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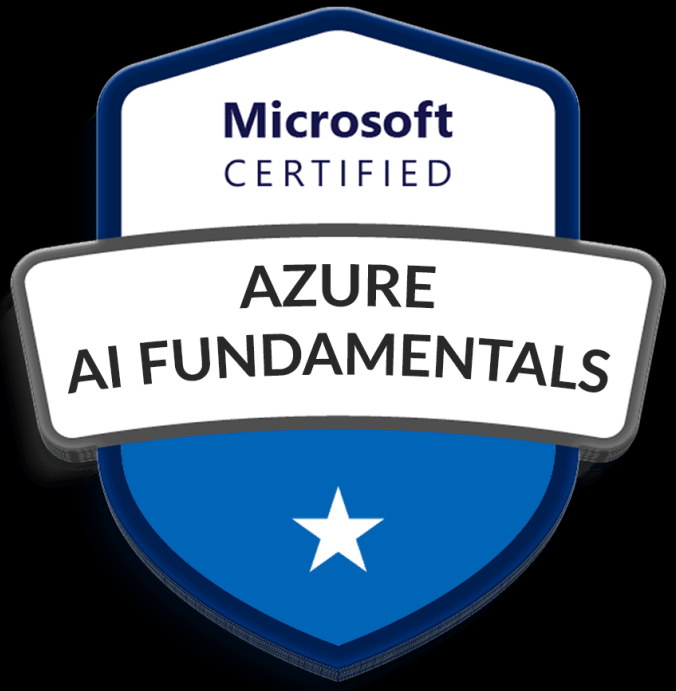
Microsoft Azure AI Fundamentals



EXAM: AI-900

#1: Course Introduction

Hello! Instructor Introduction

Susanth Sutheesh

Blog: AGuideToCloud.com

@AGuideToCloud

Skills Measured

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Skills	Weights
Describe AI workloads and considerations	15-20%
Describe fundamental principles of machine learning on Azure	30-35%
Describe features of computer vision workloads on Azure	15-20%
Describe features of Natural Language Processing (NLP) workloads on Azure	15-20%
Describe features of conversational AI workloads on Azure	15-20%

About this Course: Course Outline

A Guide To Cloud

- Module 01: Introduction to AI
- Module 02: Machine Learning
- Module 03: Computer Vision
- Module 04: Natural Language Processing
- Module 05: Conversational AI

Exam Basics

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40-60 questions

- Some questions worth more than 1 point
- Answer all the questions
  - *No penalty for guessing*
  - *Some questions cannot be skipped!*
- Mark items for review if you're not sure of your answer

Plan for 180 minutes

- 150 minutes to answer questions
- 30 minutes for instructions, comments, score reporting, etc.

More than just multiple-choice questions!

- Build list, hot area, active screen, drag and drop, etc.

Case Studies

- Detailed information on business and technical requirements; existing environment and other background you need to solve problems
- Requires you to understand and integrate information across multiple sources, determine what's important, and make the best decision

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Module 01: Introduction to AI

#2: Artificial Intelligence in Azure

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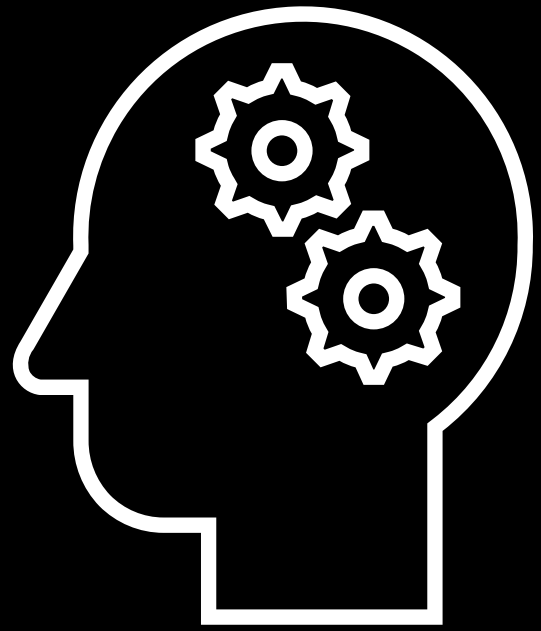
What is Artificial Intelligence?

Software that imitates human capabilities



Common Artificial Intelligence Workloads

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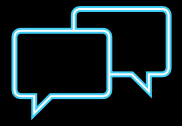
Machine Learning

Anomaly Detection

Computer Vision

Natural Language Processing



Conversational AI

Artificial Intelligence in Microsoft Azure

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Azure Machine Learning

Cognitive Services

Azure Bot Service

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Module 01: Introduction to AI

#3: Responsible AI

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Challenges and Risks with AI

- Bias can affect results
- Errors may cause harm
- Data could be exposed
- Solutions may not work for everyone
- Users must trust a complex system
- Who's liable for AI-driven decisions?

Principles of Responsible AI

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Fairness

Reliability & Safety

Privacy & Security

Inclusiveness

Transparency

Accountability

https://www.microsoft.com/ai/responsible-ai

Principles of Responsible AI

Fairness

Principles of Responsible AI

Reliability & Safety

Principles of Responsible AI

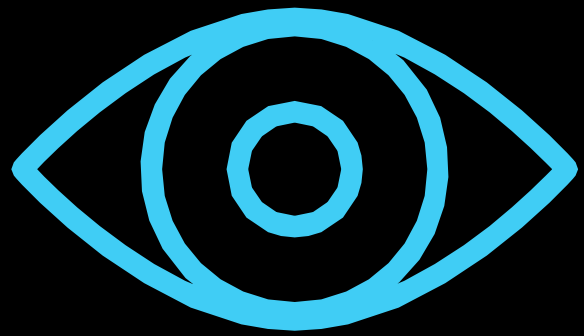
Privacy & Security

Principles of Responsible AI

Inclusiveness

Principles of Responsible AI

Transparency



Principles of Responsible AI

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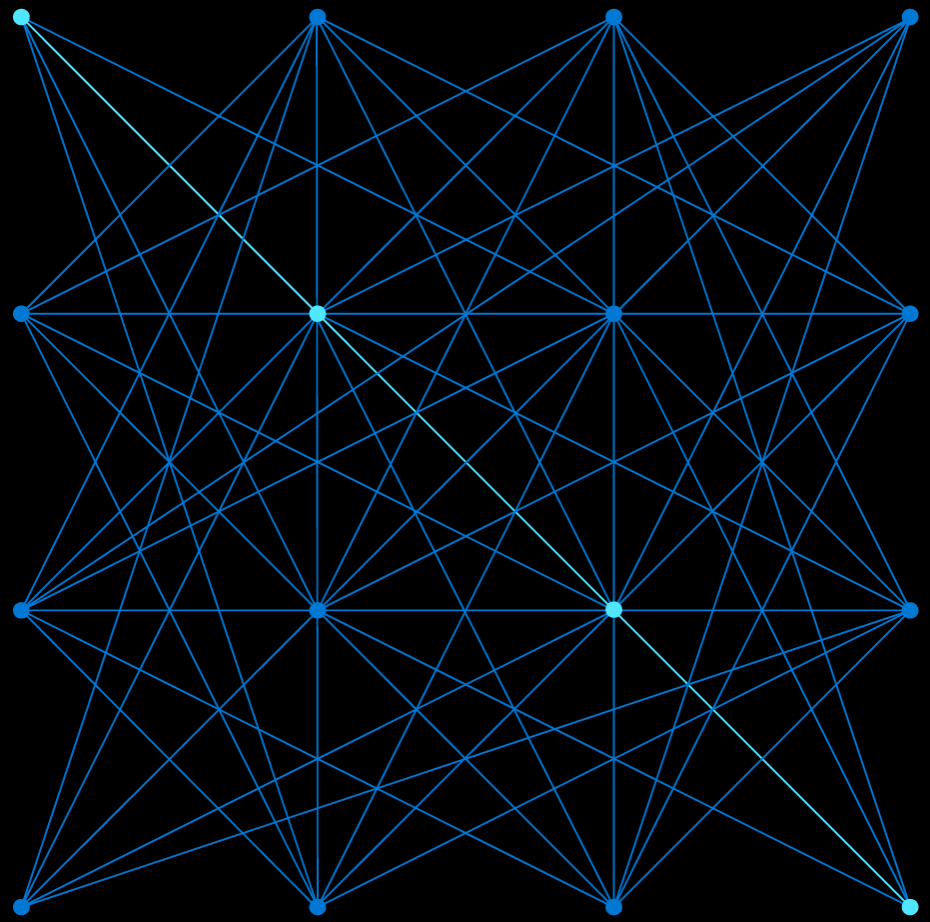
Accountability

LAB:
Responsible AI



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Module 02: Machine Learning

#4: Introduction to Machine Learning

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What is Machine Learning?

Creating predictive models by finding relationships in data

Machine Learning Example

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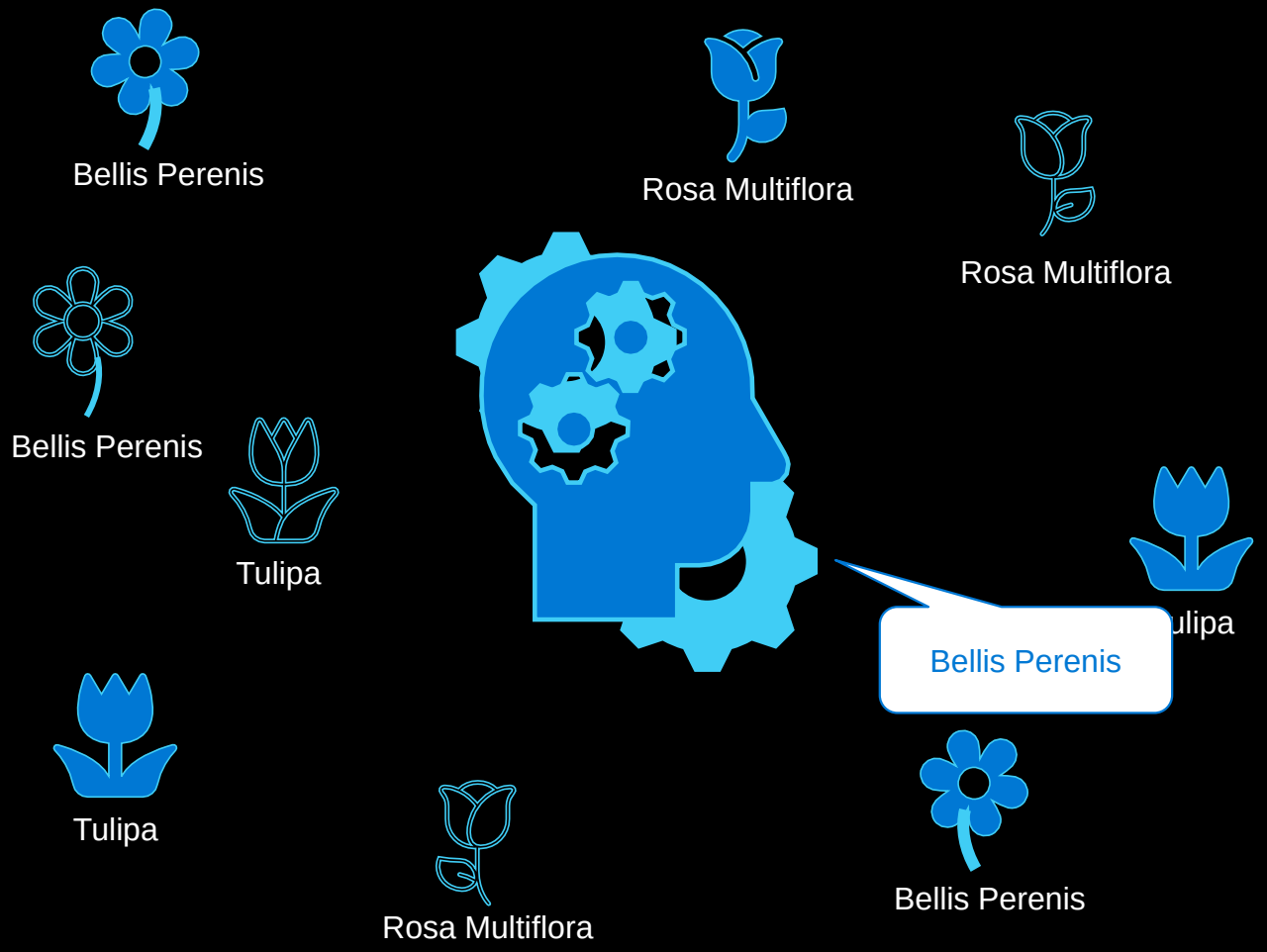

Regression

Regression Example

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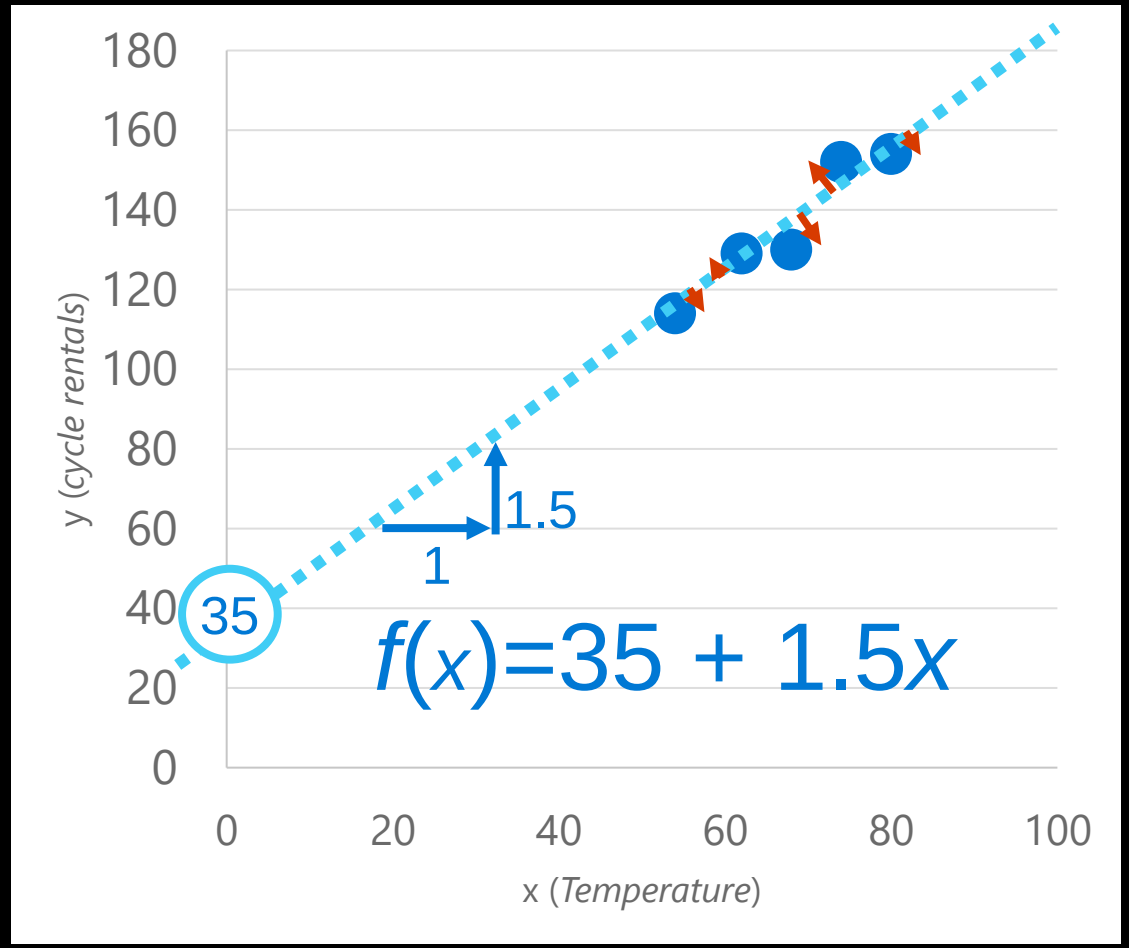
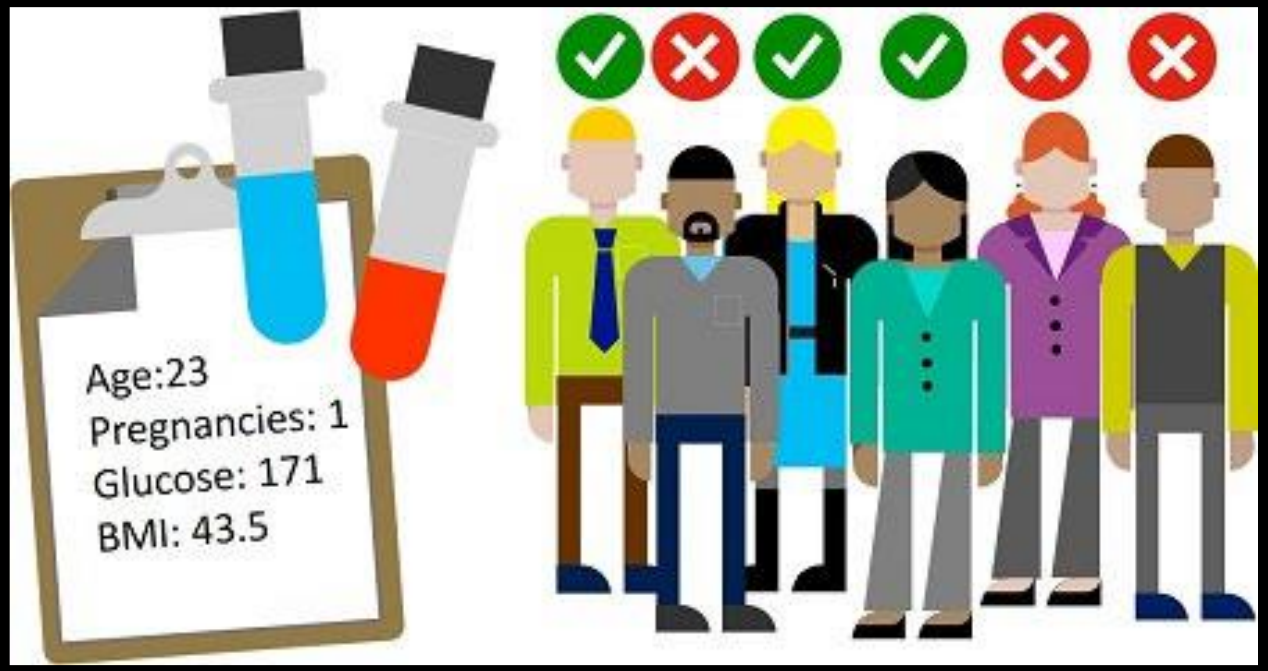
	x	y	$f(x)$ $\hat{y}$
Training	56	115	
	61	126	
	67	137	
	72	140	
	76	152	
	82	156	
Validation	54	114	116
	62	129	128
	68	130	137
	74	152	146
	80	154	155



Classification



Classification

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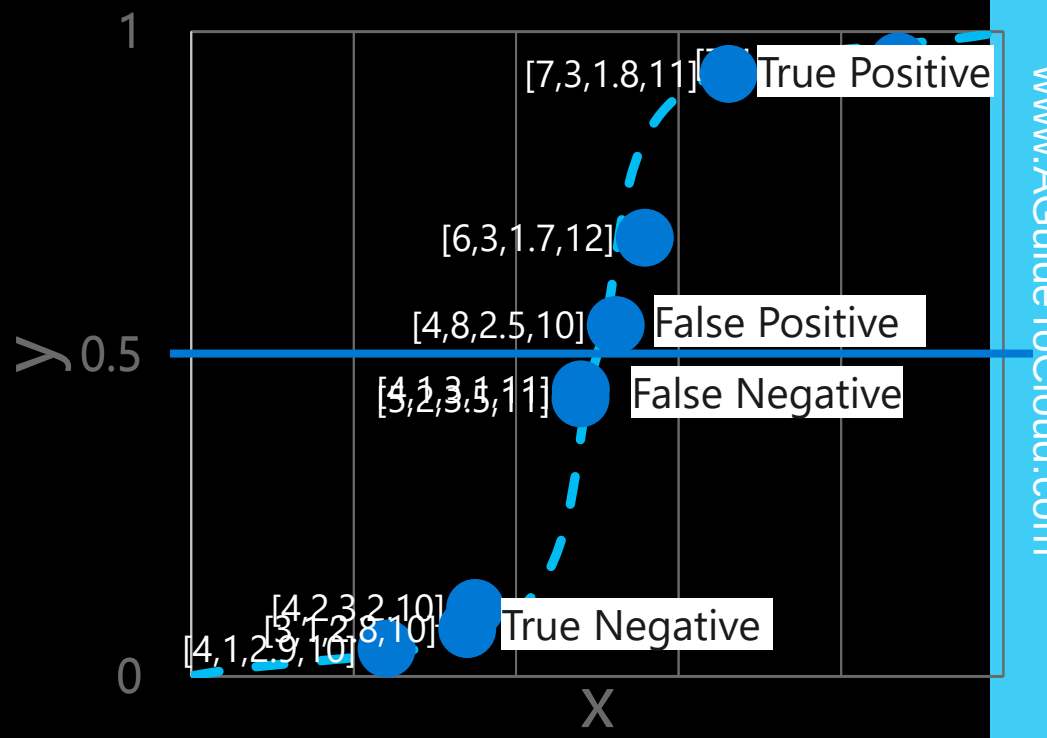
	x	y
Training	[4,2,3.2,10]	0
	[6,3,1.7,12]	1
	[5,2,3.5,11]	0
	[4,1,2.9,10]	0
	[7,4,2.1,11]	1
Validation	[3,1,2.8,10]	0
	[7,3,1.8,11]	1
	[4,8,2.5,10]	0
	[4,1,3,1,11]	1

	Actual 1	Actual 0
Predicted 1	126	21
Predicted 0	7	119

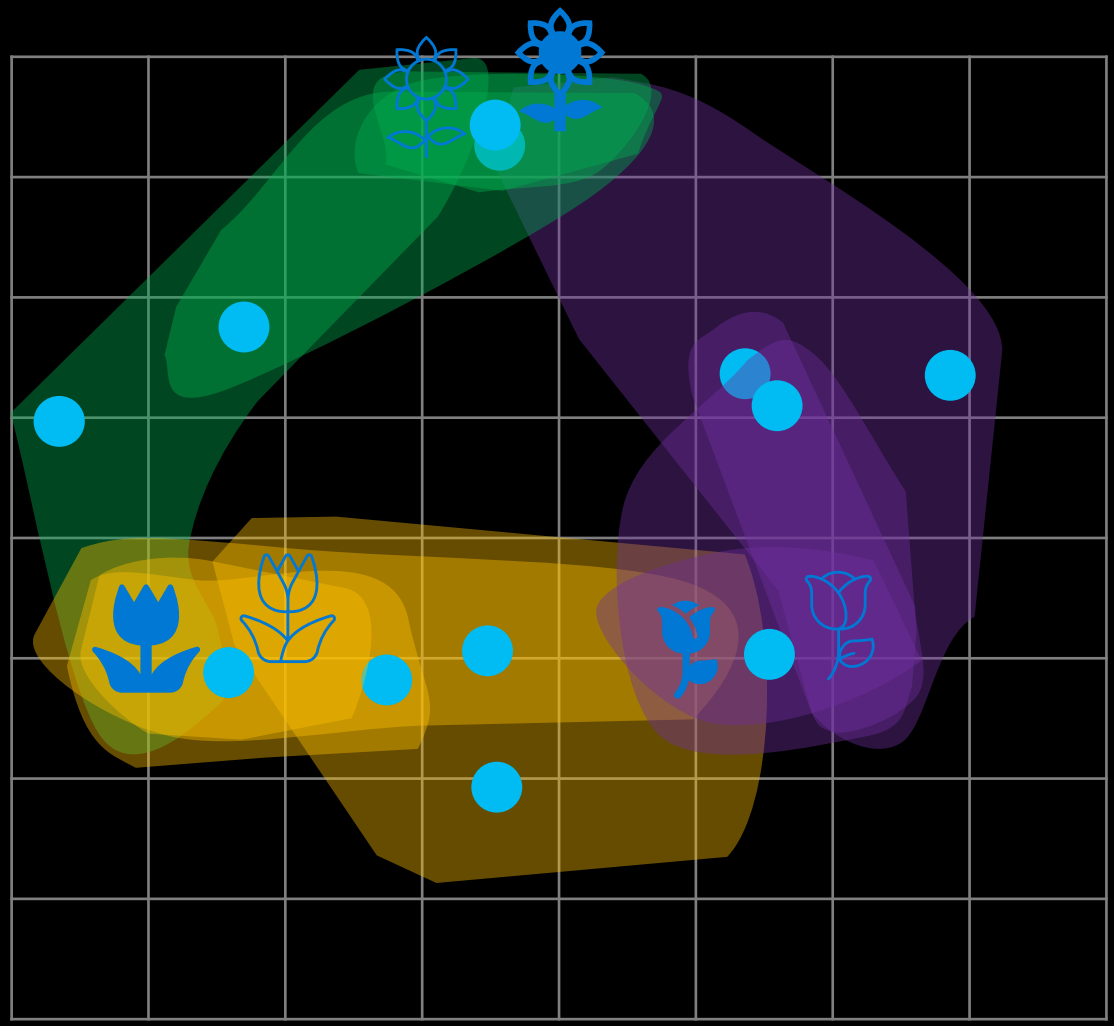
P(1)	P(0)	ŷ	
0.2	0.8	0	✓
0.9	0.1	1	✓
0.6	0.4	1	✗
0.3	0.7	0	✗



Clustering

Clustering

	6	3
	5	3
	2	3
	1	3
	3	8
	4	8



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Module 02: Machine Learning

#5: Azure Machine Learning

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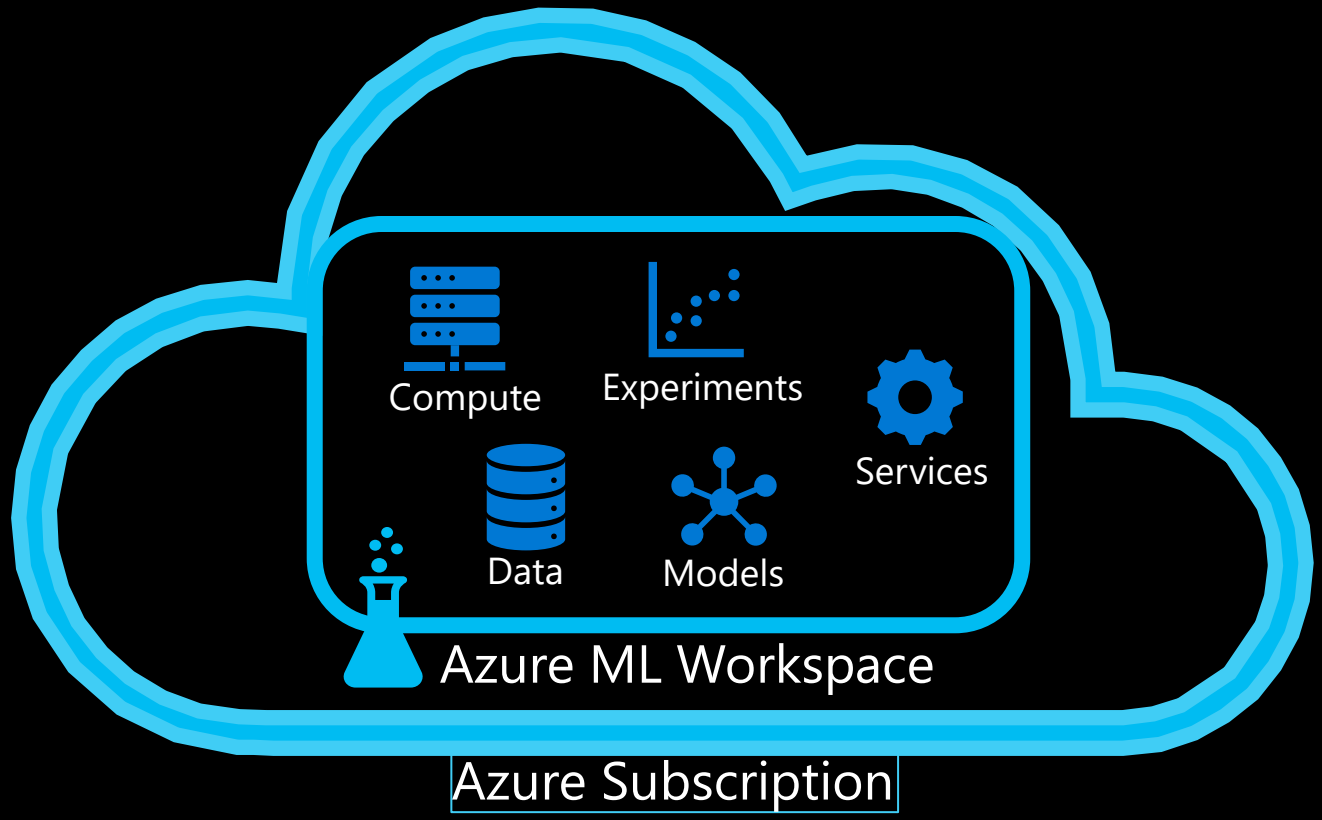
What is Azure Machine Learning?

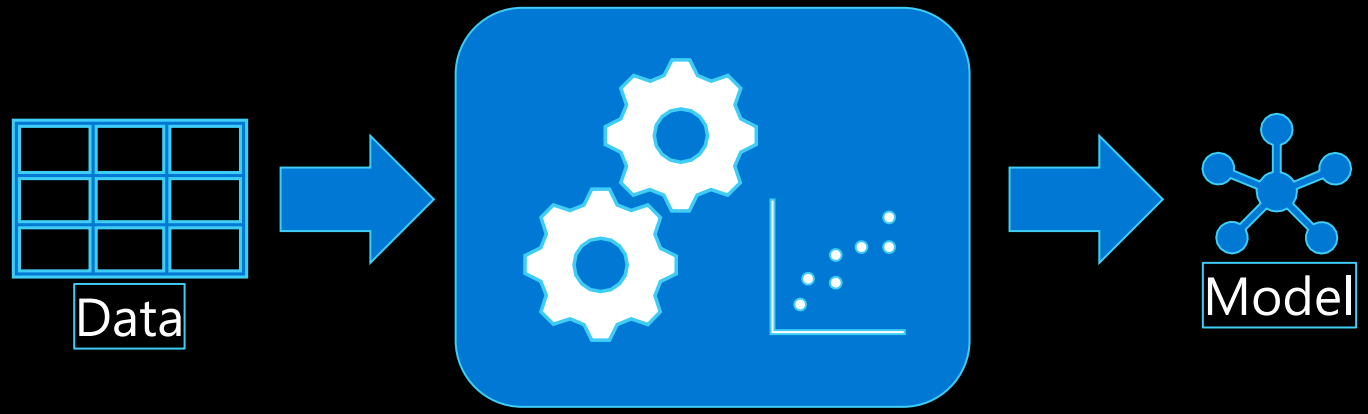
A cloud-based platform for machine learning



Automated Machine Learning

Takes the hard work out of machine learning

- Supply the data and desired model type, and let Azure Machine Learning find the best model



Azure Machine Learning *designer*

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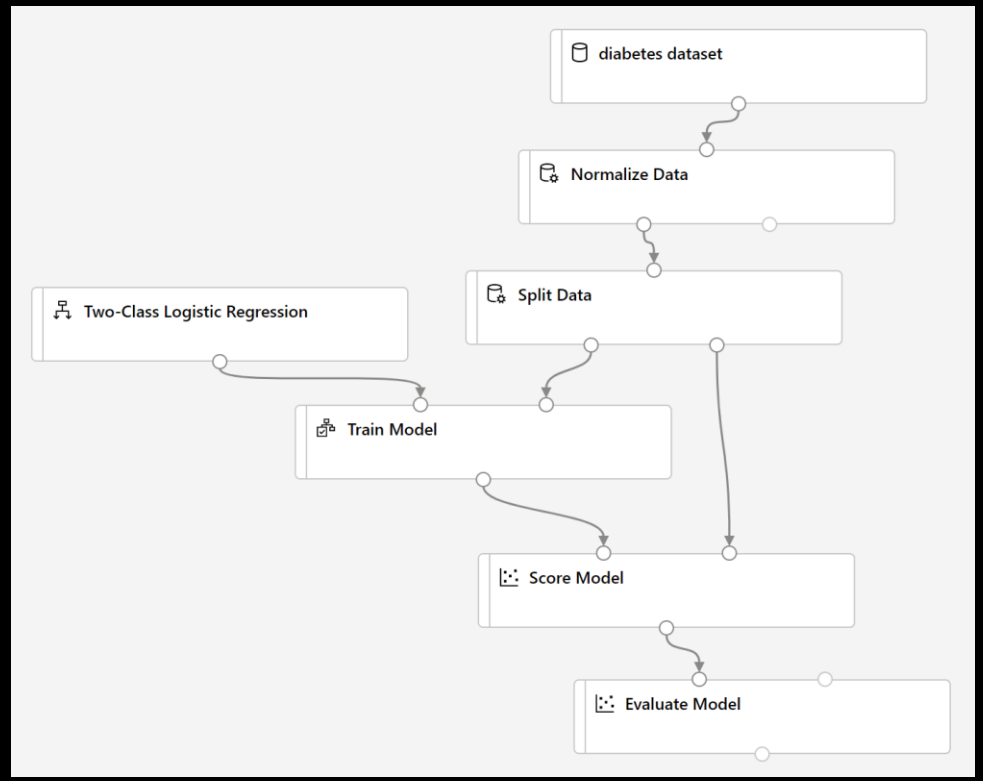
Visual tool for creating a machine learning *pipeline*

1. Use a *training pipeline* to train and evaluate a model
2. Create an *inference pipeline* to predict labels from new data
3. Deploy the inference pipeline as a *service* for apps to use



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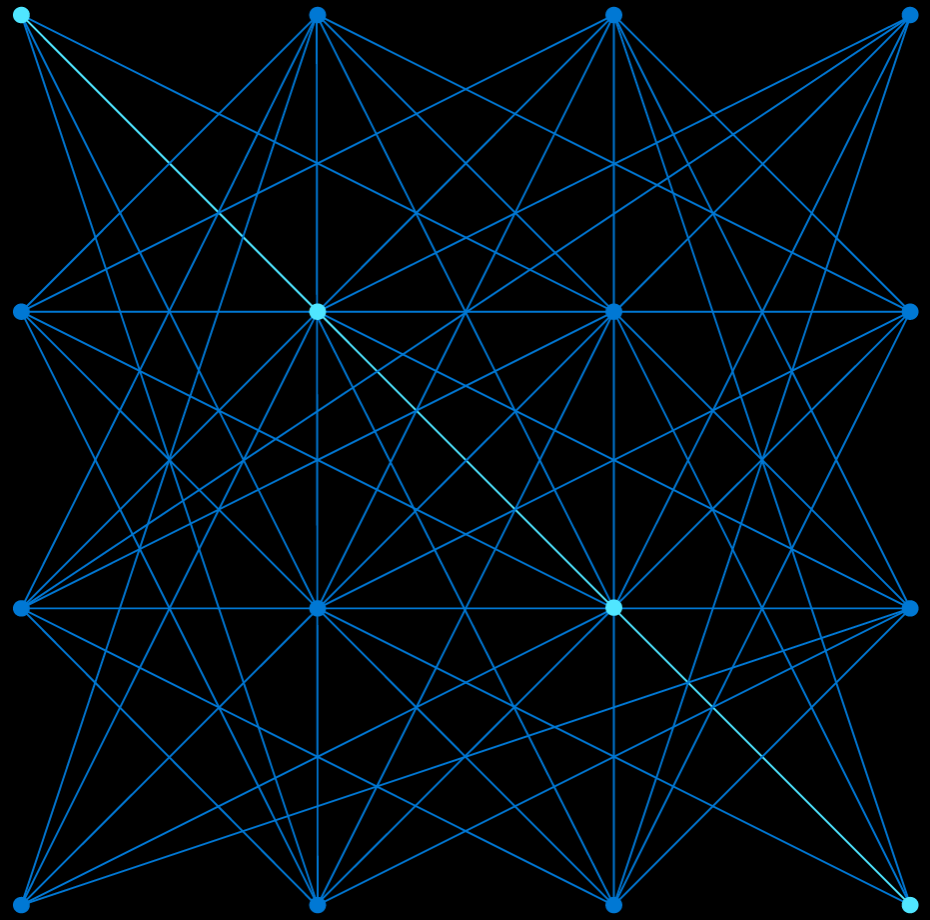
LAB:
Azure Machine Learning



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Module 03: Computer Vision

#6: Computer Vision Concepts

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Computer Vision

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What is Computer Vision?

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Applications of Computer Vision

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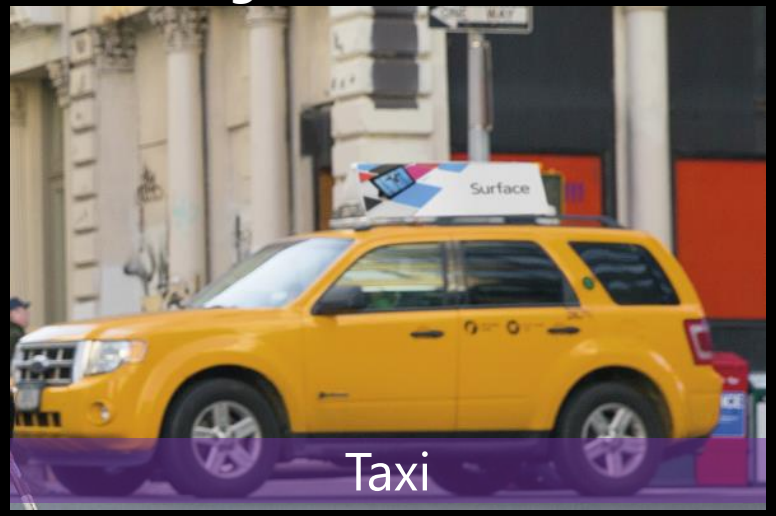
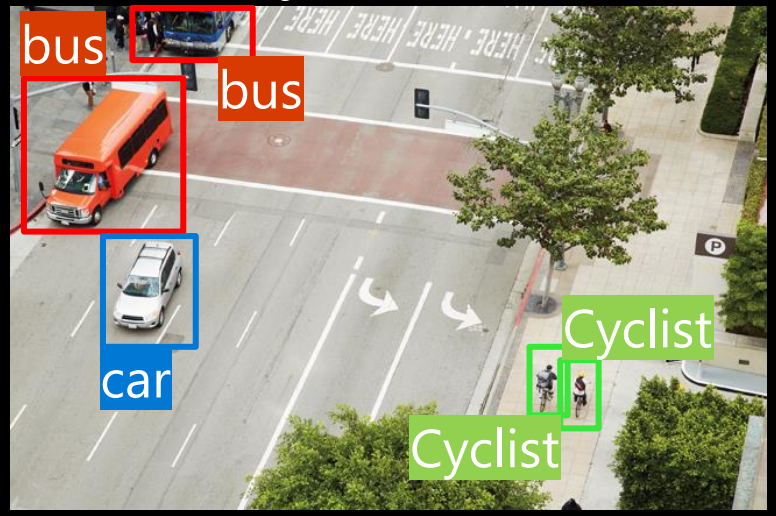
Image Classification



Object Detection



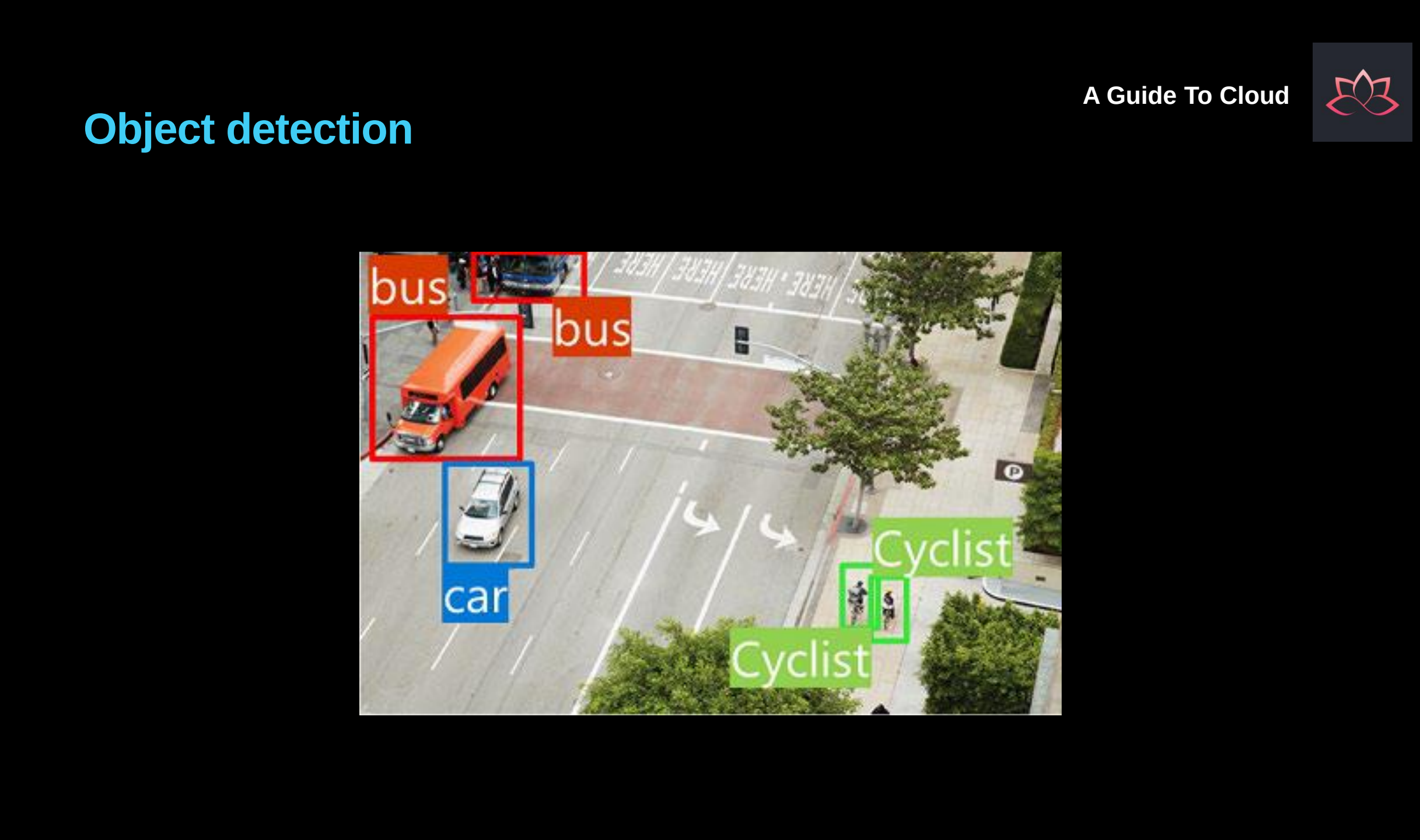
Semantic Segmentation

Image Analysis

Face Detection & Recognition

Optical Character Recognition

Image Classification



Object detection

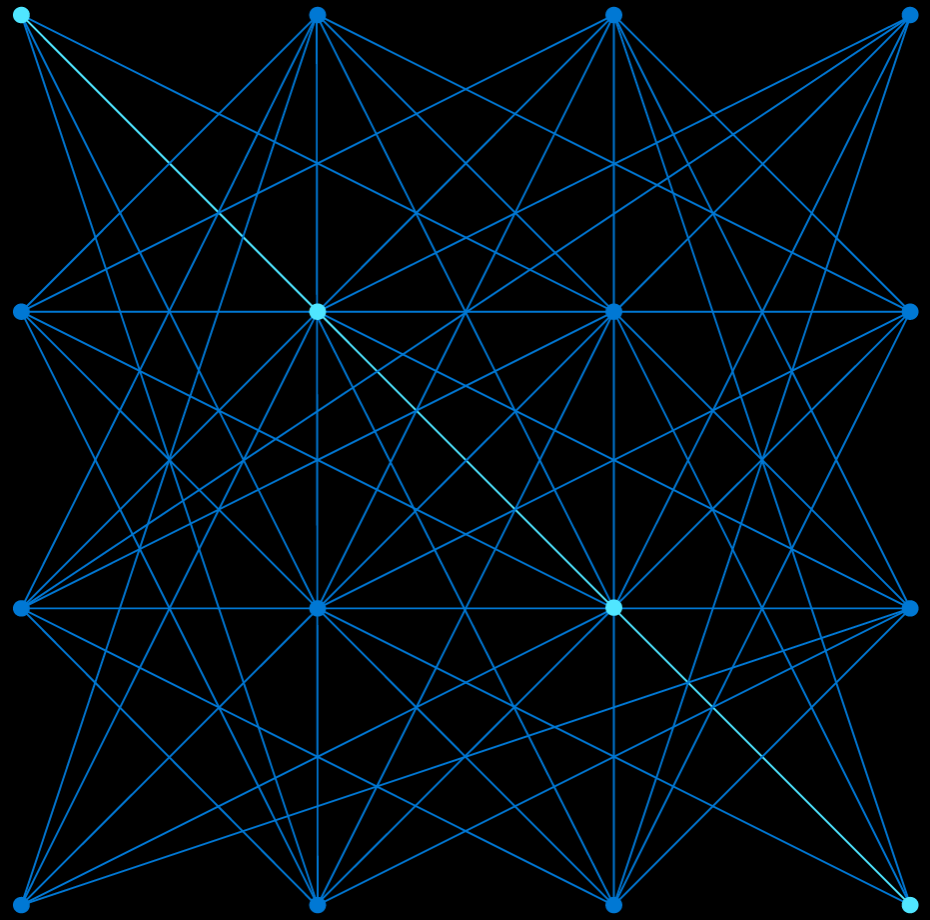
Semantic segmentation

Image analysis

Face detection, analysis and recognition

Optical character recognition (OCR)

DEMO:
Computer Vision



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Module 03: Computer Vision

#7: Computer Vision in Azure

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Cognitive Services

AI application resources in an Azure subscription:

You will explore cognitive services using an online environment named Visual Studio Codespaces

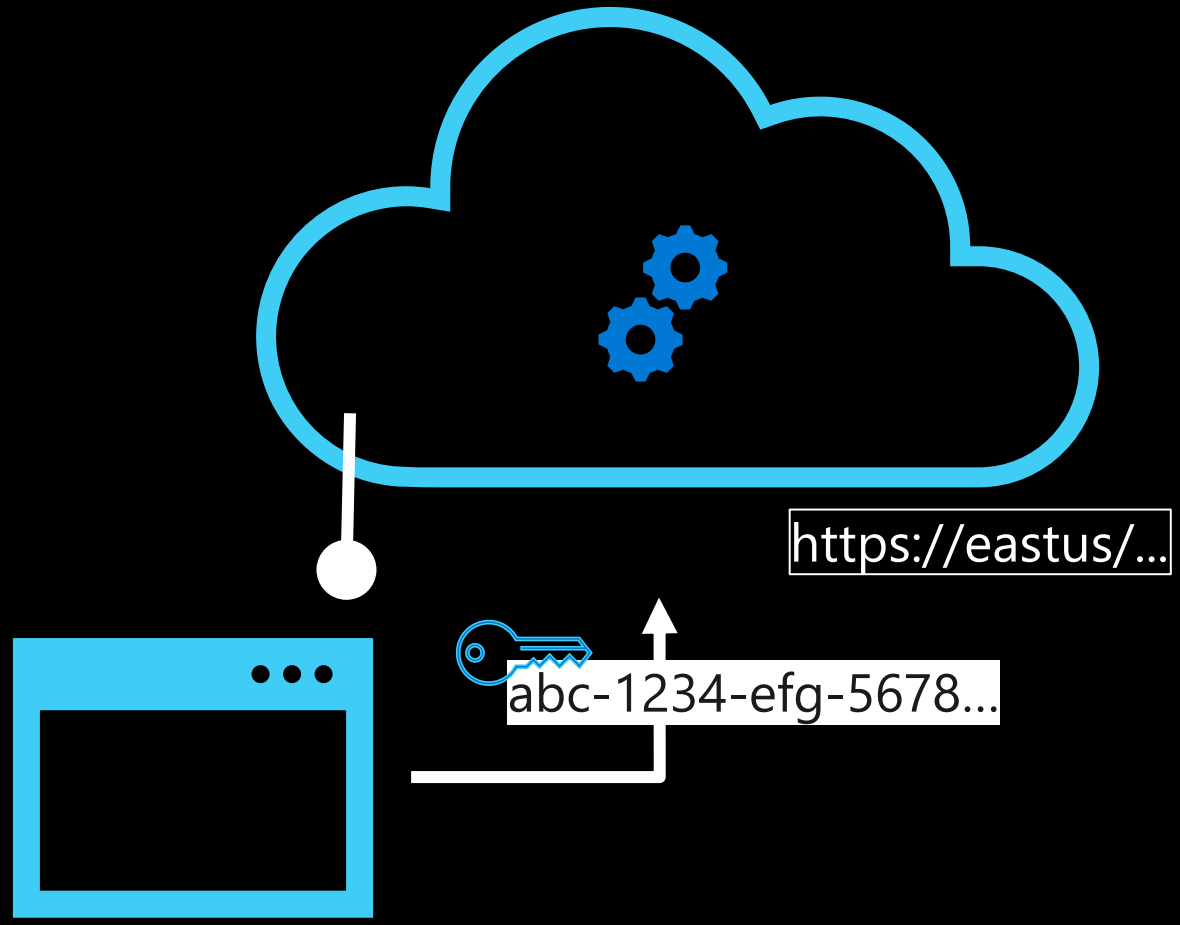

Image Analysis with the *Computer Vision* Service

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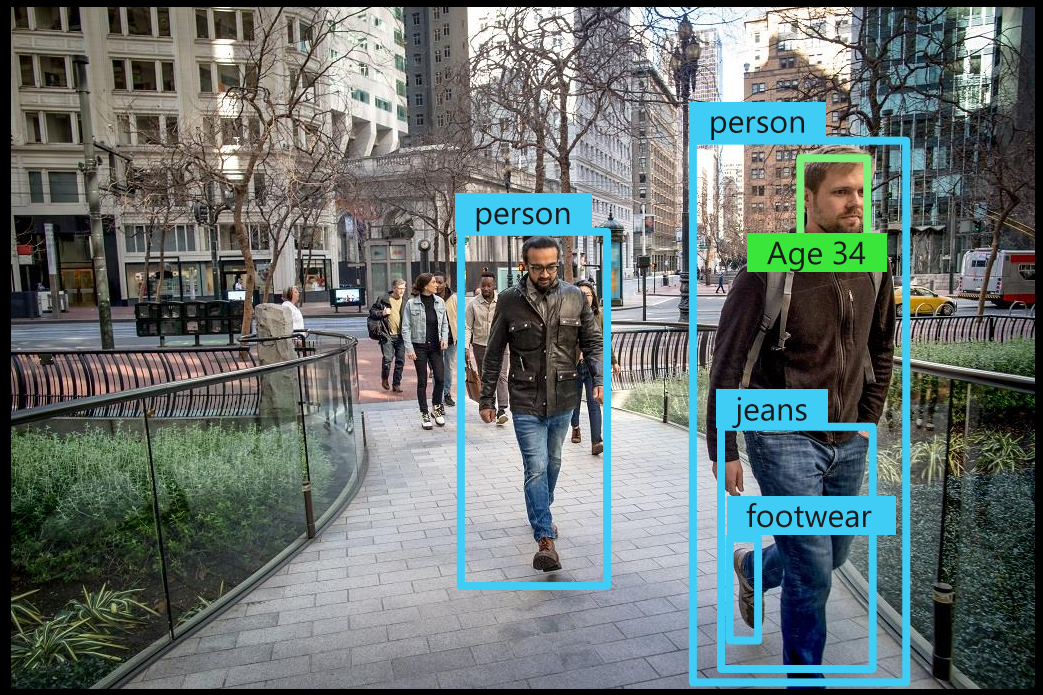
Computer Vision

Cognitive Services



Caption: a group of people walking on a sidewalk
Tags: building, jeans, street, outdoor, jacket, city, person
Ratings: Adult: False, Racy: False, Gore: False

Training Models with the *Custom Vision* Service

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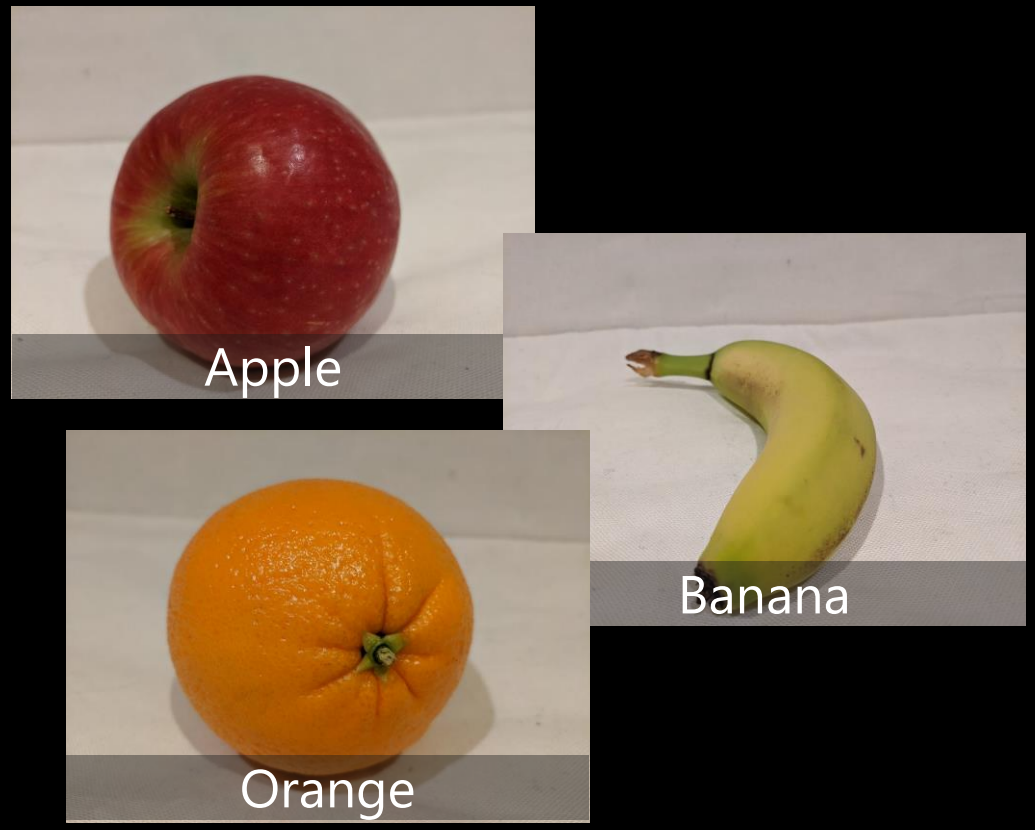
Image Classification



Object Detection

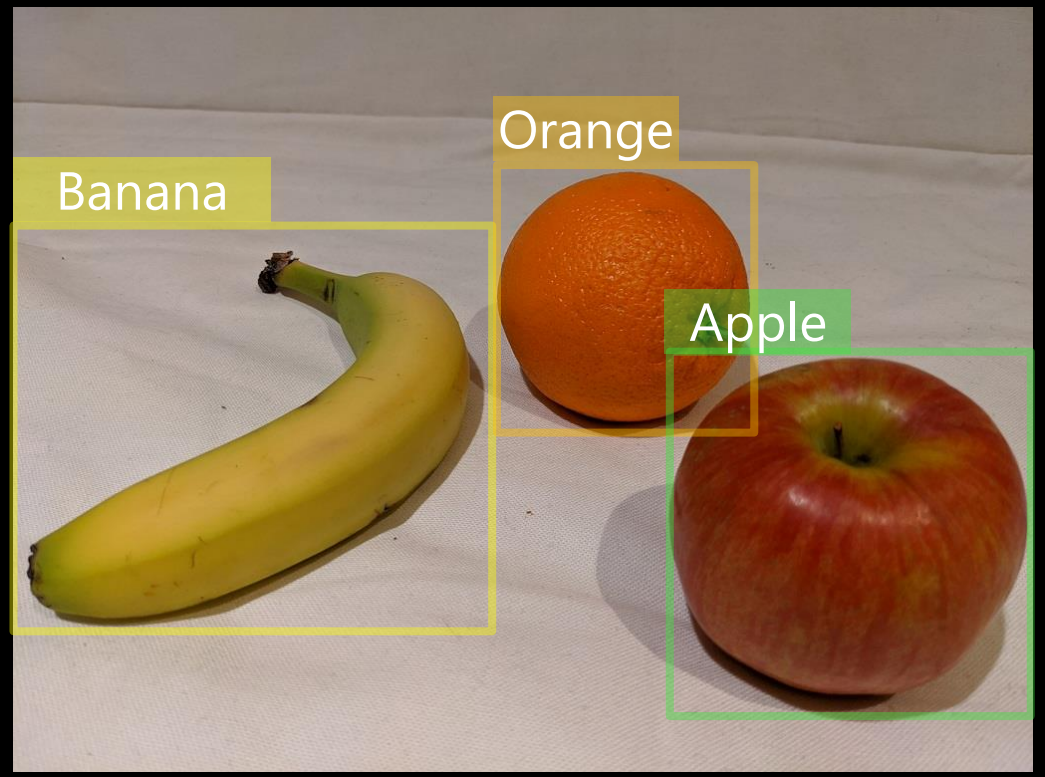


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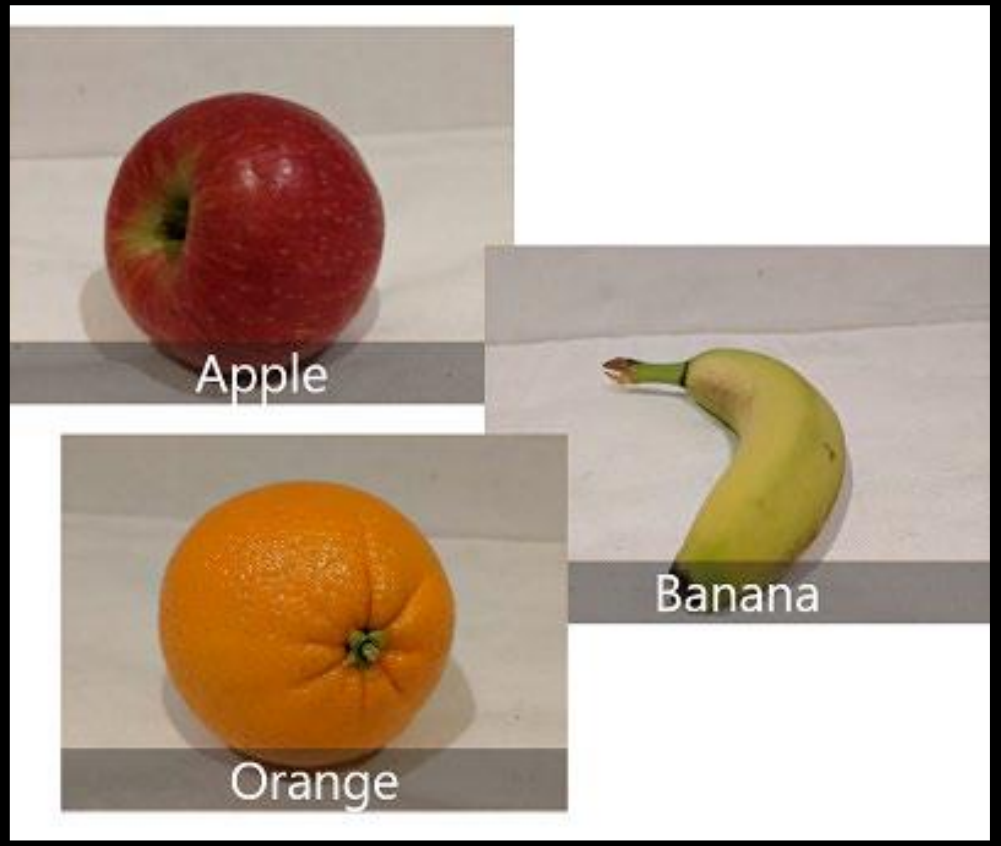
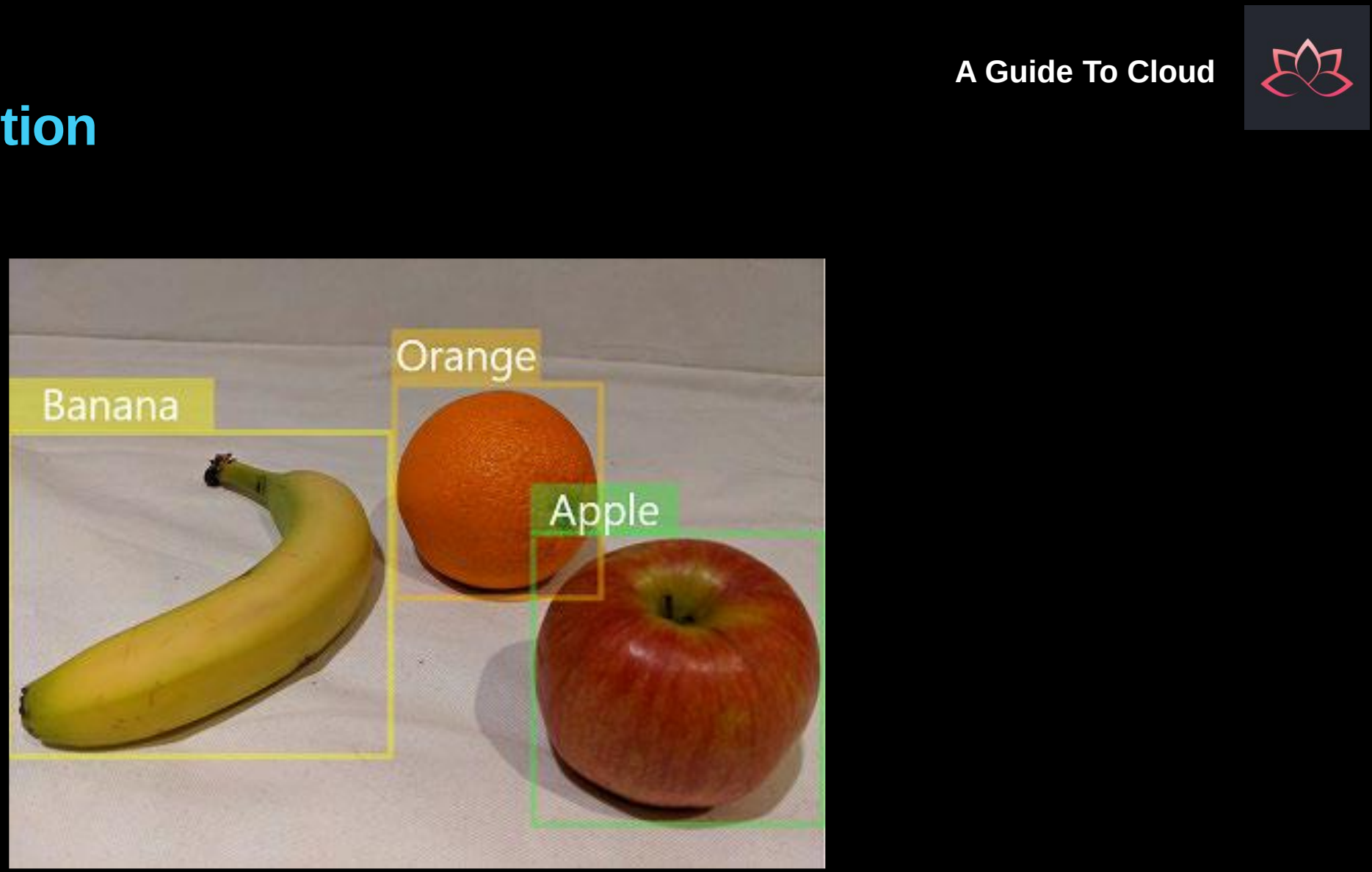
Image Classification





Object Detection

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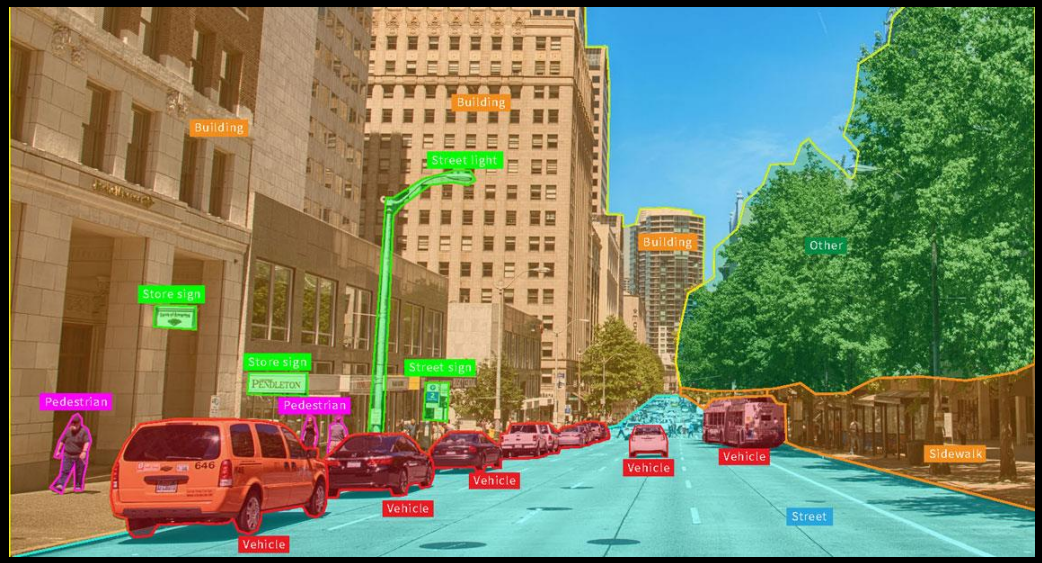
Using custom Vision Service

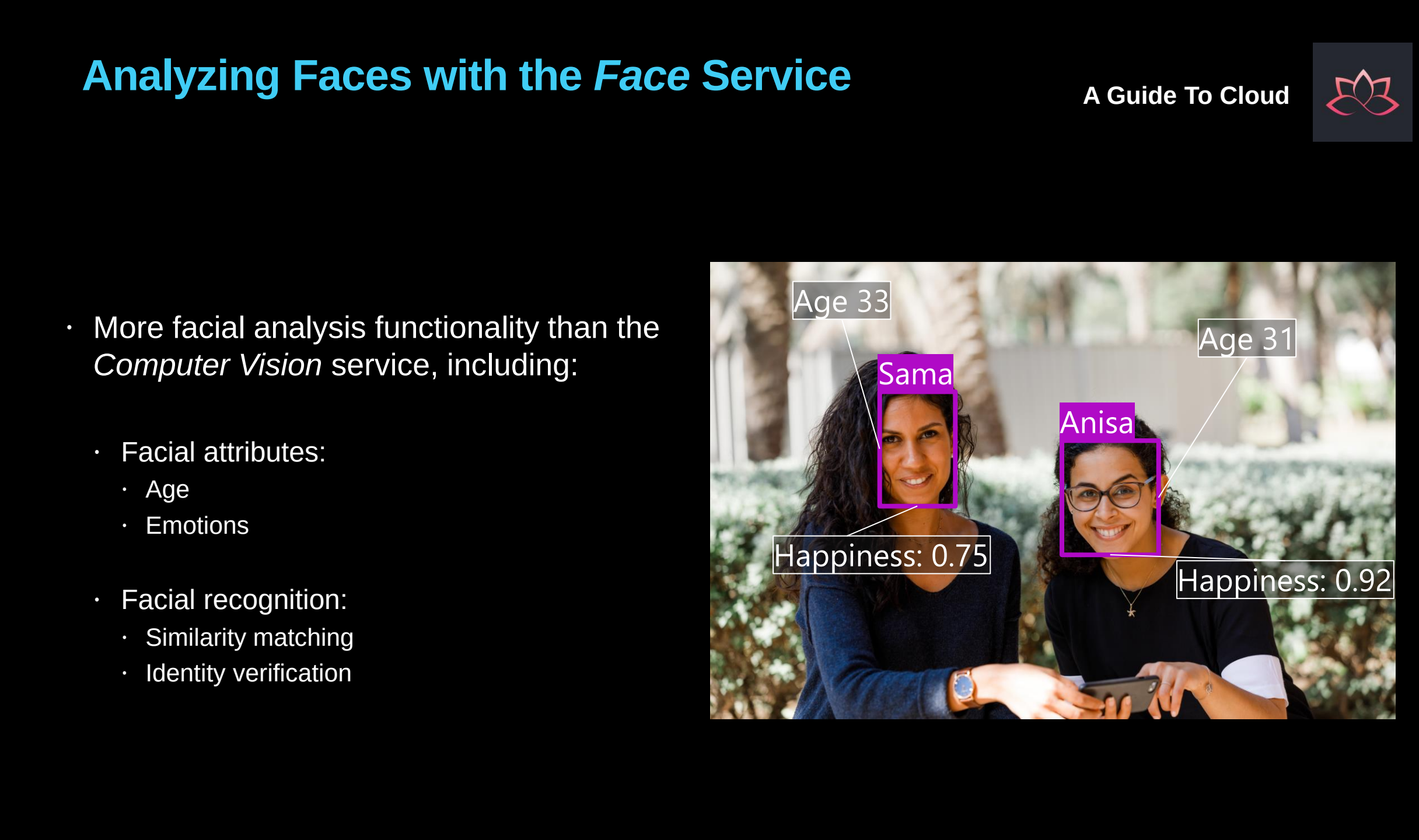
Custom Vision

Cognitive Services



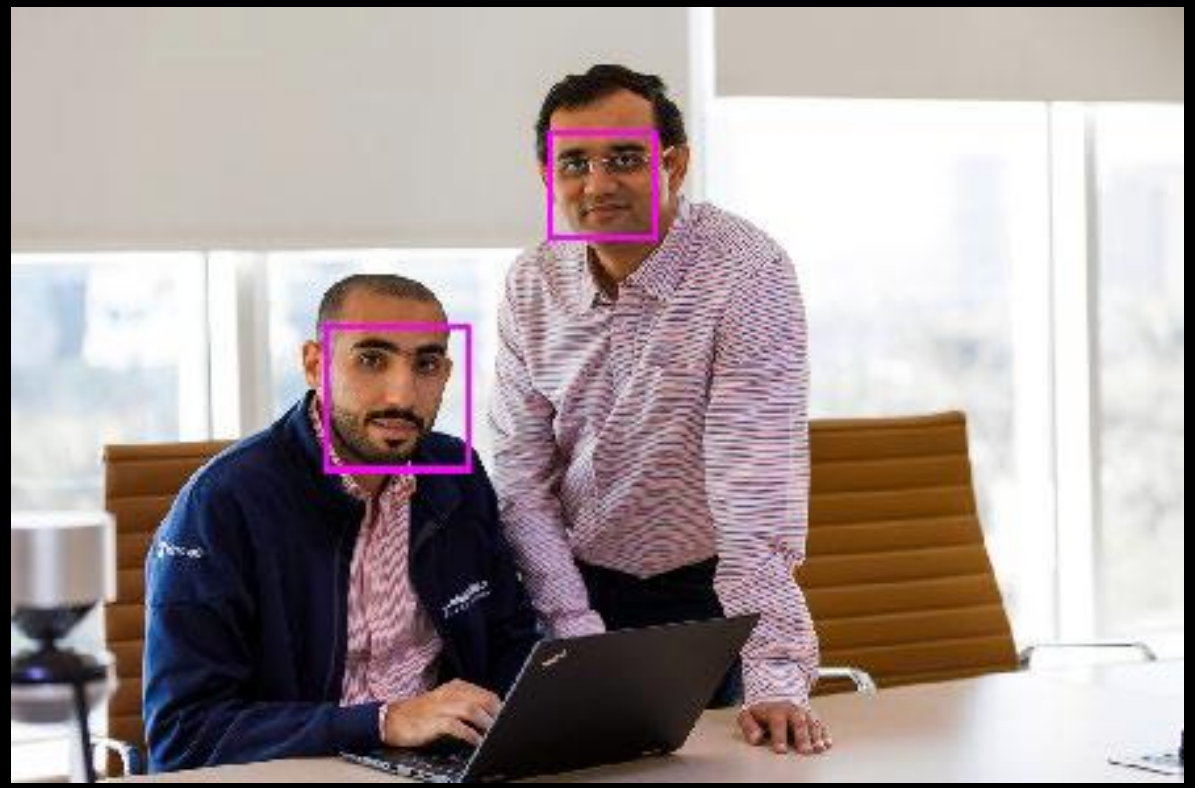
Model training

Analyzing Faces with the *Face* Service

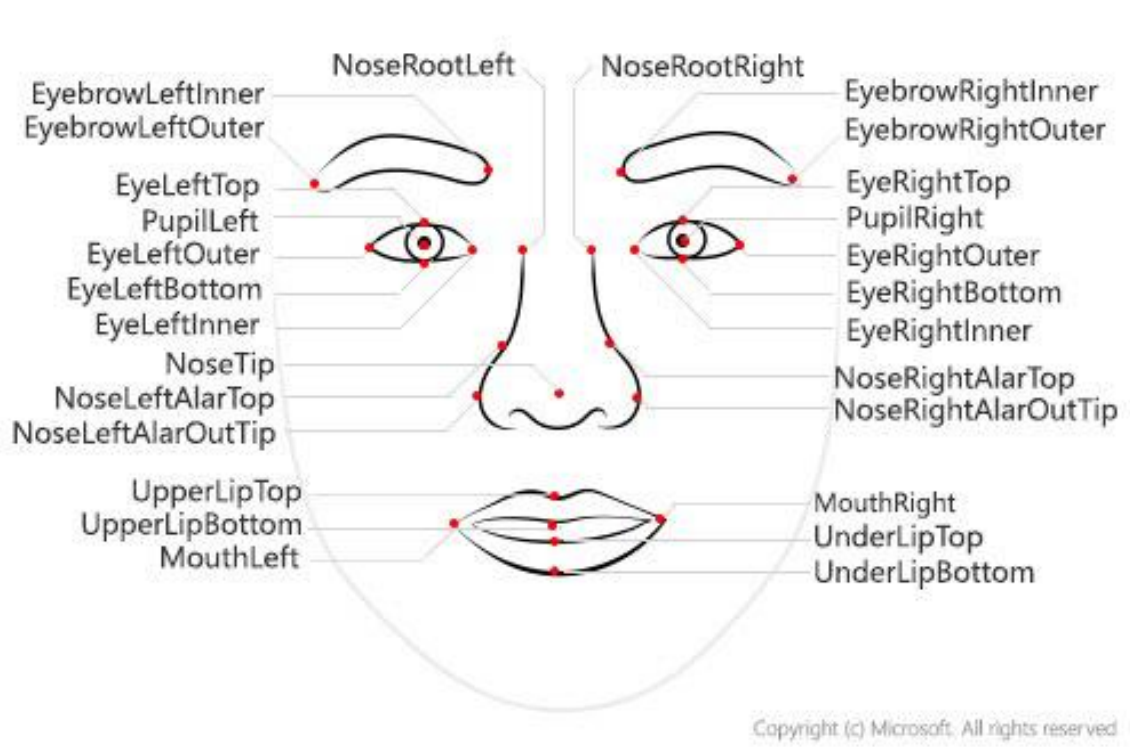


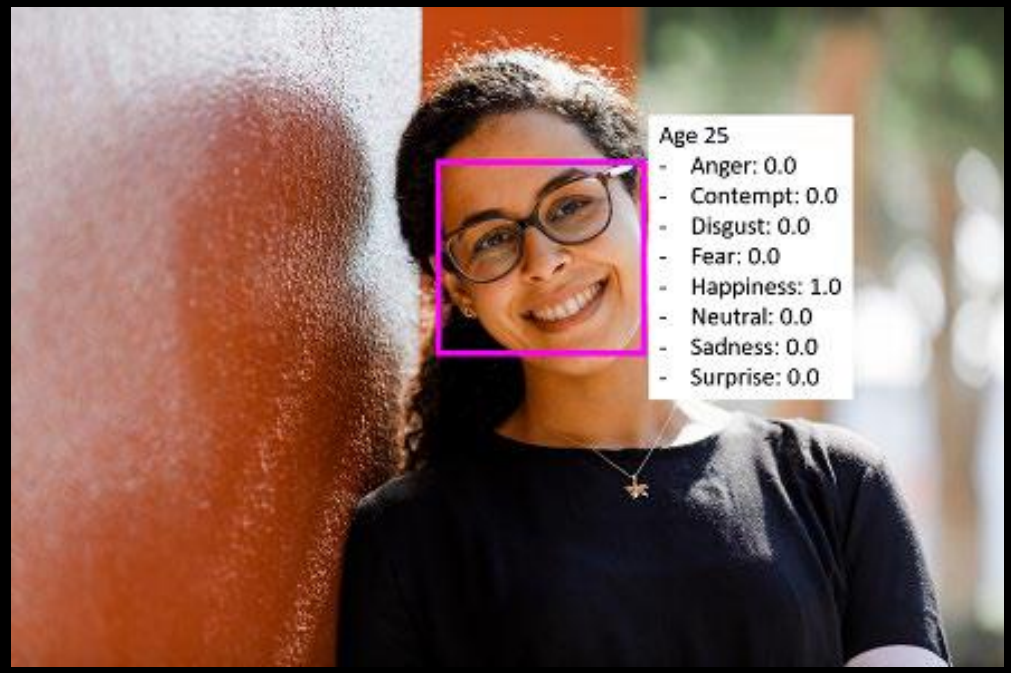
- More facial analysis functionality than the *Computer Vision* service, including:
  - Facial attributes:
    - Age
    - Emotions
  - Facial recognition:
    - Similarity matching
    - Identity verification

Face detection

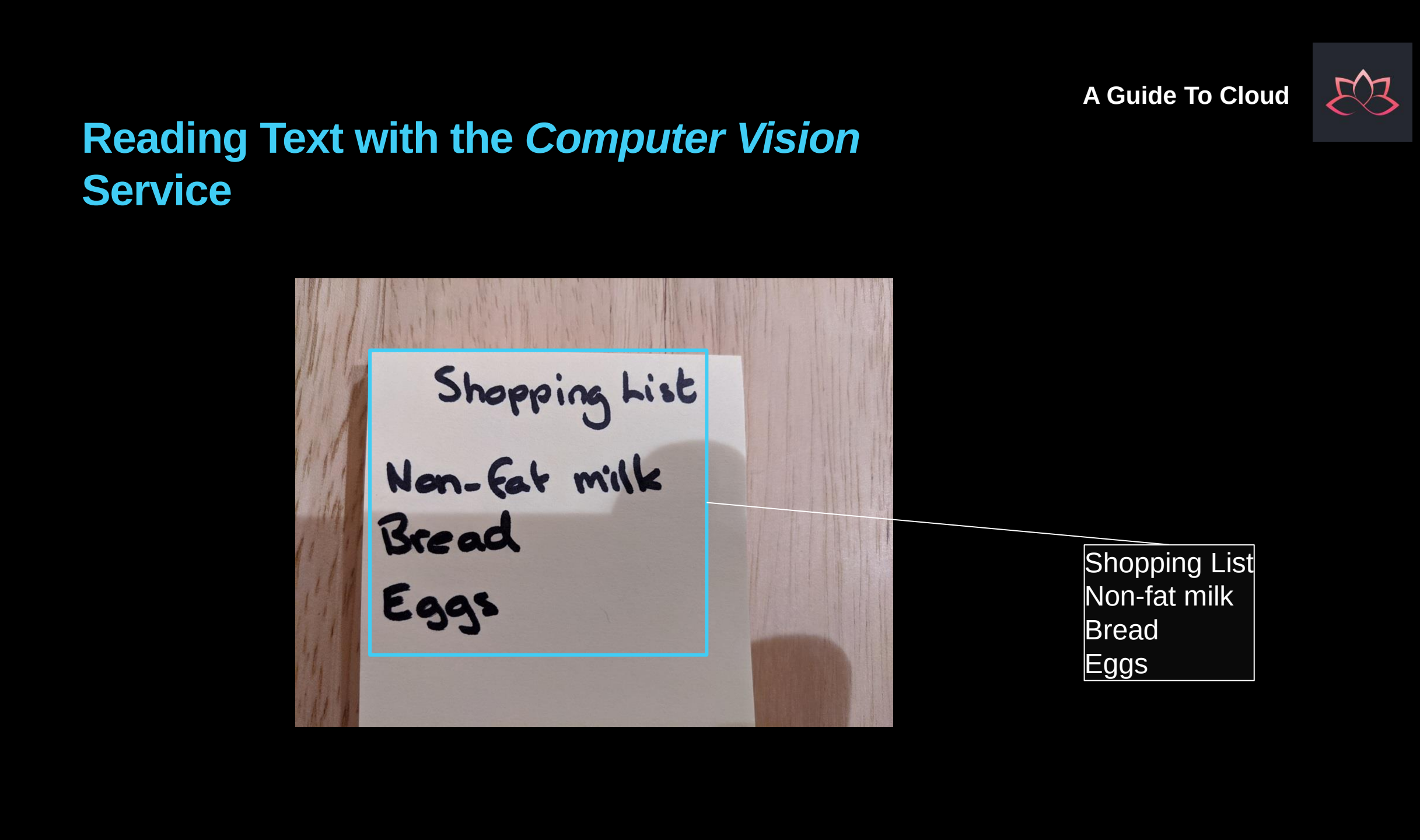


Face analysis





Facial recognition



Reading Text with the *Computer Vision* Service

Shopping List
Non-fat milk
Bread
Eggs

Analyzing Forms with the *Form Recognizer* Service

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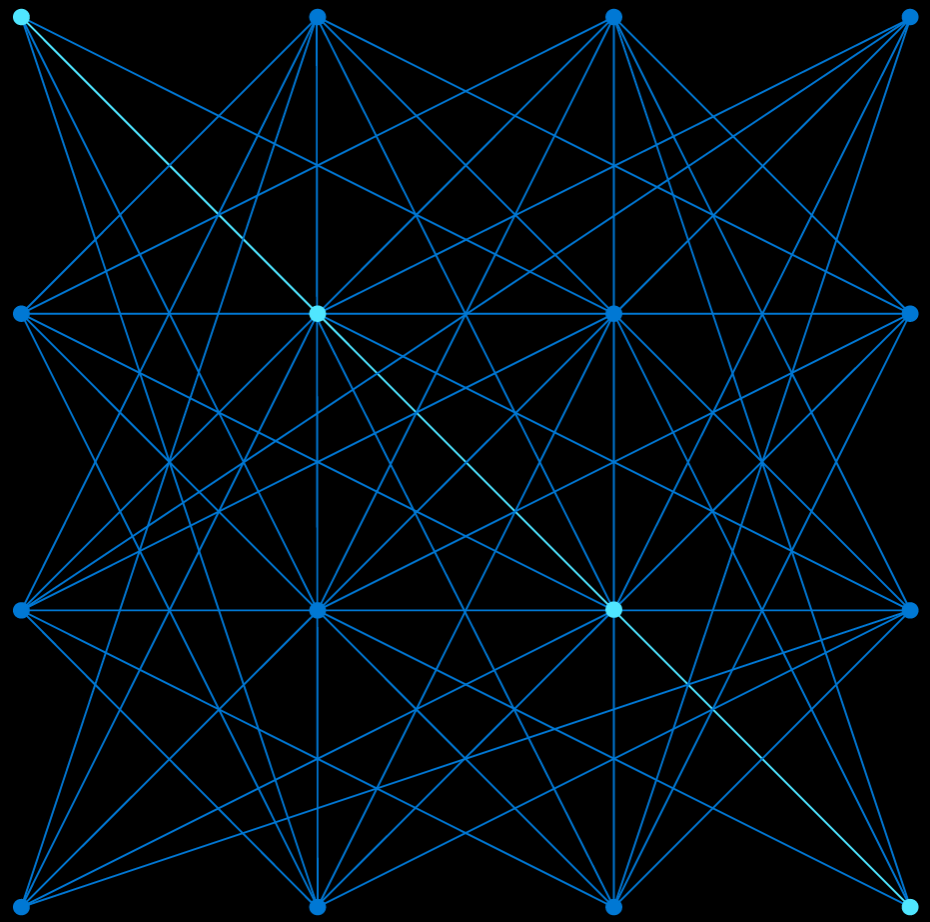
LAB:
Image Classification



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Module 04: Natural Language Processing (NLP)

#8: Introduction to NLP

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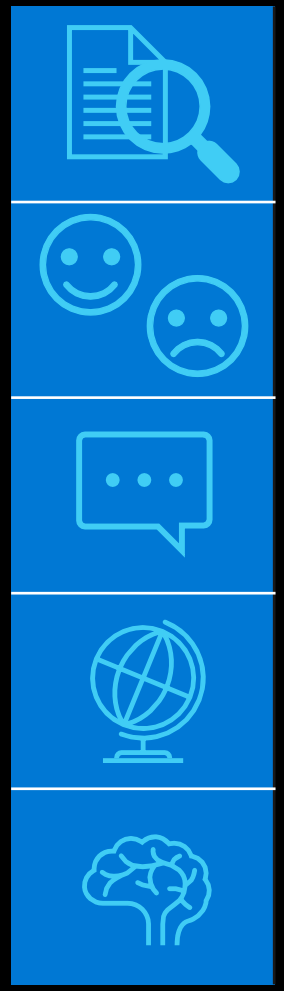
What is Natural Language Processing?



Text analysis and entity recognition

Sentiment analysis

Speech recognition and synthesis

Machine translation

Semantic language modeling

Text analysis

Text Analytics

Cognitive Services

Language detection

Review 1: "*A fantastic place for lunch. The soup was delicious.*"
Review 2: "*Comida maravillosa y gran servicio.*"
Review 3: "*The croque monsieur avec frites was terrific. Bon appetit!*"

Document	Language Name	ISO 6391 Code	Score
Review 1	English	en	1.0
Review 2	Spanish	es	1.0
Review 3	English	en	0.9

Sentiment analysis

"We had dinner at this restaurant last night and the first thing I noticed was how courteous the staff was. We were greeted in a friendly manner and taken to our table right away. The table was clean, the chairs were comfortable, and the food was amazing."

0.9

"Our dining experience at this restaurant was one of the worst I've ever had. The service was slow, and the food was awful. I'll never eat at this establishment again."

0.1

Key phrase extraction

- attentive service
- great food
- birthday celebration
- fantastic experience
- table
- friendly hostess
- dinner
- ambiance
- place

Entity recognition

Type	SubType	Example
Person		"Bill Gates", "John"
Location		"Paris", "New York"
Organization		"Microsoft"
Quantity	Number	"6" or "six"
Quantity	Percentage	"25%" or "fifty percent"
Quantity	Ordinal	"1st" or "first"
Quantity	Age	"90 day old" or "30 years old"
Quantity	Currency	"10.99"
Quantity	Dimension	"10 miles", "40 cm"
Quantity	Temperature	"45 degrees"
DateTime		"6:30PM February 4, 2012"
DateTime	Date	"May 2nd, 2017" or "05/02/2017"
DateTime	Time	"8am" or "8:00"
DateTime	DateRange	"May 2nd to May 5th"
DateTime	TimeRange	"6pm to 7pm"
DateTime	Duration	"1 minute and 45 seconds"
DateTime	Set	"every Tuesday"
URL		"https://www.bing.com"
Email		"support@microsoft.com"
US-based Phone Number		"(312) 555-0176"
IP Address		"10.0.1.125"

Speech Recognition and Synthesis

Speech recognition

Speech synthesis

Speech Recognition and Synthesis

The speech-to-text API

Real-time transcription

Batch transcription

The text-to-speech API

Speech synthesis voices

Machine Translation

Literal and semantic translation

Text and speech translation

Azure services for translation

Translator Text service

Speech service

Language Understanding

Utterances

"Switch the fan on."
"Turn on the light."

Entities

*"Switch the **fan** on."*
*"Turn on the **light**."*

Intents

Intent	Related Utterances	Entities
Greeting	"Hello"	
	"Hi"	
	"Hey"	
	"Good morning"	
TurnOn	"Switch the fan on"	fan (device)

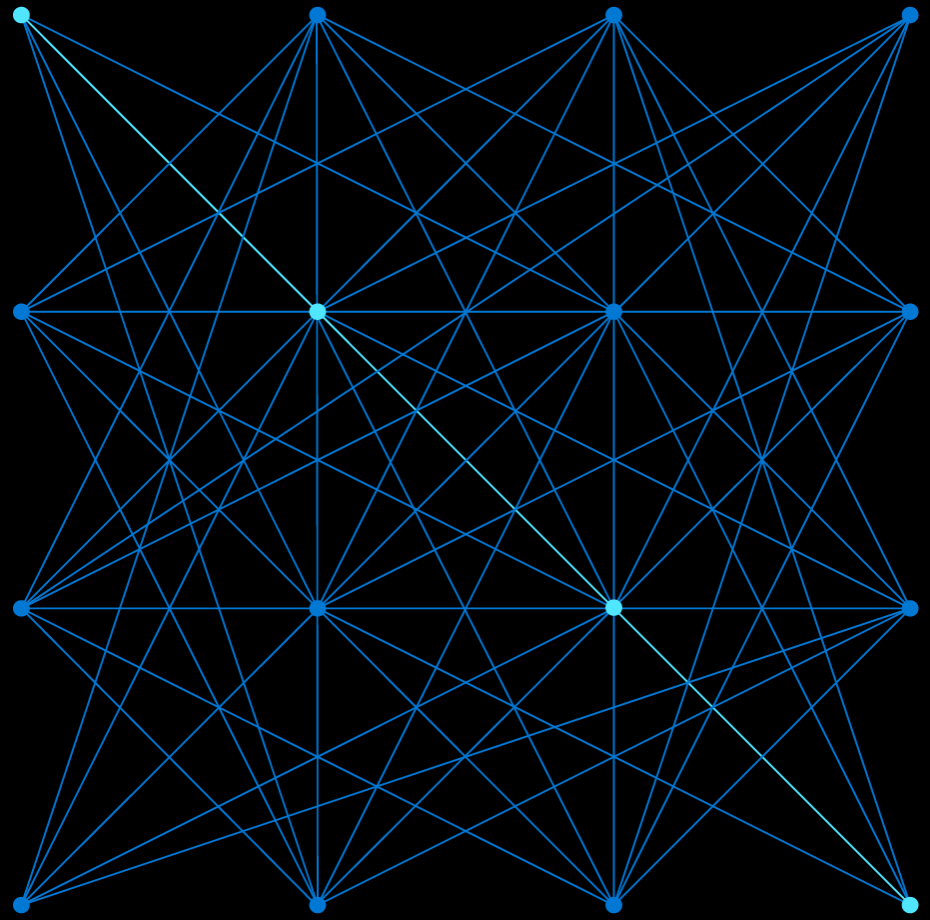
Creating a Language Understanding application

Language Understanding:

Cognitive Services

Predicting

DEMO:
Natural Language Processing



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Module 04: Natural Language Processing (NLP)

#9: Using NLP Services

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Text Analytics

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I had a wonderful vacation in France.

- Predominant Language: English
- Sentiment: 88% (positive)
- Key Phrases: "wonderful vacation"
- Entities: France

Speech Recognition and Synthesis

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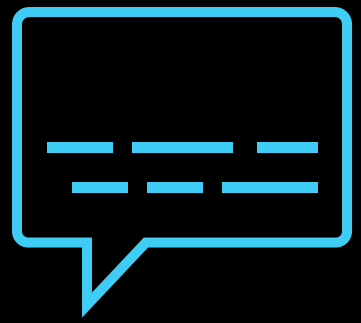
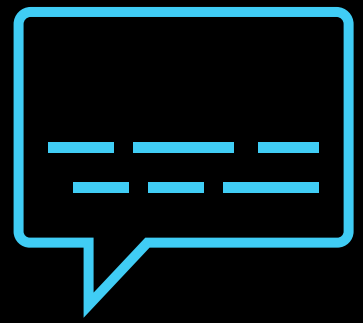
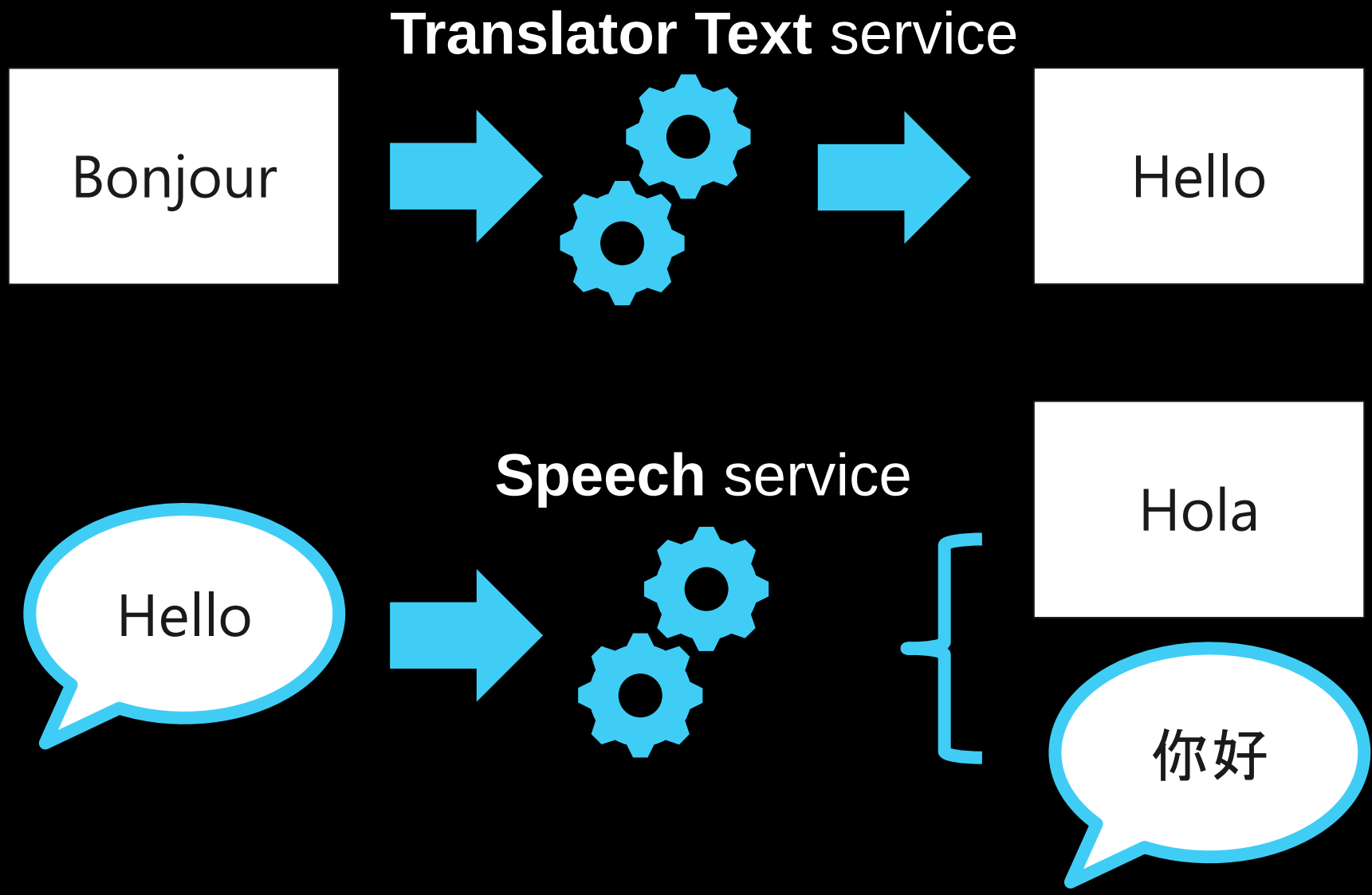


Use the *speech-to-text* capabilities of the **Speech** service to transcribe audible speech to text

Use the *text-to-speech* capabilities of the **Speech** service to generate audible speech from text



Translation



Language Understanding

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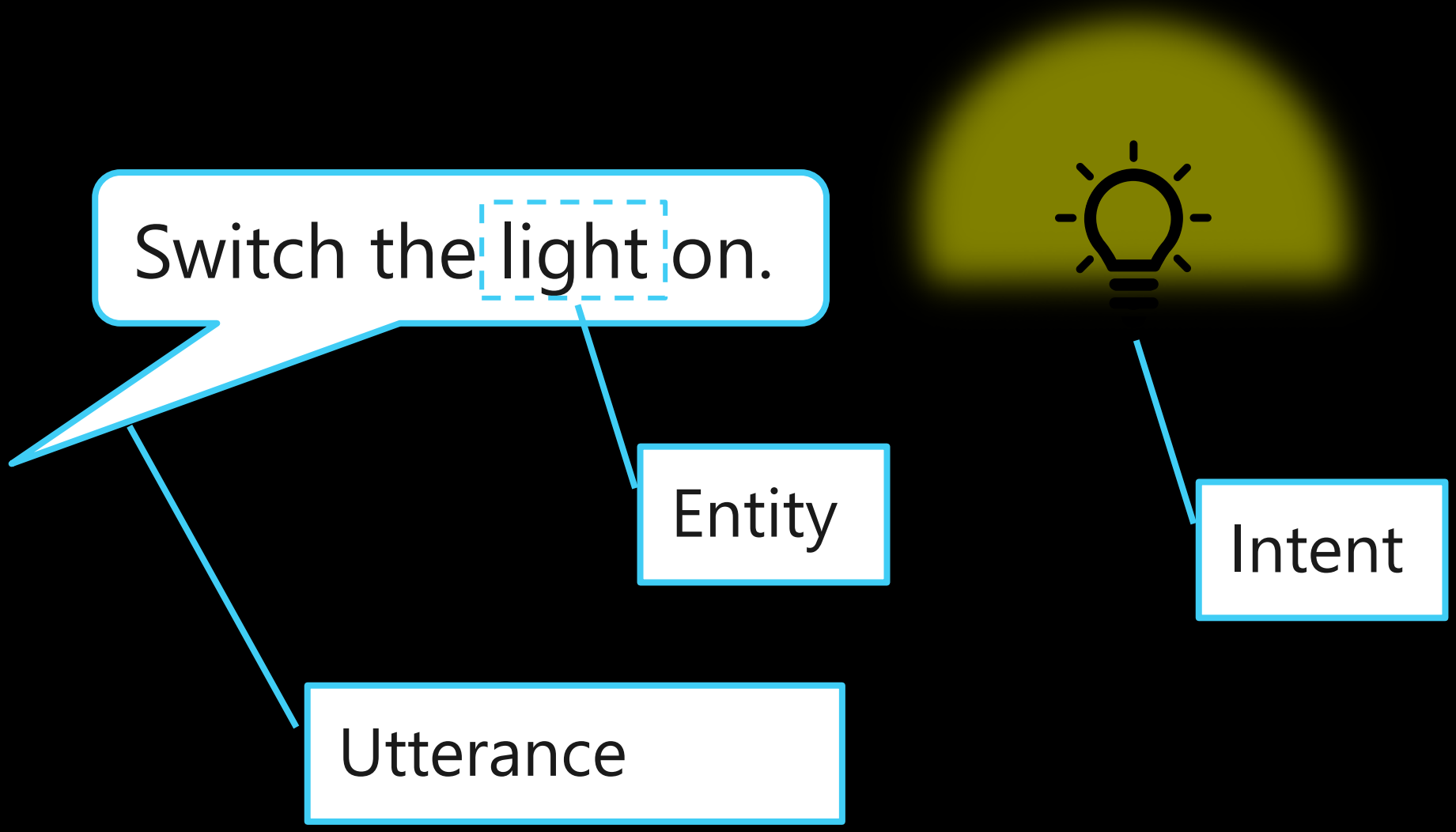
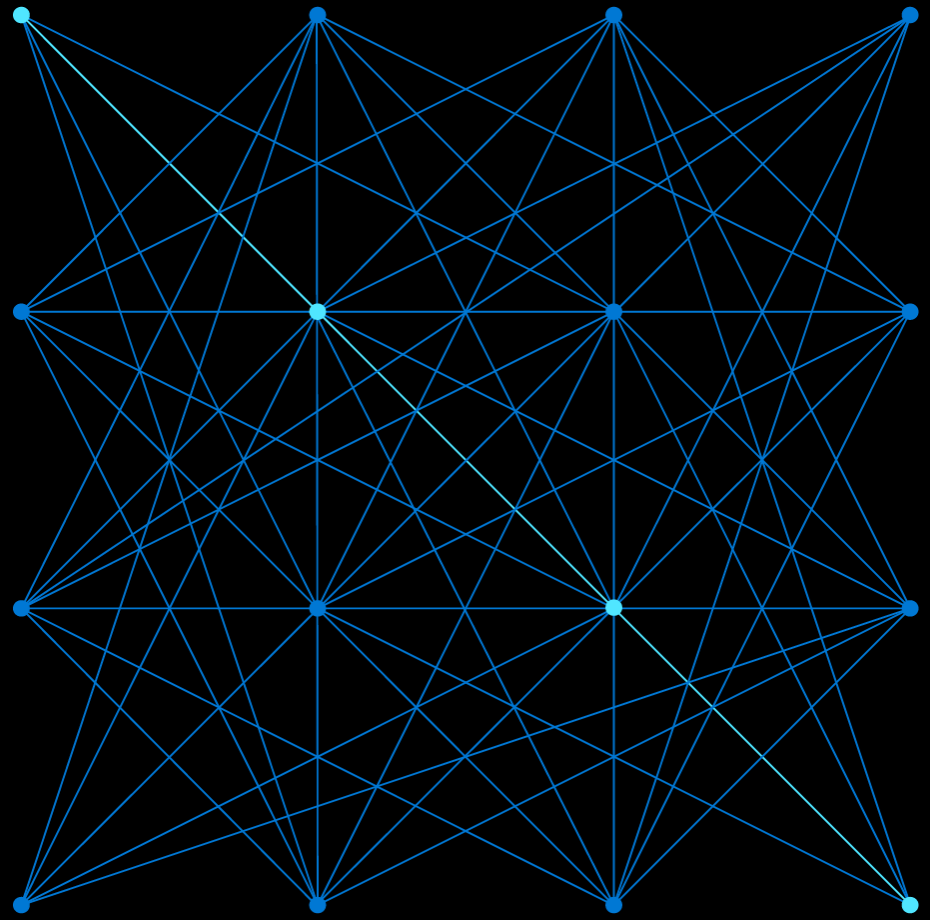


DEMO:
Language Understanding



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Module 05: Conversational AI

#10: Conversational AI Concepts

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Current technologies

- Voice calls
- Messaging services
- Online chat applications
- Email
- Social media platforms
- Collaborative workplace tools

What is Conversational AI?

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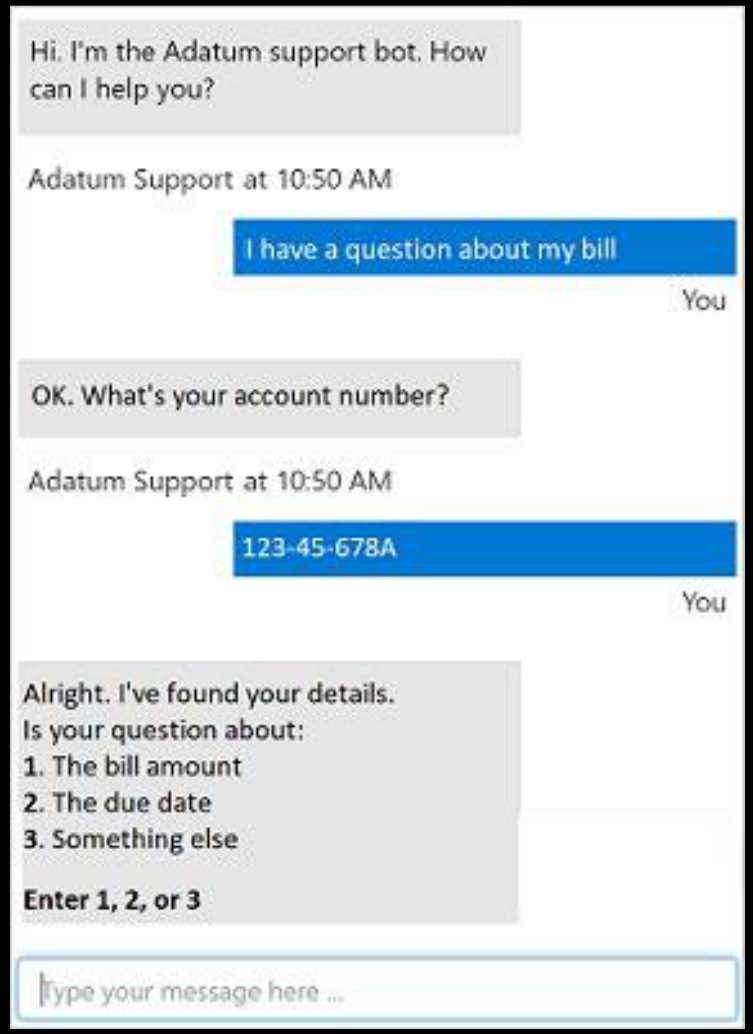

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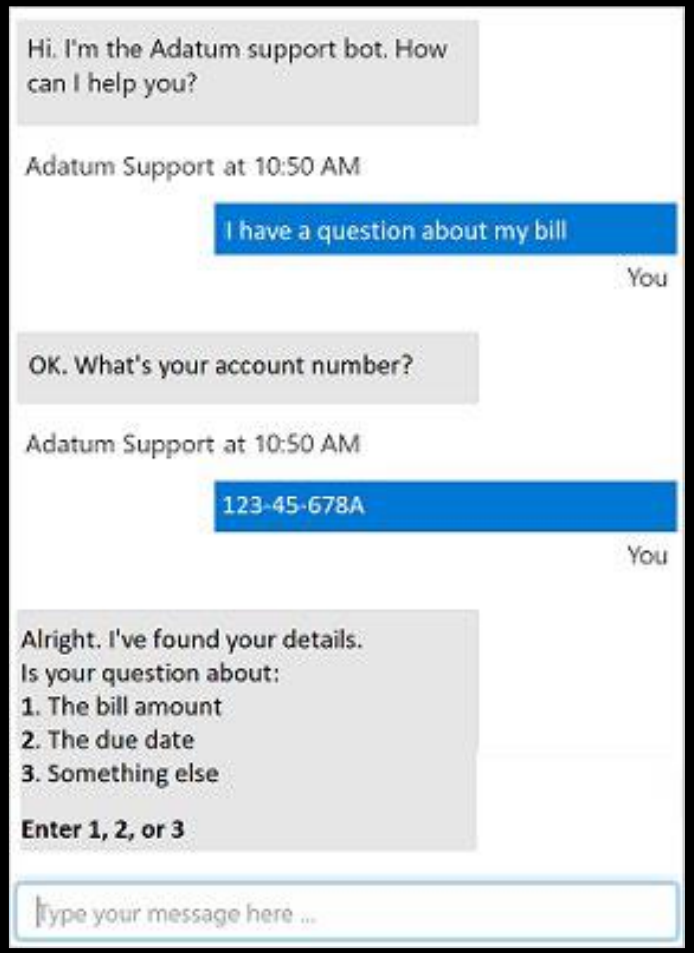

knowledge base

bot service

Responsible AI Guidelines for Bots

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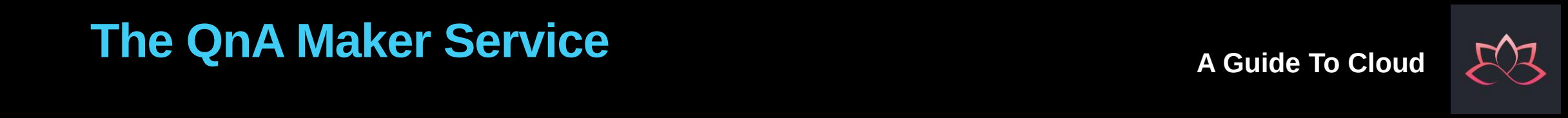
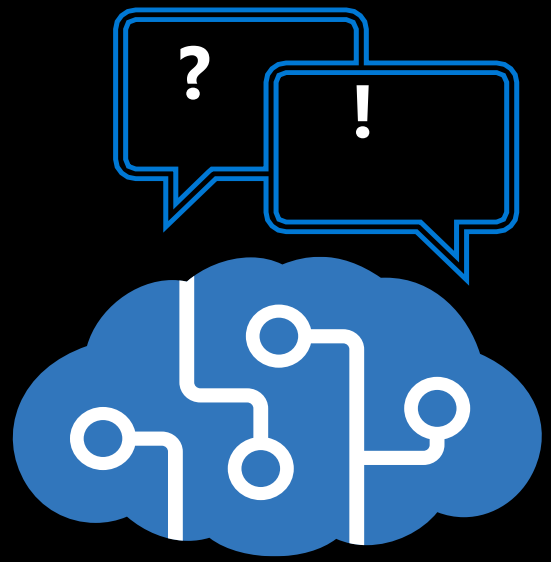
1. Be transparent about what the bot can (and can't) do
2. Make it clear that the user is communicating with a bot
3. Enable the bot to seamlessly hand-off to a human if necessary
4. Ensure the bot respects cultural norms
5. Ensure the bot is reliable
6. Respect user privacy
7. Handle data securely
8. Ensure the bot meets accessibility standards
9. Assume accountability for the bot's actions

The QnA Maker Service



Define a *knowledge base* of question and answer pairs:

- By entering questions and answers
- From an existing FAQ document
- By using built-in *chit-chat*



Azure Bot Service

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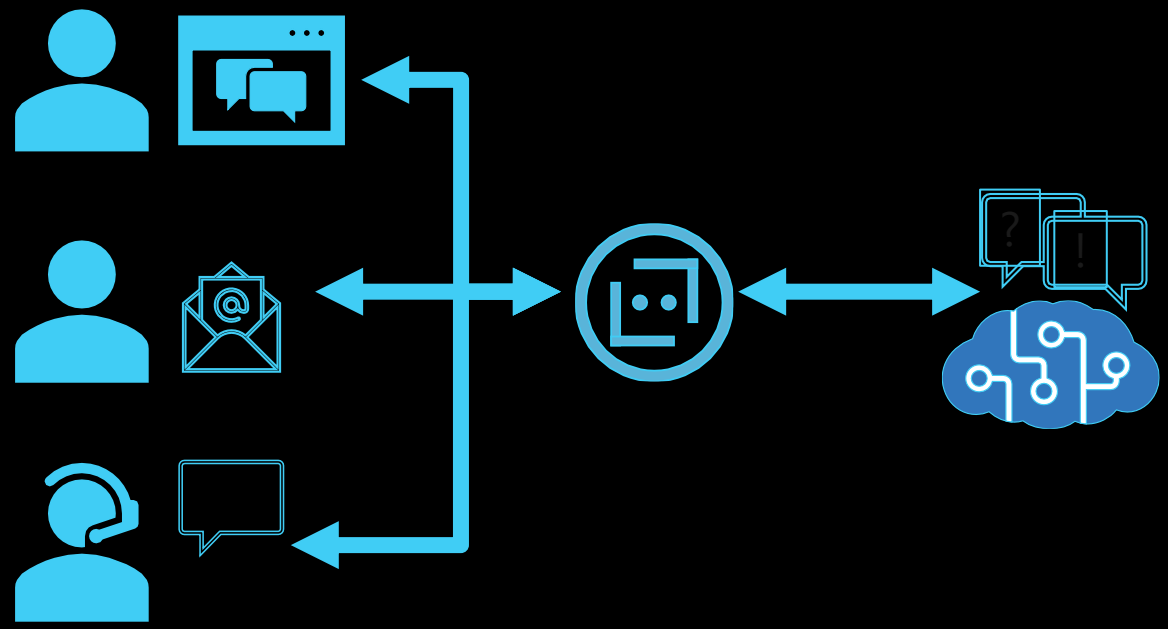
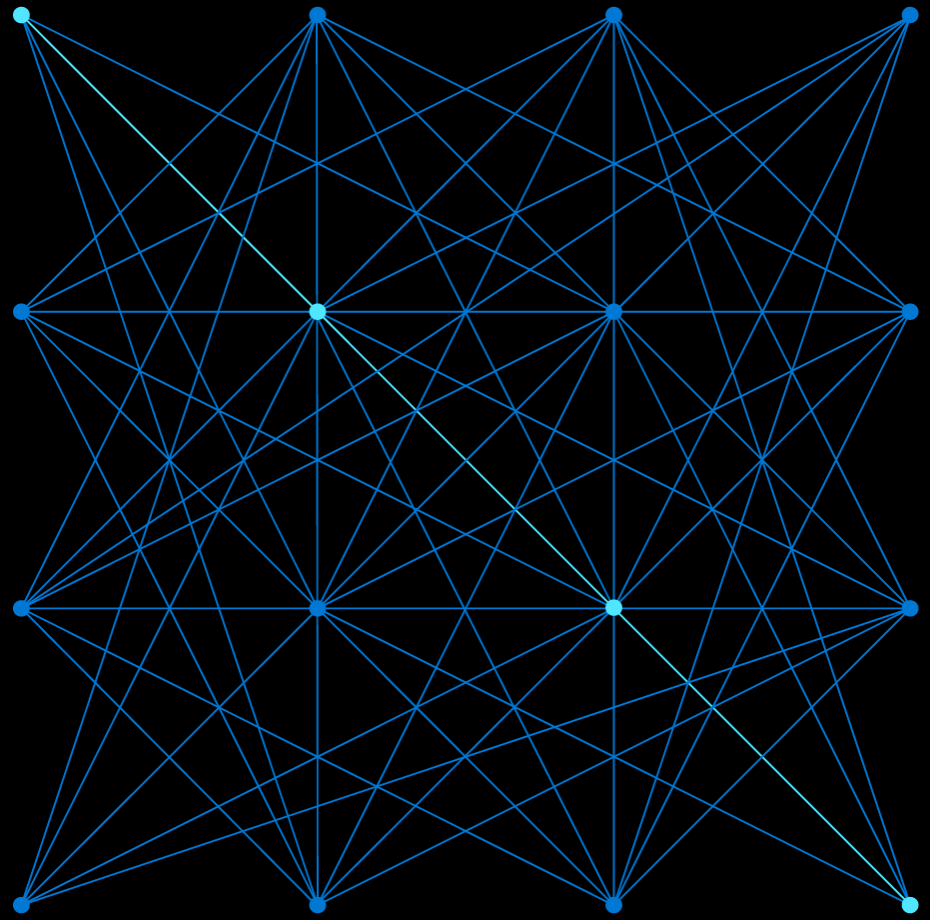


- Cloud-based platform for developing and managing bots
- Integration with LUIS, QnA Maker, and others
- Connectivity through multiple channels

THANK YOU

DEMO:
Using a Bot



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Microsoft Azure AI Fundamentals

Module 05: Conversational AI

#11: Conversational AI in Azure

EXAM: AI-900

www.AGuideToCloud.com

DEMO:
Create a Bot