**ASSIGNMENT 3**

**Problem Statement**: Apply appropriate ML algorithm on a dataset collected in a cosmetics shop showing details of customers to predict customer response for special offer. The cosmetics shop aims to optimize its marketing strategies by predicting customer responses to special offers.

Objective: The main objective is to develop a predictive model using logistic regression and linear regression to classify customers into two categories: likely to respond positively or likely to respond negatively to special offers. By doing so, the shop can target specific customer segments more effectively and improve the efficiency of their marketing campaigns. To achieve this, we've collected data on their customers, including CustomerID, Gender, Age, Annual Income, and Spending Score. The objective is to build a machine learning model that can accurately predict whether a customer will respond positively or negatively to special offers based on their demographic and spending characteristics.

**S/W Packages and H/W apparatus used: Software used**:

Python 3.x

Google Colab

**Libraries and packages used**:

NumPy, Pandas

**Logistic Regression and Linear Regression:**

Logistic Regression:

Supervised Learning Algorithm: Logistic regression is a supervised learning algorithm used for binary classification tasks.

Probability Estimation: Logistic regression models the probability that a given input belongs to a particular class. It uses the logistic function to map the output to a probability value between 0 and 1.

Decision Boundary: Logistic regression uses a decision boundary to separate the classes. This decision boundary can be linear or nonlinear, depending on the features and the model complexity.

Interpretability: Logistic regression provides interpretable coefficients that indicate the impact of each feature on the predicted probability.

Application: Logistic regression is widely used in various fields such as healthcare (predicting disease outcomes), finance (credit risk assessment), and marketing (customer churn prediction).

Linear Regression:

Supervised Learning Algorithm: Linear regression is a supervised learning algorithm used for regression tasks.

Relationship Modelling: Linear regression models the relationship between the input features and the continuous target variable. It assumes a linear relationship between the features and the target.

Coefficient Estimation: Linear regression estimates the coefficients of the linear equation that best fits the data. These coefficients represent the slope of the line and the intercept.

Prediction: Linear regression predicts the target variable by computing the dot product of the input features and the coefficients.

Application: Linear regression is commonly used for tasks such as predicting house prices, stock prices, and sales forecasting.

**Application:**

Logistic regression and linear regression can be applied to predict customer responses to special offers based on their demographic and spending characteristics. By analysing features such as age, gender, annual income, and spending score, these algorithms can classify customers into different response categories, helping the shop tailor its marketing strategies accordingly.

Both algorithms provide interpretable results, allowing the shop to understand the impact of each feature on the predicted response.

**Conclusion**: In conclusion, logistic regression and linear regression are suitable algorithms for predicting customer responses to special offers based on demographic and spending characteristics. These algorithms provide interpretable results and can help the cosmetics shop optimize its marketing strategies. However, it's essential to pre-process the data properly and choose the appropriate features to achieve the best performance. Additionally, hyperparameter tuning may be necessary to improve the model's accuracy and generalization capabilities.