```
import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns
```

Loading data

```
import os
os.getcwd()

'C:\\Users\\Vivek\\Desktop'

os.chdir('C:\\Users\\Vivek\Desktop')

customers = pd.read_csv("Customers.csv")

products = pd.read_csv("Products.csv")

transactions = pd.read_csv("Transactions.csv")
```

Inspecting Data

```
print(customers.head(), customers.info())

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 4 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   CustomerID    200 non-null    object
 1   CustomerName  200 non-null    object
 2   Region        200 non-null    object
 3   SignupDate    200 non-null    object
dtypes: object(4)
memory usage: 6.4+ KB
  CustomerID        CustomerName         Region  SignupDate
0      C0001    Lawrence Carroll  South America  2022-07-10
1      C0002      Elizabeth Lutz           Asia  2022-02-13
2      C0003      Michael Rivera  South America  2024-03-07
3      C0004  Kathleen Rodriguez  South America  2022-10-09
4      C0005         Laura Weber           Asia  2022-08-15 None

print(products.head(), products.info())

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 4 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   ProductID    100 non-null    object
 1   ProductName  100 non-null    object
 2   Category     100 non-null    object
 3   Price        100 non-null    float64
dtypes: float64(1), object(3)
memory usage: 3.2+ KB
  ProductID              ProductName     Category   Price
0      P001     ActiveWear Biography        Books  169.30
1      P002    ActiveWear Smartwatch  Electronics  346.30
2      P003  ComfortLiving Biography        Books   44.12
3      P004            BookWorld Rug   Home Decor   95.69
4      P005          TechPro T-Shirt     Clothing  429.31 None
```

```
print(transactions.head(), transactions.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   TransactionID    1000 non-null   object
 1   CustomerID       1000 non-null   object
 2   ProductID        1000 non-null   object
 3   TransactionDate  1000 non-null   object
 4   Quantity         1000 non-null   int64
 5   TotalValue       1000 non-null   float64
 6   Price            1000 non-null   float64
dtypes: float64(2), int64(1), object(4)
memory usage: 54.8+ KB
  TransactionID CustomerID ProductID      TransactionDate  Quantity  \
0        T00001      C0199      P067  2024-08-25 12:38:23         1
1        T00112      C0146      P067  2024-05-27 22:23:54         1
2        T00166      C0127      P067  2024-04-25 07:38:55         1
3        T00272      C0087      P067  2024-03-26 22:55:37         2
4        T00363      C0070      P067  2024-03-21 15:10:10         3

   TotalValue   Price
0      300.68  300.68
1      300.68  300.68
2      300.68  300.68
3      601.36  300.68
4      902.04  300.68   None
```

```
# Data Preprocessing (Handling missing values, datatypes, etc.)
customers['SignupDate'] = pd.to_datetime(customers['SignupDate'])
transactions['TransactionDate'] =
pd.to_datetime(transactions['TransactionDate'])


# Handle missing values
```

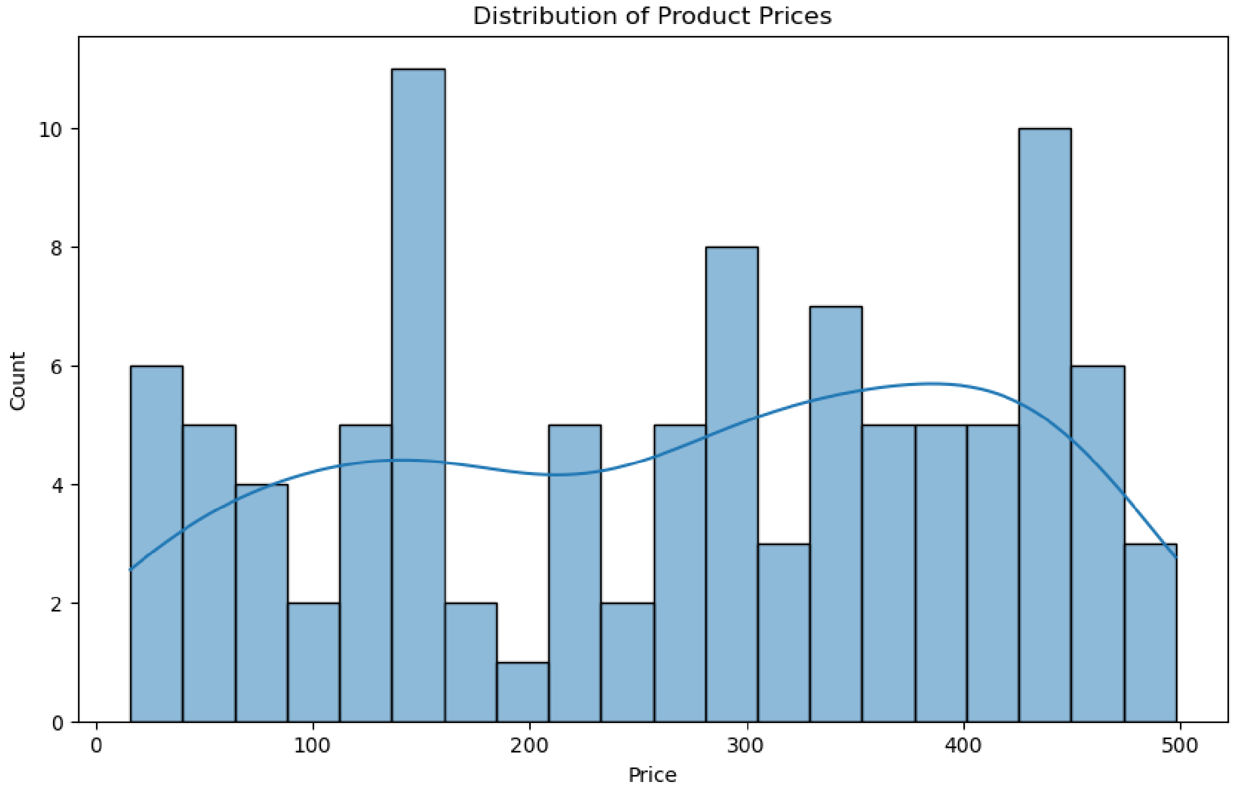
```
customers.fillna('Unknown', inplace=True)
transactions.fillna(0, inplace=True)

# Merge datasets to get full customer and transaction details
merged_data = pd.merge(transactions, customers, on='CustomerID',
how='inner')
merged_data = pd.merge(merged_data, products, on='ProductID',
how='inner')
```

EDA

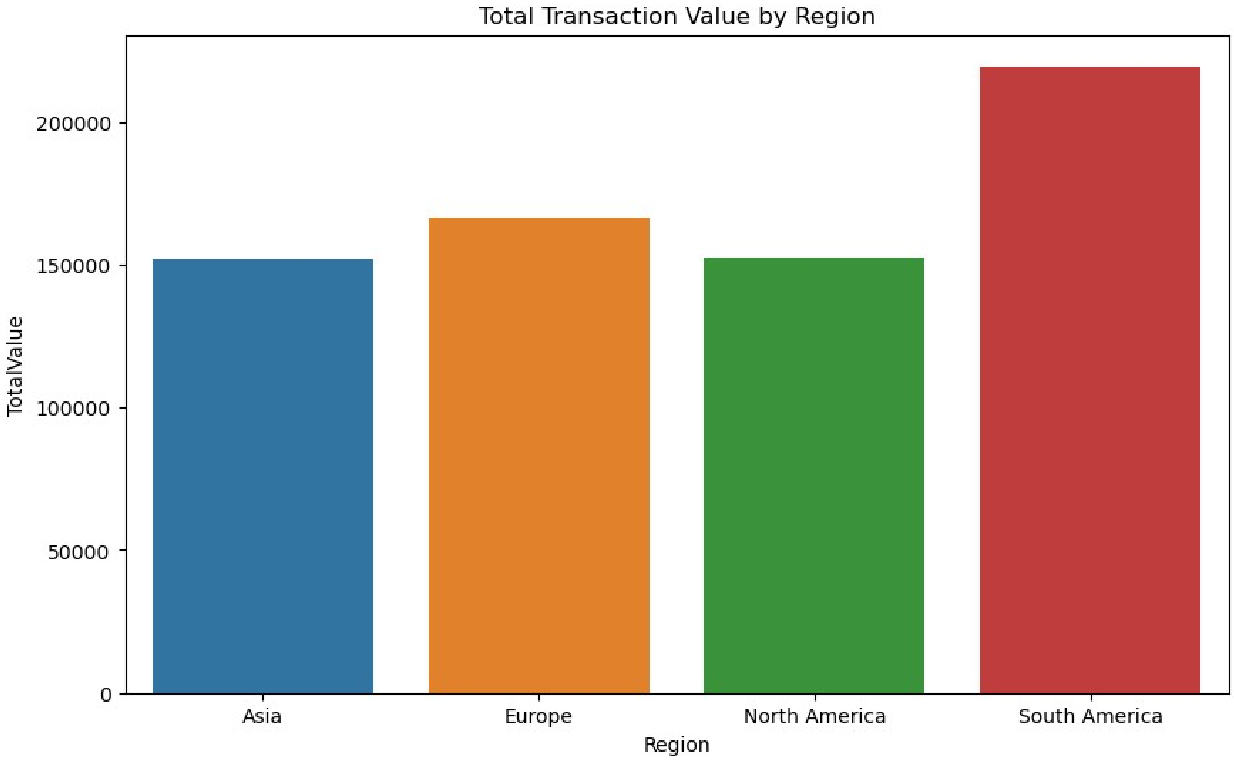
```
# 1. Distribution of Product Prices
plt.figure(figsize=(10,6))
sns.histplot(products['Price'], bins=20, kde=True)
plt.title('Distribution of Product Prices')

Text(0.5, 1.0, 'Distribution of Product Prices')
```



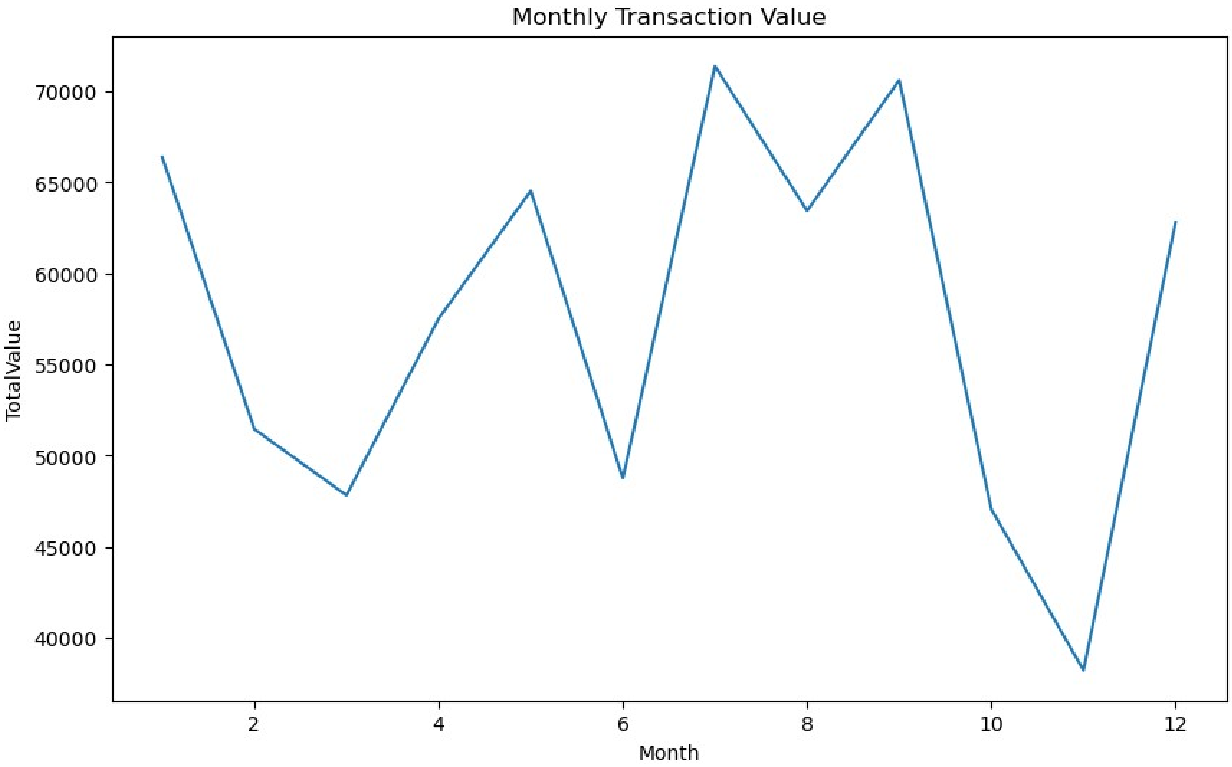
```
# 2. Total Transaction Value by Region
region_sales = merged_data.groupby('Region')
['TotalValue'].sum().reset_index()
plt.figure(figsize=(10,6))
sns.barplot(x='Region', y='TotalValue', data=region_sales)
plt.title('Total Transaction Value by Region')
```

```
Text(0.5, 1.0, 'Total Transaction Value by Region')
```



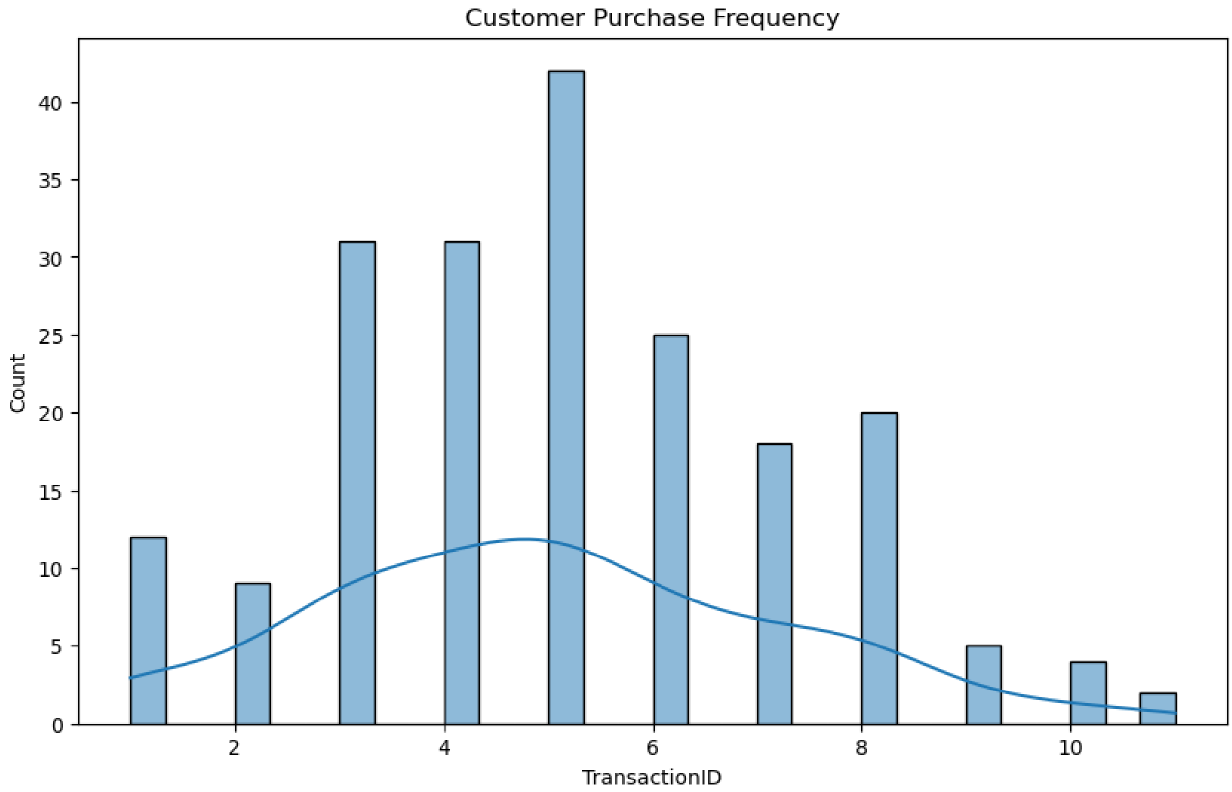
```
# 3. Transaction Value over Time (Monthly)
merged_data['Month'] = merged_data['TransactionDate'].dt.month
monthly_sales = merged_data.groupby('Month')
['TotalValue'].sum().reset_index()
plt.figure(figsize=(10,6))
sns.lineplot(x='Month', y='TotalValue', data=monthly_sales)
plt.title('Monthly Transaction Value')
```

```
Text(0.5, 1.0, 'Monthly Transaction Value')
```



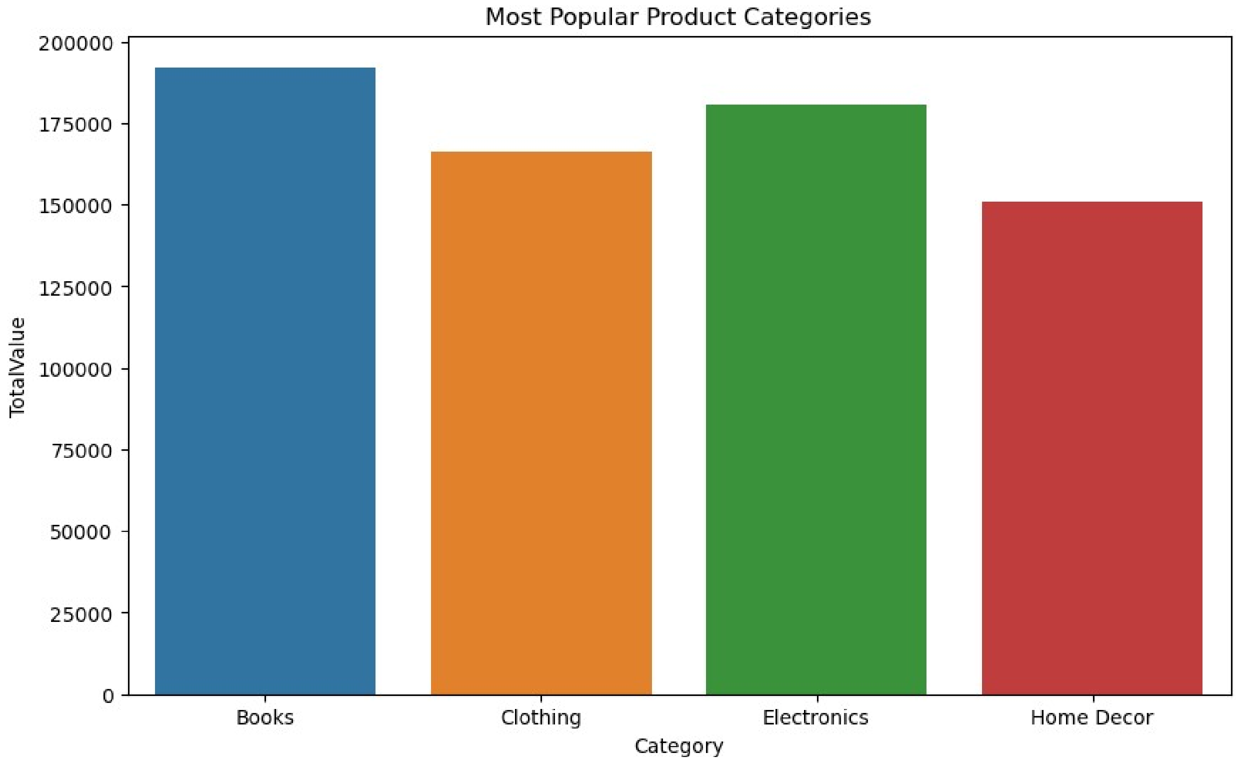
```
# 4. Customer Purchase Frequency
customer_purchase_freq = merged_data.groupby('CustomerID')
['TransactionID'].count().reset_index()
plt.figure(figsize=(10,6))
sns.histplot(customer_purchase_freq['TransactionID'], bins=30,
kde=True)
plt.title('Customer Purchase Frequency')
```

```
Text(0.5, 1.0, 'Customer Purchase Frequency')
```



```
# 5. Most Popular Product Categories
category_sales = merged_data.groupby('Category')
['TotalValue'].sum().reset_index()
plt.figure(figsize=(10,6))
sns.barplot(x='Category', y='TotalValue', data=category_sales)
plt.title('Most Popular Product Categories')

Text(0.5, 1.0, 'Most Popular Product Categories')
```



Merge data for combined analysis

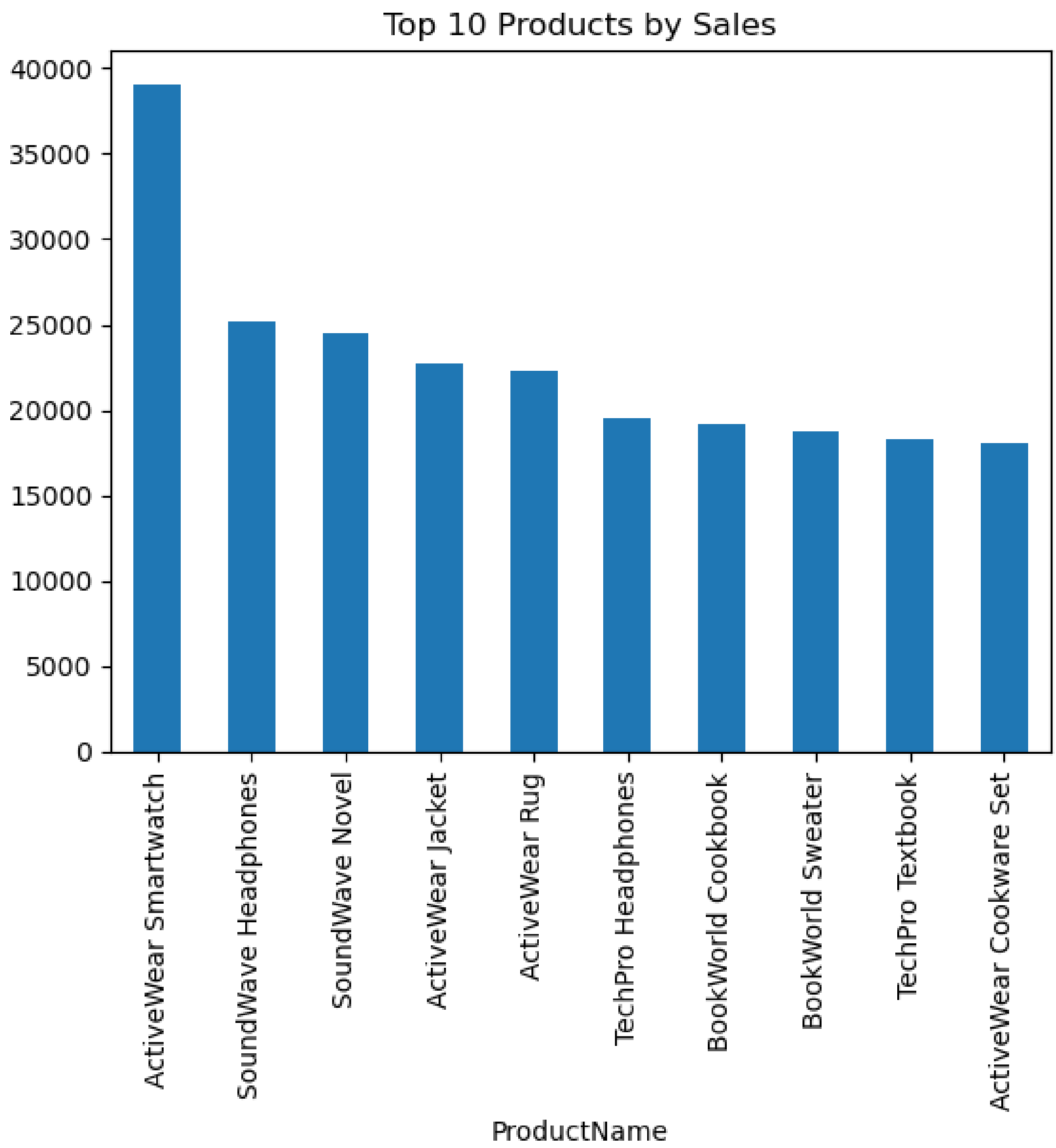
```
merged_data = transactions.merge(customers,
on='CustomerID').merge(products, on='ProductID')
```

Top products by sales

```
top_products = merged_data.groupby("ProductName")
["TotalValue"].sum().sort_values(ascending=False).head(10)

top_products.plot(kind='bar', title='Top 10 Products by Sales')
```

```
<AxesSubplot:title={'center':'Top 10 Products by Sales'},
xlabel='ProductName'>
```

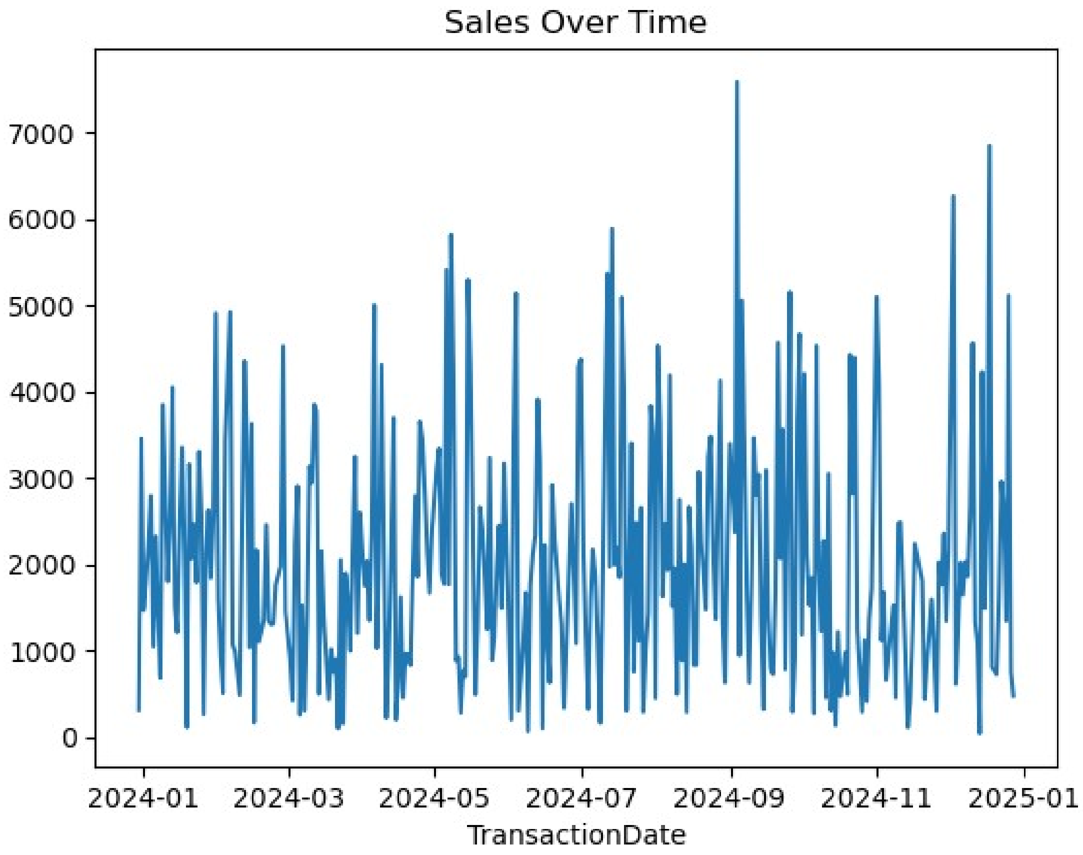


Transactions over time

```
merged_data['TransactionDate'] =
pd.to_datetime(merged_data['TransactionDate'])

merged_data.groupby(merged_data['TransactionDate'].dt.date)
["TotalValue"].sum().plot(title="Sales Over Time")
```

```
<AxesSubplot:title={'center':'Sales Over Time'},
xlabel='TransactionDate'>
```


Sales Over Time
0
1000
2000
3000
4000
5000
6000
7000
2024-01
2024-03
2024-05
2024-07
2024-09
2024-11
2025-01
TransactionDate