```
import matplotlib.pyplot as plt
import seaborn as sns
import pandas as pd
import numpy as np


url = "https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/001/293/original/walmart_data.csv?1641285094"
data = pd.read_csv(url)
data.head(10)
```

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Years	Marital_Status	Product_Category	Purcha
0	1000001	P00069042	F	0-17	10	A	2	0	3	83
1	1000001	P00248942	F	0-17	10	A	2	0	1	152
2	1000001	P00087842	F	0-17	10	A	2	0	12	14
3	1000001	P00085442	F	0-17	10	A	2	0	12	10
4	1000002	P00285442	M	55+	16	C	4+	0	8	79
5	1000003	P00193542	M	26-35	15	A	3	0	1	152
6	1000004	P00184942	M	46-50	7	B	2	1	1	192

```
print("Dataset Shape (Rows, Columns):", data.shape)
```

```
Dataset Shape (Rows, Columns): (550068, 10)
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 550068 entries, 0 to 550067
Data columns (total 10 columns):
 #   Column                      Non-Null Count   Dtype
---  ------                      --------------   -----
 0   User_ID                     550068 non-null  int64
 1   Product_ID                  550068 non-null  object
 2   Gender                      550068 non-null  object
 3   Age                         550068 non-null  object
 4   Occupation                  550068 non-null  int64
 5   City_Category               550068 non-null  object
 6   Stay_In_Current_City_Years  550068 non-null  object
 7   Marital_Status              550068 non-null  int64
 8   Product_Category            550068 non-null  int64
 9   Purchase                    550068 non-null  int64
dtypes: int64(5), object(5)
memory usage: 42.0+ MB
```

```
data.describe()
```

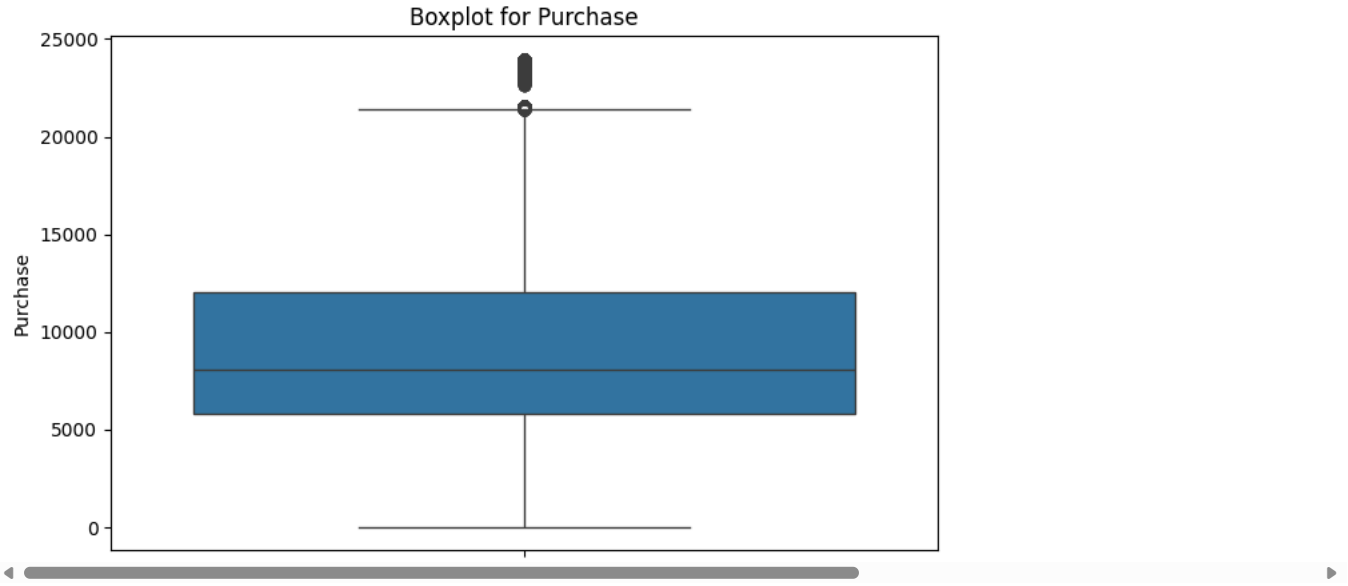
	User_ID	Occupation	Marital_Status	Product_Category	Purchase
count	5.500680e+05	550068.000000	550068.000000	550068.000000	550068.000000
mean	1.003029e+06	8.076707	0.409653	5.404270	9263.968713
std	1.727592e+03	6.522660	0.491770	3.936211	5023.065394
min	1.000001e+06	0.000000	0.000000	1.000000	12.000000
25%	1.001516e+06	2.000000	0.000000	1.000000	5823.000000
50%	1.003077e+06	7.000000	0.000000	5.000000	8047.000000
75%	1.004478e+06	14.000000	1.000000	8.000000	12054.000000
max	1.006040e+06	20.000000	1.000000	20.000000	23961.000000

```
print("Missing Values in Each Column:")
print (data.isnull().sum())
```

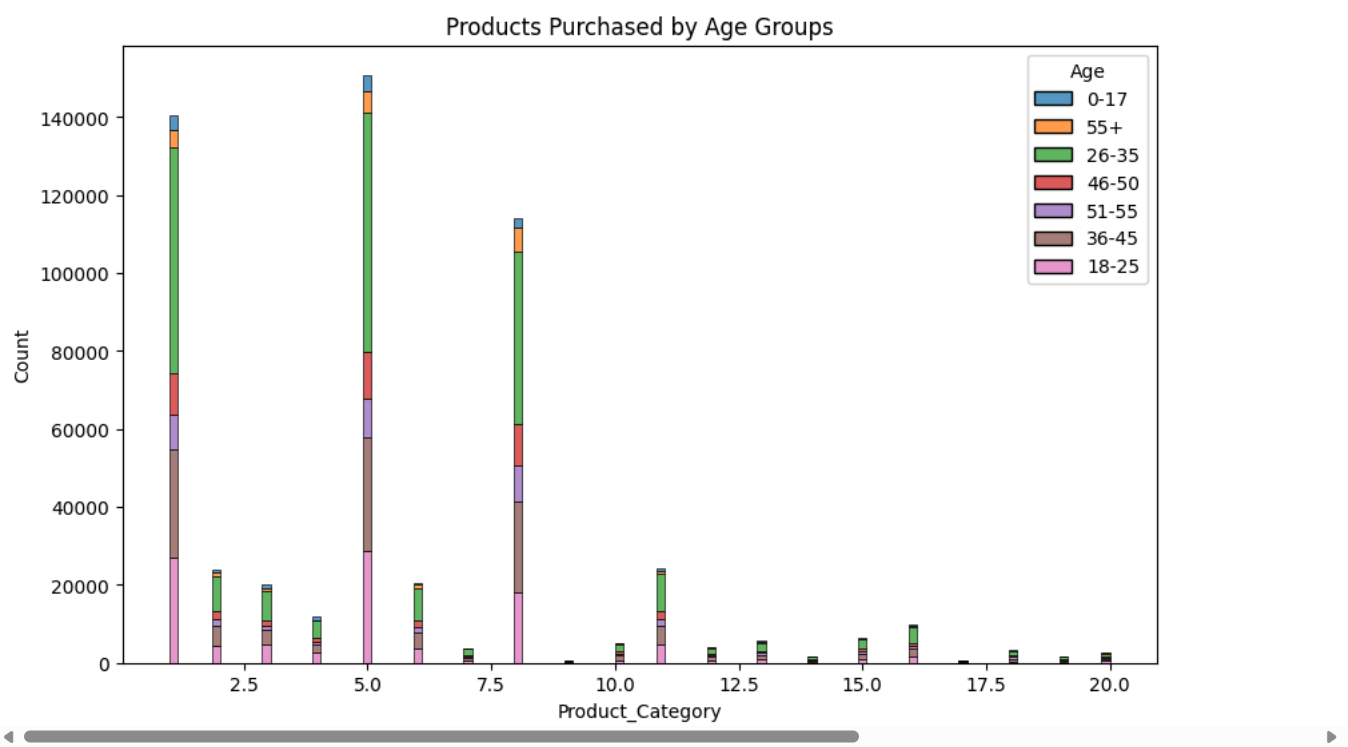
```
Missing Values in Each Column:
User_ID                       0
Product_ID                    0
Gender                        0
Age                           0
Occupation                    0
City_Category                 0
```

```
Stay_In_Current_City_Years    0
Marital_Status                0
Product_Category              0
Purchase                      0
dtype: int64
```

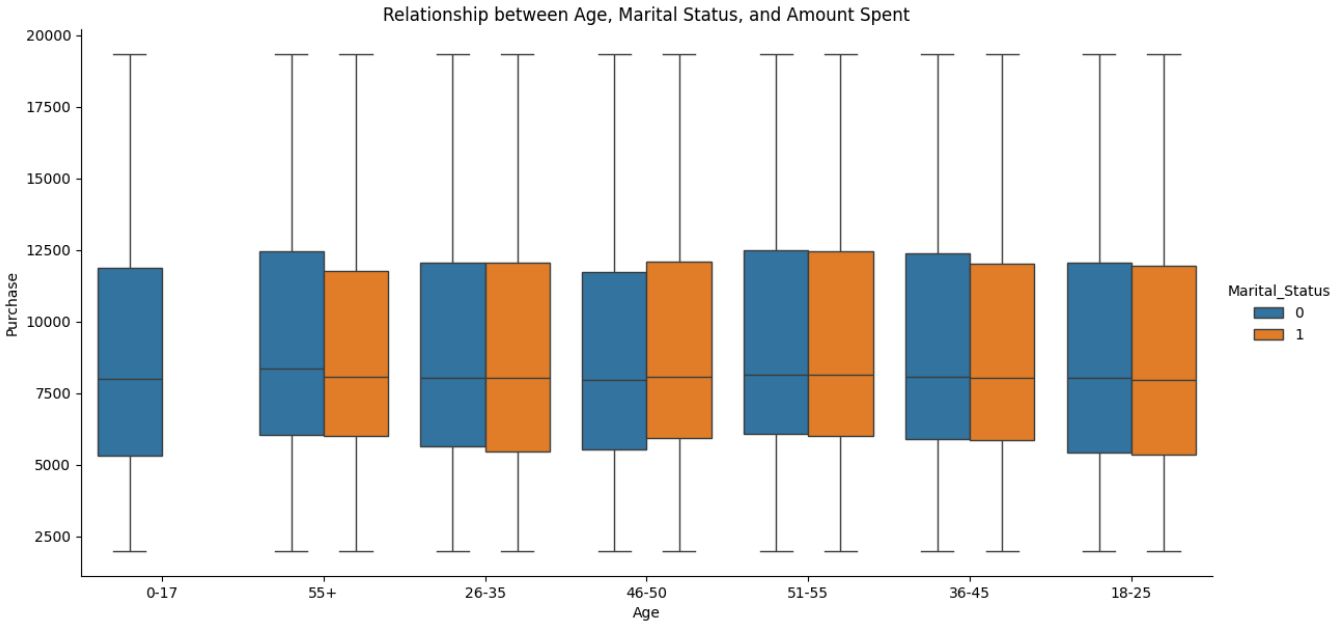
```
# (a) Outliers detection using boxplots for continuous variables
continuous_columns = ['Purchase']
for col in continuous_columns:
    plt.figure(figsize=(8, 5))
    sns.boxplot(data[col])
    plt.title(f"Boxplot for {col}")
    plt.show()

# (b) Clipping data between 5th and 95th percentile
for col in continuous_columns:
    lower_limit = np.percentile(data[col], 5)
    upper_limit = np.percentile(data[col], 95)
    data[col] = np.clip(data[col], lower_limit, upper_limit)
```



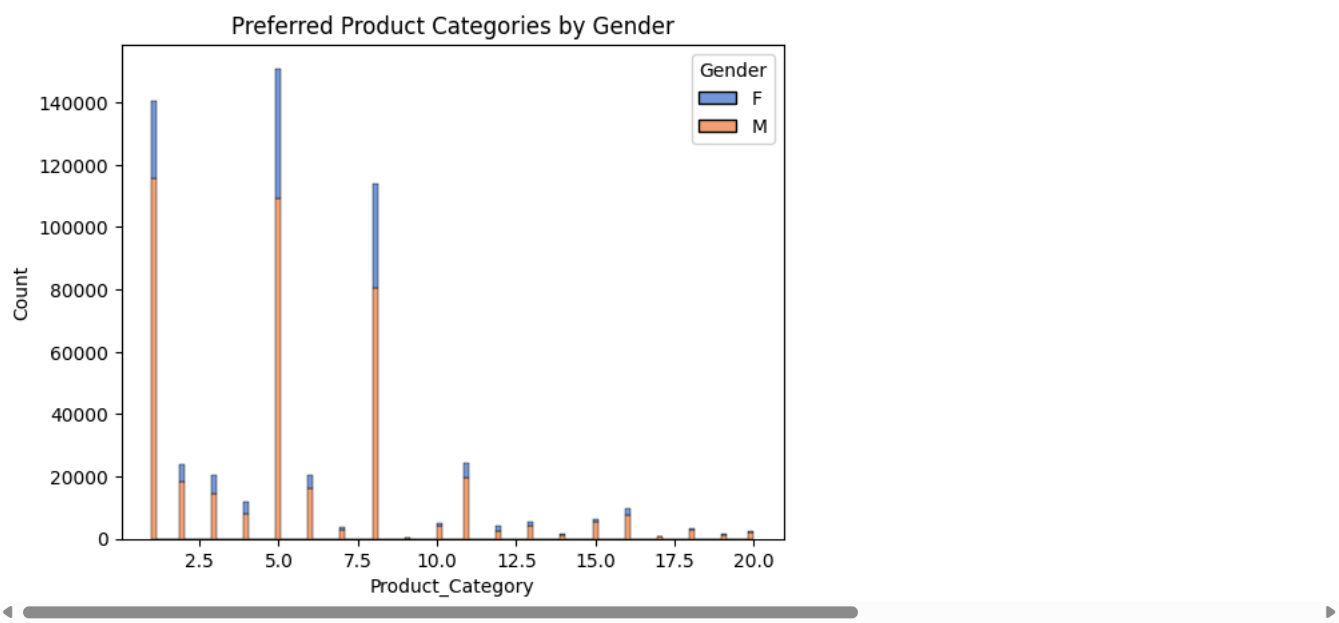

```
# (a) Products purchased by different age groups
plt.figure(figsize=(10, 6))
sns.histplot(data=data, x='Product_Category', hue='Age', multiple='stack')
plt.title("Products Purchased by Age Groups")
plt.show()
```



```
# (b) Relationship between age, marital status, and amount spent
sns.catplot(data=data, x='Age', y='Purchase', hue='Marital_Status', kind='box', height=6, aspect=2)
plt.title("Relationship between Age, Marital Status, and Amount Spent")
plt.show()
```




```
# (c) Preferred product categories for different genders
sns.histplot(data=data, x='Product_Category', hue='Gender', multiple='stack', palette='muted')
plt.title("Preferred Product Categories by Gender")
plt.show()
```




```
def bootstrap_confidence_interval(data, n_samples, sample_size, column):
    means = []
    for _ in range(n_samples):
        sample = data[column].sample(n=sample_size, replace=True)
        means.append(sample.mean())
    ci_lower = np.percentile(means, 2.5)
    ci_upper = np.percentile(means, 97.5)
    return ci_lower, ci_upper, means

# Confidence intervals for genders
genders = data['Gender'].unique()
for gender in genders:
    subset = data[data['Gender'] == gender]
    print(f"\nConfidence Interval for {gender}:")
```

```
    for size in [len(subset), 300, 3000, 30000]:
        ci = bootstrap_confidence_interval(subset, 1000, size, 'Purchase')
        print(f"Sample Size {size}: {ci[:2]}")
```

```
Confidence Interval for F:
Sample Size 135809: (8711.528347348114, 8759.376410068553)
Sample Size 300: (8259.034916666667, 9255.859999999999)
Sample Size 3000: (8559.511391666667, 8897.125233333334)
Sample Size 30000: (8684.918426666665, 8788.374099166667)

Confidence Interval for M:
Sample Size 414259: (9412.060575750918, 9443.164062579208)
Sample Size 300: (8871.585416666667, 9982.472083333332)
Sample Size 3000: (9251.932858333334, 9601.1675)
Sample Size 30000: (9374.023946666666, 9483.333472499999)
```

```
# Confidence intervals for marital status
statuses = data['Marital_Status'].unique()
for status in statuses:
    subset = data[data['Marital_Status'] == status]
    print(f"\nConfidence Interval for Marital Status {status}:")
    for size in [len(subset), 300, 3000, 30000]:
        ci = bootstrap_confidence_interval(subset, 1000, size, 'Purchase')
        print(f"Sample Size {size}: {ci[:2]}")
```

```
Confidence Interval for Marital Status 0:
Sample Size 324731: (9241.230408476555, 9275.313175212714)
Sample Size 300: (8724.838416666666, 9807.18125)
Sample Size 3000: (9081.822875, 9450.506858333334)
Sample Size 30000: (9200.293735833333, 9309.948346666668)

Confidence Interval for Marital Status 1:
Sample Size 225337: (9234.073591886818, 9274.115447196864)
Sample Size 300: (8705.054416666666, 9786.2755)
Sample Size 3000: (9088.085008333333, 9428.65265)
Sample Size 30000: (9199.342725833332, 9308.085151666666)
```

```
# Confidence intervals for different age groups
ages = data['Age'].unique()
for age in ages:
    subset = data[data['Age'] == age]
    print(f"\nConfidence Interval for Age Group {age}:")
    for size in [len(subset), 300, 3000, 30000]:
        ci = bootstrap_confidence_interval(subset, 1000, size, 'Purchase')
        print(f"Sample Size {size}: {ci[:2]}")
```

```
Confidence Interval for Age Group 0-17:
Sample Size 15102: (8865.503456495828, 9015.961597801615)
Sample Size 300: (8404.127666666665, 9516.780416666666)
Sample Size 3000: (8756.688675, 9122.665366666668)
Sample Size 30000: (8887.610594166666, 8992.908834166667)

Confidence Interval for Age Group 55+:
Sample Size 21504: (9265.84271530878, 9390.011852446056)
Sample Size 300: (8800.433583333333, 9851.695583333332)
Sample Size 3000: (9156.430841666666, 9491.554016666667)
Sample Size 30000: (9270.782683333335, 9381.112595)

Confidence Interval for Age Group 26-35:
Sample Size 219587: (9225.061488498863, 9263.651989871896)
Sample Size 300: (8709.063166666667, 9836.642833333333)
Sample Size 3000: (9072.387716666666, 9423.542591666666)
Sample Size 30000: (9186.0919125, 9296.554071666667)

Confidence Interval for Age Group 46-50:
Sample Size 45701: (9160.470384674296, 9248.591805977987)
Sample Size 300: (8622.108833333334, 9717.619666666666)
Sample Size 3000: (9035.347600000001, 9377.877841666666)
Sample Size 30000: (9146.942451666668, 9255.579011666667)

Confidence Interval for Age Group 51-55:
Sample Size 38501: (9466.464231448534, 9561.608067322926)
Sample Size 300: (8983.836916666667, 10025.896583333333)
Sample Size 3000: (9334.387858333333, 9687.123975)
Sample Size 30000: (9459.419595833333, 9568.48215)

Confidence Interval for Age Group 36-45:
Sample Size 110013: (9294.426501640715, 9350.84199662767)
Sample Size 300: (8790.171250000001, 9906.687083333334)
Sample Size 3000: (9160.85715, 9504.244316666667)
Sample Size 30000: (9268.3776475, 9379.639568333334)

Confidence Interval for Age Group 18-25:
```

```
Sample Size 99660: (9139.871410295003, 9198.158622566727)
Sample Size 300: (8648.196583333332, 9737.171083333333)
Sample Size 3000: (8986.419691666668, 9349.034158333332)
Sample Size 30000: (9114.123111666668, 9226.678635833334)
```

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