```
import numpy as np
import pandas as pd

# For the reading of customer dataset read
customers_df = pd.read_csv(r'c:\Users\siddh\OneDrive\Desktop\
internship\zeotap\Customers.csv')
customers_df.head()
```

```
  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
```

```
#For the reading of transaction data read
transactions_df = pd.read_csv(r'C:\Users\siddh\OneDrive\Desktop\
internship\zeotap\Transactions.csv')
transactions_df.head()
```

```
  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
```

```
# For the reading of product dataset read
products_df = pd.read_csv(r'C:\Users\siddh\OneDrive\Desktop\
internship\zeotap\Products.csv')
products_df.head()
```

```
  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
```

For check the information about the all datasets

```
transactions_df.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
```

```
products_df.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: 3.3+ KB
```

```
customers_df.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
```

```
# For check the missing values in the datasets
customers_missing = customers_df.isnull().sum()
products_missing = products_df.isnull().sum()
transactions_missing = transactions_df.isnull().sum()
(customers_missing,
products_missing,
transactions_missing)
```

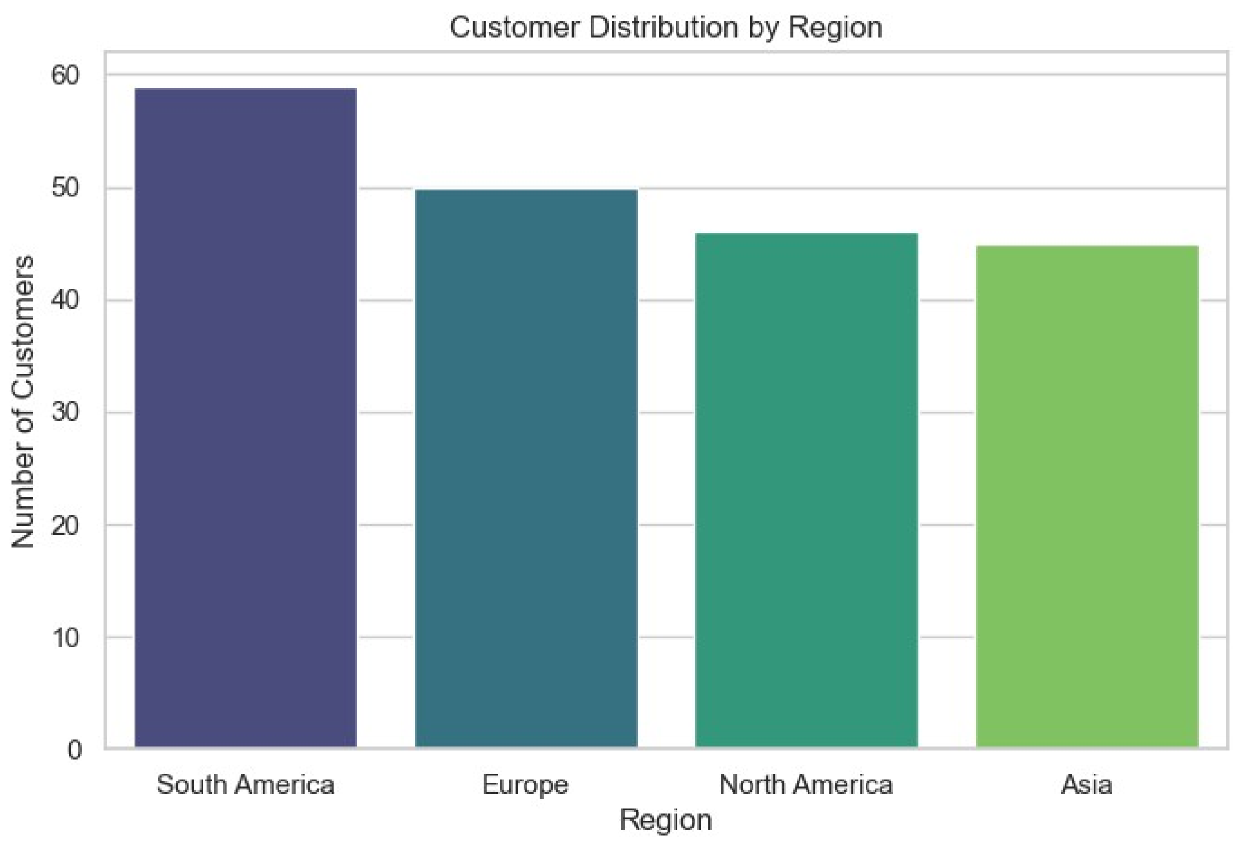
```
(CustomerID      0
 CustomerName    0
 Region          0
 SignupDate      0
 dtype: int64,
 ProductID      0
 ProductName    0
 Category       0
 Price          0
 dtype: int64,
 TransactionID      0
 CustomerID         0
 ProductID          0
 TransactionDate    0
 Quantity           0
 TotalValue         0
 Price              0
 dtype: int64)

# Converting date columns to datetime format
customers_df['SignupDate'] =
pd.to_datetime(customers_df['SignupDate'])
transactions_df['TransactionDate'] =
pd.to_datetime(transactions_df['TransactionDate'])

# Validating relationships between datasets

# Check if all CustomerIDs in Transactions are in Customers
customer_id_check =
transactions_df['CustomerID'].isin(customers_df['CustomerID']).all()

# Check if all ProductIDs in Transactions are in Products
product_id_check =
transactions_df['ProductID'].isin(products_df['ProductID']).all()

# Check for duplicate entries in each dataset
customers_duplicates = customers_df.duplicated().sum()
products_duplicates = products_df.duplicated().sum()
transactions_duplicates = transactions_df.duplicated().sum()

# Summary of the checks

cleaning_summary = {
    "CustomerID_Check": customer_id_check,
    "ProductID_Check": product_id_check,
    "Customers_Duplicates": customers_duplicates,
    "Products_Duplicates": products_duplicates,
    "Transactions_Duplicates": transactions_duplicates,
}

cleaning_summary
```

```
{'CustomerID_Check': np.True_,
 'ProductID_Check': np.True_,
 'Customers_Duplicates': np.int64(0),
 'Products_Duplicates': np.int64(0),
 'Transactions_Duplicates': np.int64(0)}
```

Data visualization as per Datasets

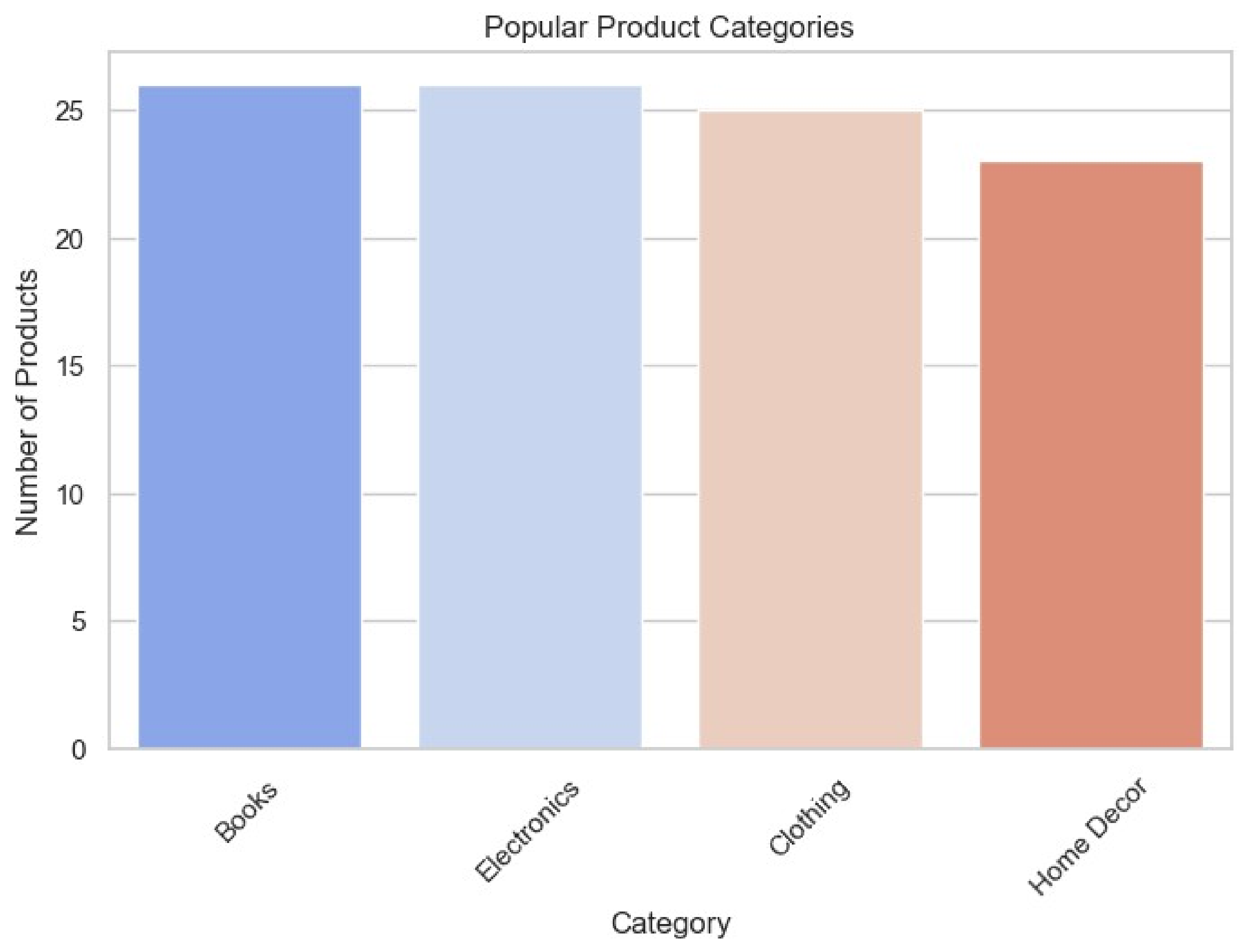
```python
import matplotlib.pyplot as plt
import seaborn as sns

# Setting a visual style
sns.set_theme(style="whitegrid")

# Customer distribution by region
region_counts = customers_df['Region'].value_counts()

plt.figure(figsize=(8, 5))
sns.barplot(x=region_counts.index, y=region_counts.values,
palette="viridis")
plt.title("Customer Distribution by Region")
plt.xlabel("Region")
plt.ylabel("Number of Customers")
plt.show()
```

```
C:\Users\siddh\AppData\Local\Temp\ipykernel_34388\1444742751.py:5:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `x` variable to `hue` and set
`legend=False` for the same effect.

  sns.barplot(x=region_counts.index, y=region_counts.values,
palette="viridis")
```

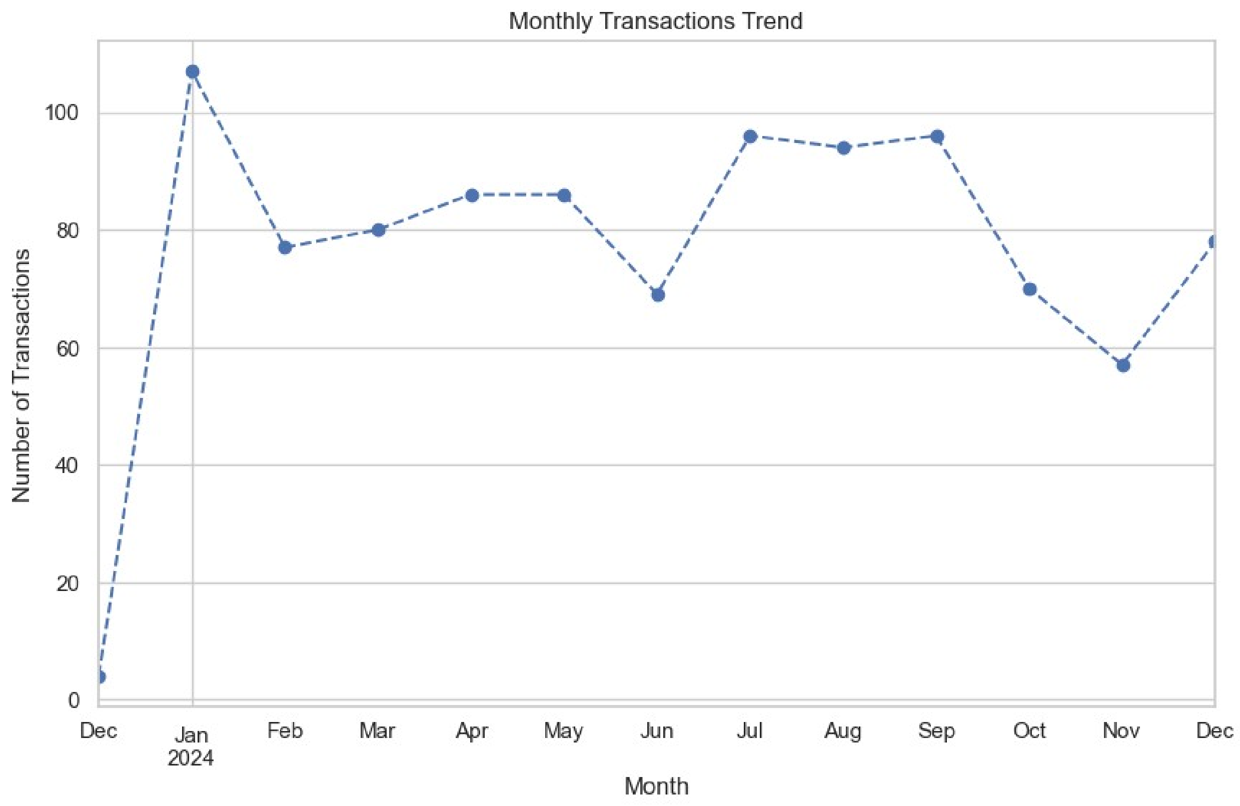


```python
# Popular product categories
category_counts = products_df['Category'].value_counts()

plt.figure(figsize=(8, 5))
sns.barplot(x=category_counts.index, y=category_counts.values, 
palette="coolwarm")
plt.title("Popular Product Categories")
plt.xlabel("Category")
plt.ylabel("Number of Products")
plt.xticks(rotation=45)
plt.show()
```

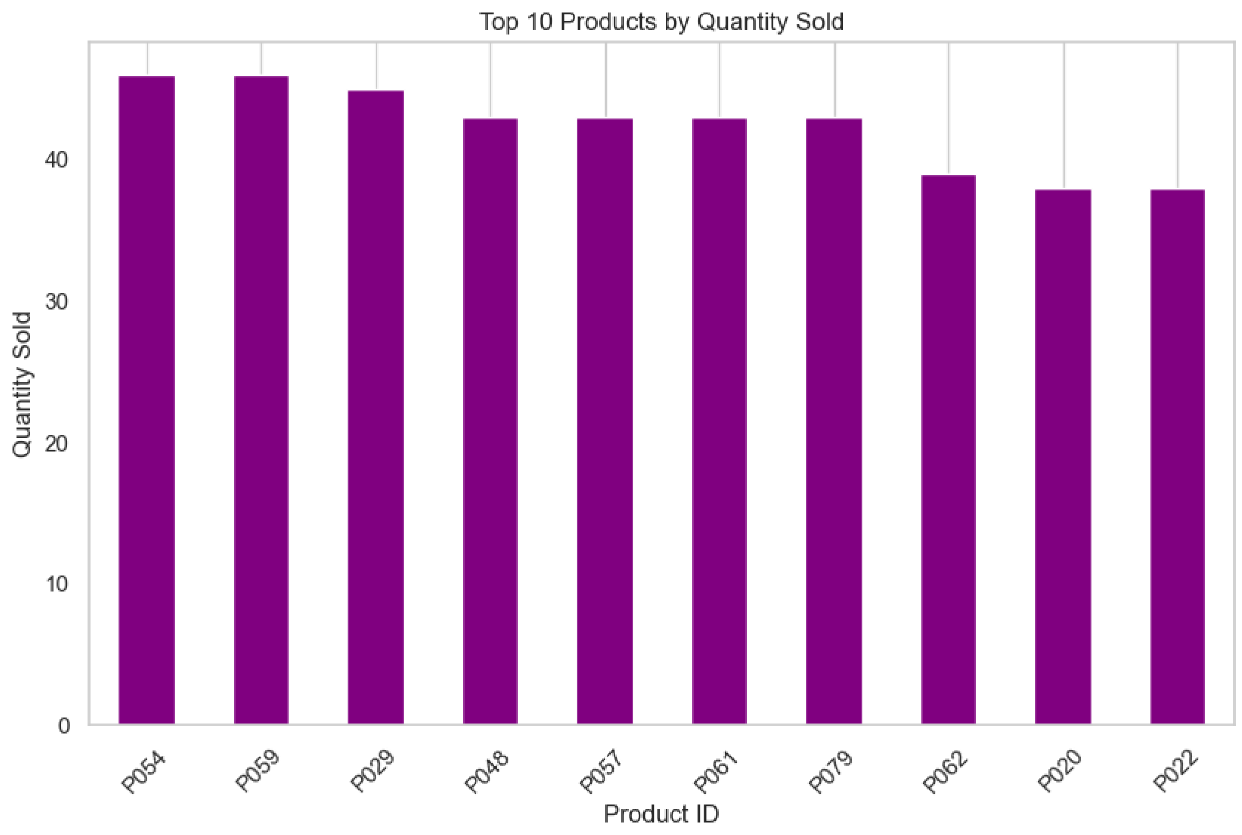
```
C:\Users\siddh\AppData\Local\Temp\ipykernel_34388\903150900.py:5: 
FutureWarning: 

Passing `palette` without assigning `hue` is deprecated and will be 
removed in v0.14.0. Assign the `x` variable to `hue` and set 
`legend=False` for the same effect.

  sns.barplot(x=category_counts.index, y=category_counts.values, 
palette="coolwarm")
```



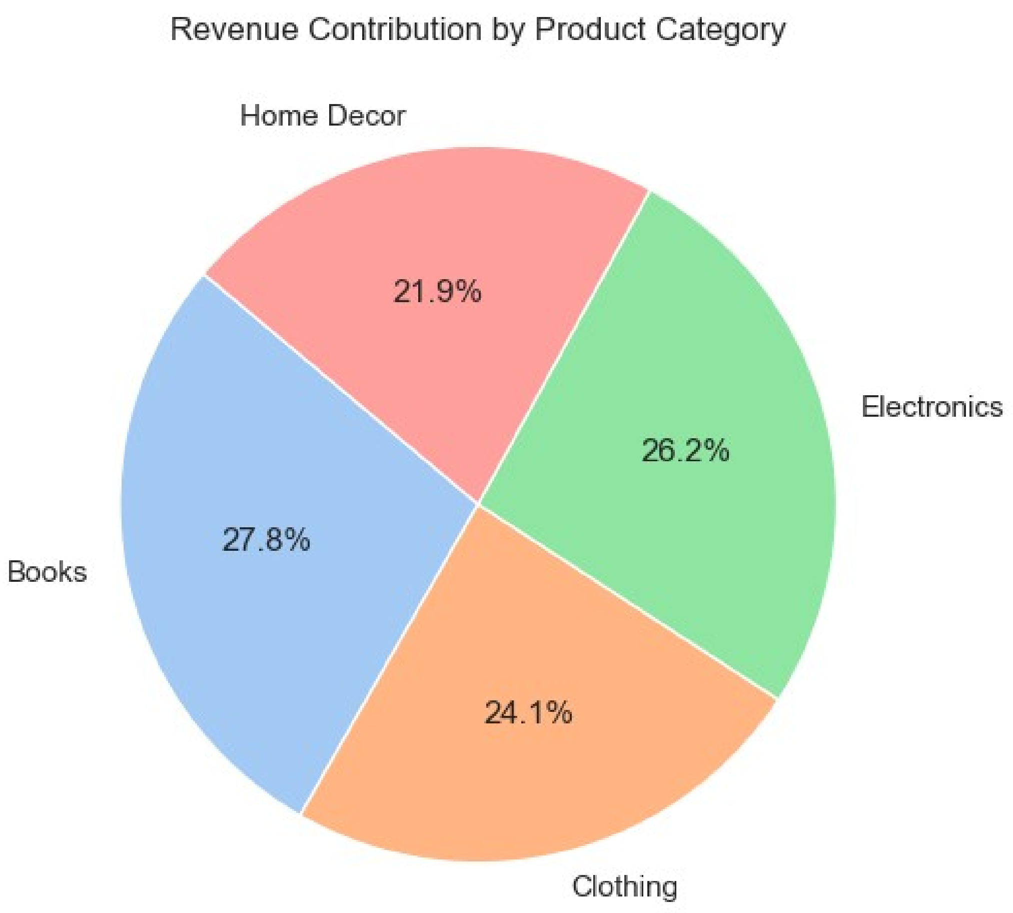
```
# Transactions over time
transactions_df['TransactionMonth'] =
transactions_df['TransactionDate'].dt.to_period('M')
monthly_transactions =
transactions_df.groupby('TransactionMonth').size()

plt.figure(figsize=(10, 6))
monthly_transactions.plot(kind='line', marker='o', color='b',
linestyle='--')
plt.title("Monthly Transactions Trend")
plt.xlabel("Month")
plt.ylabel("Number of Transactions")
plt.grid(True)
plt.show()
```



```
# Top products by quantity sold
top_products = transactions_df.groupby('ProductID')
['Quantity'].sum().nlargest(10)

plt.figure(figsize=(10, 6))
top_products.plot(kind='bar', color='purple')
plt.title("Top 10 Products by Quantity Sold")
plt.xlabel("Product ID")
plt.ylabel("Quantity Sold")
plt.xticks(rotation=45)
plt.grid(axis='y')
plt.show()
```



```
# Revenue contribution by product category
revenue_by_category = transactions_df.merge(products_df,
on='ProductID').groupby('Category')['TotalValue'].sum()

plt.figure(figsize=(10, 6))
revenue_by_category.plot(kind='pie', autopct='%1.1f%%',
startangle=140, colors=sns.color_palette("pastel"))
plt.title("Revenue Contribution by Product Category")
plt.ylabel("")  # Hide y-axis label for pie chart
plt.show()
```


Revenue Contribution by Product Category
Home Decor
21.9%
Electronics
26.2%
Books
27.8%
24.1%
Clothing