

# **Machine Learning Basics**

**Name: Varnika Mulay**

- 1. Supervised Machine Learning:** Supervised Learning is a type of Machine Learning which analyzes labeled data. This means that the dataset provided to the model contains labels assigned to each data value (each input data point has a corresponding output label) which makes it easy for the model to train as it is able to identify the features and hidden patterns and relationships between the data points using these labels. After the model is trained on the dataset, it is accurately able to classify the unseen data points into the respective label or category or is able to predict the labels of the new unseen data as well. Supervised Machine Learning is mostly used for classification and regression tasks . Some Supervised Machine Learning Techniques include Decision Tree, Random Forest, Naive Bayes, SVM, Logistic Regression and Linear Regression, etc.  
**Ex:** Consider an online shopping portal which wants to classify its customers into frequent and infrequent. For this purpose, supervised ML can be used as a model that can be trained on data having information about each customer's shopping details like frequency of purchase, number of items, etc. This data can be analyzed by the model to identify which customers are frequent buyers and which are not.
- 2. Unsupervised Machine Learning:** Unsupervised Learning is a type of Machine Learning which analyzes unlabeled data. It is the complete opposite of Supervised Machine Learning. In this method, the model is fed unlabeled data, which means that the input data points are not assigned any output label. The model has to identify relationships between data points such that it combines or forms clusters of similar data points. It basically finds out the similarity between the input data values and also identifies outliers. After training, the model is able to accurately assign the unseen data point to the corresponding cluster which is most similar to the unseen data value. Hence, unsupervised Machine Learning is mostly suitable for clustering purposes.

Some of the common techniques include K-Means clustering, K-NN, Hierarchical clustering dimensionality reduction, etc.

**Ex:** Consider a group of students and the school wants to segregate these students based on their hobbies so as to participate in the inter-school competitions. For this purpose, unsupervised ML can be used as a model that can be trained on the training data which includes the various likes and dislikes of students and other details which could help the model identify the relationships and hidden patterns in the data. This could help the model identify similarities between the students and group the students based on their hobbies.

**3. Reinforcement Learning:** Reinforcement Learning is a special type of Machine Learning which involves the use of “**agents**” to perform certain tasks by interacting with its surroundings or environment. Unlike supervised and unsupervised learning, it doesn’t include any particular model which is trained on a dataset to identify patterns and insights from the data, whereas it includes an agent which is assigned a definite task which it performs by learning from its experiences and aims to keep getting better at that task by improving its mistakes and optimizing its methods. The agent is also given a reward each time it performs its task accurately. The main objective of the agent is to maximize this reward which it obtains only by performing its task without any errors and in an optimal way. The agent analyzes its current environmental conditions and also its past actions to decide its next actions.

**Ex:** One of the most common examples of Reinforcement Learning is a cleaning robot. In this, the robot acts as the agent and its task is to clean a given area. Suppose the robot has been given an area of 4 blocks to clean, it will start with the first block, perform cleaning and move to the next block. Before moving to the next block, it will get a reward as it has successfully cleaned one block of the area. Then after it moves to the next block, it’ll analyze the area and rule out the first block it cleaned and keep on cleaning the rest of the blocks. In this way, the robot keeps obtaining rewards for every successful completion and finishes its task.

Some other examples of reinforcement learning include self-driving cars, chess-playing robots, etc.

#### 4. Classification Vs Regression Vs Clustering

Sr.No.	Classification	Regression	Clustering
1.	Type of Supervised Machine Learning.	Type of Supervised Machine Learning.	Type of Unsupervised Machine Learning.
2.	In this, the model aims to classify unseen data into predefined labels or classes.	In this, the model aims to accurately predict the labels for the unseen data points.	In this, the model aims to accurately assign the unseen data points to the cluster based on similarity.
3.	Uses discrete data.	Uses continuous data.	Can use both discrete or continuous but mostly prefers continuous data.
4.	Examples include Decision Tree, SVM, Random Forest, etc.	Examples include Logistic Regression, Linear Regression, Lasso and Ridge Regression.	Examples include DBSCAN, K-NN, K-Means clustering, Hierarchical clustering, etc.