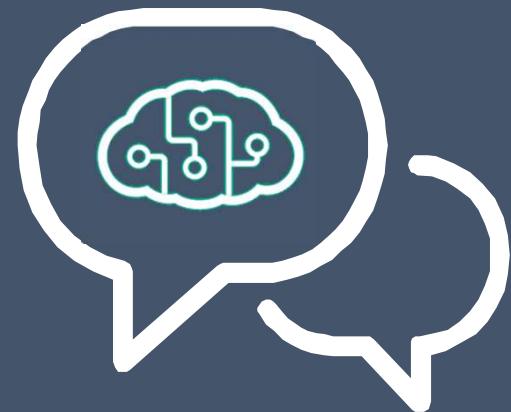
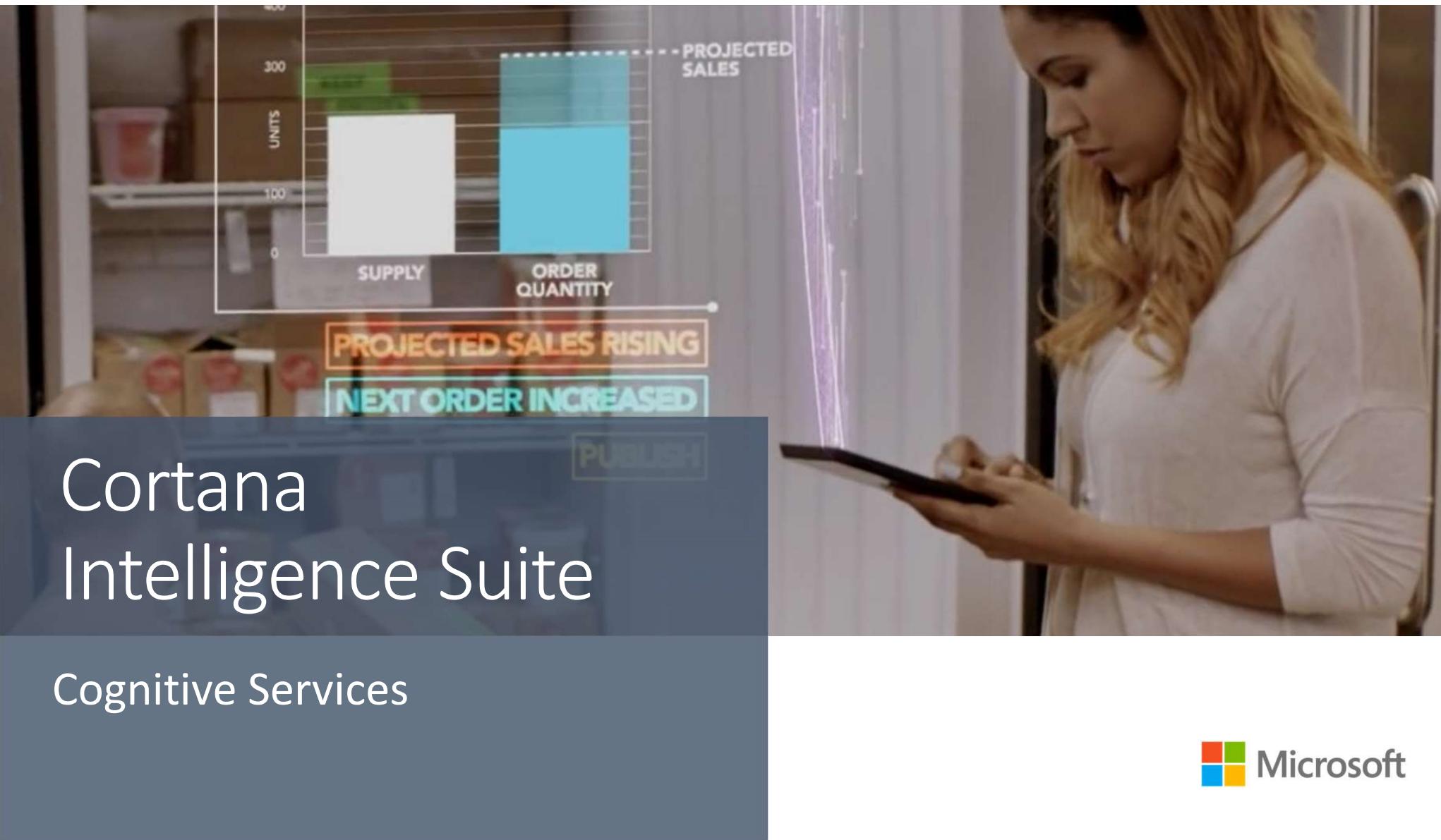


# Building Smart BOTs



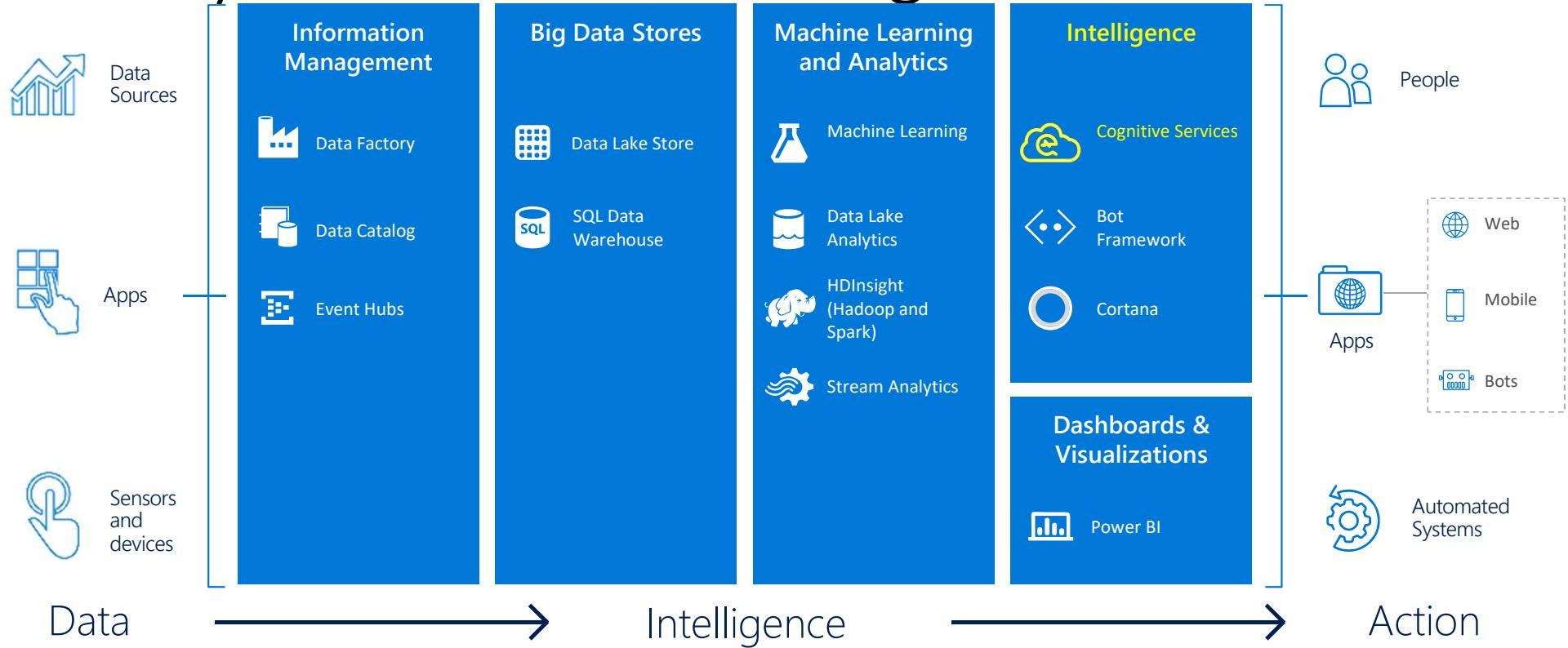


# Cortana Intelligence Suite

Cognitive Services



# Easily turn data into intelligent action



# Why Microsoft 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

Tested

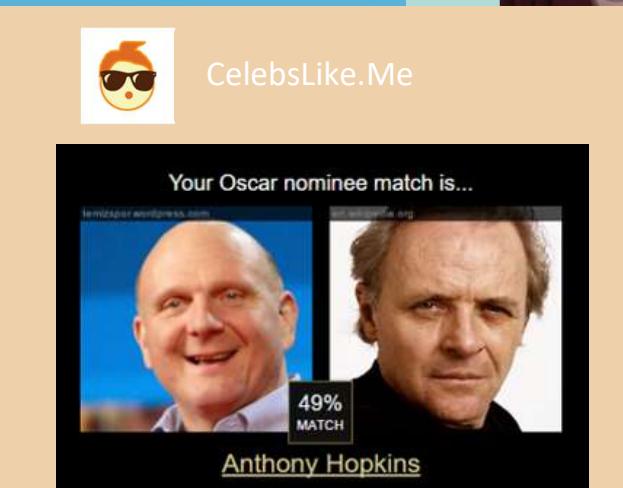
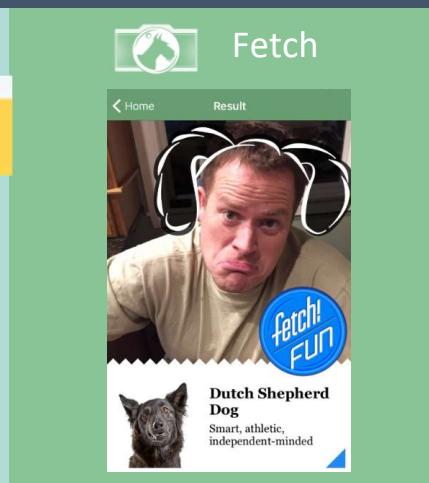
Built by experts in their field from Microsoft Research, Bing, and Azure Machine Learning

Quality documentation, sample code, and community support



# Our Showcase Apps

(visit our app catalog at [aka.ms/cognitivegallery](http://aka.ms/cognitivegallery))



# The APIs



# Cognitive Services

## Give your solutions a human side

## Microsoft Cognitive Services Collections

### Vision

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

### Speech

Custom Recognition | Speaker Recognition | Speech | Translator

### Language

Bing Spell Check | Language Understanding | Linguistics | Text Analytics | Web Language Model | Translator

### Knowledge

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

### Search

Bing Web Search | Bing Image Search | Bing News Search | Bing Video Search | Bing Auto Suggest | Bing Custom Search | Bing Entity Search

# Vision



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

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



## Computer Vision APIs

Analyze an image

Understand content within an image

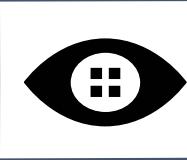
OCR

Detect and recognize words within an image

Generate thumbnail

Scale and crop images, while retaining key content





# Analyze image



## Type of image

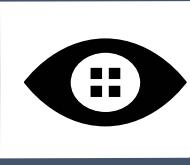
Clip Art Type 0 Non-clipart  
Line Drawing Type 0 Non-Line Drawing  
Black & White Image False

## Content of image

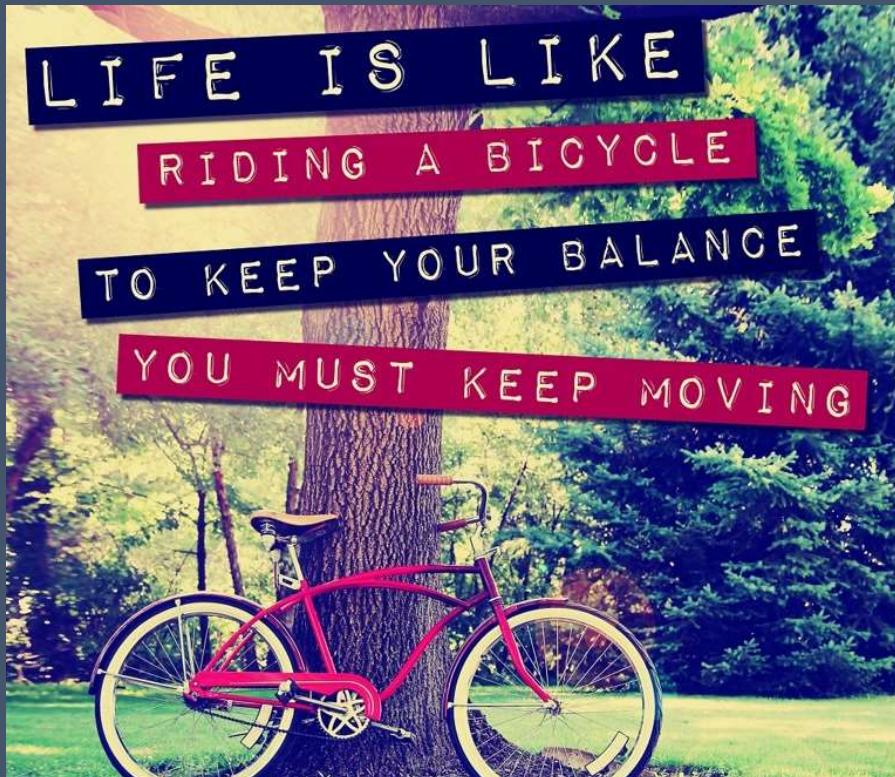
Categories [{"name": "people\_swimming", "score": 0.099609375 }]  
Adult Content False  
Adult Score 0.18533889949321747  
Faces [{"age": 27, "gender": "Male", "faceRectangle": {"left": 472, "top": 258, "width": 199, "height": 199}}]

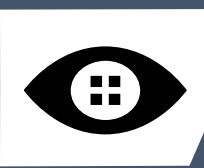
## Image colors

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



# OCR & Smart Cropping





# Customization

## 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.



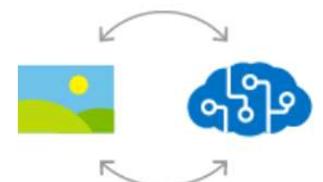
## Evaluate

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.





## Content Moderator

- Image moderation
- Text moderation
- Video moderation
- Human review tool

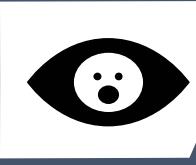


## Emotion APIs

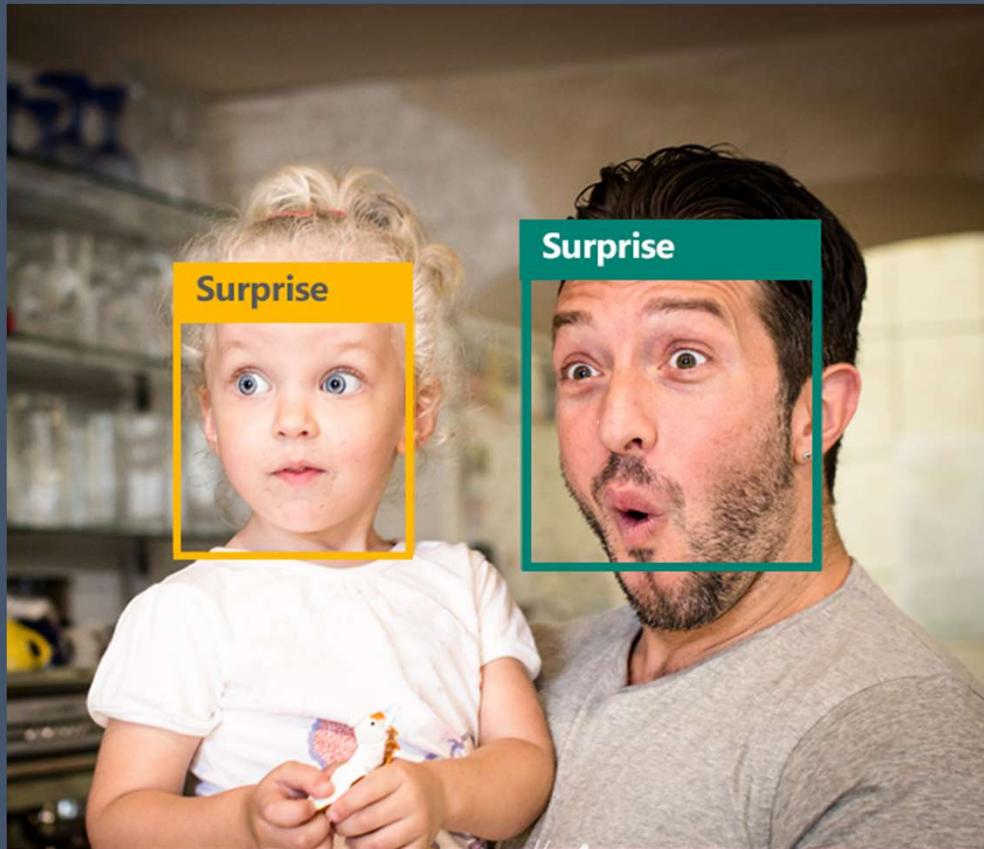
Recognize emotions

Detect emotions based on facial expressions  
in photos and videos





# Emotion APIs



## 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 APIs

## Face detection

Detect faces and their attributes within an image

## Face verification

Check if two faces belong to the same person

## Similar face searching

Find similar faces within a set of images

## Face grouping

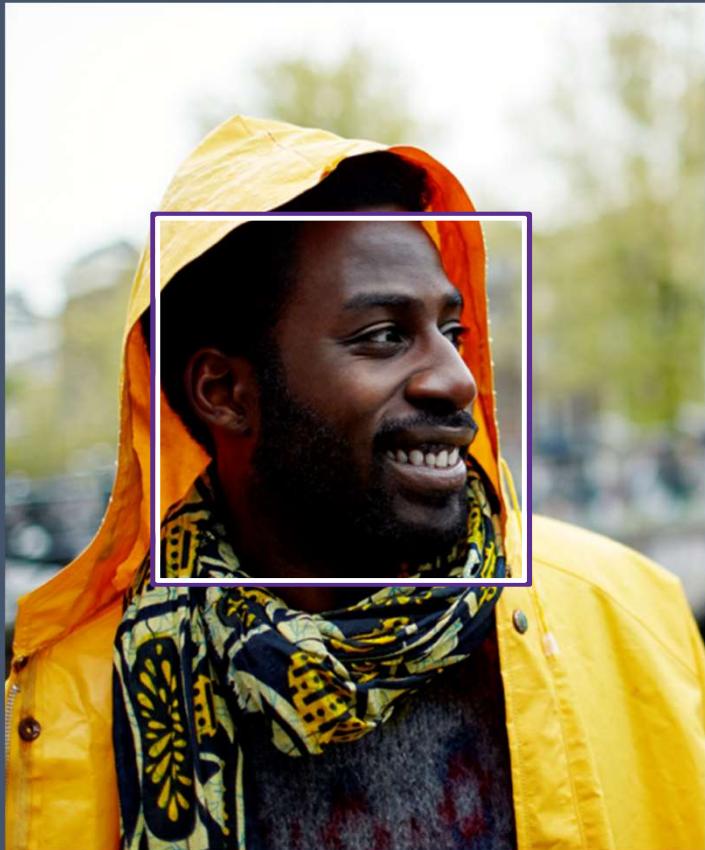
Organize many faces into groups

## Face identification

Search which person a face belongs to



# Face APIs



## 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

A photograph of a woman and a young girl running hand-in-hand across a fallen leaf-covered lawn. They are moving towards the left of the frame. In the background is a wooden picket fence and a brick building with ivy growing over it.



# Video APIs

## Stabilization

Smooth and stabilize shaky video

## Face detection and tracking

Detect and track faces in videos

## Motion detection

Detect when motion occurs



# Stabilization

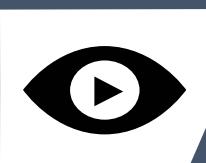
The Stabilization API provides automatic video stabilization and smoothing for shaky videos

This API uses many of the same technologies found in Microsoft Hyperlapse

Best For:

Small camera motions, with or without rolling shutter effects  
(e.g., holding a static camera, walking with a slow speed)





# Face detection and tracking

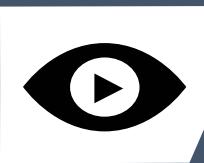
High precision face location detection and tracking

Can detect up to 64 human faces in a video (no smaller than 24x24 pixels)

Detected and tracked faces are returned with coordinates and a Face ID to track throughout the video



Time (sec)	Face ID	x, y	Width, height
0	0	0.59, 0.23	0.09, 0.16
0	1	0.38, 0.15	0.07, 0.12
1	0	0.54, 0.25	0.09, 0.15
1	1	0.23, 0.18	0.07, 0.12



# Motion detection

Indicates when motion occurs against a fixed background (e.g., surveillance video)

Trained to reduce false alarms, such as lighting and shadow changes

Current limitations:

- No support for night-vision videos
- Semi-transparent and small objects are not detected well



Start time	End time	In region
1.9	3.6	0
5.2	15.1	0



# Video Indexer

- Upload your video, and go
- Easily create intelligent apps
- Make your content more discoverable
- Improve engagement with your videos
- Trigger workflows and automate tasks

The screenshot displays the Video Indexer interface with three main sections: People, Speech Sentiment, and Keywords.

**People:** A section titled "People" shows four thumbnail images of individuals. Below them, a larger circular thumbnail highlights "Satya Nadella" with the title "Microsoft CEO". A progress bar indicates he appears for 53% of the duration. Buttons for "Show biography" and "Find in Bing" are present. A timestamp "00:57:11" is shown in the top right corner of this section.

**Speech Sentiment:** This section shows the distribution of speech sentiment. The legend indicates:

- Neutral (36%)
- Positive (61%)
- Negative (3%)

A horizontal bar chart visualizes the sentiment distribution across the video duration.

**Keywords:** This section lists several keywords extracted from the video:

- data ►
- drivers ►
- cognitive services ►
- action ►
- neural network ►
- framework ►
- crm ►
- press ►
- opportunity ►

# Speech



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

Custom Recognition | Speaker Recognition | Speech | Translator



## Speech APIs

Voice recognition (speech to text)

Converts spoken audio to text

Voice output (text to speech)

Synthesize audio from text

Speech intent recognition

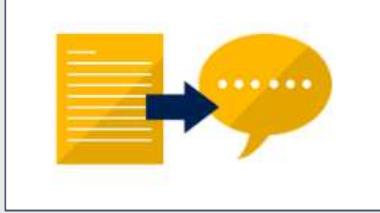
Convert spoken audio to intent



# Speech API

- **Recognize Voice** – Converts spoken audio to text. Support for 18 languages (28 locales)
- **Synthesize Speech** – Synthesize audio from Text. Support for 9 languages (17 locales)



Speech Recognition	Speech Intent Recognition	Text to Speech Conversion
 <p>Convert spoken audio to text</p>	 <p>"450 sixth St in San Francisco." "For-50-six St-San Francisco-" "456th-St-San Francisco."</p> <p>Convert audio to intent</p>	 <p>Convert text to spoken audio</p>



## Speaker Recognition API

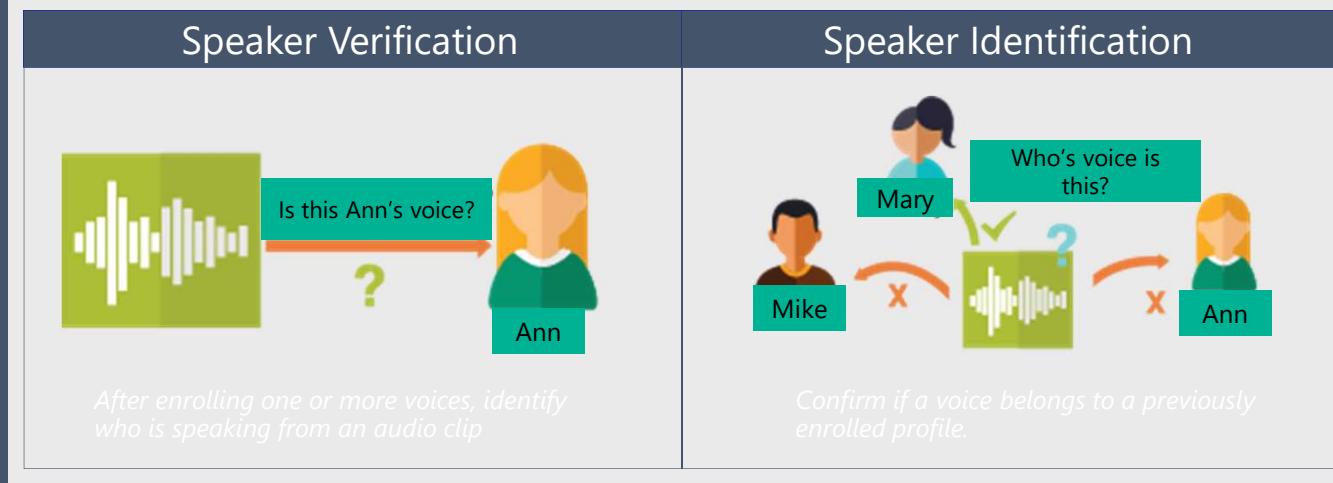
Speaker verification  
Check if two voices are the same

Speaker identification  
Identify who is speaking



## Speaker Recognition APIs

- **Speaker Verification** – Check if two voices are the same
- **Speaker Identification** – Identify who is speaking and create a unique voiceprint for a profile

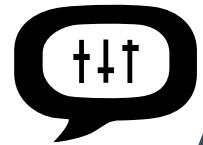




## Custom Recognition

Customize both language  
and acoustic models

Tailor speech recognition to your app and environment



# Translator Speech API

- Live Presentation Translation
- In-Person or Remote Translated Communications
- Customer Support
- Business Intelligence
- Media Subtitling
- Multi-Lingual AI Interactions

# Language

,

Process text and learn how to recognize what  
users want

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

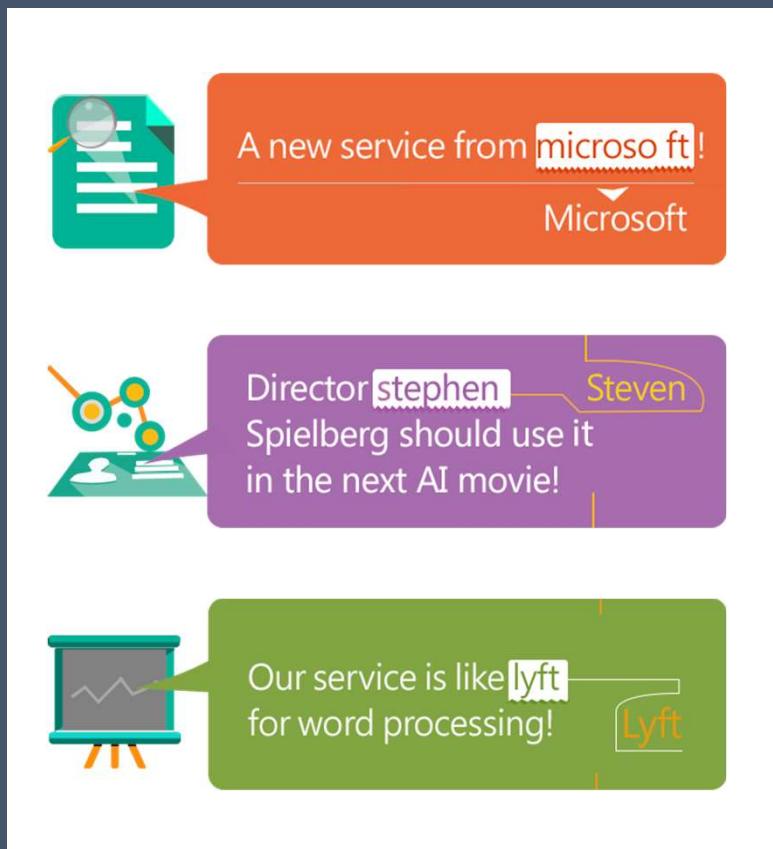
A photograph showing three students in a library. One student in the foreground is seen from the side, looking down at a screen. Two other students are visible behind her, also looking down at the same screen. They appear to be working together on a task, possibly related to the content of the slide.

## Bing spell check APIs

State-of-the-art cloud based spelling algorithms  
Recognizes a wide variety of spelling errors  
  
Recognize name errors and homonyms in context  
Difficult to spot errors that use the context of the words around them  
  
Updates over time  
Support for new brands and coined expressions as they emerge

9

# Bing spell check APIs



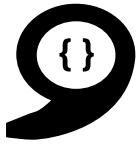
Check a single word or a whole sentence

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

Corrected Text: "four" → "for"

Identify errors and get suggestions

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



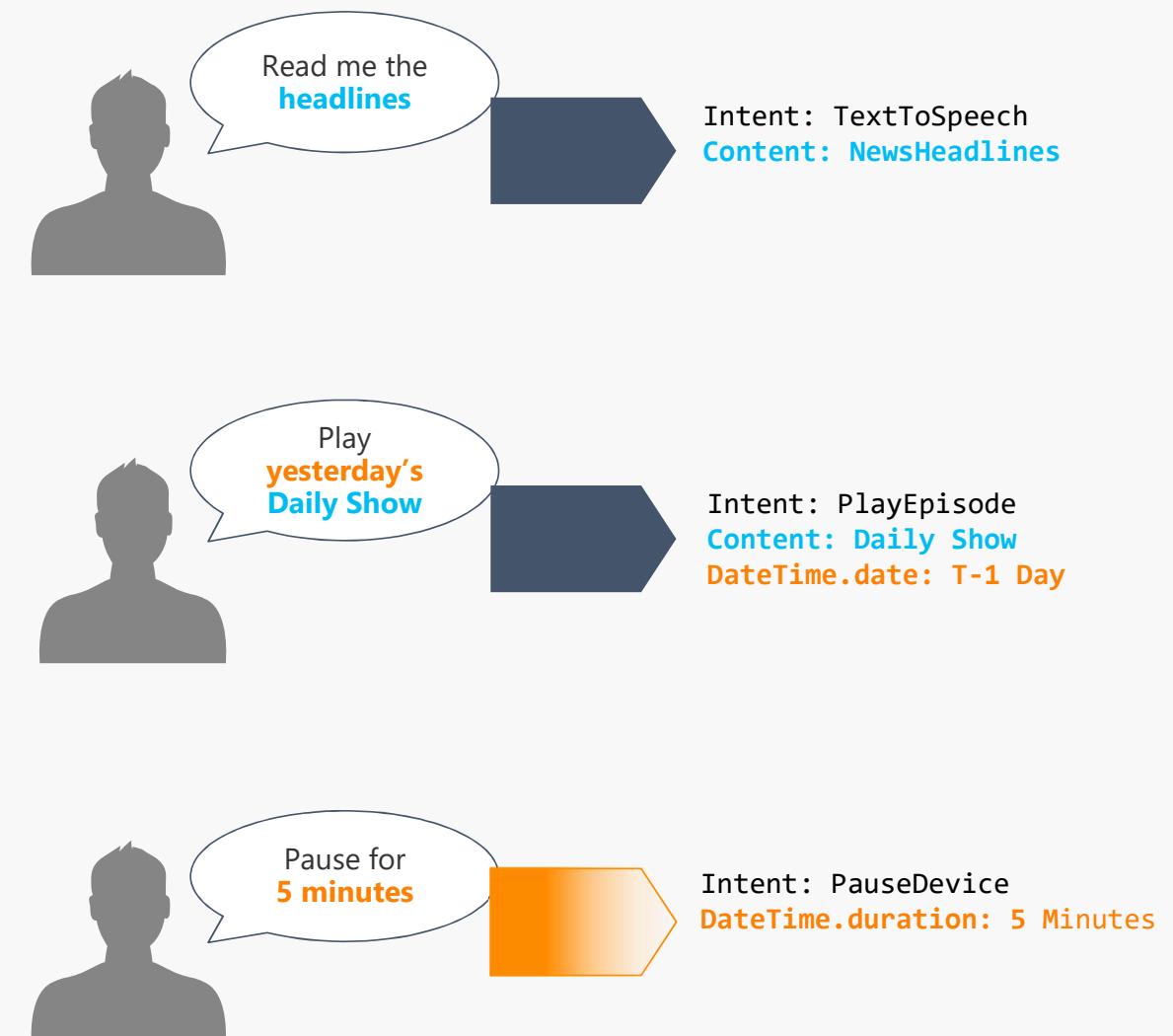
## Language Understanding

Understand what your users are saying  
Use pre-built Bing and Cortana models or create your own



# Language Understanding Intelligent Service (LUIS)

- **Determine Intent** – Understand what your users are saying in natural language
- **Determine Entities** – Identify entities within the sentence
- **Active Learning** – Train your model and improve it as you collect more data.
- **Pre-built Models** – Leverage world class models from Bing and Cortana





# Language understanding models



```
{  
  "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  
    }  
  ]  
}
```

## ExerciseTracker

Publish

Intents +

None

StartActivity

StopActivity

SetHeartRateTarget

Entities +

## ActivityType

Pre-built Entities +

number

Regex Features +

No patterns added

Phrase List Features +

ActivityWords

New utterances

Search

Suggest

Review labels

Suggest utterances that will improve:

Intent: StartActivity

Select highlight to add another entity or click to clear

begin a **log** now

StartActivity(0.96)

Submit

begin **bike ride**

StartActivity(0.94)

Submit

start tracking a **bike ride**

StartActivity(0.94)

Submit

Performance analysis

Intents

## StartActivity

11 utterances: 11 correctly predicted

## StopActivity

5 utterances: 5 correctly predicted

## SetHeartRateTarget

5 utterances: 5 correctly predicted

## None

17 utterances: 17 correctly predicted

Correctly predicted

Error (predicted as other intent)

Train

Last train completed: 8/21/2015 2:04:09 PM

Microsoft



## Linguistic analysis

Analysis tools for natural language processing  
Access to part-of-speech tagging and parsing,  
identifying concepts, and actions



# 9

# 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

## Topic detection

Use clustering techniques to identify the trending topics on a large set of text records

## Language detection

Identify the language, 120 supported languages



## Web language model

Automation of a variety of standard natural language processing tasks using state-of-the-art language modeling APIs  
Word breaking, joint probability of natural language expressions, scoring, and predicting following words in a sequence



# Translator Text API

Extend the reach of your applications

Automatically detect languages

Build customised translation systems

Crowd-source translation improvement

# Knowledge



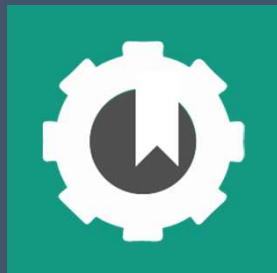
Tap into rich knowledge amassed from  
the web, academia, or your own data

Academic Knowledge

Entity Linking | Knowledge Exploration

Recommendations | QnA Maker | Custom Decision Service

# ⚙️ Knowledge



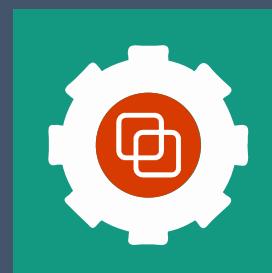
**Academic Knowledge API**

Relationships among academic papers, journals, and authors



**Knowledge Exploration Service**

Interactive search over structured data



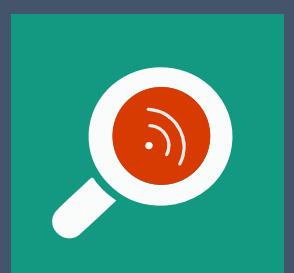
**Entity Linking Service**

Contextually extend knowledge of people, locations, and events



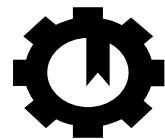
**Recommendations API**

Personalized product recommendations for your customers



**QnA Maker API**

FAQ Service from existing content



## Academic knowledge

### Interpret

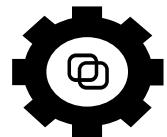
Interprets a natural language user query string. Returns annotated interpretations which can enable rich search-box auto-completion experiences that anticipate what the user is typing

### 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



# Entity Linking Service

- **Identify Entities** - Identify mentions of people, places, and things within a document
- **Disambiguate Entities** - Disambiguate mentions within the context of the sentence

**RollingStone** MUSIC POLITICS TV MOVIES CULTURE SPORTS REVIEWS LI

Has the artificial intelligence revolution taken us to the verge of witnessing the birth of a new species? How long until machines become smarter than us?

[f](#) [t](#) [g+](#) [s](#) [e](#)

Welcome to robot nursery school," Pieter Abbeel says as he opens the door to the Robot Learning Lab on the seventh floor of a sleek new building on the northern edge of the UC-Berkeley campus. The lab is chaotic: bikes leaning against the wall, a dozen or so grad students in disorganized cubicles, whiteboards covered with indecipherable equations. Abbeel, 38, is a thin, wiry guy, dressed in jeans and a stretched-out T-shirt. He moved to the U.S. from Belgium in 2000 to get a Ph.D. in computer science at Stanford and is now one of the world's foremost experts in understanding the challenge of teaching robots to think intelligently. But first, he has to teach them to "think" at all. "That's why we call this nursery school," he jokes. He introduces me to Brett, a six-foot-tall humanoid robot made by Willow Garage, a high-profile Silicon Valley robotics manufacturer that is now out of business. The lab acquired the robot several years ago to experiment with. Brett, which stands for "Berkeley robot for the elimination of tedious tasks," is a friendly-looking creature with a big, flat head and widely spaced cameras for eyes, a chunky torso, two arms with grippers for hands and wheels for feet. At the moment, Brett is off-duty and stands in the center of the lab with the mysterious, quiet grace of an unplugged robot. On the floor nearby is a box of toys that Abbeel and the students teach Brett to play with: a wooden hammer, a plastic toy airplane, some giant Lego blocks. Brett is only one of many robots in the lab. In another cubicle, a nameless 18-inch-tall robot hangs from a sling on the back of a chair. Down in the basement is an industrial robot that plays in the equivalent of a robot sandbox for hours every day, just to see what it can teach itself. Across the street in another Berkeley lab, a surgical robot is

Pieter Abbeel---Associate Professor UC Berkeley...  
[www.eecs.berkeley.edu/~pabbeel](http://www.eecs.berkeley.edu/~pabbeel)  
Quick picks: I will be lecturing on Deep Reinforcement Learning at the Machine Learning Summer School (with John Schulman) I am co ...

Contact  
[eecs.berkeley.edu/~pabbeel/contact.html](http://eecs.berkeley.edu/~pabbeel/contact.html)

Teaching  
[eecs.berkeley.edu/~pabbeel/teaching.html](http://eecs.berkeley.edu/~pabbeel/teaching.html)

Publications  
[eecs.berkeley.edu/~pabbeel/publications.html](http://eecs.berkeley.edu/~pabbeel/publications.html)

Lab Tours  
[eecs.berkeley.edu/~pabbeel/labtours.html](http://eecs.berkeley.edu/~pabbeel/labtours.html)

**Pieter Abbeel | EECS at UC Berkeley**  
[www.eecs.berkeley.edu/Faculty/Homepages/abbeel...](http://www.eecs.berkeley.edu/Faculty/Homepages/abbeel...)  
Pieter Abbeel Associate Professor Research Areas Artificial Intelligence (AI) Control, Intelligent Systems, and Robotics (CIR) Machine Learning: ...

Images

[See more images](#)

[VIDEO] RI Seminar : Pieter Abbeel : Machine Learn...  
[www.youtube.com/watch?v=S2GAz5F03Ls](http://www.youtube.com/watch?v=S2GAz5F03Ls)  
BY CMUROBOTICS 67 MIN 12K VIEWS  
Oct 18, 2013 · Pieter Abbeel Assistant Professor, Department of Electrical Engineering and Computer Science, UC ...



# 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

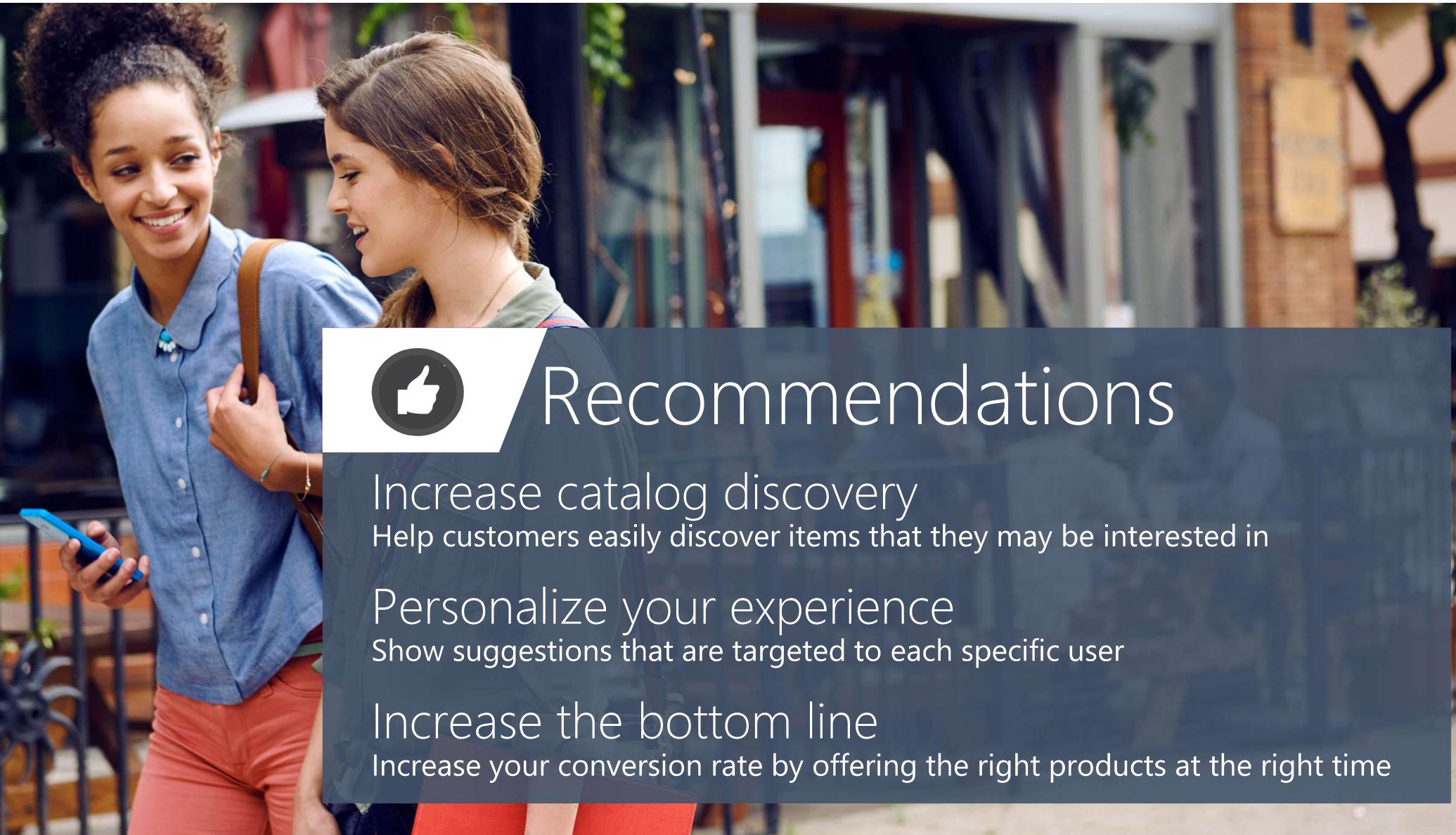
Help customers easily discover items that they may be interested in

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

Extract questions and Answers  
FAQs, URLs, Documents and Editorial Content

Train, Test and Publish  
Knowledge base endpoint

Integrate with other APIs  
Create a chatbot that answers FAQs or an interactive guide





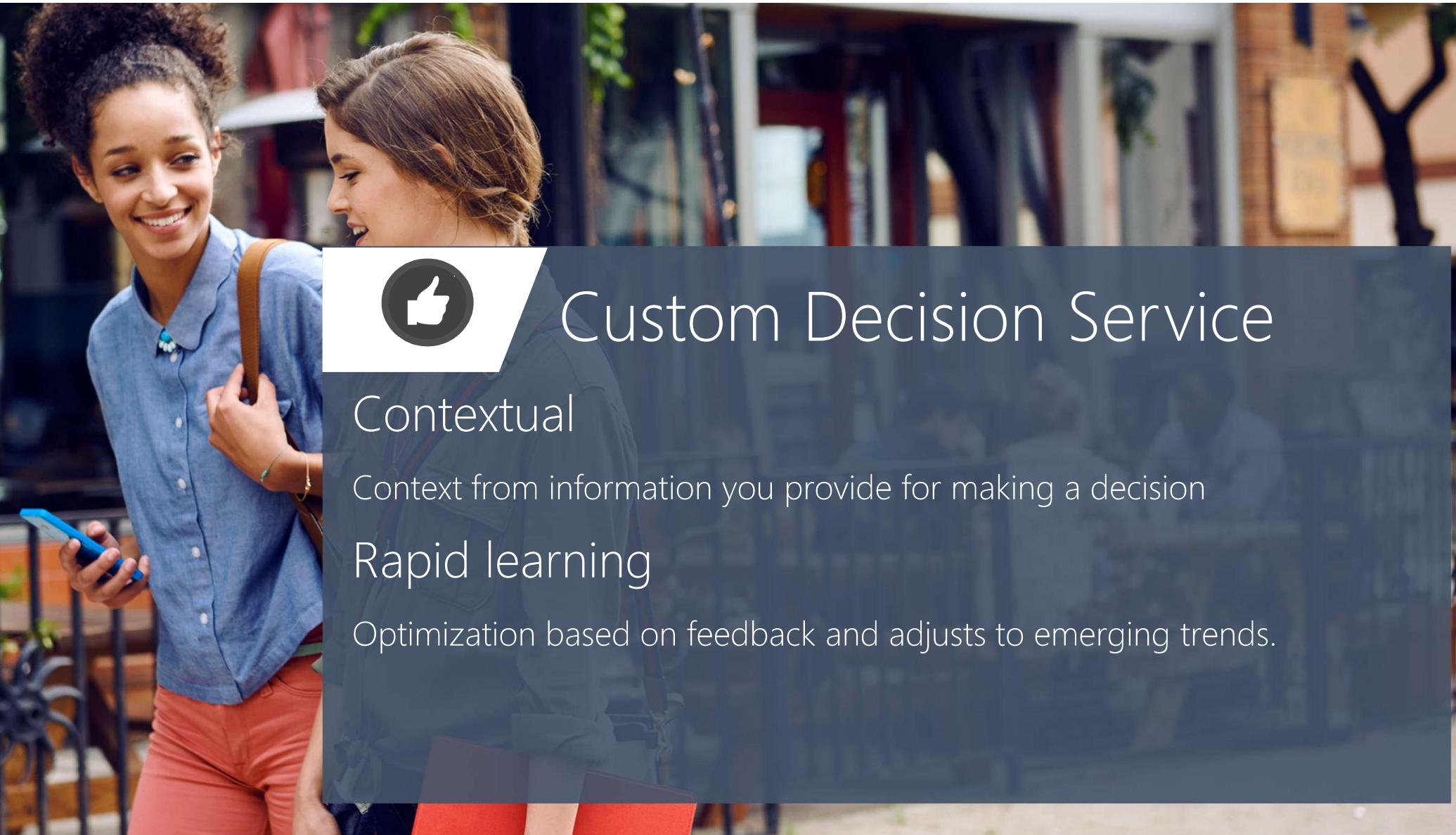
## Custom Decision Service

### Contextual

Context from information you provide for making a decision

### Rapid learning

Optimization based on feedback and adjusts to emerging trends.



# 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](#)

# 🔍 Search



Web Search API

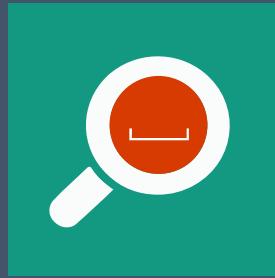
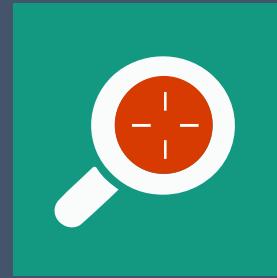
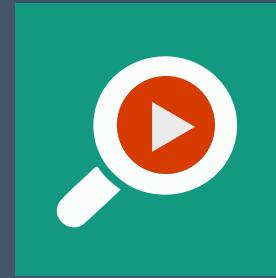


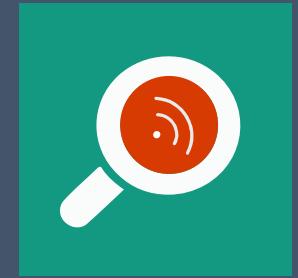
Image Search API



Video Search API



News Search API



Autosuggest API

Bring intelligent web search to your apps and harness the ability to comb billions of webpages, images, videos, news and autosuggest results with a few lines of code



## Bing web search

Intelligent search to your apps with the ability to comb billions of webpages, images, videos, and news with a single API call

Retrieve web documents indexed by Bing and narrow the results down with filters such as by answer type and freshness

# Web Search API

Get relevant web results and Answers with one API Call

<https://bingapis.azure-api.net/v5/search?q=nasa>

Web Results

Deep Links (1<sup>st</sup> Algo)

News Results

Image Results

Video Results

Related Searches

**NASA - Official Site**  
www.nasa.gov  
CUSTOMER SERVICE 202-358-0001  
NASA.gov brings you the latest news, images and videos from America's space agency, pioneering the future in space exploration, scientific discovery and aeronautics ...

**NASA TV**  
NASA Television provides live coverage of launches, spacewalks ...

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Space mission and science news, images and videos from NASA's ...

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**News about NASA**  
bing.com/news  
What does the future hold for NASA? Depends on the next president. The Christian Science Monitor - 22 minutes ago  
Space is having a resurgence. Private companies such as SpaceX and Orbital Sciences Corporation are flying supplies ...

**Images of nasa**  
bing.com/images  
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**Videos of nasa**  
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[Video thumbnails]

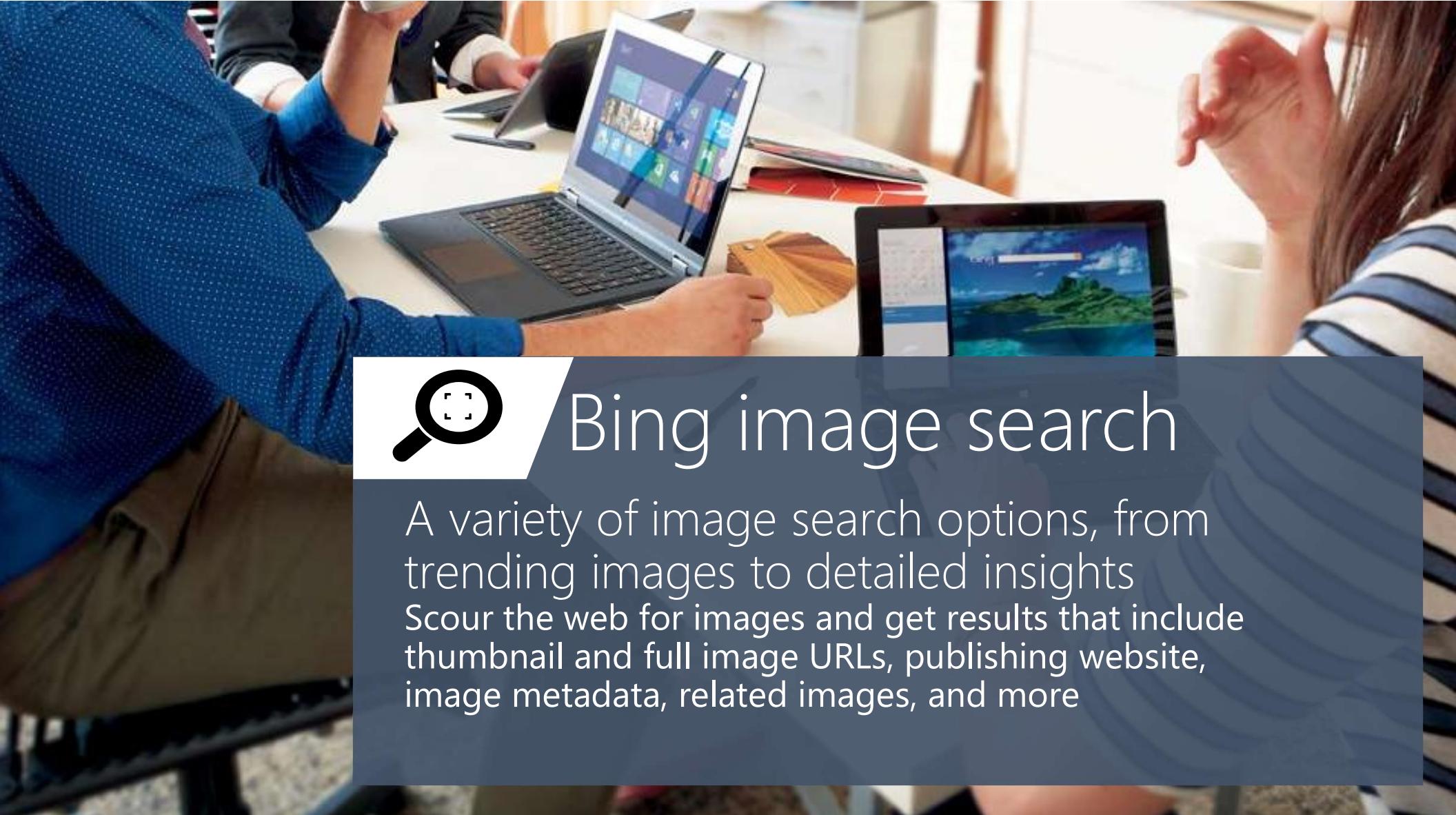
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**Search Response**

```
{  
  "_type": "SearchResponse",  
  "queryContent": "...",  
  "webPages": "...",  
  "entities": "...",  
  "news": "...",  
  "images": "...",  
  "places": "...",  
  "videos": "...",  
  "relatedSearches": "...",  
  "rankingResponse": "..."}
```

**Ranking Response**

```
{  
  "answerType": "WebPages",  
  "resultIndex": 0,...  
},  
{  
  "answerType": "News",  
  "resultIndex": 1,...  
}
```



## Bing image search

A variety of image search options, from trending images to detailed insights  
Scour the web for images and get results that include thumbnail and full image URLs, publishing website, image metadata, related images, and more

# Image Insights

Access Bing's deep image intelligence capabilities with a few lines of code

<https://bingapis.azure-api.net/v5/images/search?q=<query>&insightstoken=<imageTokenId>&modulesRequested=<moduleType>>

## Entity Recognition



```
“matchingEntities” : [ {  
    “entity” : {  
        “_type” : Person”,  
        “name” : “Satya Nadella”,
```

# Visually Similar



```
        "visuallySimilarProducts" : [{  
            "name" : "...",  
            "thumbnailUrl" : "...",  
            "hostPageUrl" : "...",
```

## Merchant/Recipe Sources



```
    "shoppingSources" : [ {  
        "offers" : [ {  
            "url" : "http://www.contoso.com/..."  
            "seller" : "contoso.com",
```



## Bing video search

A variety of advanced video search features, including trending videos, price, and other useful metadata

Find videos from across the web and get responses that provide useful metadata including creator, encoding format, video size and quality, and source view count



## Bing news search

Turn any app into a news desk with world news grouped and filtered by topic, local news, and metadata you can mine

# Trending on the Web

Explore what's trending on the web as fast as it appears in Bing

## Trending Images



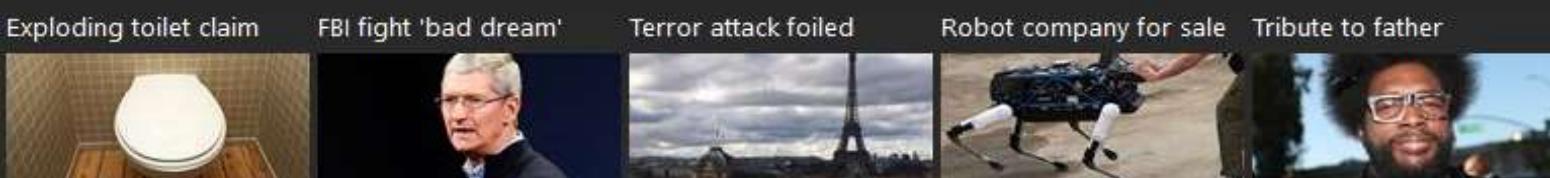
GET <https://bingapis.azure-api.net/v5/images/trending>

## Trending Videos



GET <https://bingapis.azure-api.net/v5/videos/trending>

## Trending News



GET <https://bingapis.azure-api.net/v5/news/search>



## Bing auto suggest

Query completion suggestions capabilities, so users can type less and get to what they want faster



# Bing Custom Search API

Customise your search

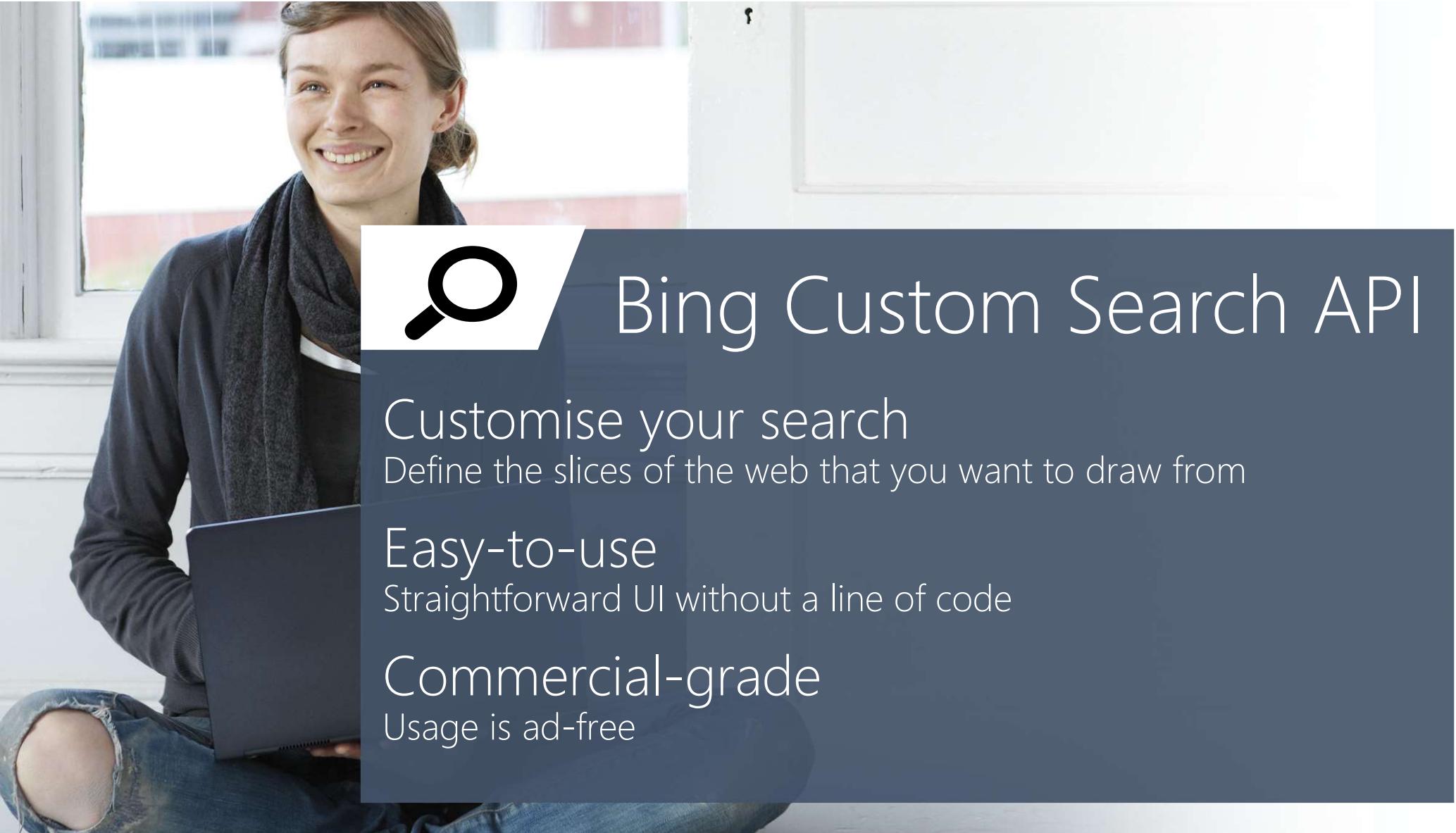
Define the slices of the web that you want to draw from

Easy-to-use

Straightforward UI without a line of code

Commercial-grade

Usage is ad-free





# Bing Entity Search API

Augment content with entity search results  
Primary details about the entities searched

Showcase of local businesses nearby  
Local businesses in the US

LAB:  
CognitiveServices  
TextMiningLab

