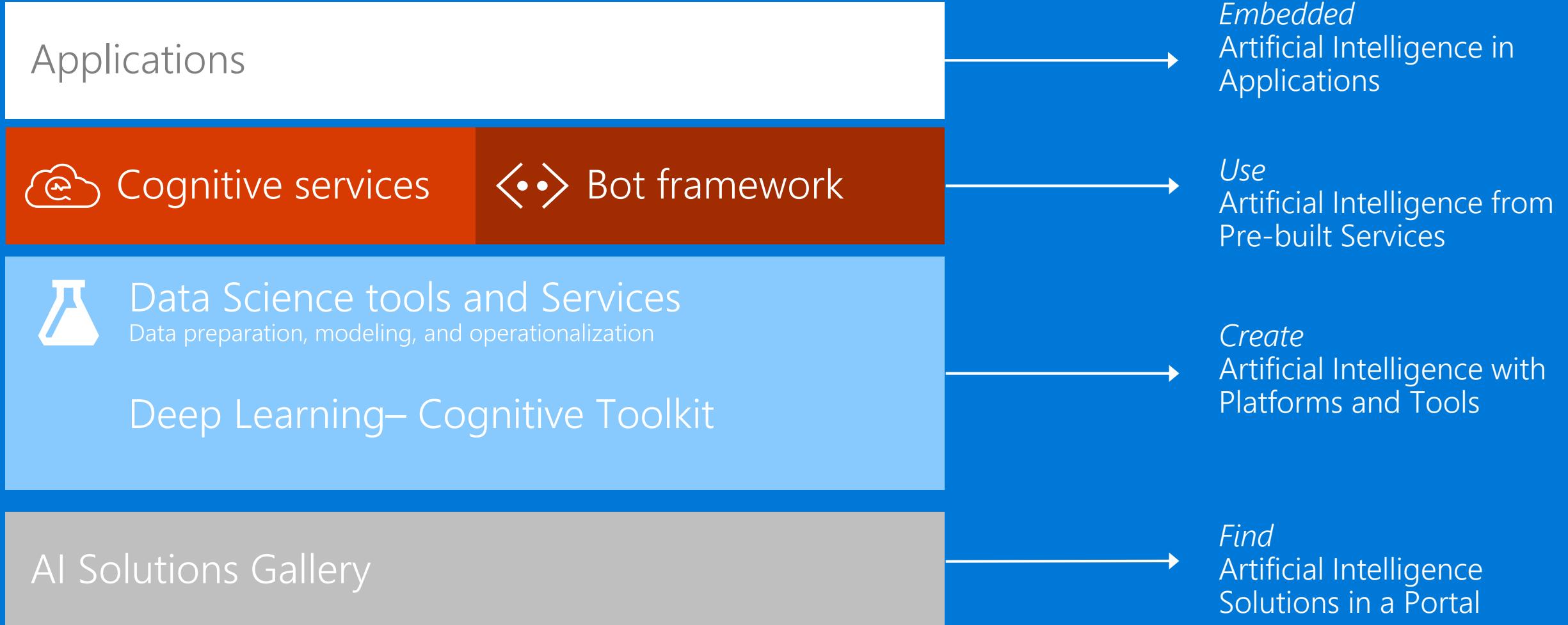


*Computing which imitates human
perception and thought*

Breakthroughs Enabling AI



The Microsoft AI Landscape



The Microsoft AI platform: Azure+AI

AI SERVICES

TRAINED SERVICES



Cognitive Services

CONVERSATIONAL AI



Bot Framework

CUSTOM SERVICES



Azure Machine Learning

AI TOOLS



Azure
ML Studio



Azure
ML Workbench



VS Code Tools
for AI



Azure
Notebooks

AI INFRASTRUCTURE

AI ON DATA



Data Lake



SQL Server



Cosmos DB



Spark



DSVM



Batch AI



ACS

DEEP LEARNING FRAMEWORKS



Cognitive
Toolkit



TensorFlow



Caffe 2

Microsoft AI



Agent



Applications



Services



Infrastructure
and Tools

Solutions Gallery



Embedded AI - Agent

Cortana

1,000+ skills and knowledge, 133 million users |
12 billion questions



Embedded AI - Applications

Office 365

Skype

Dynamics 365

Teams

SwiftKey

Calendar.help

Pix

Customer Service and Support



Services

Cognitive Services

Cognitive Services Customizations

Bot Framework

Microsoft Cognitive Services

Give your apps a human side



Vision

From faces to feelings, allow your apps to understand images and video



Speech

Hear and speak to your users by filtering noise, identifying speakers, and understanding intent



Language

Process text and learn how to recognize what users want



Knowledge

Tap into rich knowledge amassed from the web, academia, or your own data



Search

Access billions of web pages, images, videos, and news with the power of Bing APIs

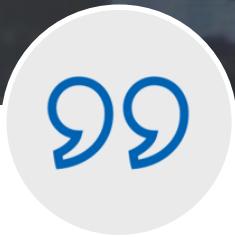


Labs

An early look at emerging Cognitive Services technologies: discover, try and give feedback on new technologies before general availability

Microsoft Cognitive Services

Give your apps a human side



Vision

Computer Vision
Content Moderator
Emotion
Face
Video Indexer

Speech

Bing Speech
Speaker Recognition

Language

Bing Spell Check
Linguistic Analysis
Text Analytics
Translator Text & Speech
Web Language Model

Knowledge

Academic Knowledge
Entity Linking
Knowledge Exploration
Recommendations
QnA Maker

Search

Bing Autosuggest
Bing Image Search
Bing News Search
Bing Video Search
Bing Web Search
Bing Entity Search

Labs

Project Prague (gesture)
Project Cuzco (events)
Project Johannesburg (routing)
Project Nanjing (isochrones)
Project Abu Dhabi (distance matrix)
Project Wollongong (location)

CUSTOMIZATION

Custom Vision Service

Custom Speech Service

Language Understanding

Custom Decision Service

Bing Custom Search

Why Cognitive Services?

Easy

Roll your own with REST APIs

Simple to add: just a few lines of code required



Flexible

Integrate into the language and platform of your choice
Breadth of offerings helps you find the right API for your app
Bring your own data for your custom experience



Tested

Built by experts in their field from Microsoft Research, Bing, and Azure Machine Learning
Quality documentation, sample code, and community support



A variety of real-world applications

Vision	Speech	Language	Knowledge	Search
 What is in the image?	 Give me directions to the nearest local branch.	 Play today's customer call recording.	 Top publications in customer lifecycle trends?	 Search for 'fraud prevention'
Computer Vision	Bing Speech	Language Understanding	Knowledge Exploration	Bing News Search
	 Convert spoken audio to text Convert text to spoken audio Extract intent of user	Natural Language Processing Intent: PlayCall Content: Customer# DateTime.date: today  Now Playing 11/29/2016 Customer Call	Here are the top results: Customer Relationship Management – 5 Key Trends for 2014 CRM Oct 28, 2015 – Here are FIVE key trends in 2014 that would help marketers in rolling ... Of late, marketers are looking at customer lifecycle management (CLM) Predictive Customer Lifecycle Management (CLM) The purpose of Customer Life-cycle Management (CLM) is to maximize both customer retention and Predictive trend analysis provides business visibility. Trends 2016: The Future of Customer Service Jan 5, 2016 – The top 10 customer service trends for 2016 that North American Consumer Language Around Customer Lifecycles in the Banking Industry View PDF	 Information Communications Media Market News It also investigates the top three expected Fraud Detection and Prevention programs, in terms of demand in key markets...  The Big Question: In-House or Outsourced Fraud Protection? First, let's point out that there is not one absolute answer—there are "pros" and "cons" to each. Those who favor in-house...  How to Protect Your Business from Online Fraud this Holiday Season Michael heads fraud prevention tool. Online and mobile shopping are expected to continue growing apace...



VISION

From faces to feelings, allow your apps to understand images and video

Computer Vision | Content Moderator | Emotion | Face | Video Indexer | Custom Vision Service

Computer Vision API

Analyze an image

Understand content within an image

OCR

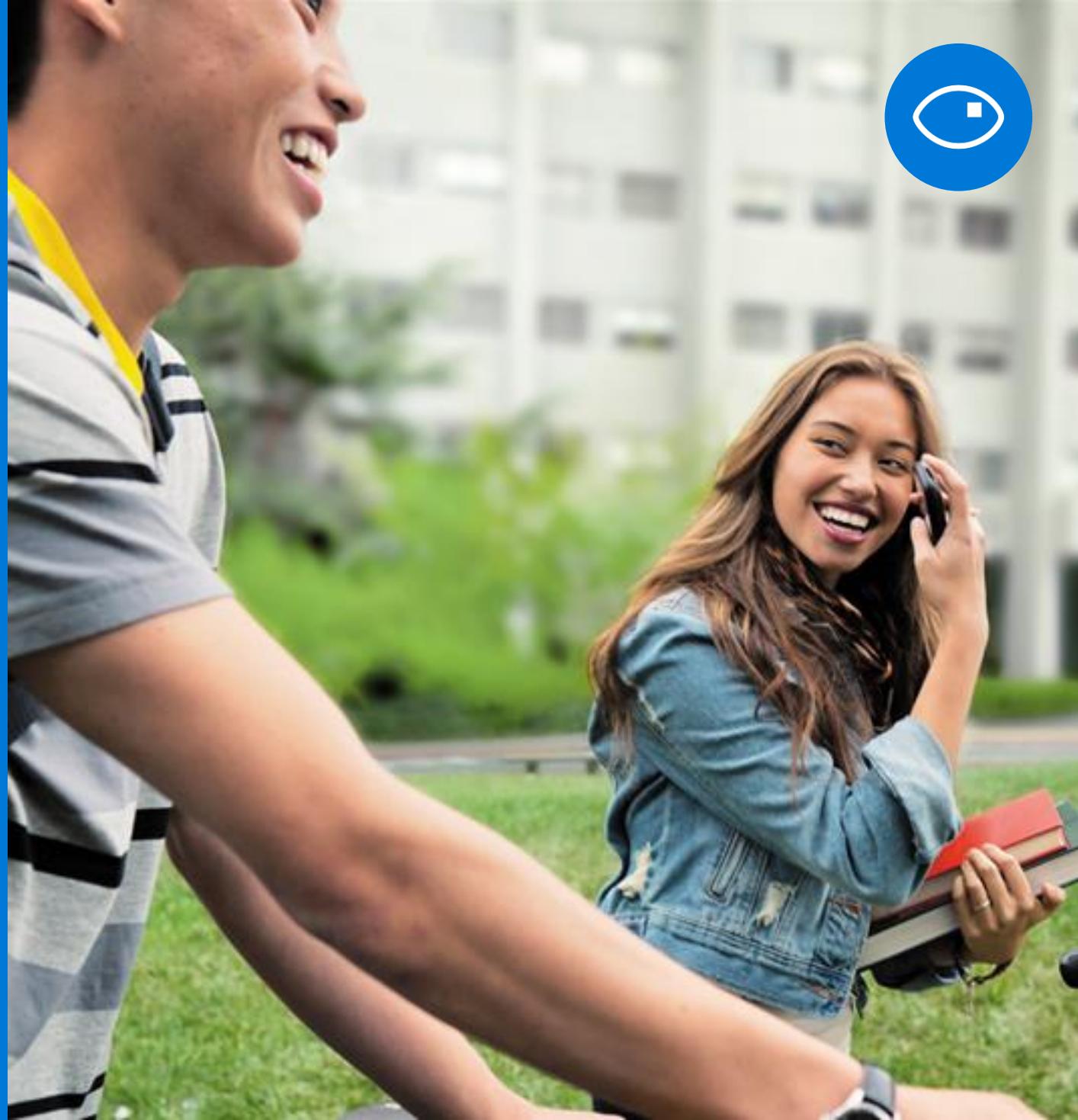
Detect and recognize words within an image

Generate thumbnail

Scale and crop images, while retaining key content

Recognize celebrities

Thanks to domain specific models, ability to recognize 200K celebrities from business, politics, sports and entertainment around the world



Analyze image



Type of image

Clip Art Type	0 Non-clipart
Line Drawing Type	0 Non-Line Drawing
Black & White Image	False

Content of image

Categories	[{"name": "people_swimming", "score": 0.099609375}]
Adult Content	False
Adult Score	0.18533889949321747
Faces	[{"age": 27, "gender": "Male", "faceRectangle": {"left": 472, "top": 258, "width": 199, "height": 199}}]

Image colors

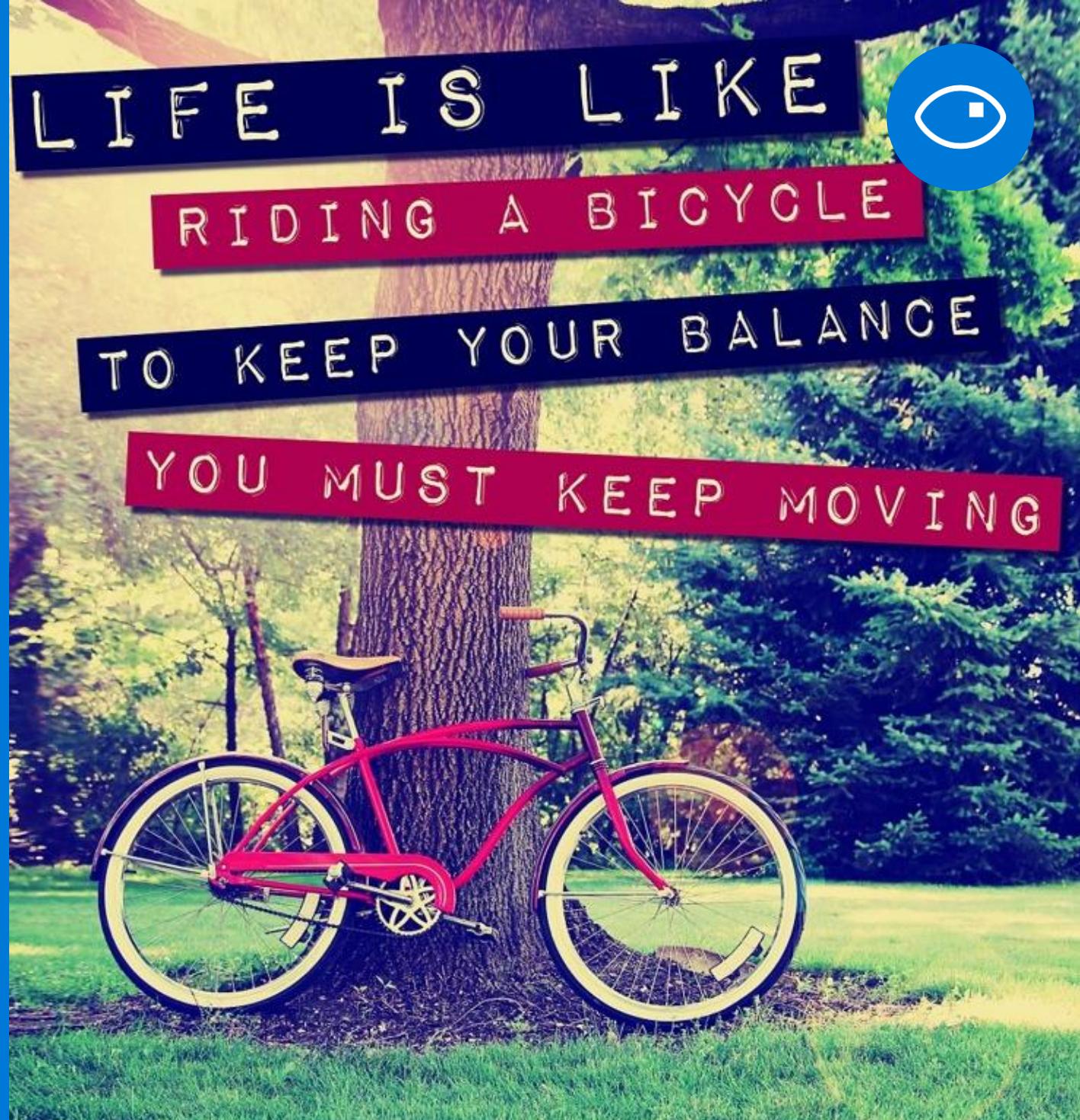
Dominant Color Background	White
Dominant Color Foreground	Grey
Dominant Colors	White
Accent Color	



OCR

JSON:

```
{  
  "language": "en",  
  "orientation": "Up",  
  "regions": [  
    {  
      "boundingBox": "41,77,918,440",  
      "lines": [  
        {  
          "boundingBox": "41,77,723,89",  
          "words": [  
            {  
              "boundingBox": "41,102,225,64",  
              "text": "LIFE"  
            },  
            {  
              "boundingBox": "356,89,94,62",  
              "text": "IS"  
            },  
            {  
              "boundingBox": "539,77,225,64",  
              "text": "LIKE"  
            }  
          ]  
        ]  
      ]  
    }  
  ]  
}
```



Emotion API

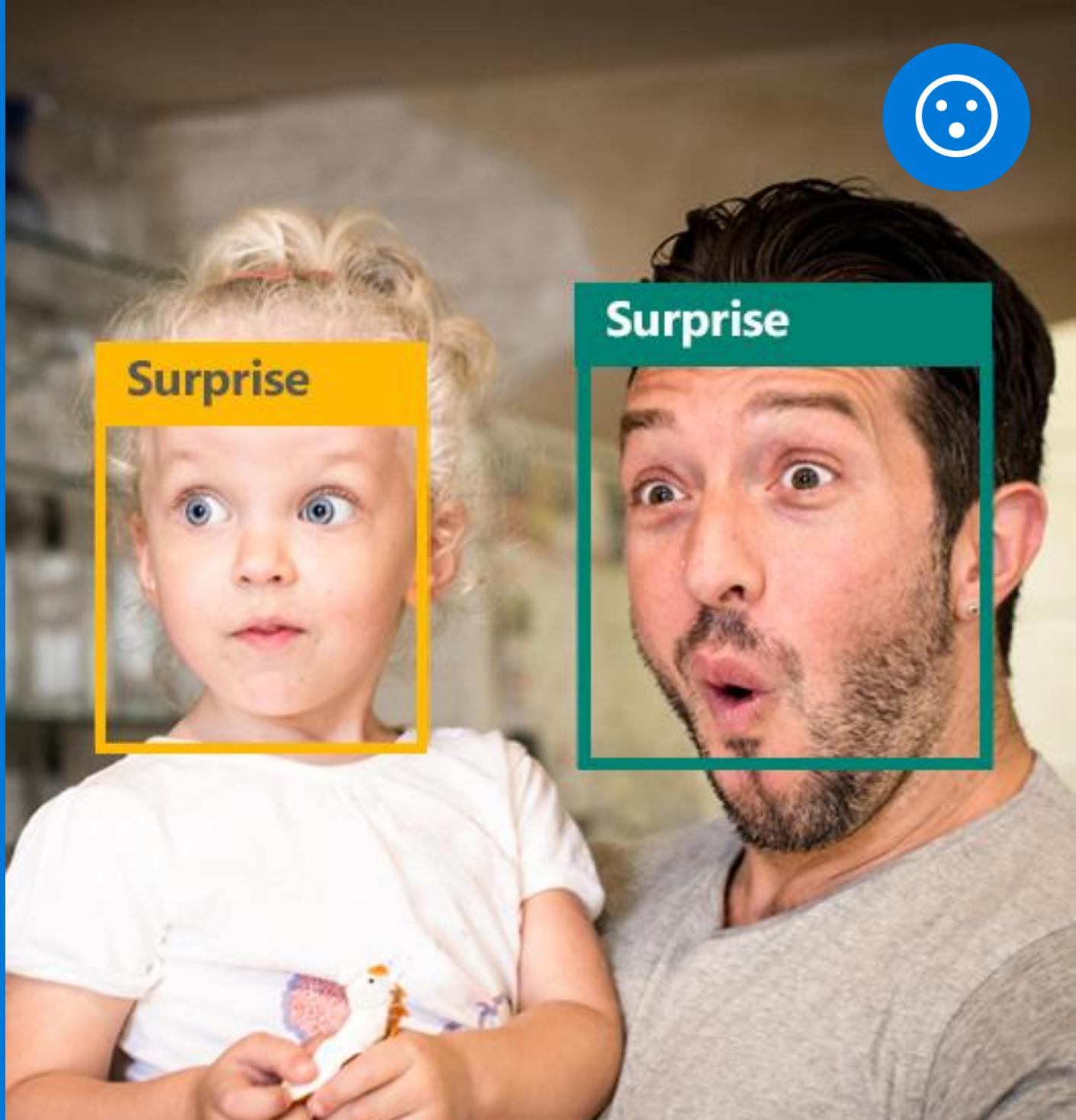


Face detection

```
"faceRectangle": {"width": 193,  
                 "height": 193,  
                 "left": 326,  
                 "top": 204} ...
```

Emotion scores

```
"scores": { "anger": 5.182241e-8,  
            "contempt": 0.0000242813,  
            "disgust": 5.621025e-7,  
            "fear": 0.00115027453,  
            "happiness": 1.06114619e-8,  
            "neutral": 0.003540177,  
            "sadness": 9.30888746e-7,  
            "surprise": 0.9952837}
```



Face API



Detection

```
"faceRectangle": {"width": 193, "height": 193,  
"left": 326, "top": 204}  
...  
...
```

Feature attributes

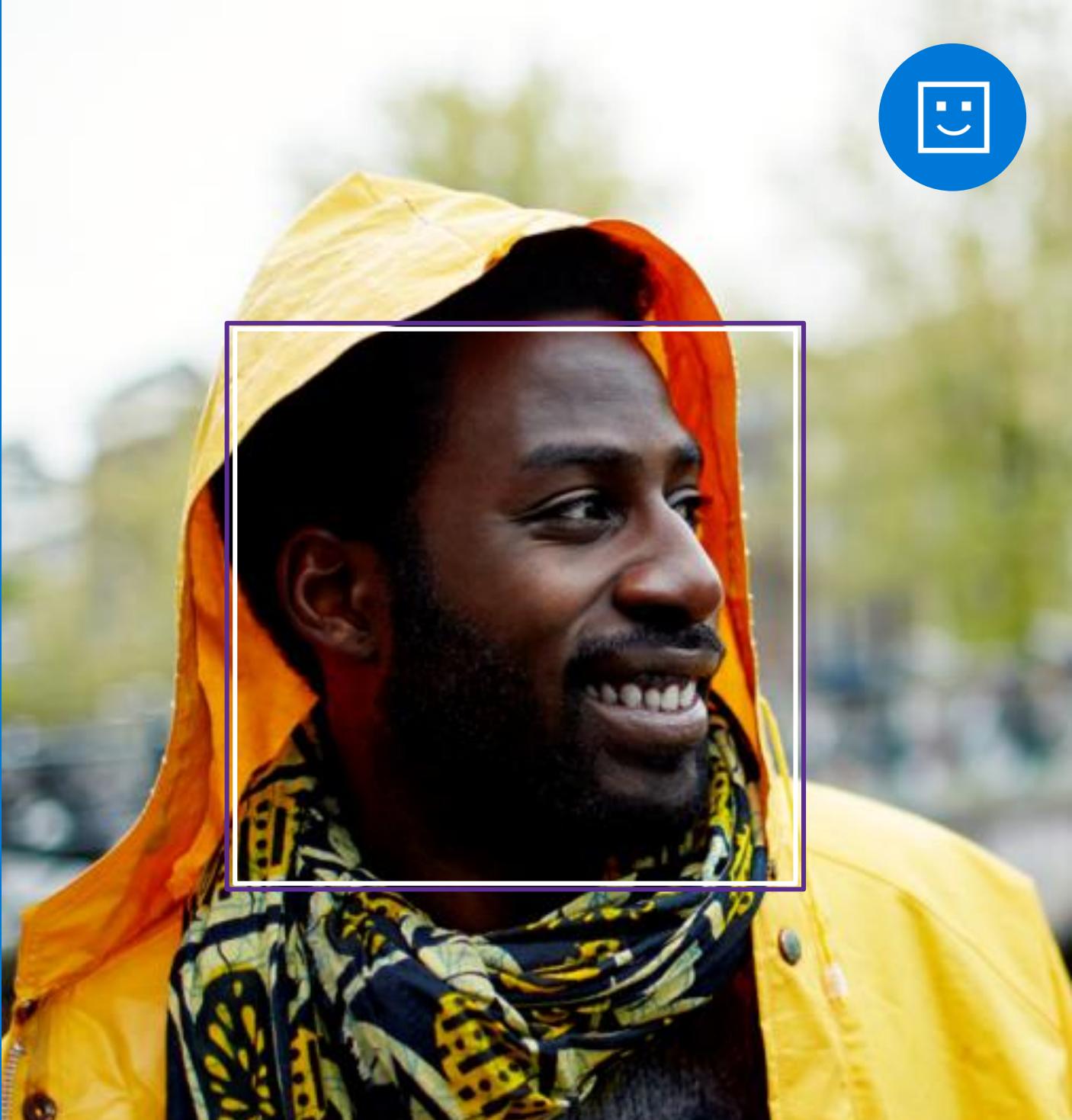
```
"attributes": { "age": 42, "gender": "male",  
"headPose": { "roll": "8.2", "yaw": "-37.8",  
"pitch": "0.0" }}
```

Grouping



Identification

Jasper Williams



Custom Vision Service

A customizable web service that learns to recognize specific content in imagery

Upload images

Upload your own labeled images, or use Custom Vision Service to quickly tag any unlabeled images

Train

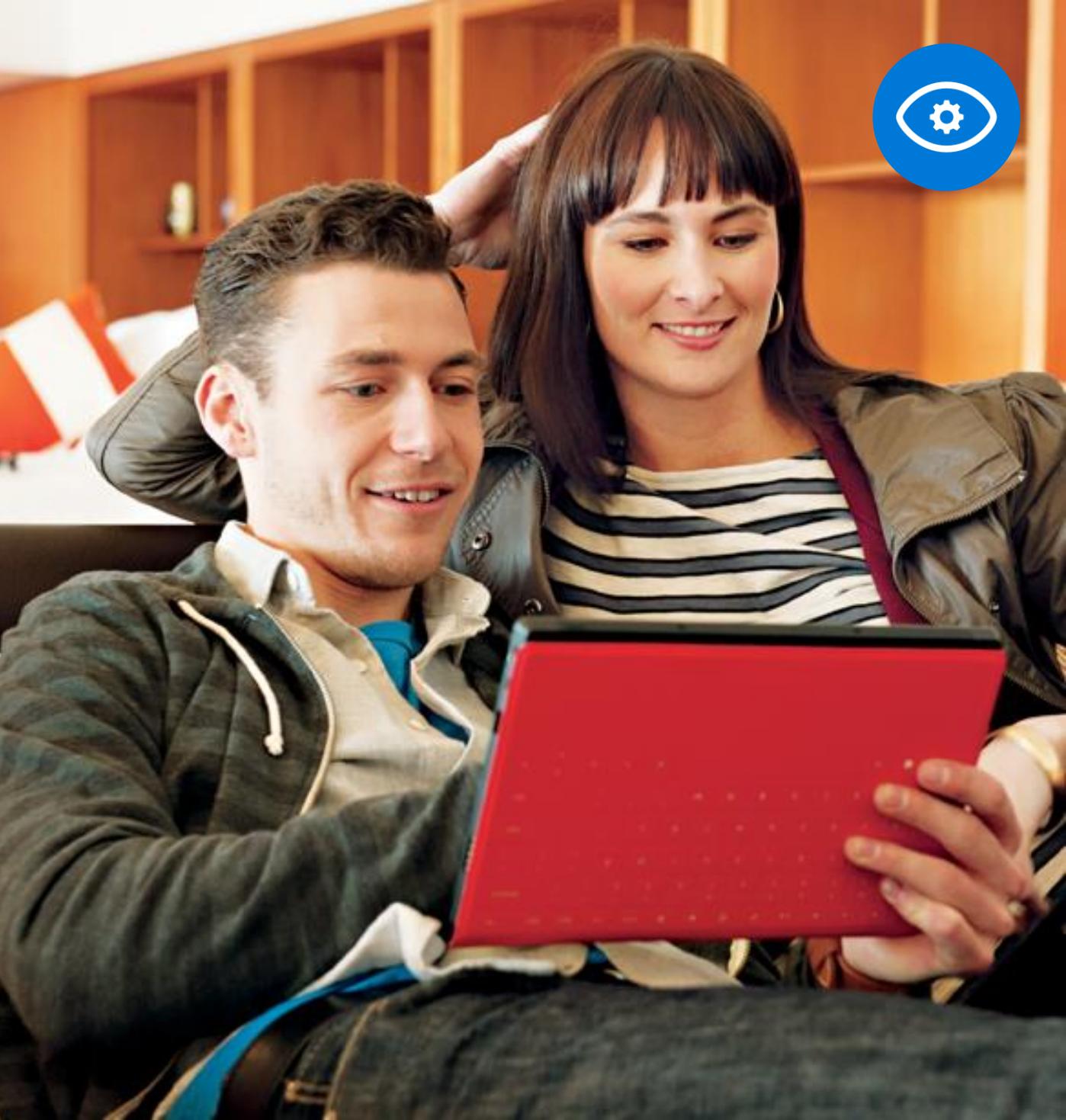
Use your labeled images to teach Custom Vision Service the concepts you want it to learn

Evaluate

Use simple REST API calls to quickly tag images with your new custom computer vision model

Active learning

Images evaluated through your custom vision model become part of a feedback loop you can use to keep improving your classifier



Demo!

Custom Vision Service

Custom Vision: SheepVsGoats

TRAINING IMAGES

PERFORMANCE

PREDICTION

Refine

Tags

All (31)

Goat (16)

Sheep (15)

Untagged (0)

Select all

?

The screenshot shows the Microsoft Custom Vision Service interface for a project named "SheepVsGoats". The main area displays a grid of 15 images used for training the model to distinguish between sheep and goats. The images are arranged in three rows of five. The first row contains a goat, a goat, and a sheep. The second row contains a sheep, a goat, and a goat. The third row contains a sheep, a close-up of a sheep's face, a goat, and a sheep. On the left side, there is a sidebar with a "Tags" section containing checkboxes for "All (31)", "Goat (16)", "Sheep (15)", and "Untagged (0)". Above the sidebar, there are tabs for "Workspace" and "Iteration History". At the top, the URL https://customvision.ai/projects/acc4326a-ab0 is visible, along with various navigation and settings icons.



SPEECH

Hear and speak to your users by filtering noise, identifying speakers, and understanding intent

Custom Recognition | Speaker Recognition | Speech

Bing Speech API

Voice recognition (speech to text)

Converts spoken audio to text

Voice output (text to speech)

Synthesize audio from text

Speech intent recognition

Convert spoken audio to intent



Custom Speech Service

Customize both language and acoustic models

Tailor speech recognition to your app and environment



Custom Speech Service

Create custom language models for the vocabulary of the application

Adapt acoustic models to better match the expected environment of the application's users

Deploy to a custom endpoint and access from any device



Record audio



Transcribe



Adapt



Deploy

Speaker Recognition API



Speaker verification

Check if two voices are the same

Speaker identification

Identify who is speaking



Speaker Recognition API



Enrollment

Create a unique voiceprint for a profile

Recognition

After enrolling one or more voices, identify who is speaking from an audio clip

Verification

Confirm if a voice belongs to a previously enrolled profile



99

LANGUAGE

Process text and learn how to recognize what users want

Bing Spell Check | Language Understanding |
Linguistic Analysis | Text Analytics | Web Language Model |
Translator Text and Speech

Bing spell check API



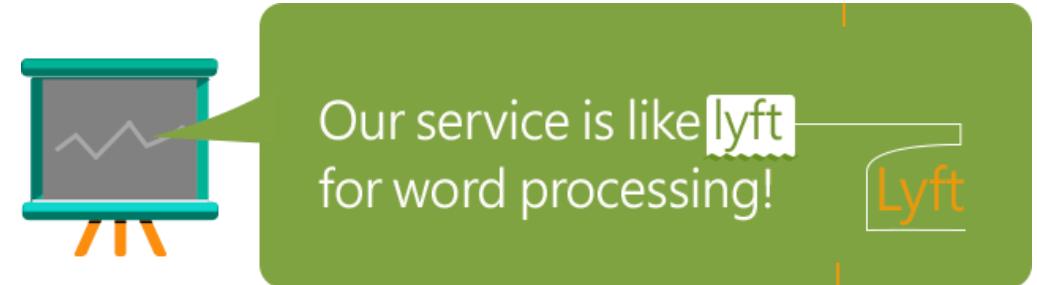
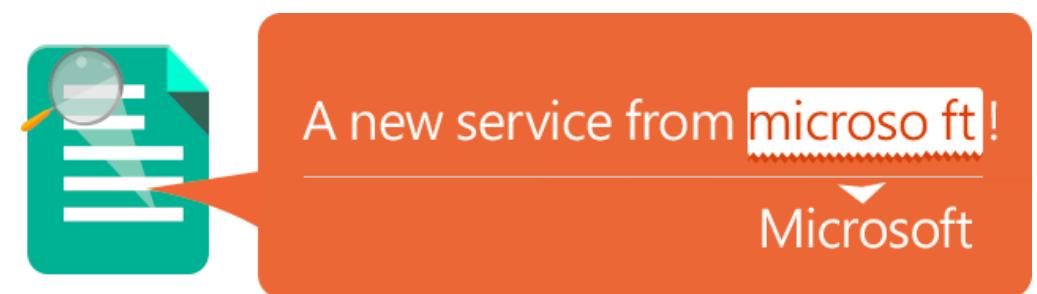
Check a single word or a whole sentence

"Our engineers developed this **four** you!"

Corrected Text: "four" → "for"

Identify errors & get suggestions

```
"spellingErrors": [  
  {  
    "offset": 5,  
    "token": "gona",  
    "type": "UnknownToken",  
    "suggestions": [  
      { "token": "gonna" }  
    ] }]
```



Language Understanding Intelligent Service

**Understand what
your users are saying**

Use pre-built Bing and Cortana
models or create your own

{ }





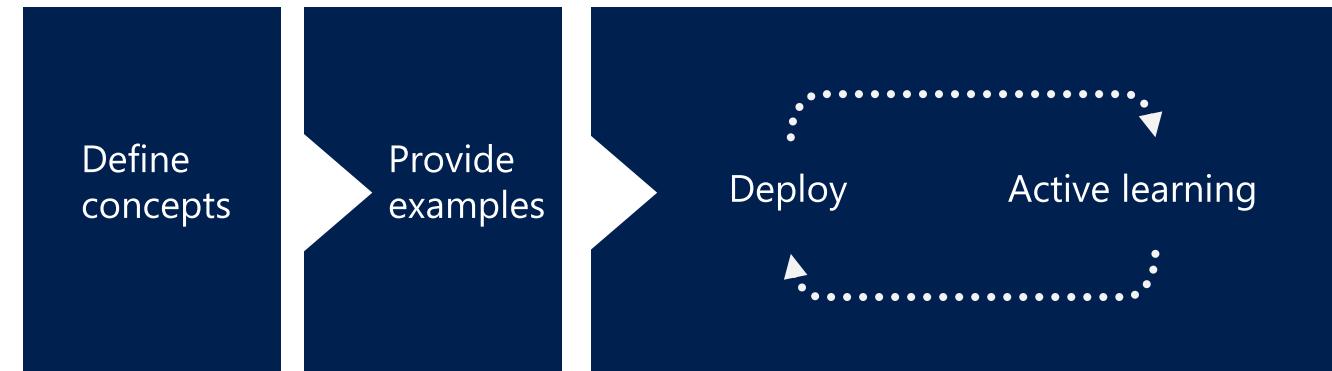
Language Understanding Intelligent Service

Reduce labeling effort
with interactive featuring

Use visualizations to gauge
performance and improvements

Leverage speech recognition
with seamless integration

Deploy using just a few
examples with active learning



Language understanding models

"News about
flight delays"



```
{  
  "entities": [  
    {  
      "entity": "flight_delays",  
      "type": "Topic"  
    }  
,  
  "intents": [  
    {  
      "intent": "FindNews",  
      "score": 0.99853384  
    },  
    {  
      "intent": "None",  
      "score": 0.07289317  
    },  
    {  
      "intent": "ReadNews",  
      "score": 0.0167122427  
    },  
    {  
      "intent": "ShareNews",  
      "score": 1.0919299E-06  
    }  
  ]  
}
```

A large blue circle in the top right corner contains a white curly brace symbol ({}).

Text analytics



Sentiment analysis

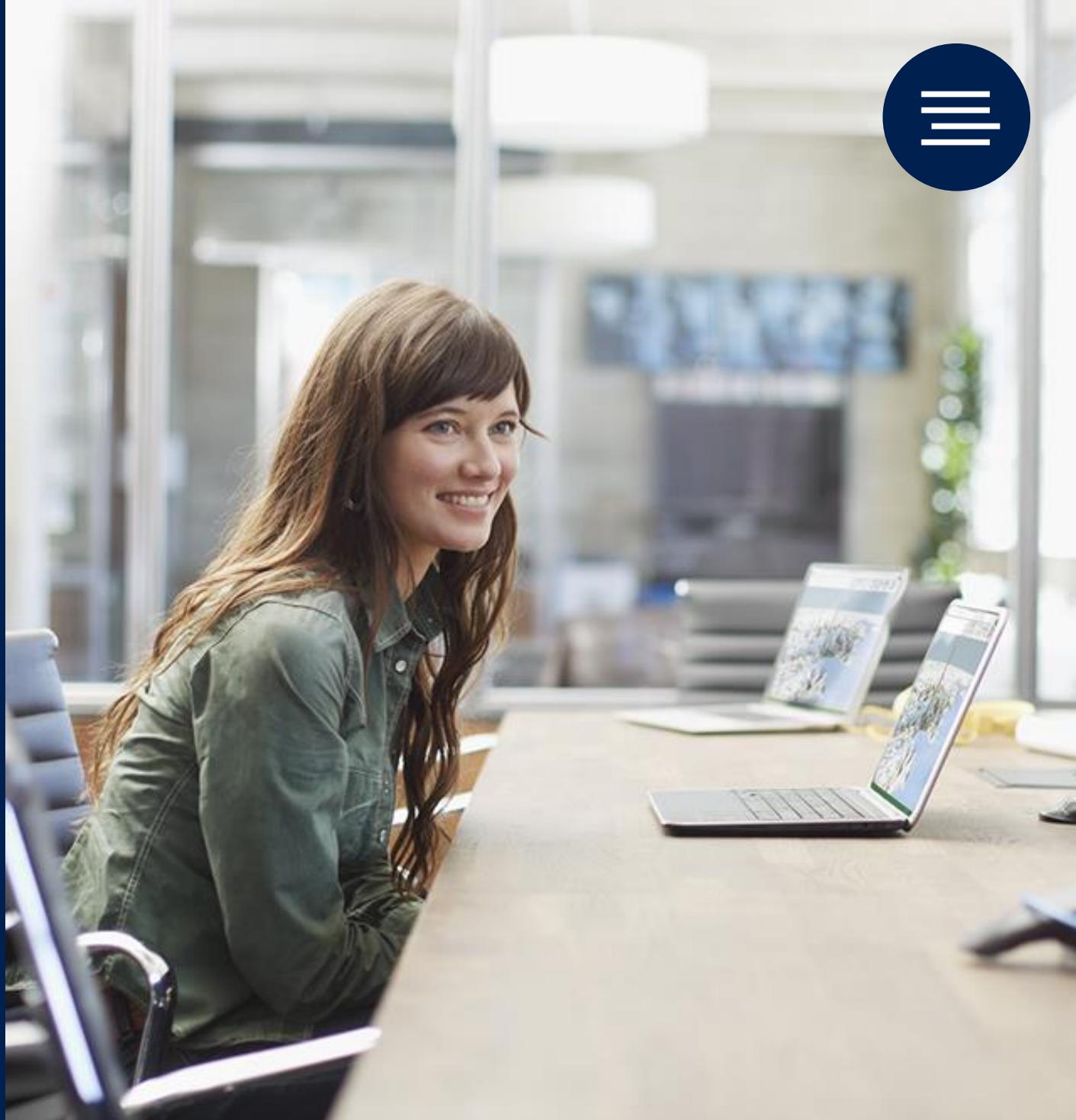
Understand if a record has positive or negative sentiment

Key phrase extraction

Extract key phrases from a piece of text, and retrieve topics

Language detection

Identify the language, 120 supported languages



Microsoft Translator

Translator Text API

Automatically detect language
and easily power translation to and
from 60 supported text languages

Translator Speech API

Easily translate real-time speech
conversations in 9 support languages





KNOWLEDGE

Tap into rich knowledge amassed from the web, academia, or your own data

Academic Knowledge | Entity Linking |
Knowledge Exploration | Recommendations |
QnA Maker | Custom Decision Service

Academic knowledge

Interpret

Interprets a natural language user query string. Returns annotated interpretations which can enable rich search-box auto-completion experiences that anticipate what the user is typing

Evaluate

Evaluates a query expression and returns academic knowledge entity results

Calchistogram

Calculates a histogram of the distribution of attribute values for the academic entities returned by a query expression, such as the distribution of citations by year for a given author



Entity linking



**Power your app's data links
with named entity recognition
and disambiguation**

A word might be used as a named entity,
a verb, or another word form within a
given sentence

**The Entity Linking Intelligence
Service will recognize and
identify each separate entity
based on the context**



Knowledge exploration

Enable interactive search experiences over structured data via natural language inputs

Attribute histograms

To enable rich visualization and interactive faceted experience

Structured query evaluation

To efficiently retrieve detailed information about matching objects

Query auto-completion

To reduce user effort and help with discovery of rich capabilities

Natural language understanding

To interpret natural language queries into structured query expressions



Recommendations

Increase catalog discovery

Help customers easily discover items that they may be interested in

Personalize your experience

Show suggestions that are targeted to each specific user

Increase the bottom line

Increase your conversion rate by offering the right products at the right time



QnA Maker

Create a FAQ service from existing content

Extract questions and answers

Extract all possible pairs of questions and answers from user provided content – FAQ URLs, documents and editorial content

Test, train and publish

Edit, remove, or add pair before testing and training the knowledge base and publishing your knowledge base as an API endpoint

Integrates with other APIs and solutions

Use QnA Maker with Cognitive Services such as LUIS & create something as elegantly simple as a chat bot that answers FAQs, or as complex as an interactive virtual guide





SEARCH

Access billions of web pages, images, videos, and news with the power of Bing APIs

[Bing Web Search](#) | [Bing Image Search](#) | [Bing News Search](#) |
[Bing Video Search](#) | [Bing Auto Suggest](#) | [Bing Custom Search](#) |
[Bing Entity Search](#)

Demo!

Cognitive Search



Ingest

Enrich

Explore



Data Feed



Cognitive Skills



Search

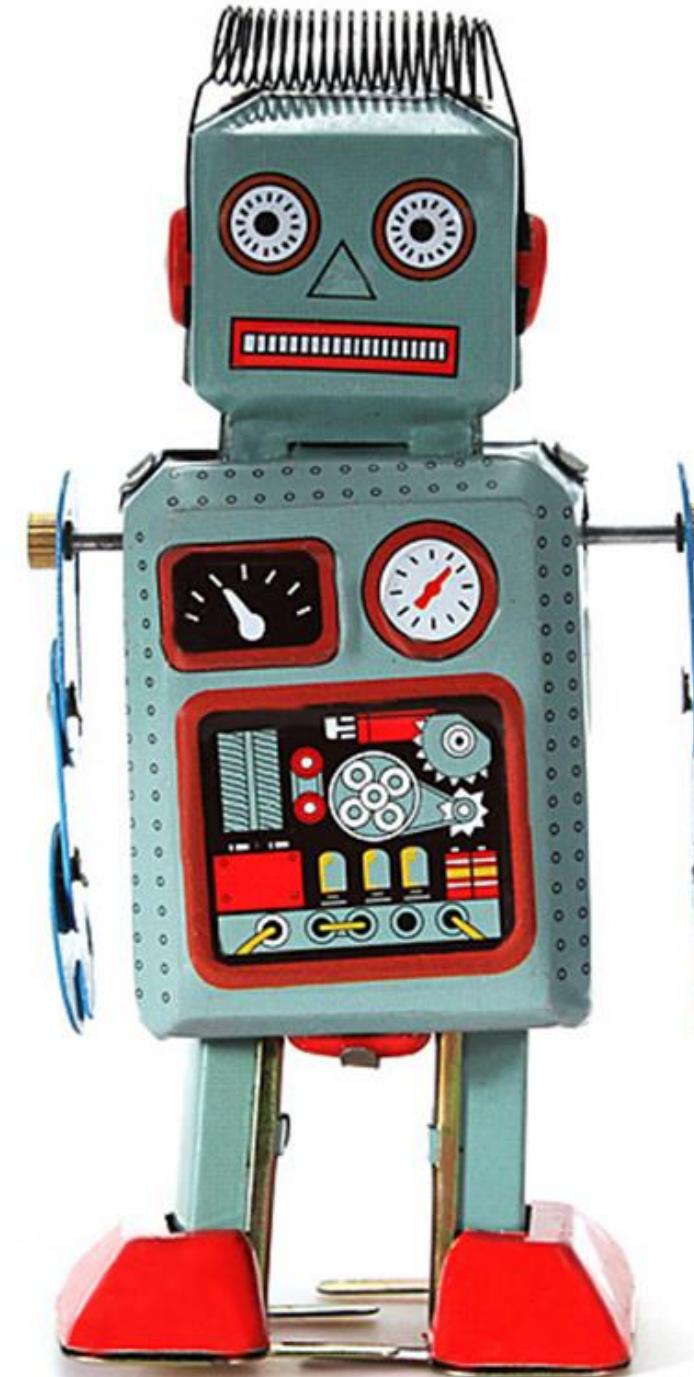
Annotations



Cognitive Search Pattern

Bot Framework

Conversational Everything!



Bot Framework - Engage with your users

A natural language interface across all conversation channels

Insights



Provide information



Perform tasks

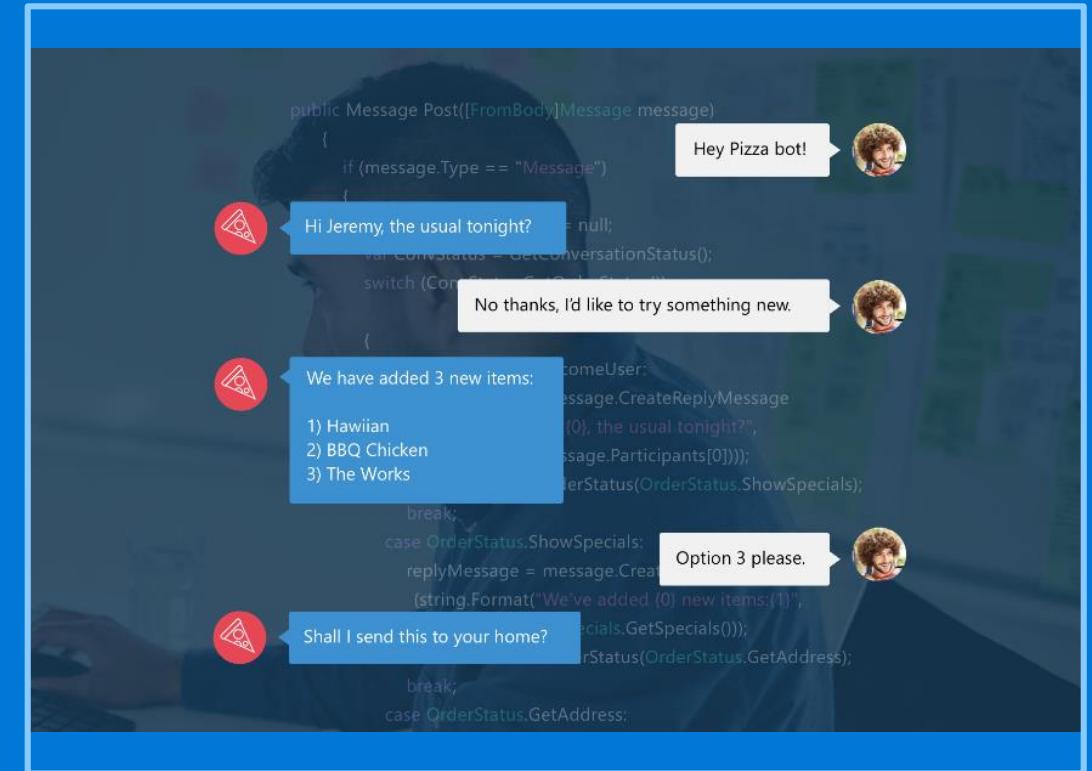


Make recommendations



Capture information

Operationalization



Flight Card Example

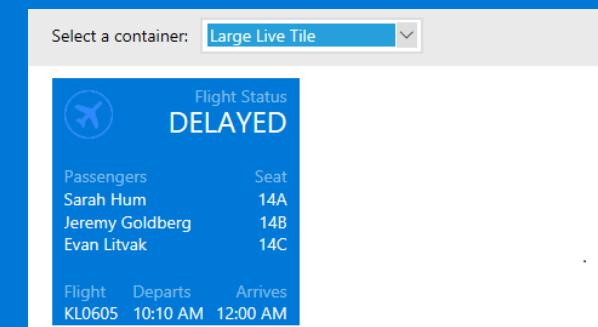
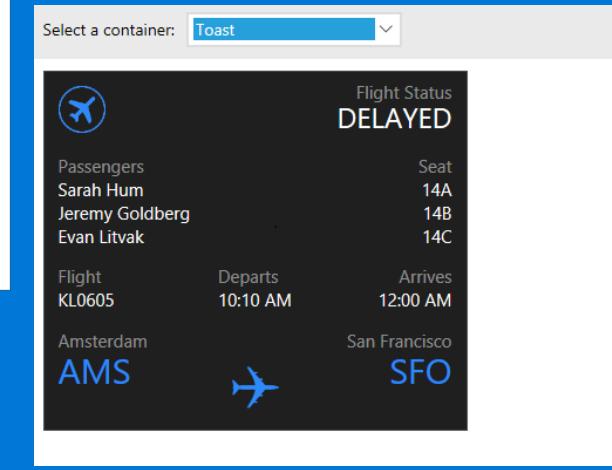
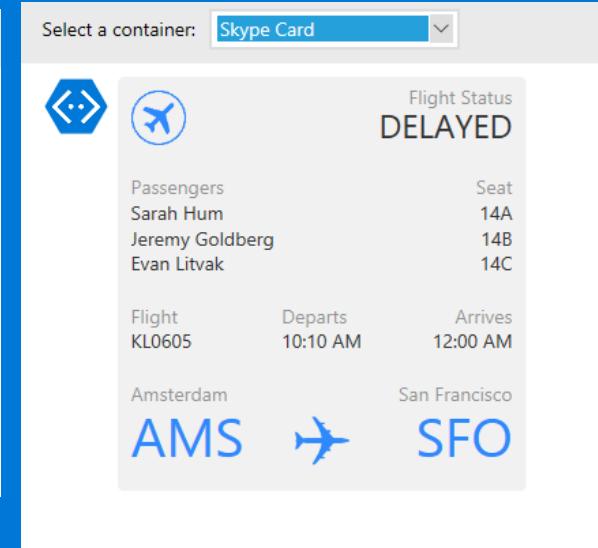
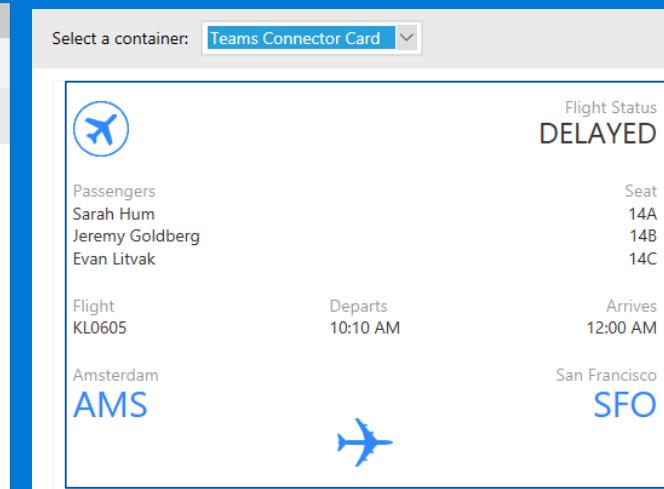
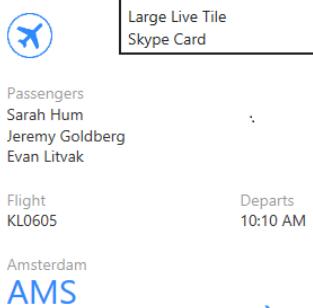
Outlook, Teams, Windows Notification & Tiles, Skype, Cortana, Bot Framework channels & web

Adaptive Card Visualizer X + file:///C:/source/github/AdaptiveCardToolkit/Visualizer/adaptiveCardVisualizer.html

Load sample from file...

```
1 {
2     "@type": "AdaptiveCard",
3     "sections": [
4         {
5             "separator": "bottom",
6             "items": [
7                 {
8                     "@type": "ColumnGroup",
9                     "items": [
10                         {
11                             "size": "auto",
12                             "items": [
13                                 {
14                                     "@type": "Image",
15                                     "size": "small",
16                                     "url": "assets/airplane i
17                                 }
18                             ]
19                         },
20                         {
21                             "size": "stretch",
22                             "items": [
23                                 {
24                                     "@type": "TextBlock",
25                                     "text": "Flight Status",
26                                     "horizontalAlignment": "right",
27                                     "isSubtle": true
28                                 },
29                                 {
30                                     "@type": "TextBlock",
31                                     "text": "DELAYED",
32                                     "horizontalAlignment": "right",
33                                     "textSize": "large",
34                                     "color": "#0072bc"
35                                 }
36                             ]
37                         }
38                     ]
39                 }
40             ]
41         }
42     ]
43 }
```

Select a container:
Outlook Connector Card
Teams Connector Card
Toast
Large Live Tile
Skype Card



Bot Framework Landscape



Bot Builder

Tools and services to build great bots that converse wherever your users are.

- Open source SDK on Github for Node.js, .NET and REST
- From simple built-in prompts and command dialogs to simple to use yet sophisticated 'FormFlow' dialogs
- Support for rich attachments (image, card, video, doc, etc.); support for calling (Skype)
- Online/offline chat Emulator
- Add bot smarts with Cognitive Services for language understanding and more



Developer Portal

Connect your bots to text/sms, Skype, Slack, Facebook Messenger, Office 365 mail and other channels.

- Register, connect, publish and manage your bot through your bot's dashboard
- Automatic card normalization across channels
- Skype channel auto-configured
- Embeddable Web chat control
- Host your bot in your app via the Direct Line API
- Fast, scalable message routing
- Diagnostic tools



Bot Directory

Try, use, and add published bots to the world's top conversation experiences.

- Public directory of bots registered and published with Microsoft Bot Framework
- Users can try your bot from the directory via the Web chat control
- Users can discover and add your bot to the channels on which it is configured when the Directory is made public to end users

QnA Maker

Demo!

QnA Maker PREVIEW

My services Create new service Documentation Feedback

Tea Questions

Download Knowledge Base | Replace Knowledge Base

Publish

Save and retrain

Retrained 3 hours ago

Knowledge Base

Test Settings TEST

Chat

Hi! I'm Tea Questions. Say "hi" if you'd like to chat.

Tea Questions · 35 mins ago

Provide multiple alternative phrasings to the question, to broaden the knowledge base.

The screenshot shows the Microsoft QnA Maker web interface. At the top, there's a navigation bar with icons for file, back, forward, refresh, and home, followed by the title 'QnA Maker'. Below the title is a Microsoft logo and a user profile for 'David'. The main content area has a blue header with the title 'Tea Questions' and a 'PREVIEW' badge. It includes links for 'Download Knowledge Base' and 'Replace Knowledge Base', and a large blue 'Publish' button. To the right of the publish button is a green 'Save and retrain' button with a circular arrow icon, and the text 'Retrained 3 hours ago'. Below this is a section titled 'Knowledge Base' with tabs for 'Test' (selected), 'Settings', and 'TEST'. A large blue 'Chat' button is at the bottom. A message from 'Tea Questions' says 'Hi! I'm Tea Questions. Say "hi" if you'd like to chat.' with a timestamp of '35 mins ago'. A callout box on the right says 'Provide multiple alternative phrasings to the question, to broaden the knowledge base.' The overall theme is light blue and white.



Infrastructure and Tools

Azure Machine Learning Services

Azure Infrastructure

AI ON DATA

101010
010101
101010

Amos

SQL DB

SQL DW

Data Lake

Spark

DSVM

Batch AI

ACS

IoT Edge

CPU, FPGA, GPU

Tools

CODING & MANAGEMENT TOOLS

Team Data
Science
Process

VS Tools
for AI

Azure ML
Workbench

Others (PyCharm, Jupyter Notebooks...)

DEEP LEARNING FRAMEWORKS

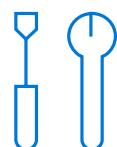
3rd Party

Cognitive
Toolkit

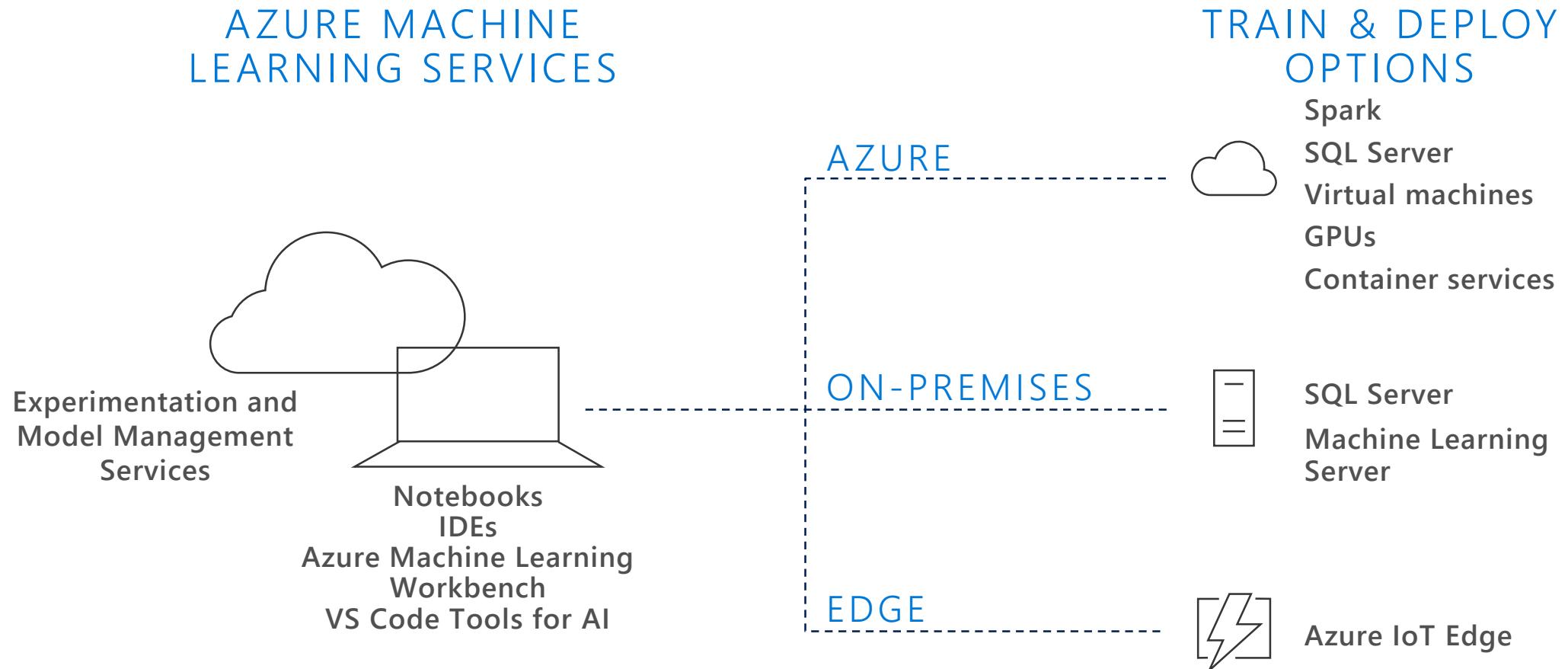
TensorFlow

Caffe

Others (Scikit-learn, MXNet, Keras,
Chainer, Gluon...)

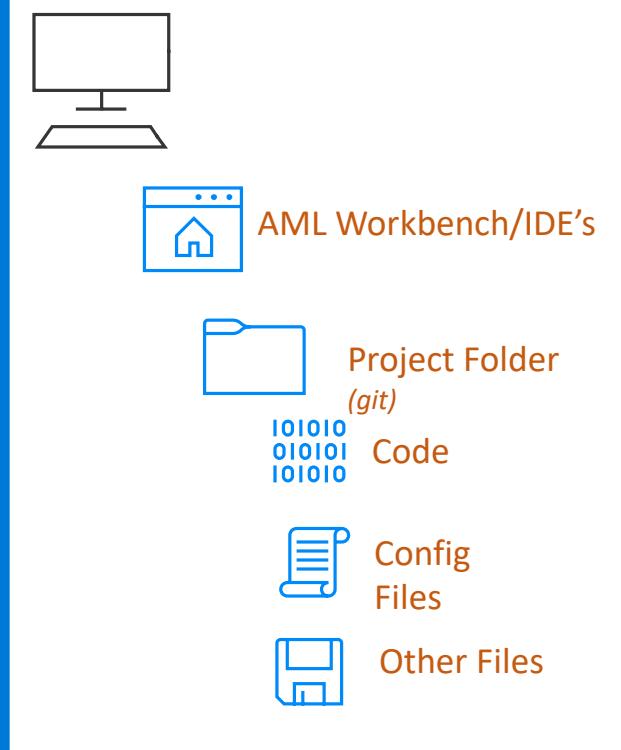


Azure ML Services

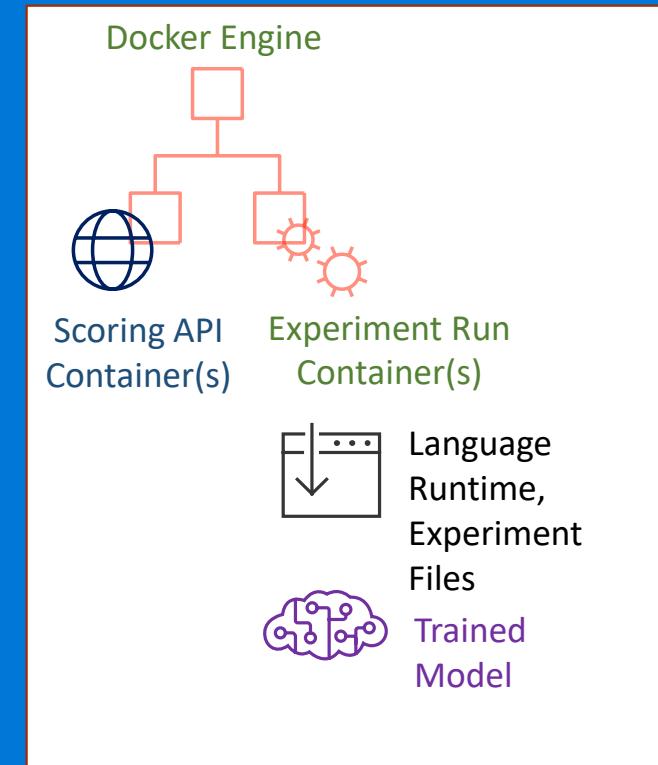


Azure Machine Learning Architecture Components

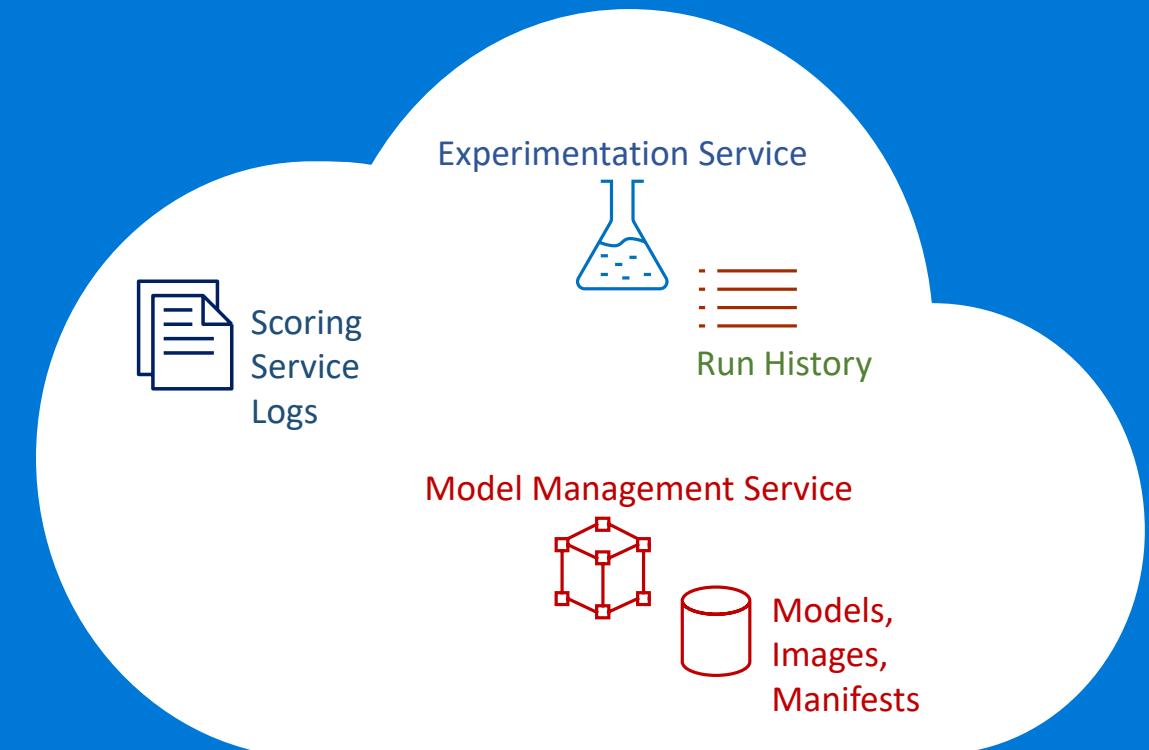
Local Workstation / VM
(Create, Develop)



Docker (Local Docker / VM / AKS)
(Experiment, Deploy)



Microsoft Azure
(Track, Instrument)



The Team Data Science Process

<http://aka.ms/tdsp>

Business Understanding

- Define Objectives
- Identify Data Sources

Data Acquisition and Understanding

- Ingest Data
- Explore Data
- Update Data

Modeling

- Feature Selection
- Create and Train Model

Deployment

- Operationalize

Customer Acceptance

- Testing and Validation
- Handoff
- Re-train and re-score

Machine Learning & AI Portfolio

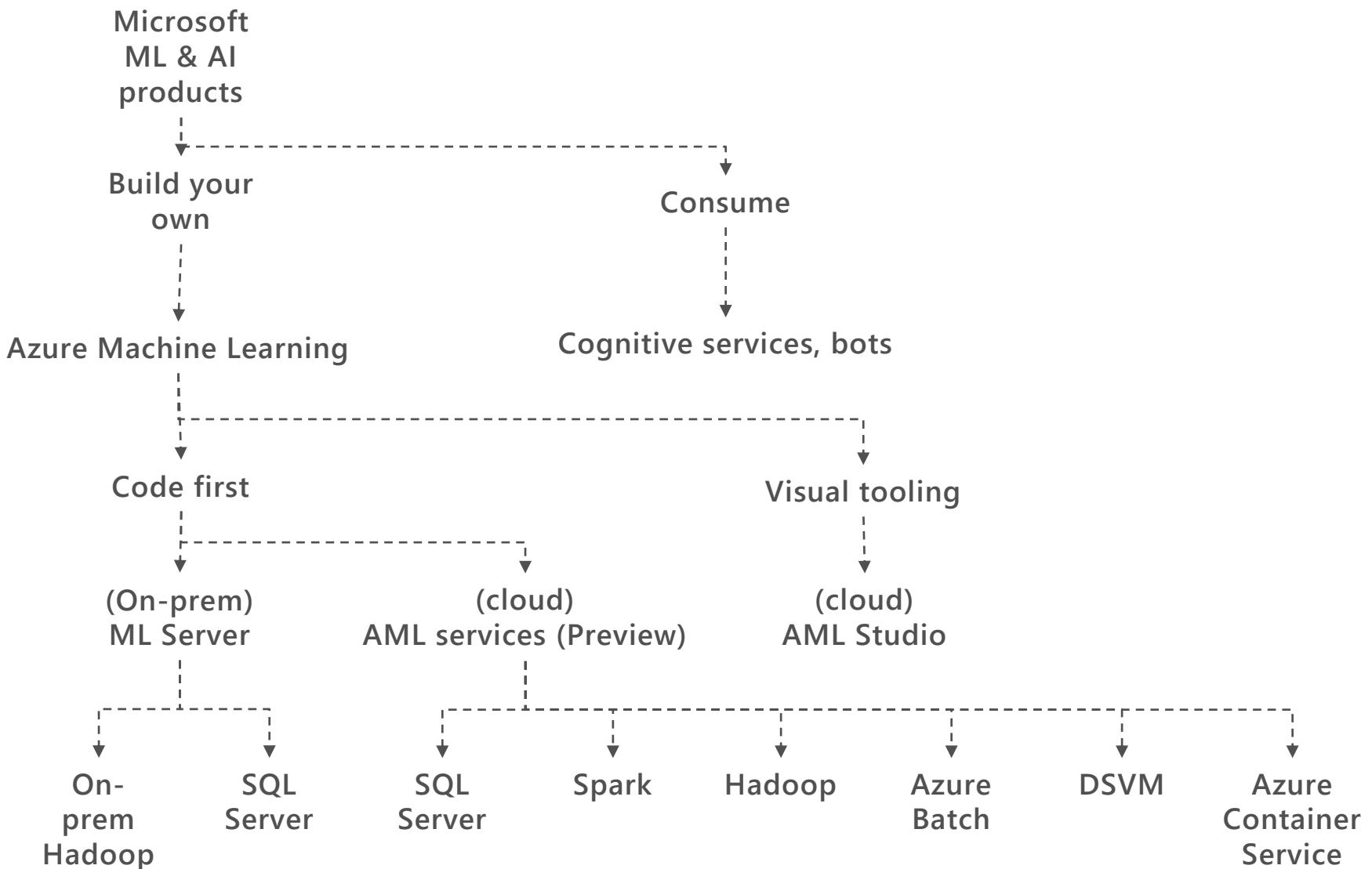
When to use what?

Build your own or consume pre-trained models?

Which experience do you want?

Deployment target

What engine(s) do you want to use?





<http://microsoft.com/ai>

[http:// aka.ms/ai-landscape](http://aka.ms/ai-landscape)