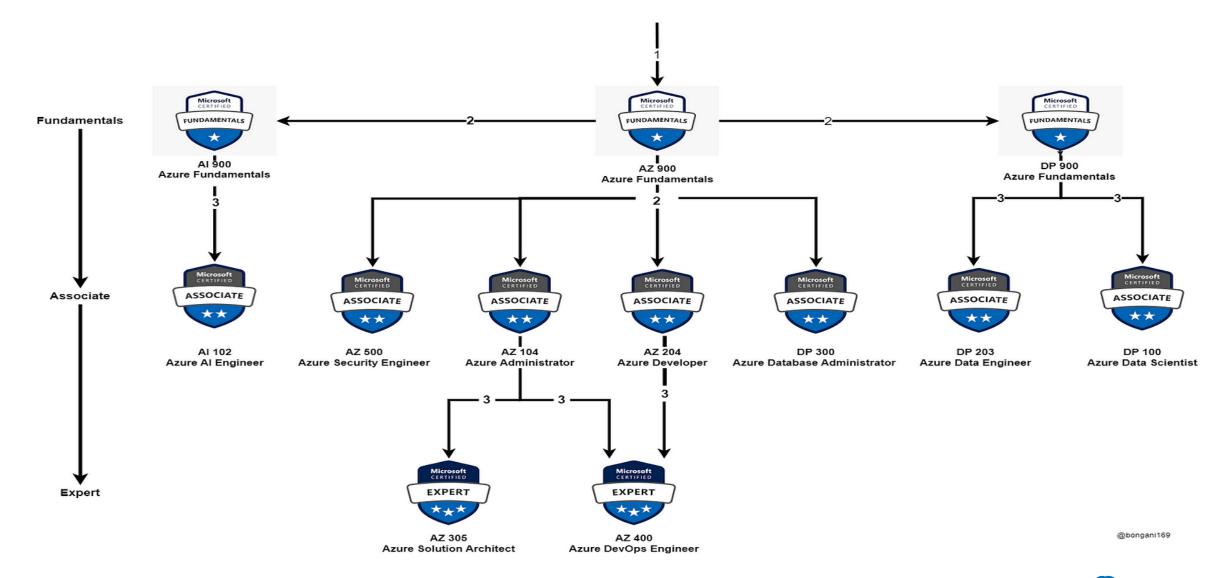
# Microsoft Azure AI-900 Certification: Azure AI Fundamentals

Dr Siva Balan,
Technical Training Advisor
Sivabalan.n@nttdata.com

# **Azure Learning Tracks**



# Why AI-900?

- Al 900 certification is a **fundamental grade** certification for **any beginner** to have an idea of how to apply Al and Machine Learning in their profession.
- ➤ It certifies you for using Azure services related to ML and AI.
- > we can use the Al 900 Microsoft Azure Al Fundamentals certification exam as an important tool for demonstrating a thorough understanding of general **ML and Al workloads**.



# Why Use Azure AI Solutions?

- > Gives a cloud platform for implementing AI Solutions
- ➤ Provide no-code ML models for processing data.
- > Implement and monitor AI solutions
- ➤ You can design AI as cost-effective Intelligent Edge solutions.



# AI-900 Exam Details

> Name of the Exam: Microsoft Azure Al Fundamentals

> Exam Code: AI-900

> Technology: Microsoft Azure

> Prerequisites: None

> Registration Fee: 99 USD

> **Duration**: 45 minutes

➤ Exam Language: English, Japanese, Chinese (Simplified), Korean, German, French, Spanish, Portuguese (Brazil), Russian, Indonesian (Indonesia), Arabic (Saudi Arabia), Chinese (Traditional), Italian



## Who This Certification Is For?

- > Candidates who are interested in Machine Learning and Al.
- > IT professionals who have a knowledge of Microsoft Azure.
- ➤ Those working as **Azure Engineers**.
- > People working as **Data Scientists**.
- ➤ Candidates who architect and implement cloud solutions.



# **Azure Cognitive Services**

- ➤ Azure Cognitive Services is an integral part of the AI services that helps in building effective and intelligent software applications.
- ➤ Azure Cognitive Services are pre-made APIs that are available to developers to help them build intelligent software applications without having any direct machine learning or AI skills expertise.
- > Azure Cognitive Services allows developers to easily embed cognitive services in their applications.

# Azure Cognitive Services(cntd)

- In **Machine learning**, the developer has to bring together the training dataset and then test the validity of the dataset through suitable models, and then evaluate the results this requires knowledge of different models and concepts of machine learning
- ➤ But with **Azure Cognitive Services** the tasks become easy as the developer has to provide the data only and the rest like training the data and finding the best models is done by the cognitive services that are provided.



# Benefits Of Using Azure Cognitive Services

- ➤ Azure Cognitive Services has empowered developers around the globe by making it easier to add AI capabilities to software applications.
- > Requires no machine learning expertise.
- ➤ Easy to add AI capabilities to existing applications.
- > It provides containers for deploying in the cloud or on-premises.



# Azure Cognitive Services – Service Catalog

> 20 different sets of Azure Cognitive Services are available which are further categorized into 5 families namely:

#### > Vision

- ➤ 1. Computer vision
- > 2.Face
- > 3.Form Recogniser

#### > Decision

- > 1. Anomaly Detection
- > 2. Content Moderator

#### > Speech

- ➤ 1. Speech Translation
- > 2. Speech Recognition



# Azure Cognitive Services – Service Catalog

#### > Language

- ➤ 1. Text Analytics
- ➤ 2. Translator
- > 3. QnA maker

#### > Web Search

- > 1. Bing Image search
- > 2. Bing Autosuggest
- > 3. Bing Spell Check



# Azure Cognitive Services – Service Catalog











Vision

Speech

Language

**Decision** 

Web Search



### **Key Principles of Responsible AI**





### **Key Principles of Responsible AI**

- •Fairness: Al systems should be unbiased and treat individuals fairly.
- •Reliability and Safety: Al systems should be reliable and safe to use.
- •Privacy and Security: Al systems should protect user privacy and security.
- •Inclusivity: Al systems should be accessible to everyone, regardless of their background or abilities.
- •Transparency and Explainability: All systems should be transparent and explainable, allowing users to understand how they work.
- •Accountability: Organizations deploying Al systems should be accountable for their actions.



## Service - Vision

➤ 1) **Computer Vision**: It is an AI service that is generally used for analyzing content in images

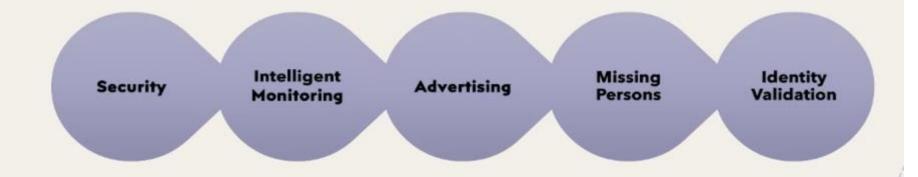
https://azure.microsoft.com/en-in/products/ai-services/ai-vision/#features

- ➤ 2) Face: It is an AI service that is used for identifying people and emotions in images.
- > 3) Form Recogniser: This AI service is used for extracting information from documents.

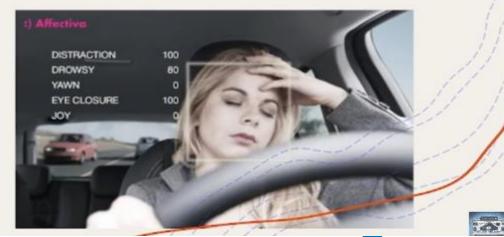


# Face detection and analysis applications











#### The Face API tasks fall into five categories:

- Verification: Check the likelihood that two faces belong to the same person.
- Detection: Detect human faces in an image.
- Identification: Search and identify faces.
- Similarity: Find similar faces.
- Grouping: Prganize unidentified faces into groups, based on their visual similarity.

#### The Face API uses artificial intelligence to:

- Detect human activity in images.
- Attempt to match faces to existing image databases.
- Detect human faces and return their coordinates.
- Manage profiles based on face attributes.
- Analyze and identify faces in video frames.



# Types of facial data



3 minutes

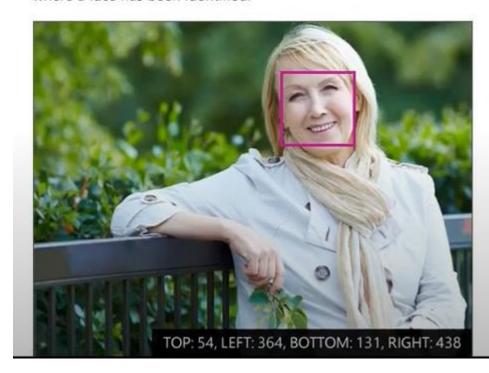
The Face API provides methods to detect human faces in images and can return face locations, landmarks, and attributes:

- Locations: In the image that includes a face, the Face API finds the top, left, width, and height coordinates of the face region.
- Landmarks: The Face API finds the position of common face elements, such as pupils, nose, and lips.
- Attributes: The Face API estimates face attributes such as age, gender, hair color, smile, facial hair, glasses, and emotion.



### Locations

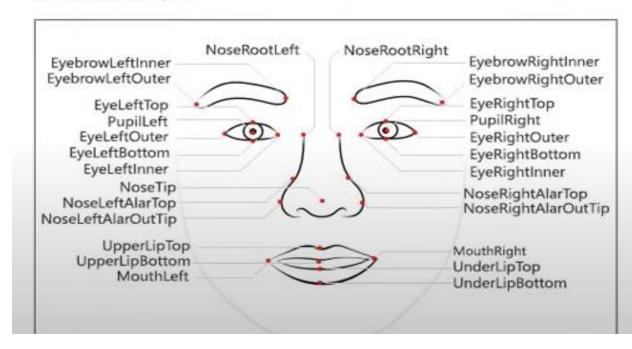
A face location is another term for a collection of face coordinates. The location is a rectangular pixel area in the image where a face has been identified.





### Landmarks

Face landmarks are a collection of detailed points on a face. These points identify common facial elements such as a pupil, nose, or eyebrow by using pixel coordinates. The Face API can return up to 27 landmarks for each identified face that you can use for analysis.





### **Attributes**

Face attributes are predefined properties of a face or a person represented by a face. The Face API can optionally identify and return the following types of attributes for a detected face:

- Age
- Gender
- Smile intensity
- Facial hair
- Head pose (3D)
- Emotion



# Face detection vs. Face recognition

Facial recognition builds on the facial detection API by analyzing the landmarks in two or more pictures to determine if the same face is present. There are four aspects which can be determined through this analysis.

- Do two images of a face belong to the same person? This defines verification.
- Does this person look like other people? This defines similarity.
- 3. Do all of these faces belong together? This defines grouping.
- 4. Who is this person in this group of people? This defines identification.



## Overview of face recognition



3 minutes

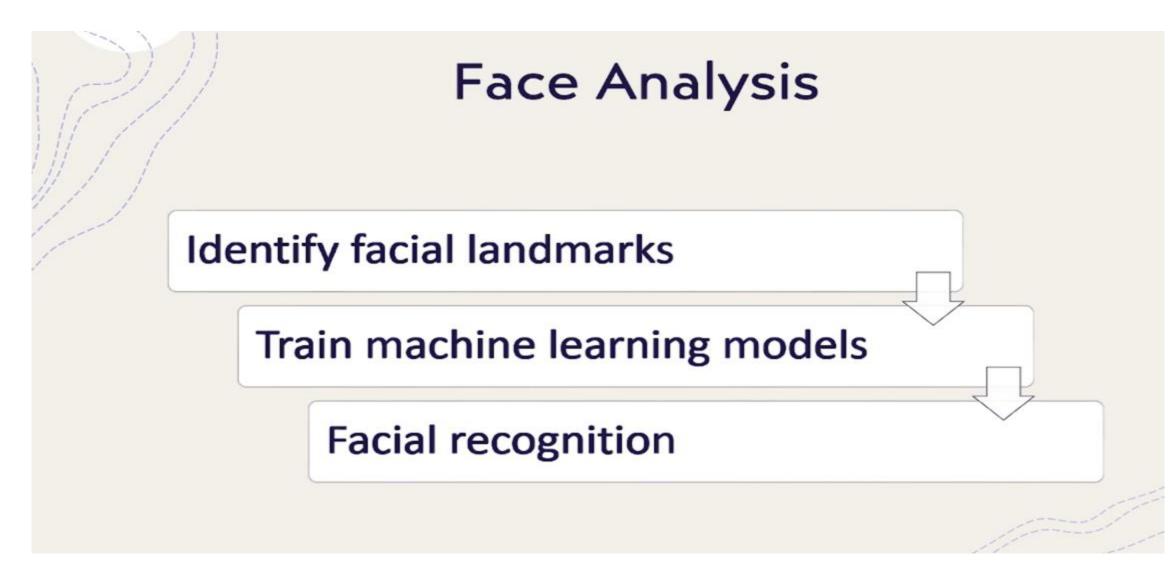
The face detection API provides information about detected faces in an image, but isn't designed to identify or recognize a specific face. However, the Face API provides this capability through a Facial recognition API.

Facial recognition is used in many areas, including security, natural user interfaces, image analysis, mobile apps, and robotics.

The ability to use artificial intelligence to recognize and match faces is one of the more powerful aspects of the Face API.







# Azure Face Analysis

Azure Al Face

**Basic Detection** 

Attributes

Limited Access Features

**Face Comparison** 

Named Individual Identification Azure Resource Types

Face

**Azure Al Services** 

**Accuracy Tips** 

Image Format

File Size

Face Size

Avoid Extreme angles



## Service - Décision

Used for making decisions faster and smarter. It includes APIs like:

➤ 1) **Anomaly Detection**: This AI service helps to detect problems before they occur.

➤ 2) **Content Moderator**: This AI service is used as a review tool for images, texts, and videos.



# Service - Speech

Used for embedding speech processors in software applications. It includes APIs like:

1) **Speech Translation**: It is a service that embeds speech translation features in real time.

https://azure.microsoft.com/en-in/products/ai-services/ai-speech/#features

2) Speech Recognition: It is a service that is used to identify and verify speakers.



# Service - Language

1) **Text Analytics**: Al service to detect language and sentiments from a text. Text analysis-language

2) Translator: Al service to translate text into different languages. It can support 60 languages.

3) **QnA Maker**: All service that provides the facility to create a conversational question and answer like a bot

### Service – Web Search

- 1) **Bing Image search**: This AI service allows us to add a variety of search images into one's application.
- 2) **Bing Autosuggest**: This service helps to complete queries faster by providing IntelliSense support.
- 3) **Bing Spell Check**: This service helps in correcting spelling errors, understand homophones, and differentiate between names, brands, etc.



# Introduction To Machine Learning

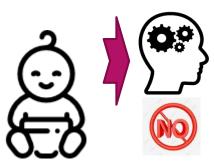
## **Human Learning**

- Humans have learning capability
- ▶ In the real world, we humans can learn everything from our experiences







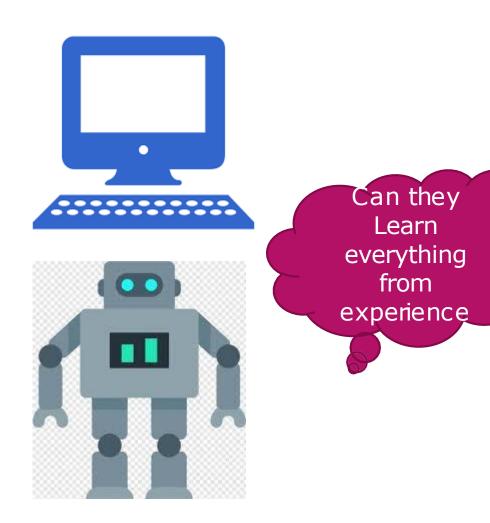






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- Computers or machines work on our instructions.
- Can a machine also learn from experiences or past data like a human?
- ► Answer is Yes Machine Learning.



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## What is Machine Learning?

- ▶ Arthur Samuel, a pioneer in <u>Artificial Intelligence</u> coined the term Machine Learning in the year 1959 as "Field of study that gives computers the ability to learn without being explicitly programmed".
- In 1997, Tom Mitchell gave a "well-posed" mathematical and relational definition that "A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E.

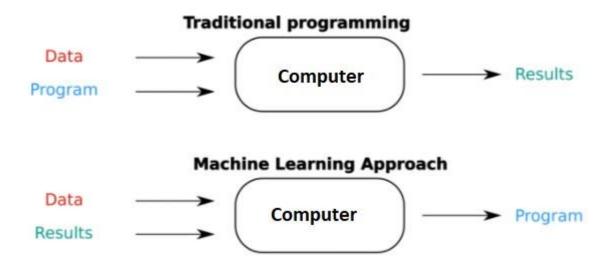


## Example

- ► Email Program learns which emails are marked as spam and which are not. Based on this learning, it can filter the spam better.
- ▶ **Task**: Classifying the emails as spam or not spam
- ► **Experience**: Program learns from which emails are labelled by users as spam or not spam
- Performance: The fraction of emails correctly classified as spam or not spam



### How is ML different from traditional



• programming?

- Traditional Programming accepts input data and a well written and tested program and generate output.
- Machine learning accepts input data along with the output and produces the program or model.

## Applications of Machine Learning

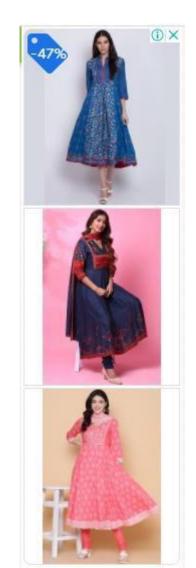


#### **Product Recommendations**

- ▶ Almost every e-commerce website like amazon, flipkart uses today
- ► Track user behavior based on their previous purchase, searching pattern cart history, and make product recommendations.
- ▶ Netflix uses ML to recommend entertainment series, movies
- ▶ When we search for some product, we get an advertisement for the same product while internet surfing on the same browser







Biba.in

### Speech Recognition

- Google: "Search by voice,"
- Speech recognition is a process of converting voice instructions into text,
- **Voice Assistants** are using speech recognition technology to follow the voice instructions.
  - Apple's Siri
  - Amazon's Alexa
  - Microsoft's Cortana
  - Google assistant





### Traffic prediction and faster route selection

- ▶ Google Maps: shows us the path with the shortest route and predicts the traffic conditions.
- ▶ It predicts the traffic conditions such as heavily congested
  - ► Real Time location of the vehicles
  - ► Average time taken on past days at the same time-Data obtained from everyone who is using Google Map.





### Travel

- ▶ Used by Uber, ola to determine the price of your ride
- Estimated tile of arrival







### Sentiment analysis (opinion mining)

- Natural language processing technique used to determine whether data is positive, negative or neutral.
- ▶ Performed on textual data to help businesses monitor product sentiment in customer feedback, and understand customer needs.
- Example: I loved the product, but the packaging was not good.
- ► In the AFINN word list, 'loved' and 'not good' have +3 and -2 scores. If you combine these two scores, you will get

+1. This means the user sentiment was slightly positive.



### Self-driving cars

- A self-driving car, also known as an autonomous vehicle, driverless car, or robo-car, is a vehicle that is capable of sensing its environment and moving safely with little or no human input
- Tesla, Google's waymo are most popular projects self-driving car.
- It is using ML to train the cars to detect people and objects while driving.





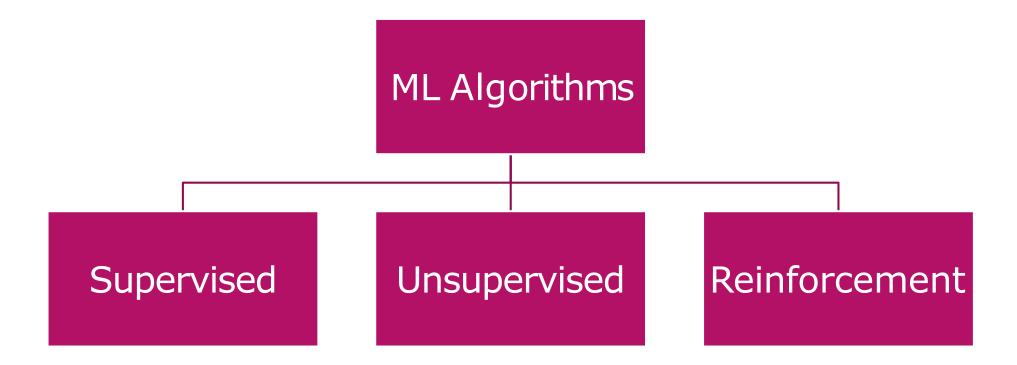
#### **StockMarket Prediction**

- Stock market prediction determines the future movement of the stock value of a financial exchange.
- ▶ The accurate prediction of share price will help investors to make profit.





## Types of machine learning algorithms



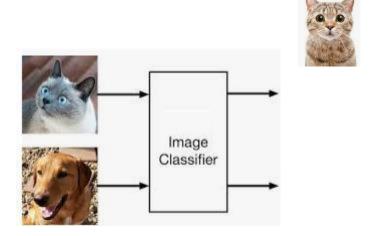


### Supervised Learning

- Supervised learning has the presence of a supervisor.
- Algorithm is trained on labeled dataset.
- Data is already tagged with the correct answer and the machine is trained and model is developed.
- We provide the machine with a lot of information about a given case and also provide it with the case outcome.
- The outcome is called the labelled data while the rest of the information is used as input features.
- When the machine is provided with a new set of examples, the supervised learning algorithm produces a correct outcome from labeled data.
- Data needs to be labeled accurately for this method to work

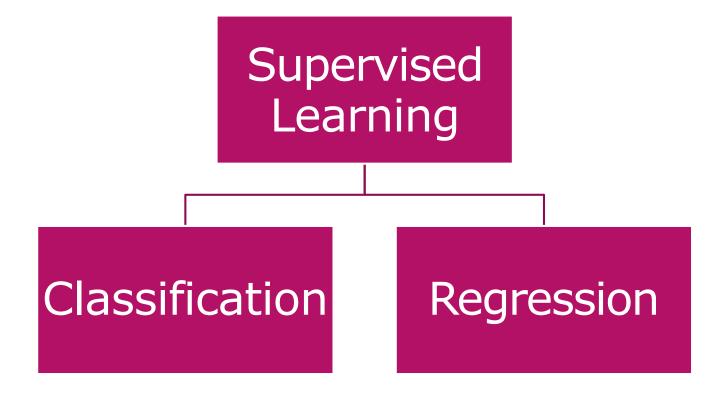


# Example





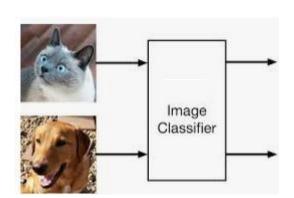
## **Types of Supervised Learning**





#### Classification

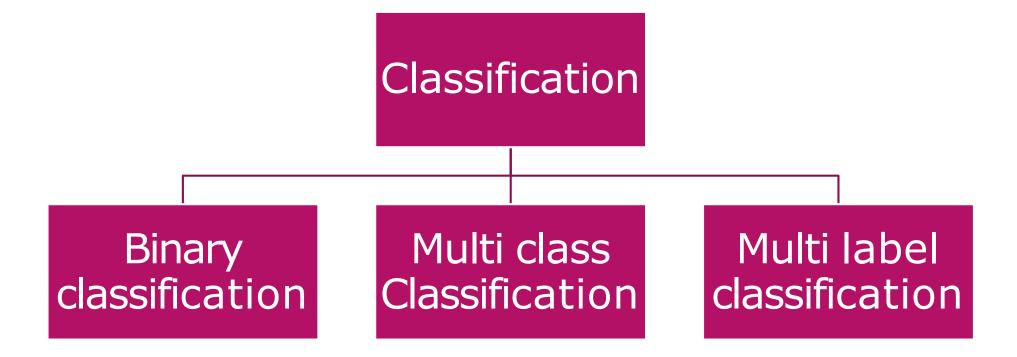
- ▶ It is a Supervised Learning task where output is having defined labels(discrete value).
- ▶ The goal is to predict discrete values belonging to a particular class
- machine learning algorithms learn how to assign a class label to examples from the problem domain.
- Examples
  - Classifying images as cat and dog
  - classifying emails as "spam" or "not spam."







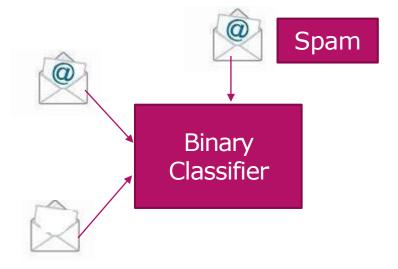
## Types of classification





## Binary classification

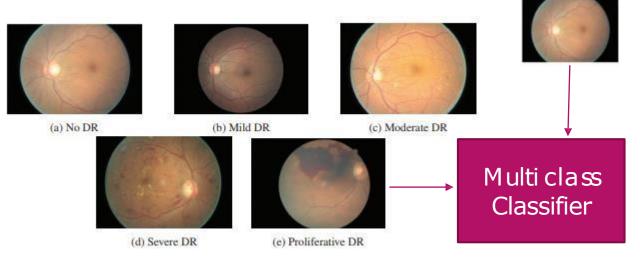
- predicting one of two classes
- involves one class that is the normal state and another class that is the abnormal state.
- ► For example "not spam" is the normal state and "spam" is the abnormal state.
- ► Another example is "cancer not detected" is the normal state of a task that involves a medical test and "cancer detected" is the abnormal state.





#### **Multi-Class Classification**

- Multi-class classification refers to those classification tasks that have more than two class labels.
- Multi-class classification: predicting one of more than two classes.
- Diabetic Retinopathy
  - ▶ 5 classes





#### **Multi-Label Classification**

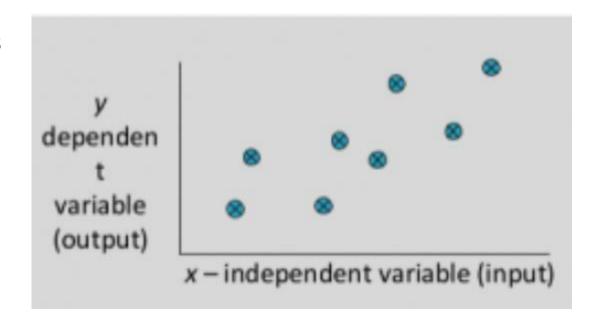
- Classification tasks that have two or more class labels and one or more class labels may be predicted for each example.
- <u>Photo classification</u>: A given photo may have multiple objects in the scene and a model may predict the presence of multiple known objects in the photo, such as "bicycle," "apple," "person," etc.
- In binary classification and multi-class classification, a single class label is predicted for each example.
- In multi-label classification tasks, multiple outputs are predicted



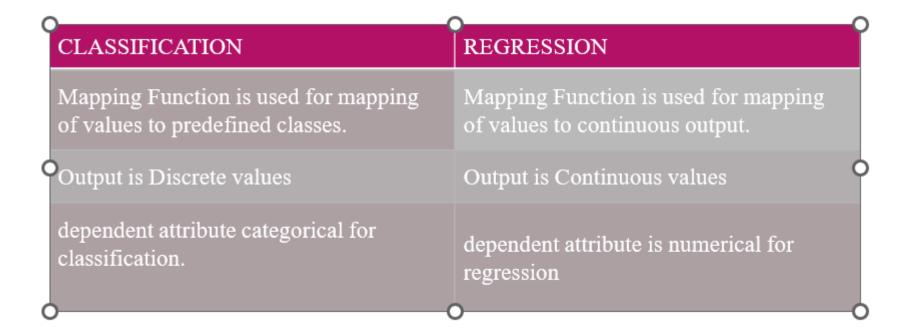


## Regression

- Output variable is a real or continuous value, such as "house price", "salary" or "weight".
- Many different models can be used, the simplest is the linear regression. It tries to fit data with the best hyperplane which goes through the points.
- Regression is the process of finding a model or function to fit the data with the best hyper-plane that goes through the points







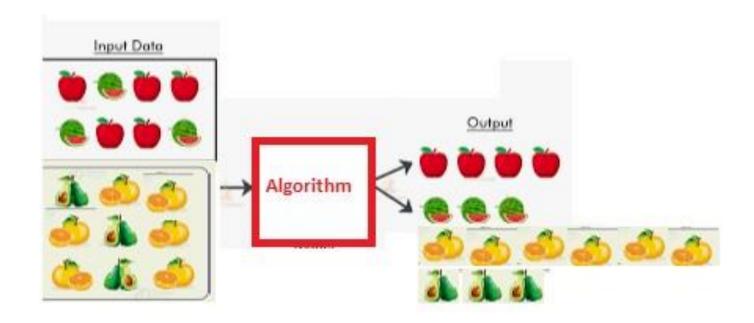
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## Unsupervised learning

- Input data is not labeled
- Algorithm should learn information without guidance.
- task of the machine is to group unsorted information according to similarities, patterns, and differences without any prior training of data.
- no supervisor is provided and no training will be given to the machine.
- the machine should find the hidden structure in unlabeled data by itself.



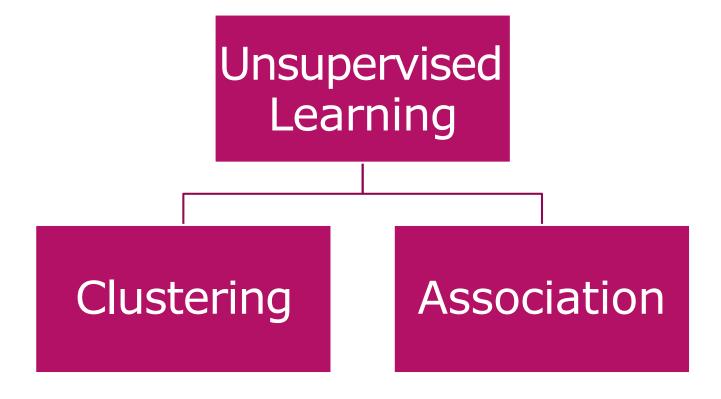
# Example





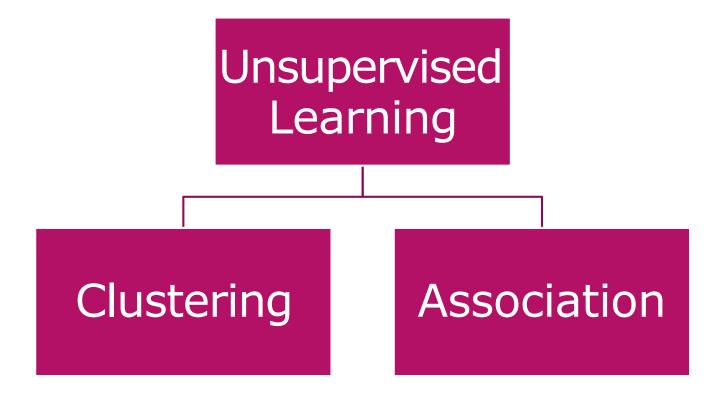
SUPERVISED LEARNING	UNSUPERVISED LEARNING
Supervised learning algorithms are trained using labeled data.	Unsupervised learning algorithms are trained using unlabeled data.
Number of Classes are known	Number of Classes are not known
Supervised learning modelpredicts the output.	Unsupervised learning model finds the hidden patterns in data.
In supervised learning, input data is provided to the model along with the output.	In unsupervised learning, only input data is provided to the model.
The goal of supervised learning is to train the model so that it can predict the output when it is given new data.	The goal of unsupervised learning is to find the hidden patterns and useful insights from the unknown dataset.
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## **Types of Unsupervised Learning**





## **Types of Unsupervised Learning**





## Clustering

- To discover the inherent groupings in the data
- It mainly deals with finding pattern in a collection of uncategorized data.
- Clustering algorithms process data and find natural clusters(groups) if they exist in the data.
- Examples
  - grouping customers by purchasing behavior.







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## Association

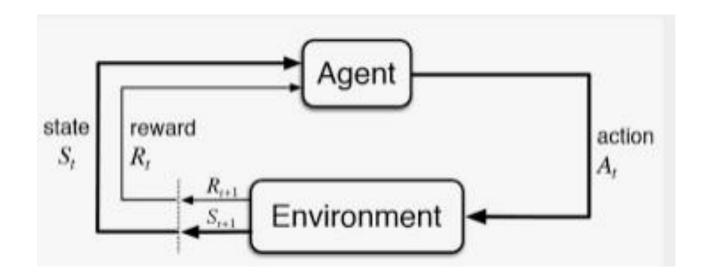
▶ An association rule learning problem is where you want to discover rules that describe large portions of your data, such as people that buy X also tend to buy Y.

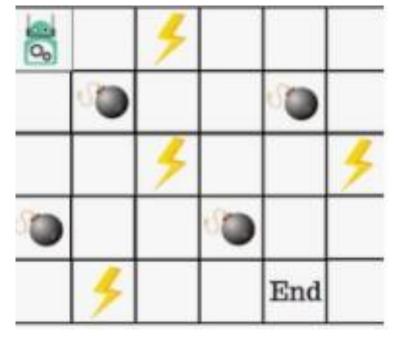
## Reinforcement Learning

- ▶ It is a feedback-based Machine learning technique
- An agent learns to behave in an environment by performing the actions and getting the feedback for each actions.
- For each good action, the agent gets positive feedback, and for each bad action, the agent gets negative feedback or penalty.
- The agent learns automatically using feedbacks without any labeled data.
- Since there is no labeled data, so the agent is bound to learn by its experience only.
- Used in applications where decision making is sequential.
- Example game-playing, robotics, etc.

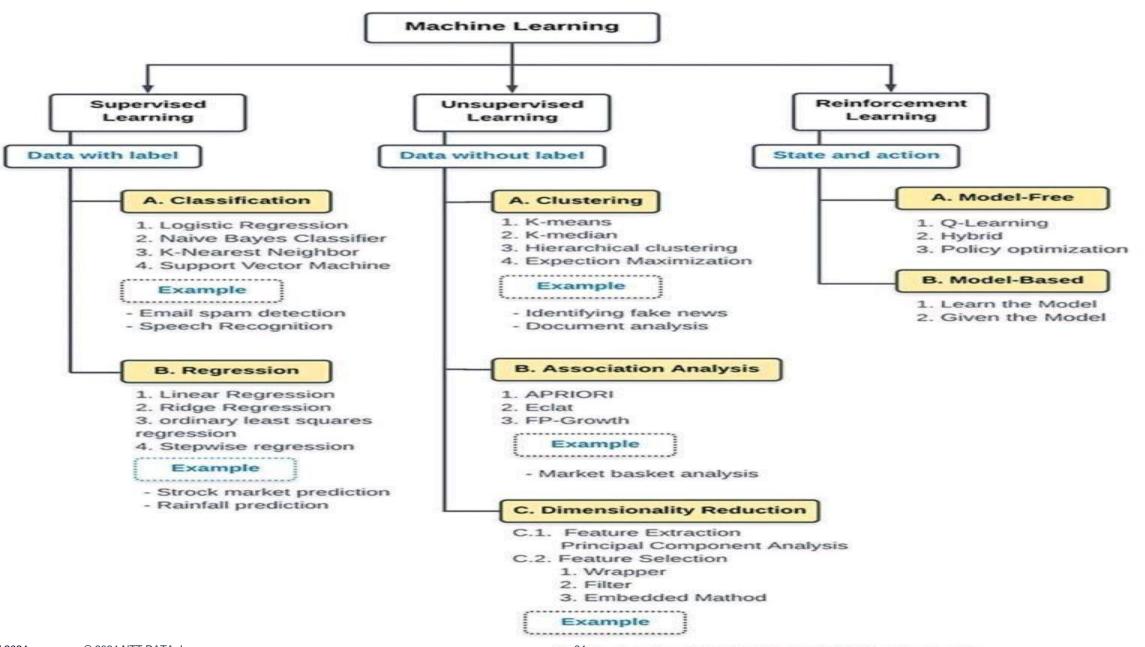


## Reinforcement Learning









# AI-900 Exam Topics

1. Artificial Intelligence Workloads and Considerations (15–20%)

2. Fundamental Principles of Machine Learning on Azure (20–25%)

3. Features of Computer Vision Workloads on Azure (15–20%)

4. Features of Natural Language Processing (NLP) Workloads on Azure (15–20%)

5. Features of Generative AI Workloads on Azure (15–20%)



# 1. Artificial Intelligence Workloads and Considerations (15–20%)

#### •Identify features of common AI workloads

- Features of content moderation and personalization workloads
- Features of computer vision workloads
- Features of natural language processing workloads
- Features of knowledge mining workloads
- Features of document intelligence workloads
- Features of generative AI workloads.

#### Identify guiding principles for responsible AI

- Considerations for fairness in an AI solution
- Considerations for reliability and safety in an AI solution
- Considerations for privacy and security in an AI solution
- Considerations for inclusiveness in an AI solution
- Considerations for transparency in an AI solution
- Considerations for accountability in an AI solution



# 2. Fundamental Principles of Machine Learning on Azure (20–25%)

#### Identify common machine-learning techniques

- Identify regression machine learning scenarios
- Identify classification machine learning scenarios
- Identify clustering machine learning scenarios
- Identify features of deep learning techniques

#### Describe core machine learning concepts

- Identify features and labels in a dataset for machine learning
- Describe how training and validation datasets are used in machine learning

#### Describe Azure Machine Learning capabilities

- Capabilities of automated machine learning
- Data and compute services for data science and machine learning
- Model management and deployment capabilities in Azure Machine Learning



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# 3. Features of Computer Vision Workloads on Azure (15–20%)

#### Identify common types of computer vision solution

- Features of image classification solutions
- Features of object detection solutions
- Features of optical character recognition solutions
- Features of facial detection and facial analysis solutions

#### •Identify Azure tools and services for computer vision tasks

- Capabilities of the Azure AI Vision service
- Capabilities of the Azure AI Face Detection service
- Describe the capabilities of the Azure Al Video Indexer service



#### 4. Features of Natural Language Processing (NLP) Workloads on Azure (15–20%)

#### •Identify features of common NLP Workload Scenarios

- Features and uses for keyphrase extraction
- Features and uses for entity recognition
- Features and uses for sentiment analysis
- Features and uses for language modeling
- Features and uses for speech recognition and synthesis
- Features and uses for translation

#### Identify Azure tools and services for NLP workloads

- Capabilities of the Azure Al-Language service
- Capabilities of the Azure AI Speech Service



### 5. Features of Generative AI Workloads on Azure (15–20%)

#### •Identify features of generative AI solutions

- Features of generative AI models
- Common scenarios for generative Al
- Responsible AI considerations for generative AI

#### Identify capabilities of Azure OpenAl Service

- Natural language generation capabilities of Azure OpenAl Service
- Code generation capabilities of Azure OpenAl Service
- Image generation capabilities of Azure OpenAl Service

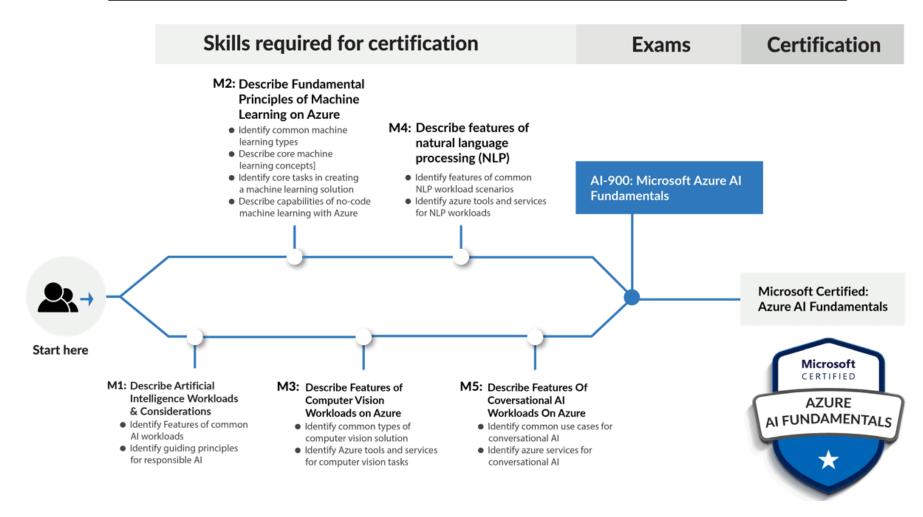


# AI-900 Learning Path



#### Learning Path for [AI-900] Microsoft Azure AI Fundamentals

Microsoft Partner





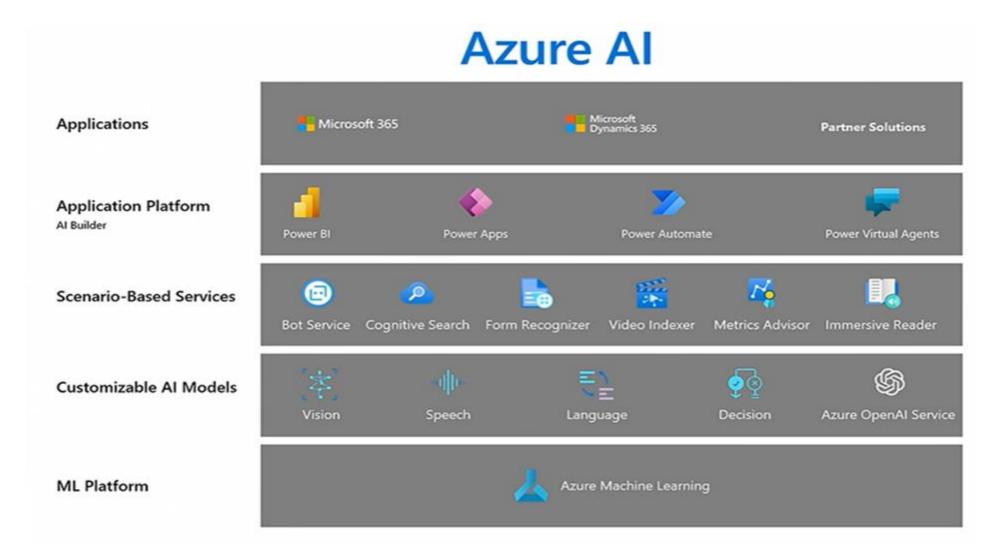
# 4 steps to clear AI-900 Certification Exam

- Read all the links of Al900 exam from Microsoft Learn Website.
- Attend Microsoft Virtual Day training program / Watch anyone one video tutorial
- Explore AI Services in Azure (Optional)
- Read Sample questions

**Note**: Look for Microsoft Challenges to get 100% discount on the exam.



#### Azure AI



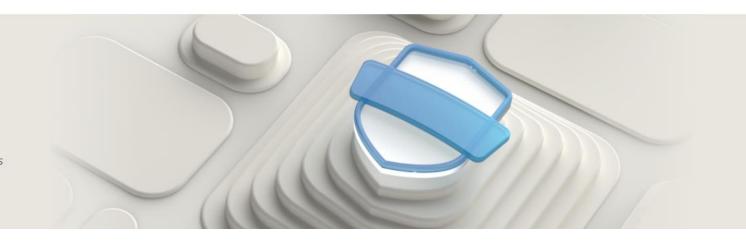


# Microsoft Learning – AI-900



#### Microsoft Certified: Azure Al Fundamentals

Demonstrate fundamental AI concepts related to the development of software and services of Microsoft Azure to create AI solutions.



https://learn.microsoft.com/en-us/credentials/certifications/azure-ai-fundamentals/?practice-assessment-type=certification



# Important Links

- Azure account creation: <a href="https://portal.azure.com/">https://portal.azure.com/</a>
- Microsoft Modular Training Videos (on24.com)
  - Registration Link: <a href="https://vshow.on24.com/vshow/GSI\_MMOC/registration/20801?partnerref=MMOC\_ALL\_ORG\_OTH\_PNSKP">https://vshow.on24.com/vshow/GSI\_MMOC/registration/20801?partnerref=MMOC\_ALL\_ORG\_OTH\_PNSKP</a>
  - Login page: <a href="https://vshow.on24.com/vshow/GSI\_MMOC/exhibits/Azure\_Nov">https://vshow.on24.com/vshow/GSI\_MMOC/exhibits/Azure\_Nov</a>



Which scenario is an example of the conversational AI workload?

- A. Extracting key phases from student essays
- B. Generating automatic descriptions for published images
- C. Using chatbot to answer common customer questions
- D. Predicting whether customers should be targeted by a new marketing campaign



Which scenario is an example of the conversational Al workload?

- A. Extracting key phases from student essays
- B. Generating automatic descriptions for published images
- C. Using chatbot to answer common customer questions

(Correct)

D. Predicting whether customers should be targeted by a new marketing campaign



Select appropriate solution for Computer Vision.

A computer vision solution may be used once, more than once, or not at all.

Scenario

Tool

Returning bounding box coordinates for all identified animals in a photo

Pixel-level classification of an image content

Retrieval of printed text from a scanned document

Semantic segmentation

**Object Detection** 

Optical Character Recognition



Select appropriate solution for Computer Vision.

A computer vision solution may be used once, more than once, or not at all.

#### Scenario

Returning bounding box coordinates for all identified animals in a photo

Pixel-level classification of an image content

Retrieval of printed text from a scanned document

Tool

**Object Detection** 

**Semantic segmentation** 

**Optical Character Recognition** 



Which of the following is a scenario where you would need to use an optical character recognition solution?

- A. Evaluating compliance with building safety regulations
- B. Processing and validating invoices
- C. Identifying products in a warehouse location
- D. Validating identity for access to busines premises



Which of the following is a scenario where you would need to use an optical character recognition solution?

- A. Evaluating compliance with building safety regulations
  - B. Processing and validating invoices

(Correct)

- C. Identifying products in a warehouse location
- D Validating identity for access to busines premises



A company needs to build an AI solution that can identify and disambiguate entities in your input texts using Wikipedia as its knowledge base.

Which of the following Azure cognitive service should the company use?

- A. Custom Vision
- **B.** Form Recognizer
- C. Bing Autosuggest
- D. Text Analytics



A company needs to build an AI solution that can identify and disambiguate entities in your input texts using Wikipedia as its knowledge base.

Which of the following Azure cognitive service should the company use?

—A. Custom Vision	
B. Form Recognizer	
- C. Bing Autosuggest	
D. Text Analytics	( Correct )



Predicting stock market index values based on macro economic changes is an example of what machine learning scenario?

- A. Classification
- **B.** Clustering
- C. Regression



<u>Predicting stock market index values</u> based on macro economic changes is an example of what machine learning scenario?

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An HR AI system screens job candidates without taking into account personal factors such as age, gender, ethnicity, or physical abilities.

This is an example of applying which responsible AI principle?

- A. Fairness
- **B.** Accountability
- C. Inclusiveness
- D. Transparency



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Analyzing X-ray images to detect whether a person has pneumonia is an example of what machine learning scenario?

- A. Regression
- **B.** Clustering
- C. Classification



Analyzing X-ray images to detect whether a person has pneumonia is an example of what machine learning scenario?

A. Regression

**B. Clustering** 

C. Classification

(Correct)



A company gives clear explanations of how the banking AI system works and what factors it considers in approving mortgage applications.

Which responsible AI principle is this an example of?

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Select appropriate Conversational AI Workload for different scenarios. A tool may be used once, more than once, or not at all.

Scenario

Tool

Schedule meetings and appointments

B

Travel reservations and bookings

Capturing feedback after an interaction with a call center

Telephone voice menu

**Web Chat** 

**Personal Digital Assistant** 



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Which Azure cognitive services can you combine to recognize intents in voice commands? Choose TWO services.

A. Form Recognizer

**B.** Language Understanding

C. Text Translator

D. Speech



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