**What is MACHINE LEARNING ?**

Machine learning is concerned with computer programs that automatically improve their performance through experience.

It enables a machine to automatically learn from data, improve performance from experiences and predict things without being explicitly programmed.

Learning is used when:

* Human expertise does not exist (navigating on Mars).
* Humans are unable to explain their expertise (speech recognition).
* Solution changes in time (routing on a computer network).
* Solution needs to be adapted to particular cases (user biometrics).

Historic data (Original Data= Training Data) are used for assumption/prediction without explicitly programmed.

Machine learning is all about to make Prediction and Classifications.

* **Application :-**

Banking/Telecom/Retail

Identify: Good Customers, Dissatisfied Customers

Obtain: More effective advertising, Less credit card risk

Biomedical/Biometrics

* + Screening
  + Diagnostics
  + Fingertips

Computer/Internet

* + Handwriting and Speech
  + Spam Filtering

**What is SUPERVISED LEARNING ?**

* Here, we train the machines using the labelled dataset, and based on that dataset machine predicts the output.
* Input & Output both are labelled.
* So here machines knows the output before processing it because we provide algorithm according to our requirement before working on it, here we knew the output.
* Here, the labelled data specifies that some of the inputs are already mapped to the output.
* Very well defined training phase so can forecast outcome easily.
* Supervised learning classified into two categories of algorithms:
* **1) Classification**: A classification problem is when the output variable is a category, such as “Red” or “blue” or “disease” and “no disease”.
* **2)  Regression**: A regression problem is when the output variable is a real value, such as “dollars” or “weight”.
* Supervised learning deals with or learns with “labeled” data.

**What is CLASSIFICATION & REGRESSION?**

Classification is a supervised machine learning technique used to assign discrete labels or categories to input data based on learned patterns from labeled training datasets. In engineering applications, classification models are commonly employed in areas such as quality control (e.g., classifying components as acceptable or defective), fault detection (e.g., identifying types of system faults), and pattern recognition (e.g., voice or image recognition systems).

Regression is a supervised machine learning approach aimed at modeling the relationship between input variables and a continuous output variable. It is particularly useful in engineering scenarios where predictions of quantitative measures are required, such as predicting temperature distribution in thermal systems, estimating structural load responses, or forecasting energy demand.