**Supervised Learning**

To put it simply, we train an algorithm and at the end pick the model that best predicts some well-defined output based on input data.

Supervised techniques adapt the model to reproduce outputs known from a training set. In the beginning, the system receives input data as well as output data. Its task is to create appropriate rules that map the input to the output. The training process should continue until the level of performance is high enough. After training, the system should be able to assign an output objects which it has not seen during the training phase. In most cases, this process is really fast and accurate.

There are two types if Supervised Learning techniques:

1. **Classification**
2. **Regression**

Classification – Separates the data.

Regression – fits the data

**Classification**

Classification is a technique that aims to reproduce class assignments. It can predict the response value and the data is separated into “classes”.

***Example:*** Recognition of a type of car in a photo, is this mail spam or a message from a friend, or what the weather will be today.

**Basic Terminology in Classification Algorithms**

1. **Classifier:** An algorithm that maps the input data to a specific category.
2. **Classification model:** A classification model tries to draw some conclusions from the input values given for training. It will predict the class labels/categories for the new data.
3. **Feature:** A feature is an individual measurable property of a phenomenon being observed.
4. **Binary Classification:** Classification task with two possible outcomes.

***E.g.*** *Gender classification(Male/Female)*

1. **Multi-class classification:** Classification with more than two classes. In multi-class

classification, each sample is assigned to one and only one target label.

***E.g.*** *An animal can be a cat or dog but not both at the same time.*

1. **Multi-label classification:** Classification task where each sample is mapped to a set of target labels (more than once class).

***E.g.*** *A news article can be about sports, a person, and location at the same time.*

**Applications of Classification Algorithms**

* Email spam classification
* Bank customers loan pay willingness prediction.
* Cancer tumor cell identification.
* Sentiment analysis
* Drugs classification
* Facial key points detection
* Pedestrian detection in automotive car driving.

**Types of Classification Algorithms**

Classification Algorithms could be broadly classified as the following:

1. **Linear Classifiers**

* Logistic regression
* Naïve Bayes classifier
* Fisher’s linear discriminant

1. **Support vector machines**

* Least squares support vector machines

1. **Quadratic classifiers**
2. **Kernel estimation**

* K-nearest neighbor

1. **Decision tress**

* Random forests

1. **Neural networks**
2. **Learning vector quantization**

**Regression**

Regression is a technique that aims to reproduce the output value. We can use it, for example, to predict the price of some product, like a price of a house in a specific city or the value of a stock. There is a huge number of things we can predict if we wish.