

```
In [2]: import pandas as pd
import numpy as np
```

```
In [3]: a = pd.read_csv("customer_shopping_behavior.csv")
```

```
In [4]: a.head(8)
```

```
Out[4]: Customer ID Age Gender Item Purchased Category Purchase Amount (USD) Location Size Color Season Review Rating Subscription Status Shipping Type Discount Applied Promo Code Used Previous Purchases Payment Method Frequency of Purchases
0 1 55 Male Blouse Clothing 53 Kentucky L Gray Winter 3.1 Yes Express Yes Yes 14 Venmo Fortnightly
1 2 19 Male Sweater Clothing 64 Maine L Maroon Winter 3.1 Yes Express Yes Yes 2 Cash Fortnightly
2 3 50 Male Jeans Clothing 73 Massachusetts S Maroon Spring 3.1 Yes Free Shipping Yes Yes 23 Credit Card Weekly
3 4 21 Male Sandals Footwear 90 Rhode Island M Maroon Spring 3.5 Yes Next Day Air Yes Yes 49 PayPal Weekly
4 5 45 Male Blouse Clothing 49 Oregon M Turquoise Spring 2.7 Yes Free Shipping Yes Yes 31 PayPal Annually
5 6 46 Male Sneakers Footwear 20 Wyoming M White Summer 2.9 Yes Standard Yes Yes 14 Venmo Weekly
6 7 63 Male Shirt Clothing 85 Montana L Gray Fall 3.2 Yes Free Shipping Yes Yes 49 Cash Quarterly
7 8 27 Male Shorts Clothing 34 Louisiana L Charcoal Winter 3.2 Yes Free Shipping Yes Yes 19 Credit Card Weekly
```

```
In [5]: a.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3900 entries, 0 to 3899
Data columns (total 18 columns):
 # Column          Non-Null Count  Dtype  
--- 
 0  Customer ID    3900 non-null   int64  
 1  Age             3900 non-null   int64  
 2  Gender          3900 non-null   object 
 3  Item Purchased 3900 non-null   object 
 4  Category        3900 non-null   object 
 5  Purchase Amount (USD) 3900 non-null   int64  
 6  Location         3900 non-null   object 
 7  Size             3900 non-null   object 
 8  Color            3900 non-null   object 
 9  Season           3900 non-null   object 
 10 Review Rating    3863 non-null   float64
 11 Subscription Status 3900 non-null   object 
 12 Shipping Type    3900 non-null   object 
 13 Discount Applied 3900 non-null   object 
 14 Promo Code Used 3900 non-null   object 
 15 Previous Purchases 3900 non-null   int64  
 16 Payment Method    3900 non-null   object 
 17 Frequency of Purchases 3900 non-null   object 
dtypes: float64(4), int64(4), object(13)
memory usage: 548.6+ KB
```

```
In [7]: a.describe()
```

```
Out[7]: Customer ID Age Purchase Amount (USD) Review Rating Previous Purchases
count 3900.000000 3900.000000 3900.000000 3863.000000 3900.000000
mean 1950.500000 44.068462 59.764359 3.750065 25.351538
std 1125.977353 15.207589 23.685392 0.716983 14.447125
min 1.000000 18.000000 20.000000 2.500000 1.000000
25% 975.750000 31.000000 39.000000 3.100000 13.000000
50% 1950.500000 44.000000 60.000000 3.800000 25.000000
75% 2925.250000 57.000000 81.000000 4.400000 38.000000
max 3900.000000 70.000000 100.000000 5.000000 50.000000
```

```
In [8]: # For all dataset including Number and String both
a.describe(include = "all")
```

```
Out[8]: Customer ID Age Purchase Amount (USD) Review Rating Previous Purchases
count 3900.000000 3900.000000 3900 3900 3900.000000 3900 3900 3900 3900 3900.000000 3900 3900
unique NaN NaN 2 25 4 NaN 50 4 25 4 NaN 2 6 2 2 NaN 6 7
top NaN NaN NaN Male Blouse Clothing NaN Montana M Olive Spring NaN No Free Shipping No No NaN PayPal Every 3 Months
freq NaN NaN 2652 171 1737 NaN 96 1755 177 999 NaN 2847 675 2223 2223 NaN 677 584
mean 1950.500000 44.068462 NaN NaN 59.764359 NaN NaN NaN NaN 3.750065 NaN NaN NaN NaN 25.351538 NaN NaN
std 1125.977353 15.207589 NaN NaN 23.685392 NaN NaN NaN NaN 0.716983 NaN NaN NaN NaN 14.447125 NaN NaN
min 1.000000 18.000000 NaN NaN 20.000000 NaN NaN NaN NaN 2.500000 NaN NaN NaN NaN 1.000000 NaN NaN
25% 975.750000 31.000000 NaN NaN 39.000000 NaN NaN NaN NaN 3.100000 NaN NaN NaN NaN 13.000000 NaN NaN
50% 1950.500000 44.000000 NaN NaN 60.000000 NaN NaN NaN NaN 3.800000 NaN NaN NaN NaN 25.000000 NaN NaN
75% 2925.250000 57.000000 NaN NaN 81.000000 NaN NaN NaN NaN 4.400000 NaN NaN NaN NaN 38.000000 NaN NaN
max 3900.000000 70.000000 NaN NaN 100.000000 NaN NaN NaN NaN 5.000000 NaN NaN NaN NaN 50.000000 NaN NaN
```

```
In [9]: a.isnull().sum()
```

```
Out[9]: Customer ID 0
Age 0
Gender 0
Item Purchased 0
Category 0
Purchase Amount (USD) 0
Location 0
Size 0
Color 0
Season 0
Review Rating 37
Subscription Status 0
Shipping Type 0
Discount Applied 0
Promo Code Used 0
Previous Purchases 0
Payment Method 0
Frequency of Purchases 0
dtype: int64
```

```
In [17]: a[["Review Rating"]] = a.groupby(["Category"])["Review Rating"].transform(lambda x: x.fillna(x.median()))
```

```
In [19]: a.isnull().sum()
```

```
Out[19]: Customer ID 0
Age 0
Gender 0
Item Purchased 0
Category 0
Purchase Amount (USD) 0
Location 0
Size 0
Color 0
Season 0
Review Rating 0
Subscription Status 0
Shipping Type 0
Discount Applied 0
Promo Code Used 0
Previous Purchases 0
Payment Method 0
Frequency of Purchases 0
dtype: int64
```

```
In [21]: a.columns = a.columns.str.lower()
a.columns = a.columns.str.replace(" ", "_")
```

```
In [22]: a.columns
```

```
Out[22]: Index(['customer_id', 'age', 'gender', 'item_purchased', 'category',
       'purchase_amount_(usd)', 'location', 'size', 'color', 'season',
       'review_rating', 'subscription_status', 'shipping_type',
       'discount_applied', 'promo_code_used', 'previous_purchases',
       'payment_method', 'frequency_of_purchases'],
      dtype='object')
```

```
In [24]: a = a.rename(columns={"purchase_amount_(usd)": "purchase_amount"})
```

```
In [25]: a.columns
```

```
Out[25]: Index(['customer_id', 'age', 'gender', 'item_purchased', 'category',
       'purchase_amount', 'location', 'size', 'color', 'season',
       'review_rating', 'subscription_status', 'shipping_type',
       'discount_applied', 'promo_code_used', 'previous_purchases',
       'payment_method', 'frequency_of_purchases'],
      dtype='object')
```

```
In [30]: # Create a group wise age_group
labels = ["Young Adult", "Adult", "Middle-aged", "Senior"]
a["age_group"] = pd.qcut(a["age"], q=4, labels=labels)
```

```
In [31]: [[{"age": "19", "age_group": "Young Adult"}, {"age": "21", "age_group": "Young Adult"}, {"age": "25", "age_group": "Young Adult"}, {"age": "30", "age_group": "Young Adult"}, {"age": "35", "age_group": "Young Adult"}, {"age": "40", "age_group": "Young Adult"}, {"age": "45", "age_group": "Young Adult"}, {"age": "50", "age_group": "Young Adult"}, {"age": "55", "age_group": "Young Adult"}, {"age": "60", "age_group": "Young Adult"}, {"age": "63", "age_group": "Young Adult"}, {"age": "65", "age_group": "Young Adult"}, {"age": "68", "age_group": "Young Adult"}, {"age": "70", "age_group": "Young Adult"}, {"age": "75", "age_group": "Young Adult"}, {"age": "80", "age_group": "Young Adult"}, {"age": "85", "age_group": "Young Adult"}, {"age": "90", "age_group": "Young Adult"}, {"age": "95", "age_group": "Young Adult"}, {"age": "100", "age_group": "Young Adult"}, {"age": "105", "age_group": "Young Adult"}, {"age": "110", "age_group": "Young Adult"}, {"age": "115", "age_group": "Young 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