

Q1. Supervised Learning:

Supervised learning is when the model / algorithm is aware of the required output / label and is corrected at every step based on how far the model is from the actual value. A model essentially creates a function by mapping training input and output values and then uses that function to predict the outcome of unknown input values.

The data provided to a supervised learning algorithm / function is called a labelled dataset and it consists of an output column.

Some supervised learning algorithms are:

1. Regression
2. Classification
3. Decision Trees
4. Neural Networks
5. Support Vector Machines
6. Naïve Bayesian Model

Q2. Unsupervised Learning:

Contrary to supervised learning, when the model is unaware of the required output / label, and tries to make sense in patterns already existing in the dataset. The algorithm essentially tries to find intrinsic relations in the dataset. These correlations in the dataset are then used to predict the value of unknown input values.

The data provided to an unsupervised learning algorithm / function is called an unlabeled dataset and it does not consist of the output column.

Some unsupervised learning algorithms are:

1. K-means clustering
2. KNN (k-nearest neighbors)
3. Hierarchical clustering
4. Principle Component Analysis
5. Independent Component Analysis

Q3. Online Learning

In online learning the entire dataset is not provided to the model, but each reading / dataset row is provided to the learning algorithm as a continuous stream of data while being generated. It is mainly used when the algorithm is required to dynamically adapt to the changing patterns inside the dataset. Hence, this type of machine learning can be used in 2 scenarios:

1. Data is too big to fit into memory (RAM) for processing
2. Data is a continuous stream rather than a set

Some online learning algorithms are:

1. Stochastic approximation and sample average approximation.
2. Stochastic gradient descent. Sparse updates.
3. Minibatching. Acceleration.
4. Pegasos. SGD for Kernel SVM. Perceptron.

Q4. Batch Learning

Contrary to online learning, Batch Learning (also called as offline learning) is the training of the model / algorithm using the entire dataset for every iteration whereas in online learning the model learns incrementally at each step and as data is fed into it. As a huge amount of data is often processed it requires a lot of computing power and memory, which is why it is done offline. Once the model is trained independently, it is put into deployment. The main difference being the model not being dynamically updated according to new data. Hence, this type of machine learning can be used in 2 scenarios:

1. The memory and computational power of the training resources are enough to handle the data
2. Data is a static set rather than a continuous stream

All of the supervised and unsupervised learning algorithms can be used as batch learning algorithms

Q5. Model Based Learning

Model-based learning algorithms use the given training data set and create a model that has parameters learned from the training data. It is the traditional machine learning that is considered when training a model. For example - In a Support Vector Machine, weights for each input value and the bias values are calculated on each iteration and perfected over the complete training procedure. After the model is completed and tested at a satisfactory level of efficiency and accuracy, the training data can be discarded as there is no longer a dependency on it.

Q6. Instance Based Learning

In instance based learning, the learning algorithm uses the entire dataset as the model. This happens in clustering algorithms like KNN (K-Nearest neighbors) which looks at the closest neighbors to the input example which is being calculated and finds the most probable output for it. This algorithm uses the values of the adjacent closest neighbors anytime a new input is provided, hence the learning data cannot be discarded but is instead used as the actual model to make the prediction.