

Supervised Learning

- Supervised data is defined by its use of labelled datasets to train algorithms that to classify outcomes data or predict outcomes accurately.
- Supervised learning uses a training set to teach models to yield the desired output. The training dataset includes inputs and correct outputs, which allow the model to learn over time
- Supervised Learning Algorithms
 1. Neural networks- inspired by human brain, passed through several nodes made of different weight, bias, inputs and outputs
 2. Naive Bayes - classification approach that adopts the principle of class conditional independence from the Bayes Theorem. This means that the presence of one feature does not impact the presence of another in the probability of a given outcome, and each predictor has an equal effect on that result.
 3. Linear Regression - used to identify the relationship between a dependent variable and one or more independent variables and is typically leveraged to make predictions about future outcomes
 4. Logistic Regression - this type of regression is selected when the dependent variable is categorical
 5. Support Vector Machine - constructing a hyperplane where the distance between two classes of data points is at its maximum. This hyperplane is known as the decision boundary, separating the classes of data points on either side of the plane.
 6. KNN - non-parametric algorithm that classifies data points based on their proximity and association to other available data
 7. Random Forest -The "forest" references a collection of uncorrelated decision trees, which are then merged together to reduce variance and create more accurate data predictions
- Examples - Spam detection, Image and object identification, Customer sentiment analysis

Unsupervised Learning

- Unsupervised machine learning models are given unlabelled data and allowed to discover patterns and insights without any explicit instructions and guidance.
- Real world unsupervised learning examples-
 1. Anomaly detection- discovers datapoints that are atypical in a dataset
 2. Recommendation Engines - unsupervised machine learning can help explore transactional data to discover patterns or trends that can be used to drive personalized recommendations for online retailers
 3. Customer segmentation - unsupervised learning is commonly used to generate buyer persona profiles by clustering customer's common traits or purchasing behaviour. These profiles can be used for target marketing.

4. Natural language processing- Unsupervised learning is commonly used for various NLP applications, such as categorizing articles in news sections, text translation and classification, or speech recognition in conversational interfaces.

Reinforcement Learning

- Reinforcement learning is a feedback based Machine learning algorithm in which an agent learns to behave in an environment by performing the actions and seeing the results of actions. For each good action, the agent gets positive feedback, and for each bad action, the agent gets negative feedback or penalty.
- For example- An example of reinforcement learning is teaching a computer program to play a video game. The program learns by trying different actions, receiving points for good moves and losing points for mistakes. Over time, it learns the best strategies to maximize its score and improve its performance in the game.

Classification vs Regression vs Clustering

	Classification	Regression	Clustering
Type of Learning	Supervised	Supervised	Unsupervised
Algorithm	Seeks to predict some class label	Seeks to predict a continuous quantity	Seeks for groups based on patterns in data
Response variable type	categorical	continuous	not given
Target Variable	Can only take categorical values Example - 1000 data of dogs and cats classified as dogs and cats	Can take anyone of the infinite values within the range Example- Given the height and weight of 1000 people. Find the weight of 20 people whose height is known.	Try to cluster data into multiple groups and extract useful information Example- Given images related to basic shapes find clusters and patterns among them