Day-1
Types of Machine Learning

1.Supervised Learning:

- **Description**: The algorithm learns from labelled training data, where each input is paired with the correct output. The goal is to make predictions or classifications on new, unseen data.
- **Example**: Predicting house prices based on features like size and location. If you have a dataset with house prices and features, the model learns to predict the price for new houses.

There are 2 types of Supervised Learning:

(i) Classification:

- **Description**: The algorithm predicts discrete labels or categories for the given input data.
- **Example**: Email spam detection. The algorithm classifies emails into categories like "spam" or "not spam" based on features such as keywords or sender information.

(ii) Regression:

- **Description**: The algorithm predicts continuous values or quantities for the given input data.
- **Example**: Predicting house prices. Given features like the number of bedrooms, square footage, and location, the algorithm estimates the price of a house.

2.Unsupervised Learning:

- **Description**: The algorithm works with unlabelled data to identify patterns, groupings, or structures in the data. It finds hidden patterns or intrinsic structures in input data.

- **Example**: Customer segmentation in marketing. The algorithm clusters customers into different groups based on their purchasing behaviour, without prior labels.

There are 4 types of Supervised Learning:

(i) Clustering:

- **Description**: The algorithm groups data points into clusters based on their similarities, without any predefined labels.
- **Example**: Customer segmentation. Grouping customers into clusters based on purchasing behaviour, such as frequent buyers, occasional buyers, and non-buyers, without knowing these groups beforehand.

(ii) Dimensionality Reduction:

- **Description**: The algorithm reduces the number of features or dimensions in the data while retaining important information. This helps in simplifying the dataset and improving visualisation.
- **Example**: Principal Component Analysis (PCA). Reducing the number of features in a dataset of customer demographics to visualize the data in 2D or 3D while maintaining the core structure.

(iii) Association Rule Learning:

- **Description**: The algorithm discovers interesting relationships or associations between features in the data. Often used in market basket analysis.
- **Example**: Market basket analysis. Finding that customers who buy bread are also likely to buy butter, which helps in designing promotions or product placements.

(iv) Anomaly Detection:

Description: The algorithm identifies unusual or rare data points that do not fit the general pattern of the dataset. These anomalies can indicate outliers, errors, or novel patterns that might be of interest.

- **Example**: Fraud detection in credit card transactions. The algorithm spots unusual spending patterns or transactions that

deviate significantly from a customer's normal behavior, flagging them as potential fraud.
- Sudden rise in stockmprices

3.Semi-Supervised Learning:

- **Description**: This approach uses a small amount of labelled data along with a large amount of unlabeled data. The algorithm leverages the labelled data to guide learning and improve performance on the unlabeled data.
- **Example**: Suppose you have a dataset of images where only a few are labelled with their categories (e.g., cats, dogs, birds), and the rest are unlabeled. A semi-supervised learning model can use the small set of labelled images to help classify the unlabeled ones, improving overall accuracy by making use of the larger, unlabeled dataset.

3.Reinforcement Learning:

- **Description**: The algorithm learns by interacting with an environment, receiving rewards or penalties based on actions taken. It aims to maximise cumulative rewards over time.
- **Example**: Training a robot to navigate a maze. The robot learns to find the best path to the goal by receiving positive rewards for getting closer to the goal and penalties for wrong turns.
- Humans also learn the same way.