Microsoft

# Cognitive Services: Computer vision

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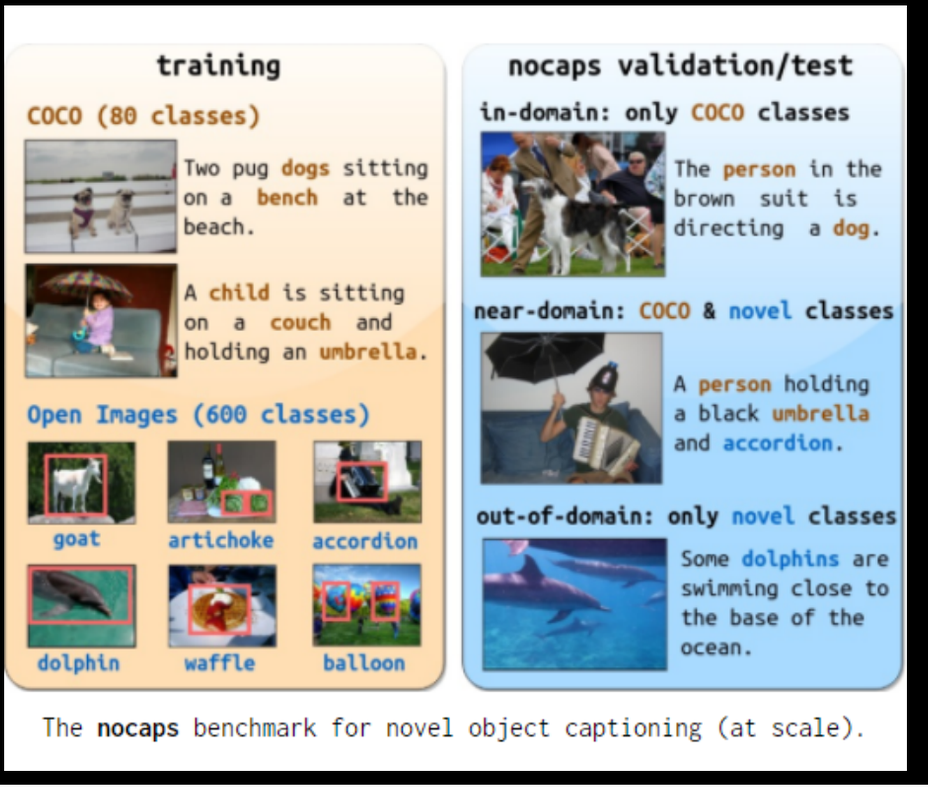
https://aka.ms/java-vision

# Microsoft achieves Image Captioning Human Parity July 2020

## Novel object captioning at scale (nocaps) challenge




The **nocaps** benchmark for novel object captioning (at scale).

### Leaderboard

Phase: **Test Phase**, Split: **Entire Dataset**

B - Baseline submission  * - Private submission

| Rank | Participant team | B1 | B2 | B3 | B4 | ROUGE-L | METEOR | CIDEr | SPICE | Last submission at |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Microsoft Cognitive Services team | 79.44 | 61.66 | 40.65 | 22.32 | 54.65 | 26.30 | 86.58 | 12.38 | 3 months ago |
| 2 | nocaps Team (Human) B | 76.64 | 56.46 | 36.37 | 19.48 | 52.83 | 28.15 | 85.34 | 14.67 | 1 year ago |

# Vision

## Computer Vision API

Distill actionable information from images

## Face API

Detect, identify, analyze, organize, and tag faces in photos

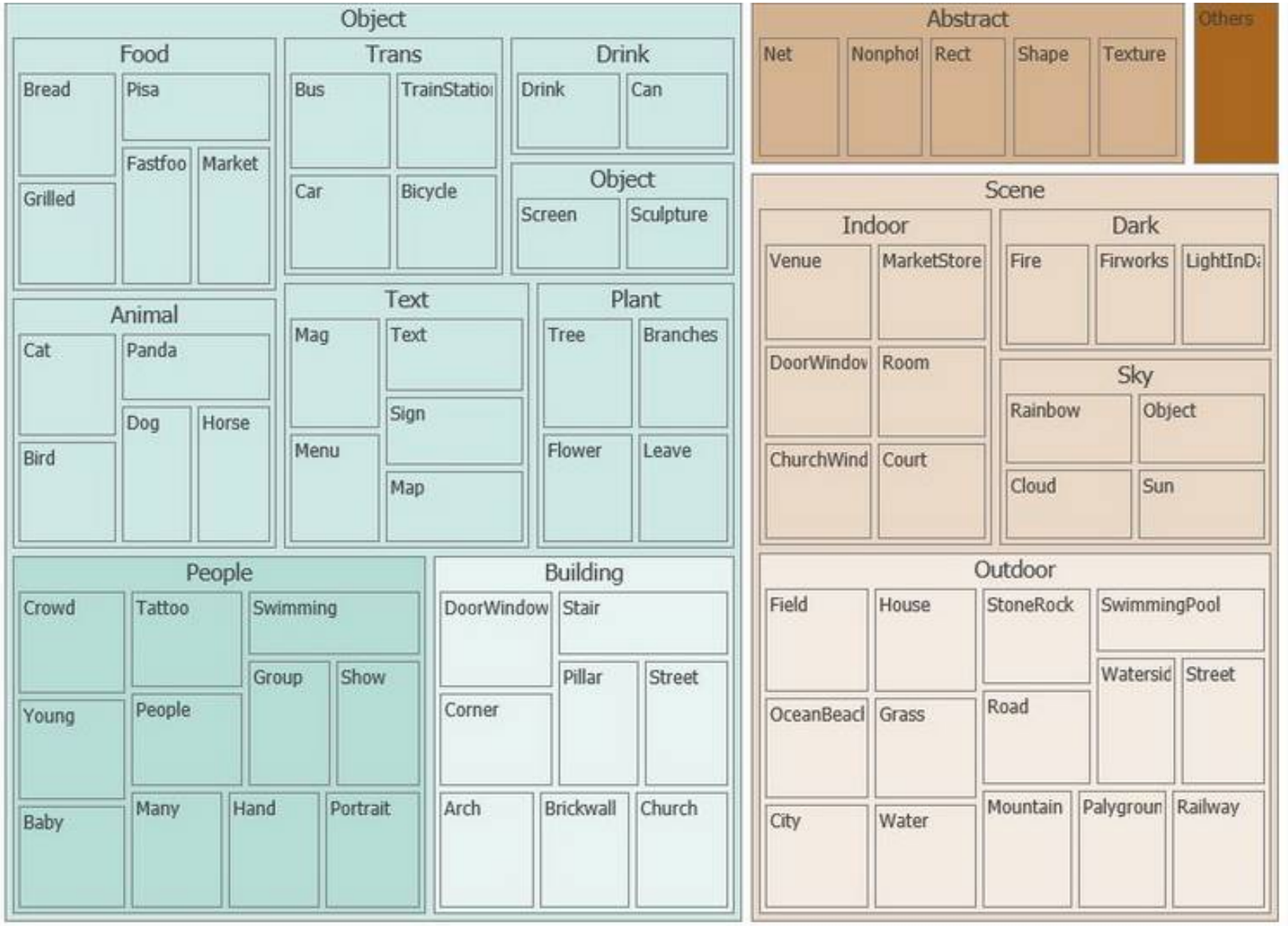
## Emotion API

Personalize experiences with emotion recognition

## Video API

Analyze, edit, and process videos within your app

# Computer Vision: 86 Categories



# Data

## Computer Vision

Description, tags, clip art, line drawing, black & white, IsAdultContent/Score, IsRacy/Score, categories, faces, dominant colors, accent color

https://www.microsoft.com/cognitive-services/en-us/computer-vision-api

## Emotions

Anger, contempt, disgust, fear, happiness, sadness, surprise, and neutral

https://www.microsoft.com/cognitive-services/en-us/emotion-api

## Face

Bounding box, 27 facial landmarks, age, gender, head pose, smile, facial hair, glasses

https://www.microsoft.com/cognitive-services/en-us/face-api

# Captioning

**Problem Statement:** Generate textual description (typically sentence) that is both adequate and fluent.

A person riding a motorcycle on a dirt road.

Two dogs play in the grass.

A group of young people playing a game of frisbee.

Two hockey players are fighting over the puck.

# The long-held dream

- Image understanding by computers

Boy riding on horse

# Time for a Turing test

A man standing on a tennis court holding a racquet

The man is on the tennis court playing a game

# Another one

An ornate kitchen is designed with rustic wooden parts

A kitchen with wooden cabinets and a sink

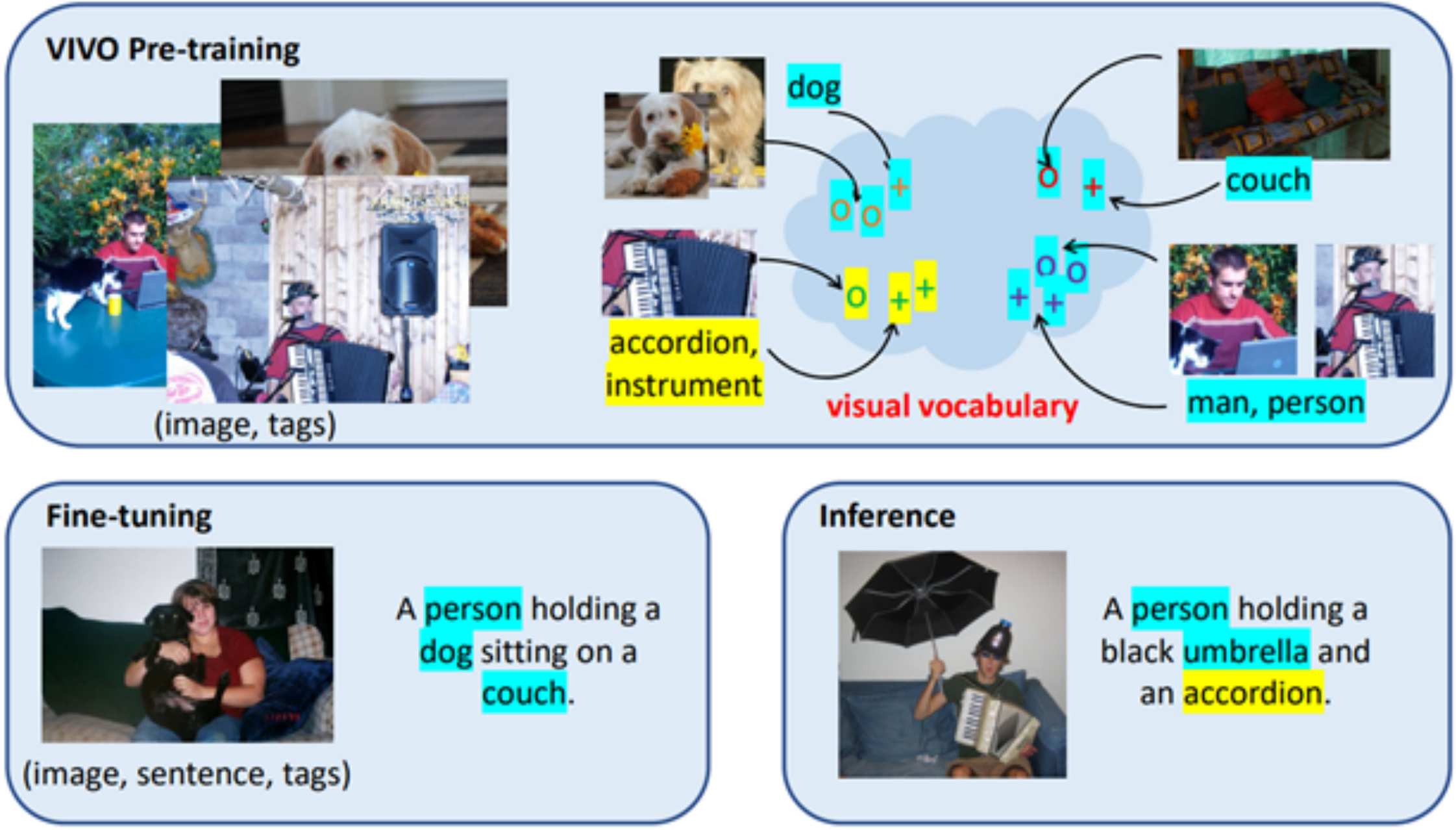
# Another one


A little girl in a pink shirt standing near a blue metal sculpture

A group of young people playing on a city street

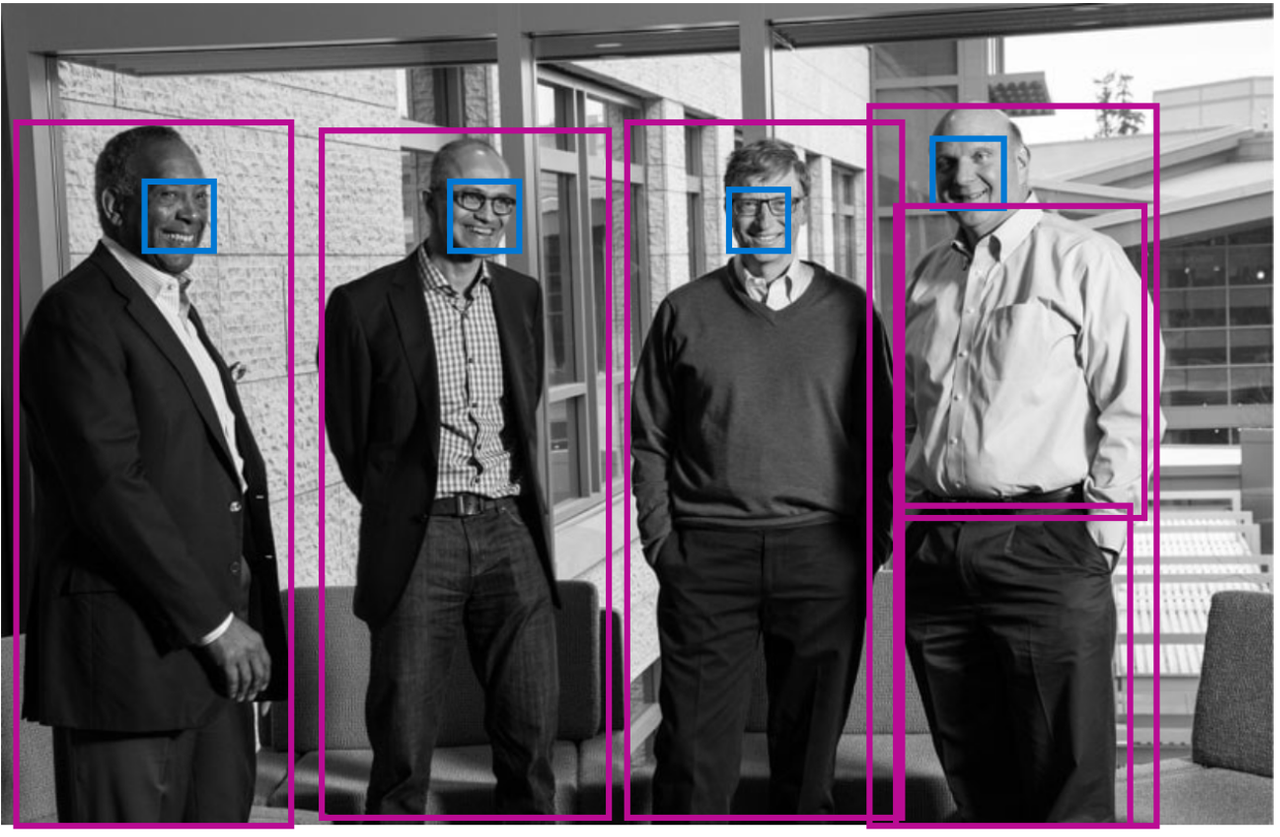
# How did we do it?

- Language generation
  - Markov model, trained on caption, conditional on words detected from image
- Image analysis
  - Deep-learned features, applied to likely objects in the image, trained to produce words in captions
- Reranking
  - Hypothetical captions reranked by deep-learned model looking at entire image




https://www.microsoft.com/en-us/research/project/azure-florence-vision-and-language/

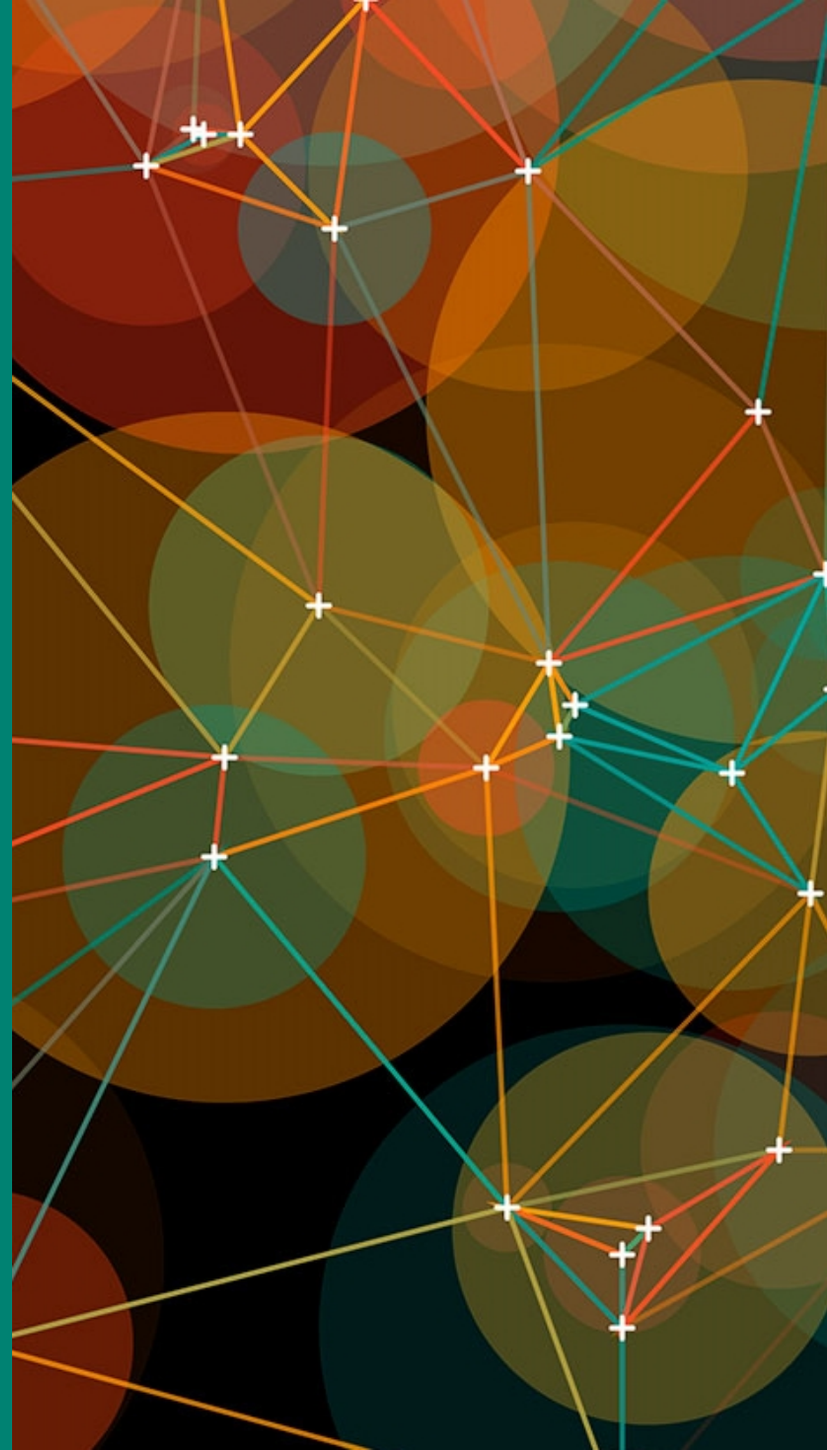
# SDK results

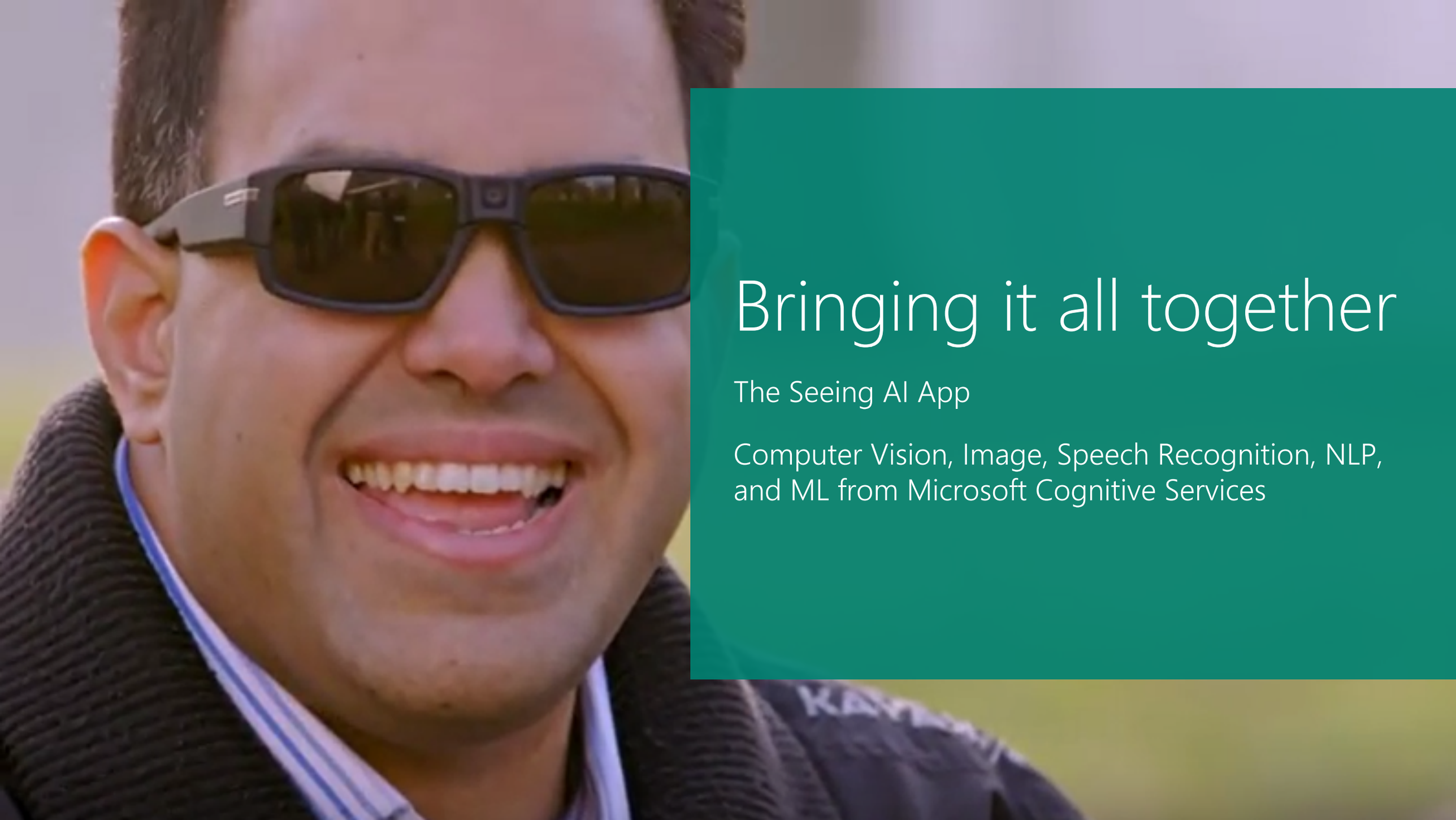


| | |
|---|---|
| | 0.967977047 }, { "name": "smile", "confidence": 0.9477451 }, { "name": "black and white", "confidence": 0.9309614 }, { "name": "man", "confidence": 0.926383138 }, { "name": "outdoor", "confidence": 0.8966964 }, { "name": "posing", "confidence": 0.834066331 }, { "name": "human face", "confidence": 0.7781277 }, { "name": "group", "confidence": 0.7551476 }, { "name": "suit", "confidence": 0.7084104 }, { "name": "clothes", "confidence": 0.172121257 } ] |
| Description | { "tags": [ "person", "building", "standing", "photo", "man", "outdoor", "posing", "group", "suit", "wearing", "player", "front", "people", "old", "court", "woman", "holding", "dressed", "room", "baseball", "field" ], "captions": [ { "text": "Satya Nadella, Bill Gates, Steve Ballmer posing for a photo", "confidence": 0.9753075 } ] } |
| Image format | "Jpeg" |
| Image | 516 x 800 |

# Demo

- Caption Bot – Computer Vision API
  - https://github.com/Azure-Samples/cognitive-services-quickstart-code





# Bringing it all together

The Seeing AI App

Computer Vision, Image, Speech Recognition, NLP, and ML from Microsoft Cognitive Services

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