- ***Defination of (AI)***

- *Is a branch of computer science that focuses on creating intelligent machines that can think and act like humans.*
- *AI systems are able to learn from their environment, recognize patterns, and make decisions with minimal human intervention.*
- *AI research includes areas such as natural language processing, robotics, computer vision, machine learning, and expert systems.*

- ***Defination of (machine learning)***

- *Machine learning is a field of artificial intelligence that uses algorithms to learn from data, To find patterns, and make decisions without being explicitly programmed.*
- *Machine learning is a Science of Computer programing So that learn From Data.*
- *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).*
- *It focuses on the development of computer programs that can access data and use it to learn for themselves.*
- ***classification of Types machine Learning according (Supervision).***
  - ***(1). Supervised Learning.***
  - ***Classification.***
    - *In a classification problem data is labelled into one of two or more classes.*
    - *Classification is a type of supervised machine learning algorithm that is used to predict a categorical label. It is used to identify to which category an item belongs to.*
    - *For example, a classification algorithm can be used to classify an email as spam or not spam.*

✓ ***Regression.***

⇨ *Regression is a type of supervised machine learning algorithm that is used to predict a continuous value.*

⇨ *It is used to predict the value of a dependent variable based on one or more independent variables.*

⇨ *For example, Predicting the price of a stock over a period of time is a regression problem.*

➢ ***(2). Unsupervised Learning.***

✓ ***Clustering.***

⇨ *It is an unsupervised learning technique used to Find patterns and group similar data points together.*

⇨ *Clustering is the process of grouping data points into clusters based on their similarity.*

✓ ***Association Rule Learning.***

⇨ *Association rule learning is a type of unsupervised learning algorithm that discovers interesting relationships between variables in large datasets.*

⇨ *It is used to find associations between items in dataset.*

✓ ***Dimensionality Reduction***

⇨ *Dimensionality reduction is the process of reducing the number of features or dimensions in a dataset while preserving important information.*

⇨ *It is used to reduce the complexity of a dataset and make it easier to analyze and interpret.*

➢ ***(3). Semi Supervised Learning.***

➢ ***(4). Reinforcement Learning***

Notes:

- ***Supervised Learning:***
  - ***Supervised learning is a type of machine learning algorithm that uses a known dataset (labeled data) to make predictions.***
  - ***It uses input data and known responses to the data (labels) to learn a function that can predict the output for new data.***

- ***Unsupervised Learning:***
  - *Unsupervised learning is a type of machine learning algorithm that does not use labeled data.*
  - *Instead, it uses input data and tries to find patterns and relationships in the data without any prior knowledge or labels.*
- ***Semi-Supervised Learning:***
  - *Semi-supervised learning is a type of machine learning algorithm that combines supervised and unsupervised techniques.*
  - *It uses both labeled and unlabeled data to learn from the dataset.*
- ***Reinforcement Learning:***
  - *Reinforcement learning is a type of machine learning algorithm that learns by trial and error.*
  - *It interacts with its environment by producing actions and discovers errors or rewards.*
  - *The goal is to maximize the cumulative reward over many trials.*

- ***Types of Machine Learning according (Can be Learn incrementally).***

Online Learning	Batch Learning
• *also known as incremental learning.* • *Online learning is type of machine learning algorithm that learns incrementally as new data becomes available.* • *It allows the model to update its parameters in real-time as new data points are added to the dataset. This makes it ideal for applications where the data is constantly changing.* *=> stock market analysis.* • *Fast And Cheap.* • *System Can be Learn about Data on The Fly.* • *Process Usually Done Offline.*	• *learning is a type of machine learning algorithm that processes all of the available data at once and then updates its parameters based on the results.* • *Batch learning algorithms are often used in applications such as image recognition and natural language processing.* • *Process Usually Done Offline.* • *Take A lot of Time and Computing Resources.*

- ***some issues with unsupervised learning***

- *Difficult to evaluate the accuracy of the results.*
- *expensive and time consuming.*
- *Unclear how to select the appropriate number of clusters or classes.*
- *Difficult to determine the right features for clustering or classification.*
- *May produce unexpected results due to lack of labels or ground truth data.*

- ***some issues with supervised learning***

- *Requires a large amount of labeled data for training, which can be difficult and expensive to obtain in some cases.*
- *Can be sensitive to outliers in the training data, which can lead to inaccurate predictions on unseen data points.*
- *May require significant feature engineering and selection in order to achieve good performance on unseen data points, which can be time consuming and difficult depending on the complexity of the problem domain.*