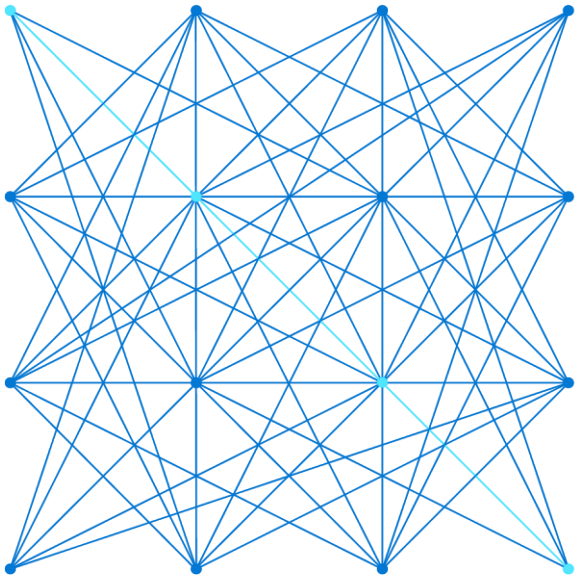
Azure AI Fundamentals



Date : 23 November 2020
Time : 14.00-16.30

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Tissana Tanaklang

Software and Solution Development Trainer
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- Master of Science Program in Software Engineering
  King Mongkut's University of Technology Thonburi
- Bachelor of Science Program in Computer Science
  Naresuan University

- Microsoft Certified Solutions Associate (MCSA) - Web Application Development
- Microsoft Certified Azure Data Fundamentals
- Microsoft Certified Azure Fundamentals
- Microsoft Certified Trainer (MCT)

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Events Agenda

Modules
Module 1: Introduction to AI
Module 2: Introduction to Machine Learning
Module 3: Introduction to Computer Vision
Module 4: Introduction to Natural Language Processing
Module 5: Introduction to Conversational AI

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Preparing for the Labs

- You will need:
  - A modern web browser (for example, Microsoft Edge)

Activate your Azure Pass subscription:

1. Go to https://live.com and sign in using a *personal* Microsoft account
   For example, an **outlook.com** account. If you don't have one, create one
2. After signing in, go to https://www.microsoftazurepass.com
3. Start the process to activate an Azure Pass
4. Enter the promo code provided for this course and activate the subscription
5. Verify you can sign into the Azure portal at https://portal.azure.com

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Azure Learning Path

Level	Category	Code	Course	Role
Beginner (Fundamentals)	-	AZ-900	Microsoft Azure Fundamentals	IT Professional and Non-IT Professional (All)
	Data	DP-900	Microsoft Azure Data Fundamentals	Data Engineer, Database Administrator
	AI	AI-900	Microsoft Azure AI Fundamentals	AI Engineer, Data Scientist, Developer, Solutions Architect
Intermediate (Associate)	DevOps	AZ-104	Microsoft Azure Administrator	Administrator, DevOps Engineer
		AZ-204	Developing solutions for Microsoft Azure	Developer, DevOps Engineer
	Security	AZ-500	Microsoft Azure Security Technologies	Security Engineer
	Data	DP-300	Administering Relational Databases on Microsoft Azure	Database Administrator
		DP-200	Implementing an Azure Data Solution	Data Engineer
		DP-201	Designing an Azure Data Solution	
		DP-100	Designing and Implementing a Data Science Solution on Azure	Data Scientist
	AI	AI-100	Designing and Implementing an Azure AI Solution	AI Engineer
Advance (Expert)	DevOps	AZ-400	Designing and Implementing Microsoft DevOps solutions	DevOps Engineer
	Solutions Architect	AZ-303	Microsoft Azure Architect Technologies	Solutions Architect
		AZ-304	Microsoft Azure Architect Design	
Specialty	Data	DA-100	Analyzing Data with Power BI	Data Analyst
	-	AZ-220	Microsoft Azure IoT Developer	Developer

Microsoft

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Microsoft Azure

Online Role-based training resources:

Microsoft Learn

https://docs.microsoft.com/learn/

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Module 1
Introduction to AI

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What is Artificial Intelligence?

Software that imitates human capabilities

- Making decisions based on data and past experience
- Recognizing abnormal events
- Interpreting visual input
- Understanding written and spoken language
- Engaging in dialogs and conversations

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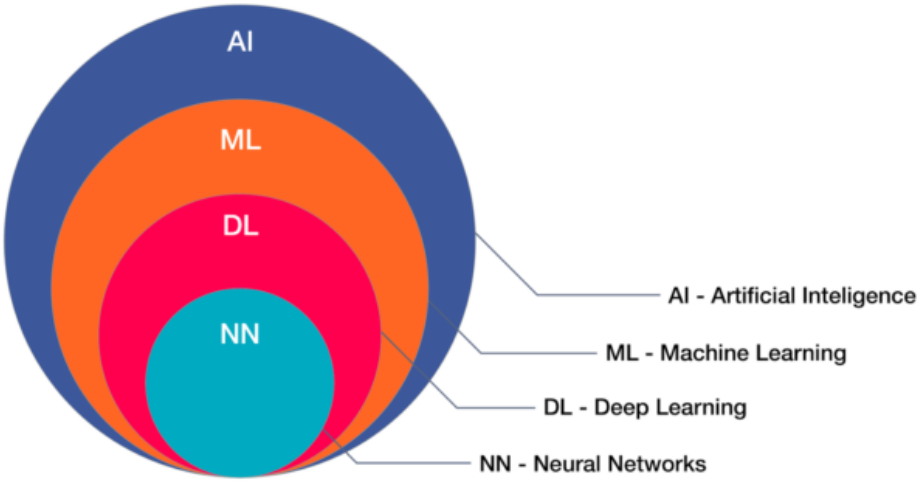
What is Artificial Intelligence?



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Common Artificial Intelligence Workloads

	Machine Learning	Predictive models based on data and statistics – the foundation for AI
	Anomaly Detection	Systems that detect unusual patterns or events, enabling pre-emptive action
	Computer Vision	Applications that interpret visual input from cameras, images, or videos
	Natural Language Processing	Applications that can interpret written or spoken language
	Conversational AI	AI agents, (or *bots*), that can engage in dialogs with human users

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Artificial Intelligence in Microsoft Azure

Scalable, reliable cloud platform for AI

- Data storage
- Compute
- Services

Azure Machine Learning	A platform for training, deploying, and managing machine learning models
Cognitive Services	A suite of services developers can use to build AI solutions
Azure Bot Service	A cloud-based platform for developing and managing bots

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Challenges and Risks with AI

Challenge or Risk	Example
Bias can affect results	A loan-approval model discriminates by gender due to bias in the data with which it was trained
Errors may cause harm	An autonomous vehicle experiences a system failure and causes a collision
Data could be exposed	A medical diagnostic bot is trained using sensitive patient data, which is stored insecurely
Solutions may not work for everyone	A predictive app provides no audio output for visually impaired users
Users must trust a complex system	An AI-based financial tool makes investment recommendations - what are they based on?
Who's liable for AI-driven decisions?	An innocent person is convicted of a crime based on evidence from facial recognition – who's responsible?

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Principles of Responsible AI

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Module 2
Introduction to Machine Learning

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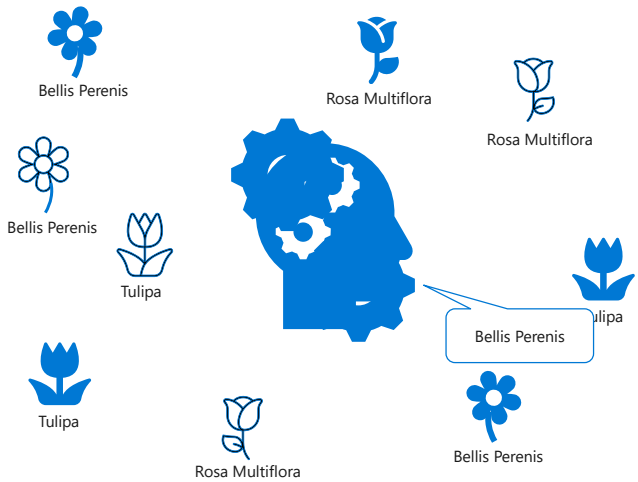
What is Machine Learning?

Creating predictive models by finding relationships in data



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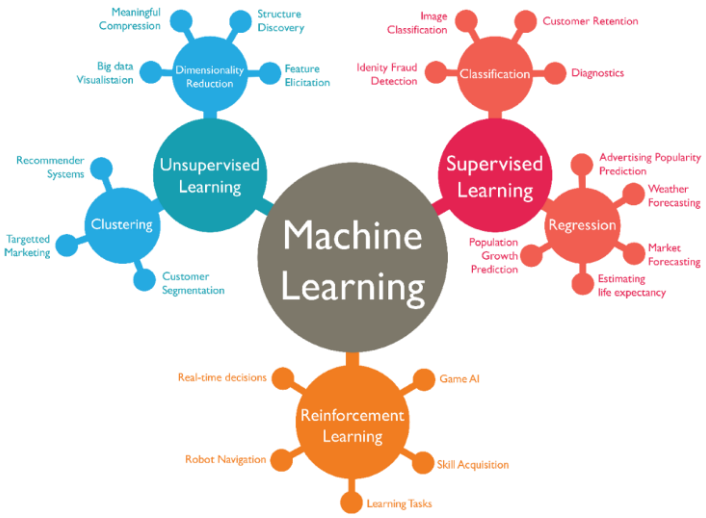
Type of Machine Learning



Content Reference : https://www.7wdata.be/visualization/types-of-machine-learning-algorithms-2/

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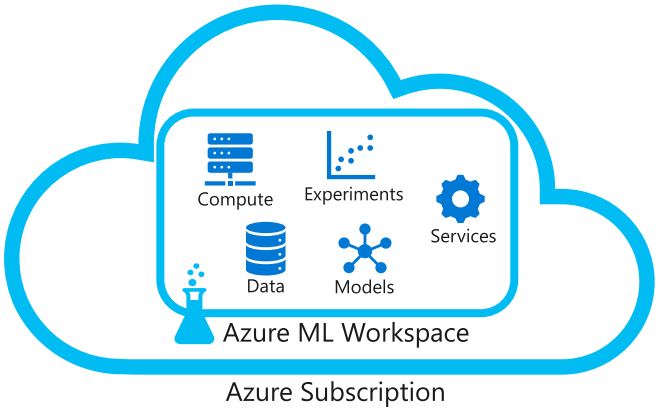
What is Azure Machine Learning?

A cloud-based platform for machine learning



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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

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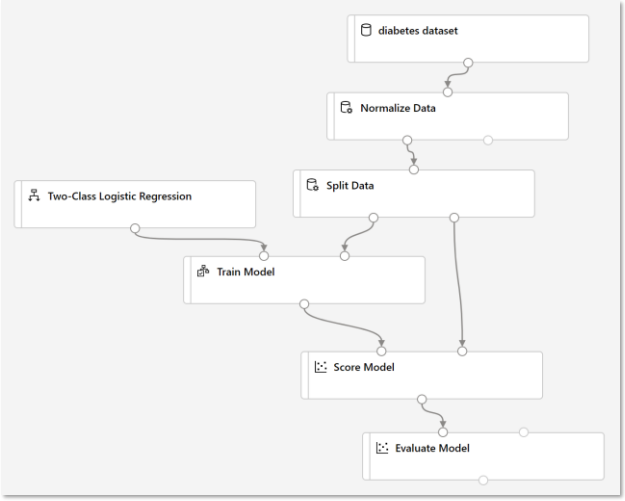
Azure Machine Learning *designer*

- 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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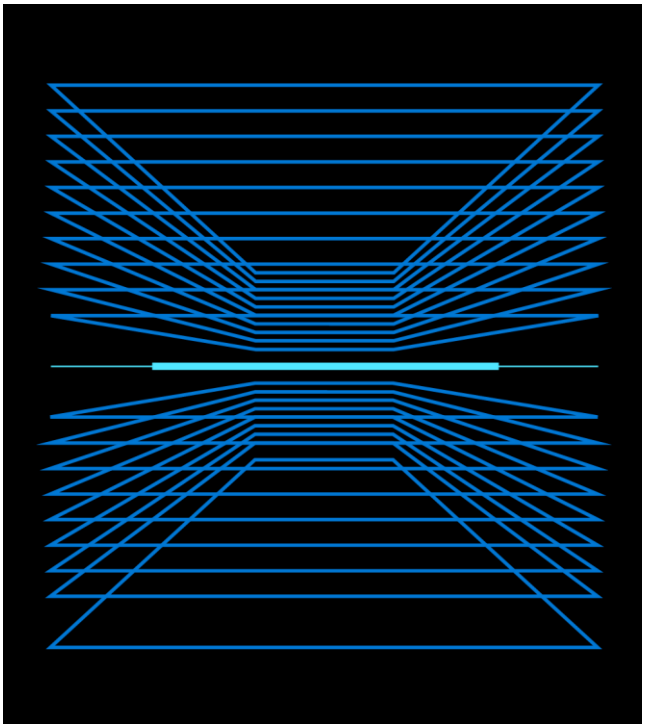
Demo
Azure Machine Learning



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Module 3
Introduction to Computer Vision

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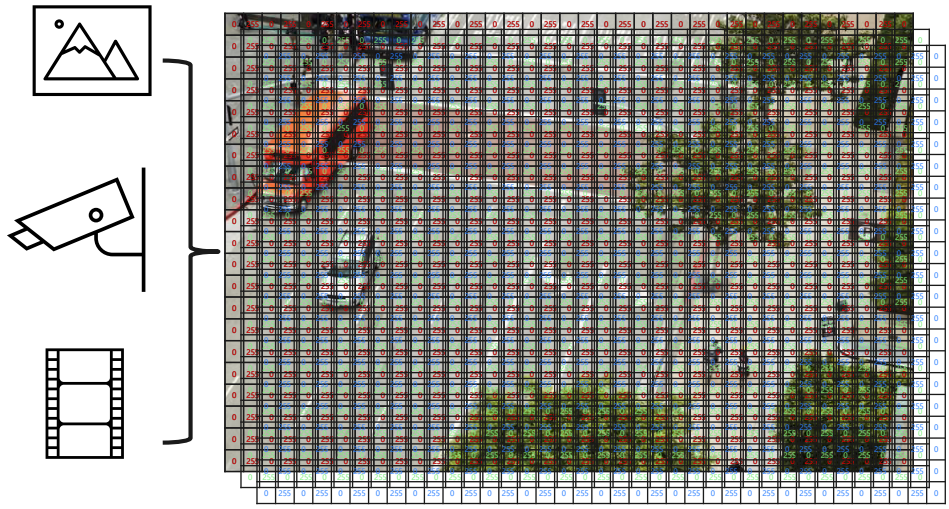
What is Computer Vision?



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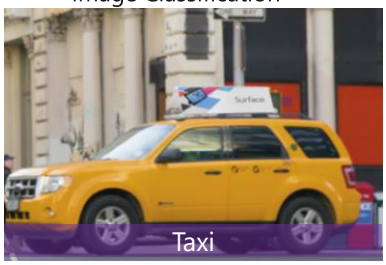
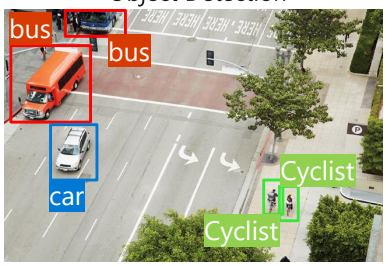
Applications of Computer Vision

Image Classification



Object Detection



Semantic Segmentation

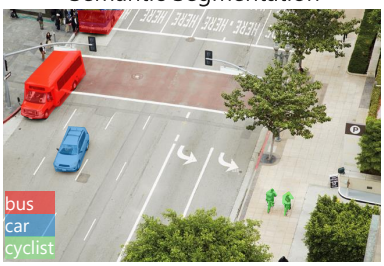
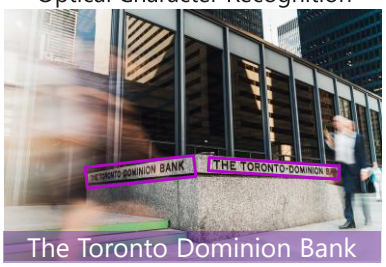


Image Analysis

Face Detection & Recognition

Optical Character Recognition



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Cognitive Services

- AI application resources in an Azure subscription:
  - Standalone resources for specific services
  - General *Cognitive Services* resource for multiple services
- Consumed by applications via:
  - A REST endpoint (https:// address)
  - An authentication key

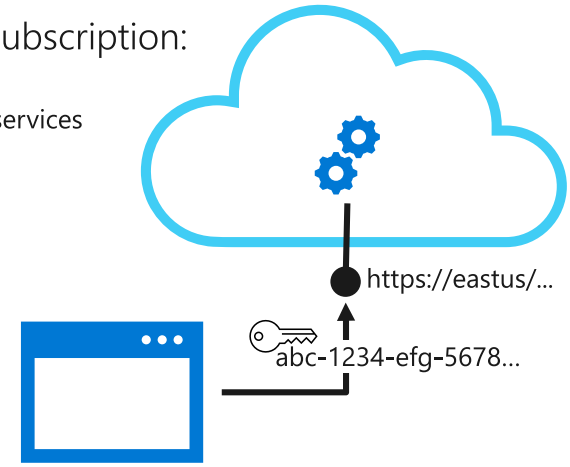

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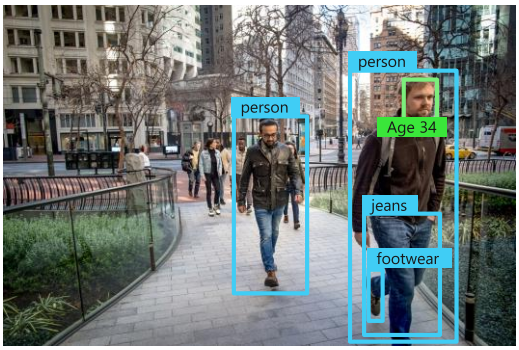
Image Analysis with the *Computer Vision* Service

- Pre-trained computer vision model
- Object detection for over 10,000 predefined classes
- Image description and tag generation
- Face detection and analysis
- Content moderation
- Text detection and OCR



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

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Image Description Example


```
{
    "description": {
        "tags": ["outdoor", "building", "photo", "city", "white", "black", "large", "sitting", "old",
        "captions": [
            {
                "text": "a black and white photo of a city",
                "confidence": 0.95301952483304808
            },
            {
                "text": "a black and white photo of a large city",
                "confidence": 0.94085190563213816
            },
            {
                "text": "a large white building in a city",
                "confidence": 0.93108362931954824
            }
        ]
    },
    "requestId": "b20bfc83-fb25-4b8d-a3f8-b2a1f084b159",
    "metadata": {
        "height": 300,
        "width": 239,
        "format": "Jpeg"
    }
}
```


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Categorize Image Example


```
{
    "categories": [
        {
            "name": "people_",
            "score": 0.81640625
        }
    ],
    "requestId": "bae7f76a-1cc7-4479-8d29-48a694974705",
    "metadata": {
        "height": 200,
        "width": 300,
        "format": "Jpeg"
    }
}
```


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Image Tagging Example


```
{
    "tags": [
        {
            "name": "grass",
            "confidence": 0.9999995231628418
        },
        {
            "name": "outdoor",
            "confidence": 0.99992108345031738
        },
        {
            "name": "house",
            "confidence": 0.99685388803482056
        },
        {
            "name": "sky",
            "confidence": 0.99532157182693481
        },
        {
            "name": "building",
            "confidence": 0.99436837434768677
        },
        {
            "name": "tree",
            "confidence": 0.98880356550216675
        },
        {
            "name": "lawn",
            "confidence": 0.788884699344635
        },
        {
            "name": "green",
            "confidence": 0.71250593662261963
```


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Face detection Example


```
{
    "faces": [
        {
            "age": 23,
            "gender": "Female",
            "faceRectangle": {
                "top": 45,
                "left": 194,
                "width": 44,
                "height": 44
            }
        }
    ],
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        "height": 200,
        "width": 300,
        "format": "Png"
    }
}
```


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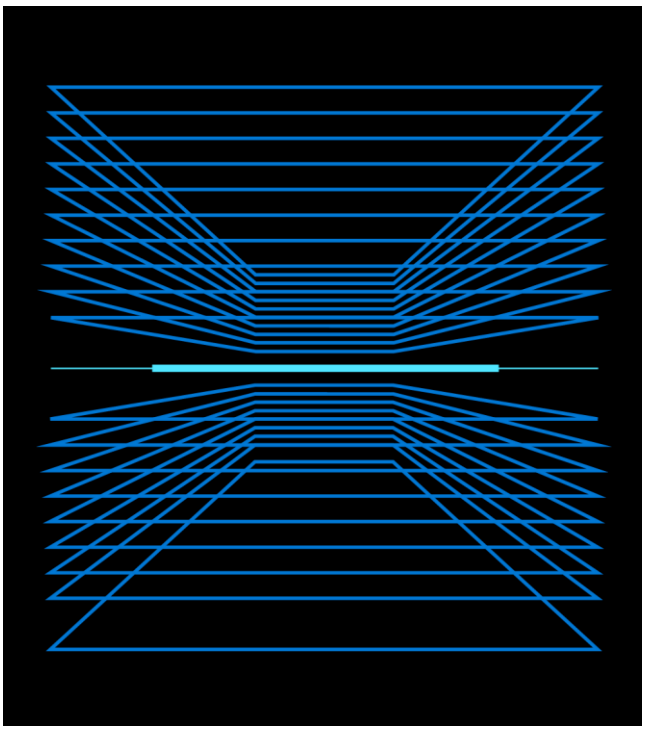
Demo

Computer Vision Service



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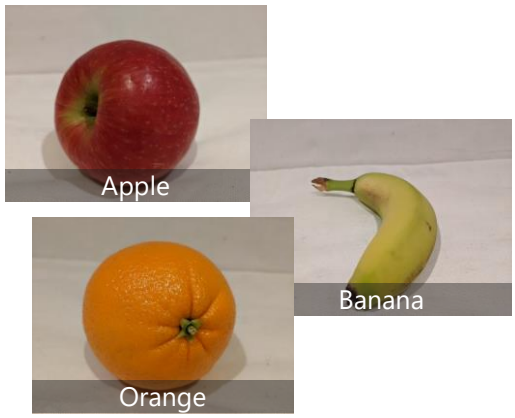
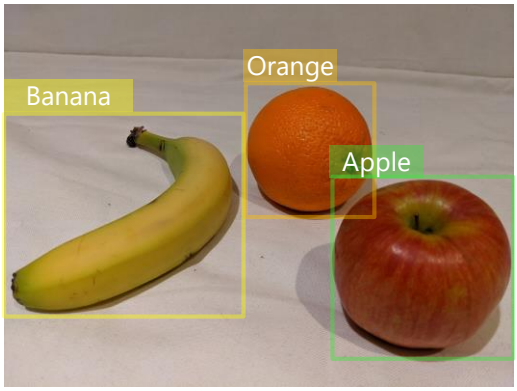
Training Models with the *Custom Vision* Service

Image Classification



Object Detection



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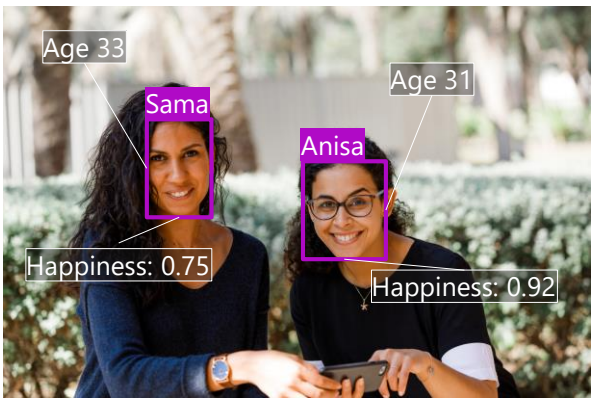
Analyzing Faces with the *Face* Service

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



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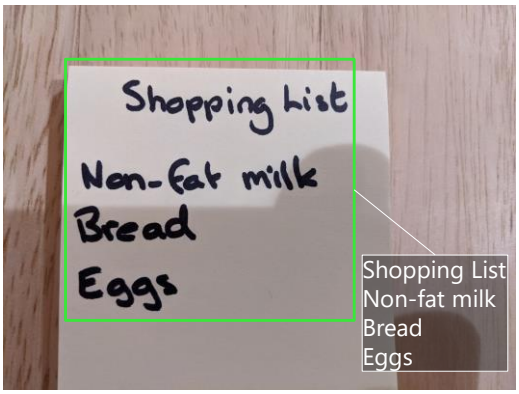
Reading Text with the *Computer Vision* Service

- Detect the location of text:
  - Printed
  - Handwritten
- Options for quick text extraction from images, or asynchronous analysis of larger scanned documents



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Module 4
Introduction to Natural Language Processing

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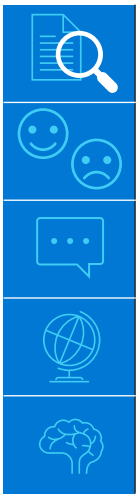
What is Natural Language Processing?



- Text analysis and entity recognition
- Sentiment analysis
- Speech recognition and synthesis
- Machine translation
- Semantic language modeling

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Natural Language Processing in Azure

Cognitive Services

Text Analytics	• Language detection • Key phrase extraction • Entity detection • Sentiment analysis
Speech	• Text to speech • Speech to text • Speech translation
Translator Text	• Text translation
Language Understanding	• Custom language modeling

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Module 5
Introduction to Conversational AI

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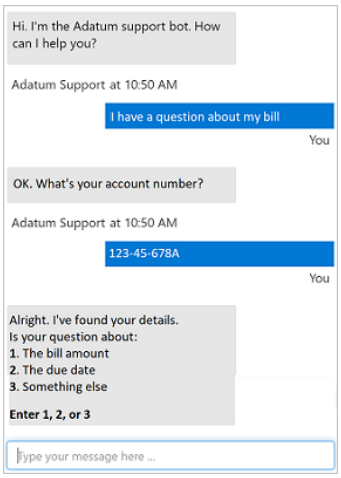
What is Conversational AI?

- A solution that enables a dialog between an AI agent and a human
- Generically, conversational AI agents are known as *bots*
- Bots can engage over multiple *channels*:
  - Web chat interfaces
  - Email
  - Social media platforms
  - Voice



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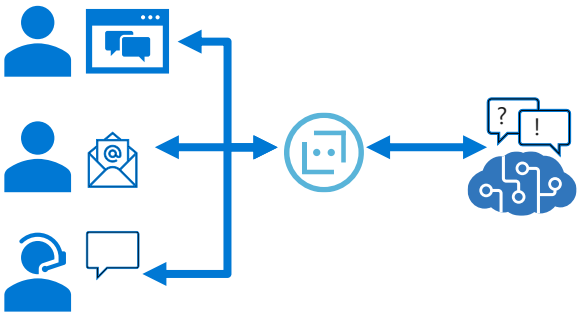
Azure Bot Service



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

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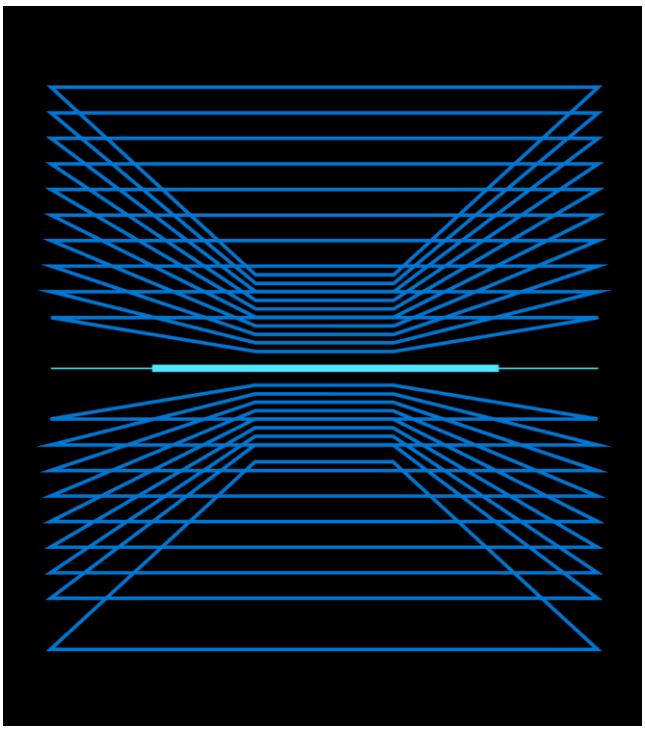
The End



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