**Chapter 3: Supervised Learning**

**Topic – 1: Linear Regression**

**Concept In Brief**

* And we call the **regression plane** in **3D space** as ***hyperplane***.

**Python Code**

***# Libraries to import***

***import pandas as pd***

***import matplotlib.pyplot as plt***

***from sklearn.linear\_model import LinearRegression***

***from sklearn.model\_selection import train\_test\_split***

***from sklearn.metrics import mean\_squared\_error***

***# Splitting data (optional)***

***x\_train, x\_test, y\_train, y\_test = train\_test\_split(x, y, test\_size=0.3, random\_state=42)***

***# Importing file & assigning columns***

***df = pd.read\_csv(r"C:\Path\To\Directory\Income.csv")***

***x = df[["Age"]] #Input value must be 2D array or DataFrame***

***y = df["Income"]***

* We can put all **independent variables** in **'x'** as array elements.

***# Fitting the model (simple linear regression)***

***model = LinearRegression()***

***model.fit(x,y)***

***prediction = model.predict(x)***

***# Fitting the model (polynomial regression)***

***from sklearn.preprocessing import PolynomialFeatures***

***poly = PolynomialFeatures(degree=2)***

***x\_poly = poly.fit\_transform(x)***

***model = LinearRegression()***

***model.fit(x\_poly,y)***

***prediction = model.predict(x\_poly)***

***# Plotting on graph***

***plt.scatter(x, y, color="blue")***

***plt.plot(x, prediction, color="red", linewidth=2)***

***plt.title("Regression")***

***plt.xlabel("Age")***

***plt.ylabel("Income")***

***plt.show()***

***# Extra measurement tools***

***print(f"Coefficient: {model.coef\_}")***

***prediction = model.predict(x\_test) # Pointing to 30% datasets instead of all***

***print("Mean squared error: ", mean\_squared\_error(y\_test, prediction))***

**Topic – 2: Logistic Regression**

**Concept In Simple Words**

* ***Logistic regression*** helps determine the **probability** for an event to occur.

**Concept In Brief**

* There can be **multiple** independent variables.
* Curve is **S-shaped** (sigmoid function).

Python Code

# Importing required libraries

import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

from sklearn.linear\_model import LogisticRegression

from sklearn.model\_selection import train\_test\_split

from sklearn.metrics import accuracy\_score, confusion\_matrix