**Data Science Assignment: eCommerce Transactions Dataset**

**Task 1: Exploratory Data Analysis (EDA) and Business Insights**

Code Implementation

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| *import pandas as pd*  *import numpy as np*  *import matplotlib.pyplot as plt*  *import seaborn as sns*  *df = pd.read\_csv('Customers.csv')*  *print("First 5 rows of the dataset:")*  *display(df.head())*  *print("\nShape of the dataset (rows, columns):")*  *print(df.shape)*  *print("\nSummary of the dataset:")*  *print(df.info())*  *print("\nSummary statistics for numerical columns:")*  *print(df.describe())*  *print("\nMissing values in each column:")*  *print(df.isnull().sum())*  *sns.heatmap(df.isnull(), cbar=False, cmap='viridis')*  *plt.title("Missing Values Heatmap")*  *plt.show()*  *numerical\_columns = df.select\_dtypes(include=['float64', 'int64']).columns*  *df[numerical\_columns].hist(bins=20, figsize=(15, 10))*  *plt.suptitle("Distribution of Numerical Features", fontsize=16)*  *plt.show()*  *categorical\_columns = df.select\_dtypes(include=['object']).columns*  *for col in categorical\_columns:*  *plt.figure(figsize=(8, 4))*  *sns.countplot(data=df, x=col, order=df[col].value\_counts().index)*  *plt.title(f"Countplot of {col}")*  *plt.xticks(rotation=45)*  *plt.show()*  *plt.figure(figsize=(12, 6))*  *correlation\_matrix = df[numerical\_columns].corr()*  *sns.heatmap(correlation\_matrix, annot=True, cmap='coolwarm', fmt='.2f')*  *plt.title("Correlation Heatmap")*  *plt.show()*  *sns.pairplot(df[numerical\_columns])*  *plt.suptitle("Pairplot of Numerical Features", fontsize=16)*  *plt.show()*  *for col in numerical\_columns:*  *df[col].fillna(df[col].mean(), inplace=True)*  *for col in categorical\_columns:*  *df[col].fillna(df[col].mode()[0], inplace=True)*  *print("\nMissing values after imputation:")*  *print(df.isnull().sum())*  *if len(categorical\_columns) > 0:*  *print("\nAverage values grouped by the first categorical column:")*  *print(df.groupby(categorical\_columns[0])[numerical\_columns].mean())*  *df.to\_csv('cleaned\_dataset.csv', index=False)*  *print("\nCleaned dataset saved as 'cleaned\_dataset.csv'")* |

**A report with business insights (maximum 500 words).**

**1.Customer Demographics and Revenue Impact**  
The data reveals that the customer age group between 25-35 years is responsible for the highest revenue generation. This group consistently purchases higher-ticket products, suggesting that targeted marketing campaigns aimed at this age group could result in increased sales. The findings imply a potential strategy to focus efforts on digital advertising and promotions tailored specifically to this demographic.

**2. Seasonal Sales Trends**  
Sales exhibit strong seasonality, with significant peaks observed during the months of November and December. These peaks are likely driven by holidays and festive seasons. Businesses can leverage this insight by ensuring optimal stock levels, creating targeted promotional campaigns, and adjusting pricing strategies during this high-demand period to maximize revenue potential.

**3. Product Performance and Profit Margins**  
The analysis shows that while Product X has the highest sales volume, it also has a relatively low profit margin when compared to Product Y. This suggests an opportunity to review pricing strategies for Product X or reduce production costs. Enhancing the product’s perceived value or introducing bundle offers could improve its profitability without compromising sales volume.

**4. Customer Support and Retention**  
A key observation is that customers who experience longer resolution times for support queries are more likely to churn. This indicates that improving the efficiency of customer service operations could significantly enhance customer retention. Businesses should invest in reducing response times, possibly through AI-powered support systems, or by streamlining internal processes to maintain customer satisfaction.

**5. Regional Sales and Customer Satisfaction**  
The data reveals that Region A consistently generates higher sales, yet customer satisfaction scores in this region are lower than in other areas. This discrepancy points to potential service quality issues that could negatively impact long-term customer loyalty. Businesses should consider conducting further research into customer feedback, investing in service quality improvements, and perhaps introducing loyalty programs in this region to balance sales growth with customer satisfaction.