**Project Name :- Black Friday Sale**

**Objective**:

The primary aim of this project is to predict the purchase amount during the Black Friday sales event based on customer demographic data and historical purchase information. The objective is to analyse patterns and build a model that can accurately predict future spending.

**Dataset Overview:**

The dataset contains variables such as **Gender**, **Age**, **City**, **Occupation**, and **Product Details**. Each record represents a unique purchase, including the amount spent by the customer during the sale. Some preprocessing is needed to handle missing values, encode categorical features, and normalize the data.

**Steps Performed:**

1. **Data Cleaning and Preprocessing**:
   * Handled missing values in the product and demographic fields.
   * Encoded categorical variables like **Gender**, **Age**, and **City** using techniques such as one-hot encoding.
   * Scaled numeric features to normalize their range.
2. **Exploratory Data Analysis (EDA)**:
   * Analyzed spending patterns across different demographic groups such as gender and age.
   * Found significant relationships between customer attributes like occupation and product categories.
3. **Feature Engineering**:
   * Created new features, such as customer lifetime value, purchase frequency, and interaction between customer demographics and product categories.
4. **Model Building**:
   * Split the dataset into training and test sets (80/20 split).
   * Trained multiple models, including **Linear Regression**, **Decision Trees**, and **Random Forests**. o Tuned the models for better performance by using cross-validation and hyperparameter optimization techniques.
5. **Model Evaluation**:
   * Compared models using metrics like **Root Mean Squared Error (RMSE)** to evaluate performance. o The **Random Forest model** performed best with the lowest RMSE and highest accuracy in predicting purchase amounts.
6. **Results and Insights**:
   * Found that certain demographics (e.g., younger individuals and males) were associated with higher spending. o Identified that customers from specific cities or with a particular occupation were more likely to make larger purchases.
7. **Conclusion**:
   * The project successfully predicted customer spending with a reasonable degree of accuracy.
   * The model can help businesses anticipate customer behavior during Black Friday, assisting in inventory planning, targeted marketing campaigns, and personalized offers to maximize sales.