Exploratory Data Analysis for Super Store

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
df = pd.read_csv('Global_SuperStore.csv', encoding= 'latin1')
#we use encoding= 'latin1' for handling text data
df.head()  #To print first 5 rows
```

[2]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	\
0	32298	CA-2012-124891	31-07-2012	31-07-2012	Same Day	RH-19495	
1	26341	IN-2013-77878	05-02-2013	07-02-2013	Second Class	JR-16210	
2	25330	IN-2013-71249	17-10-2013	18-10-2013	First Class	CR-12730	
3	13524	ES-2013-1579342	28-01-2013	30-01-2013	First Class	KM-16375	
4	47221	SG-2013-4320	05-11-2013	06-11-2013	Same Day	RH-9495	

	Customer Name	Segment	City	State	...	\
0	Rick Hansen	Consumer	New York City	New York	...	
1	Justin Ritter	Corporate	Wollongong	New South Wales	...	
2	Craig Reiter	Consumer	Brisbane	Queensland	...	
3	Katherine Murray	Home Office	Berlin	Berlin	...	
4	Rick Hansen	Consumer	Dakar	Dakar	...	

	Product ID	Category	Sub-Category	\
0	TEC-AC-10003033	Technology	Accessories	
1	FUR-CH-10003950	Furniture	Chairs	
2	TEC-PH-10004664	Technology	Phones	
3	TEC-PH-10004583	Technology	Phones	
4	TEC-SHA-10000501	Technology	Copiers	

	Product Name	Sales	Quantity	\
0	Plantronics CS510 - Over-the-Head monaural Wir...	2309.650	7	
1	Novimex Executive Leather Armchair, Black	3709.395	9	
2	Nokia Smart Phone, with Caller ID	5175.171	9	
3	Motorola Smart Phone, Cordless	2892.510	5	
4	Sharp Wireless Fax, High-Speed	2832.960	8	

	Discount	Profit	Shipping Cost	Order Priority
0	0.0	762.1845	933.57	Critical
1	0.1	-288.7650	923.63	Critical
2	0.1	919.9710	915.49	Medium
3	0.1	-96.5400	910.16	Medium
4	0.0	311.5200	903.04	Critical

[5 rows x 24 columns]

[3]:
```
df.shape

#number of rows=51290, number of columns=24
```

[3]: (51290, 24)

1 A). Data Preprocessing

1.1 1). Check Null-values

[4]:
```
df.isnull().sum()
```

[4]:
Row ID	0
Order ID	0
Order Date	0
Ship Date	0
Ship Mode	0
Customer ID	0
Customer Name	0
Segment	0
City	0
State	0
Country	0
Postal Code	41296
Market	0
Region	0
Product ID	0
Category	0
Sub-Category	0
Product Name	0
Sales	0
Quantity	0
Discount	0
Profit	0
Shipping Cost	0
Order Priority	0

dtype: int64

[5]:
```
df['Postal Code']
```

[5]:
```
0        10024.0
1            NaN
2            NaN
3            NaN
4            NaN
           ...
51285        NaN
51286    77095.0
51287    93030.0
51288        NaN
51289        NaN
Name: Postal Code, Length: 51290, dtype: float64
```

[6]:
```
print(f'Postal Code contains {41296*100/51290} % null values')
```

```
Postal Code contains 80.51472021836615 % null values
```

1.1.1 Inference

We can drop the Postal Code column as it contains null values more than 80%.

[7]:
```
df.columns
```

[7] :
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'City', 'State', 'Country',
       'Postal Code', 'Market', 'Region', 'Product ID', 'Category',
       'Sub-Category', 'Product Name', 'Sales', 'Quantity', 'Discount',
       'Profit', 'Shipping Cost', 'Order Priority'],
      dtype='object')
```

[8] :
```
df.drop('Postal Code',axis=1, inplace=True)
df.columns
```

[8] :
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'City', 'State', 'Country',
       'Market', 'Region', 'Product ID', 'Category', 'Sub-Category',
       'Product Name', 'Sales', 'Quantity', 'Discount', 'Profit',
       'Shipping Cost', 'Order Priority'],
      dtype='object')
```

1.2 2). Check Datatype

[9] :
```
df.dtypes
```

[9] :
```
Row ID              int64
Order ID           object
Order Date         object
Ship Date          object
Ship Mode          object
Customer ID        object
Customer Name      object
Segment            object
City               object
State              object
Country            object
Market             object
Region             object
Product ID         object
Category           object
Sub-Category       object
Product Name       object
Sales             float64
Quantity            int64
Discount          float64
Profit            float64
Shipping Cost     float64
Order Priority     object
dtype: object
```

1.3 3). Check Duplicates

[10] :
```
df.duplicated().sum()
```

[10]: 0

1.4 4). Extract all categorical columns and numerical columns

[11] :
```
cat_cols=df.select_dtypes(include='object').columns
num_cols=df.select_dtypes(exclude='object').columns
print(cat_cols)
print(num_cols)
```

```
Index(['Order ID', 'Order Date', 'Ship Date', 'Ship Mode', 'Customer ID',
       'Customer Name', 'Segment', 'City', 'State', 'Country', 'Market',
       'Region', 'Product ID', 'Category', 'Sub-Category', 'Product Name',
       'Order Priority'],
      dtype='object')
Index(['Row ID', 'Sales', 'Quantity', 'Discount', 'Profit', 'Shipping Cost'],
dtype='object')
```

2 B). Univariate EDA

Statistical or visual analysis of single column

2.1 1. Find value counts of categorial columns namely Category, Segment, Sub Category, Region, Ship Model and Market.Depict the following:-

a) Category count on a bar chart(matplotlib).
b) Sub-Category on a horizontal bar chart (matplotlib).
c) Segment on a Pie Chart(matplotlib).
d) Region on a bar chart seaborn).
e) Ship Mode on a tine chart(matplotlib).
f) Market on a ara chart (matplotlib).

[12] :
```
cat_cols
```

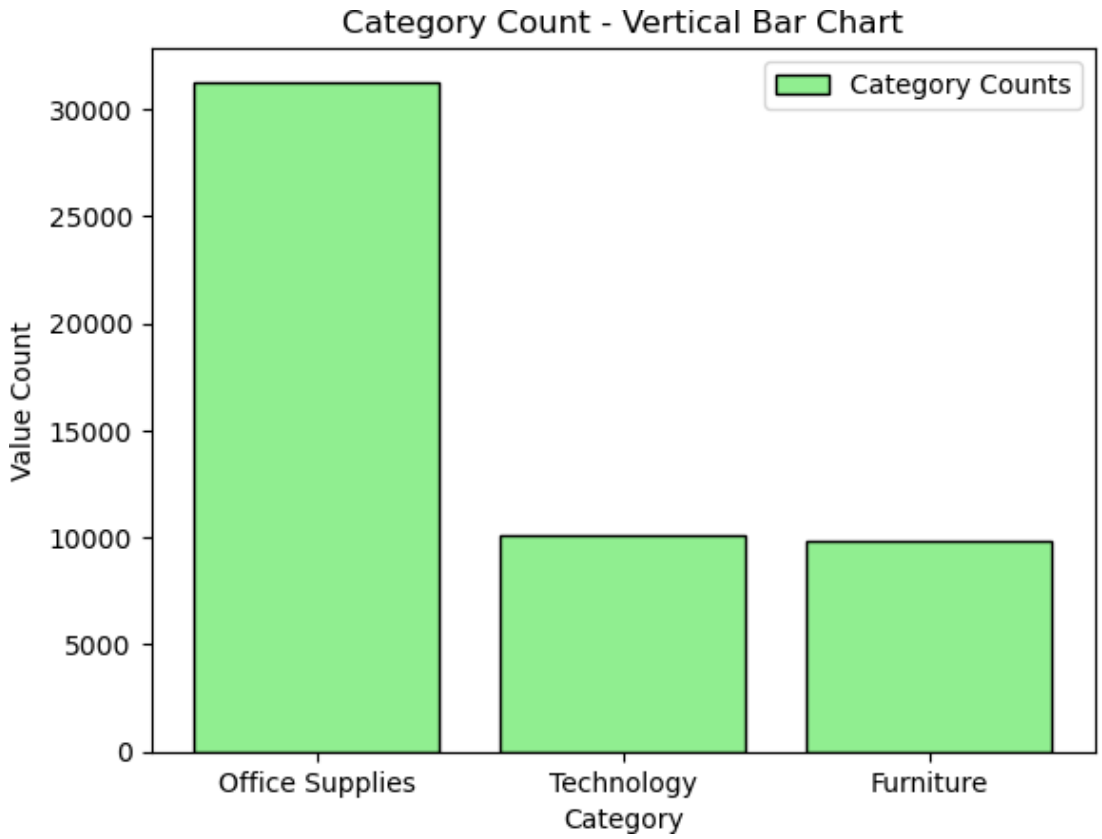
[12] :
```
Index(['Order ID', 'Order Date', 'Ship Date', 'Ship Mode', 'Customer ID',
       'Customer Name', 'Segment', 'City', 'State', 'Country', 'Market',
       'Region', 'Product ID', 'Category', 'Sub-Category', 'Product Name',
       'Order Priority'],
      dtype='object')
```

[13] :
```
a1=df['Category'].value_counts()
a1
```

[13] :
```
Office Supplies     31273
Technology          10141
Furniture            9876
Name: Category, dtype: int64
```

[14] :
```
plt.bar(a1.index,a1.values,color='lightgreen',edgecolor='black',label=
 ↪'Category Counts')
plt.xlabel('Category')
plt.ylabel('Value Count')
plt.title('Category Count - Vertical Bar Chart')
plt.legend()
plt.show
```

[14] :
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



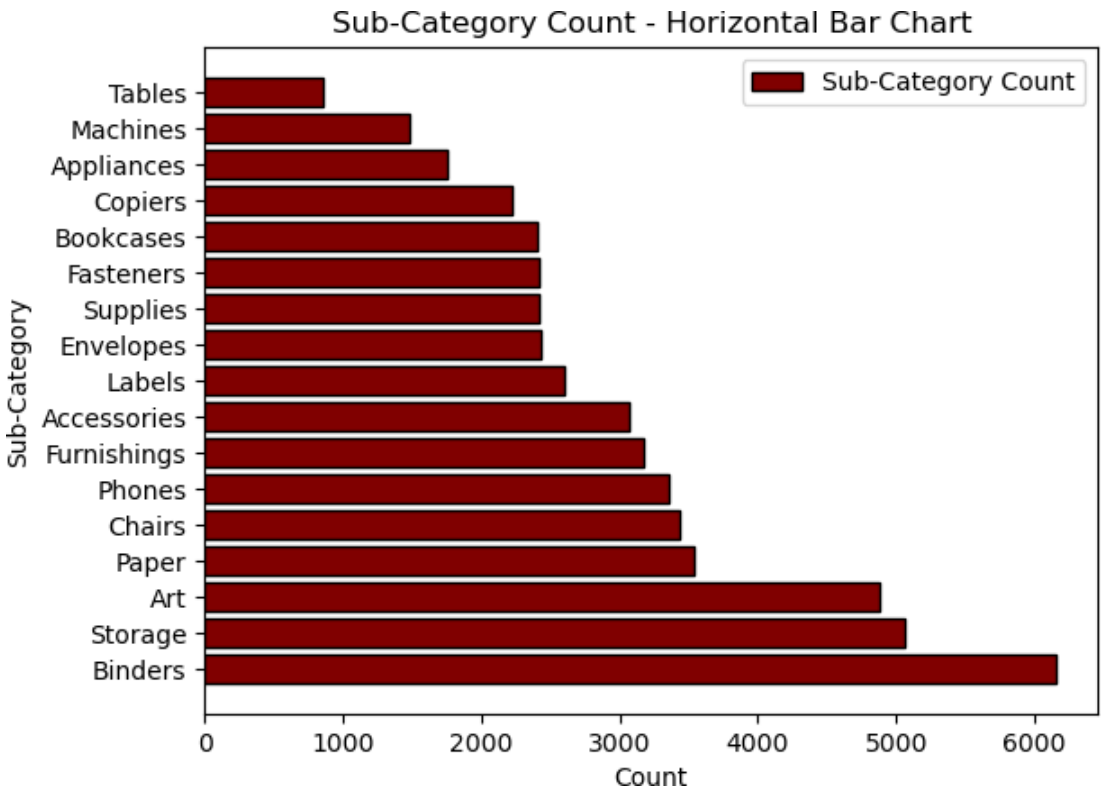
[15] :
```
a2=df['Sub-Category'].value_counts()
a2
```

[15]:
Binders	6152
Storage	5059
Art	4883
Paper	3538
Chairs	3434
Phones	3357
Furnishings	3170
Accessories	3075
Labels	2606
Envelopes	2435
Supplies	2425
Fasteners	2420
Bookcases	2411
Copiers	2223
Appliances	1755
Machines	1486
Tables	861

Name: Sub-Category, dtype: int64

[16] :
```
plt.barh(a2.index,a2.
  ↪values,color='maroon',edgecolor='black',label='Sub-Category Count')
plt.xlabel('Count')
plt.ylabel('Sub-Category')
plt.title('Sub-Category Count - Horizontal Bar Chart')
plt.legend()
plt.show
```

[16] : <function matplotlib.pyplot.show(close=None, block=None)>

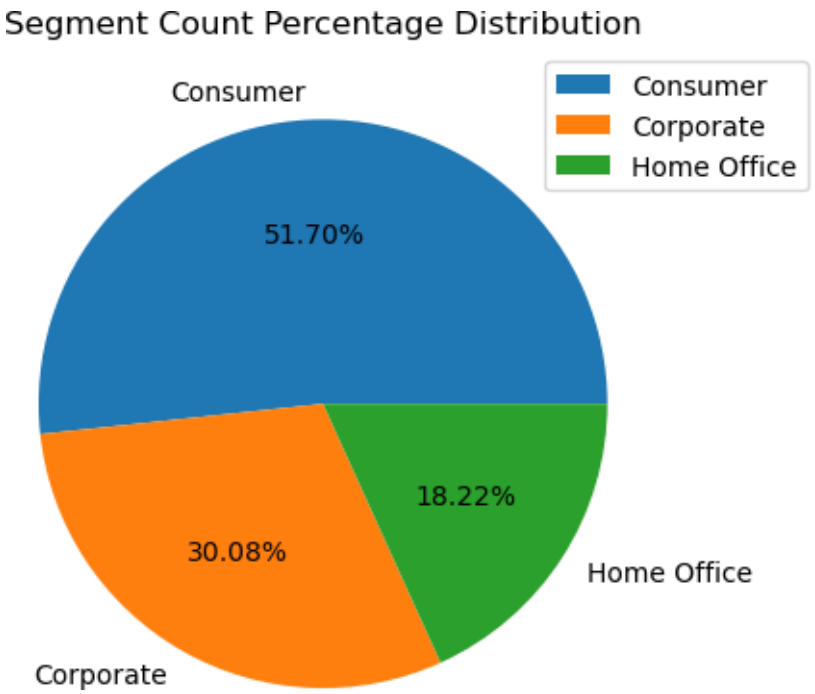


[17] :
```
a3=df['Segment'].value_counts()
a3
```

[17] : Consumer 26518
Corporate 15429
Home Office 9343
Name: Segment, dtype: int64

[18] :
```
plt.pie(a3.values,labels=a3.index,autopct='%.2f%%')
plt.title('Segment Count Percentage Distribution')
plt.legend(loc="upper right", bbox_to_anchor=(1.2, 1))
plt.show
```

[18] : <function matplotlib.pyplot.show(close=None, block=None)>



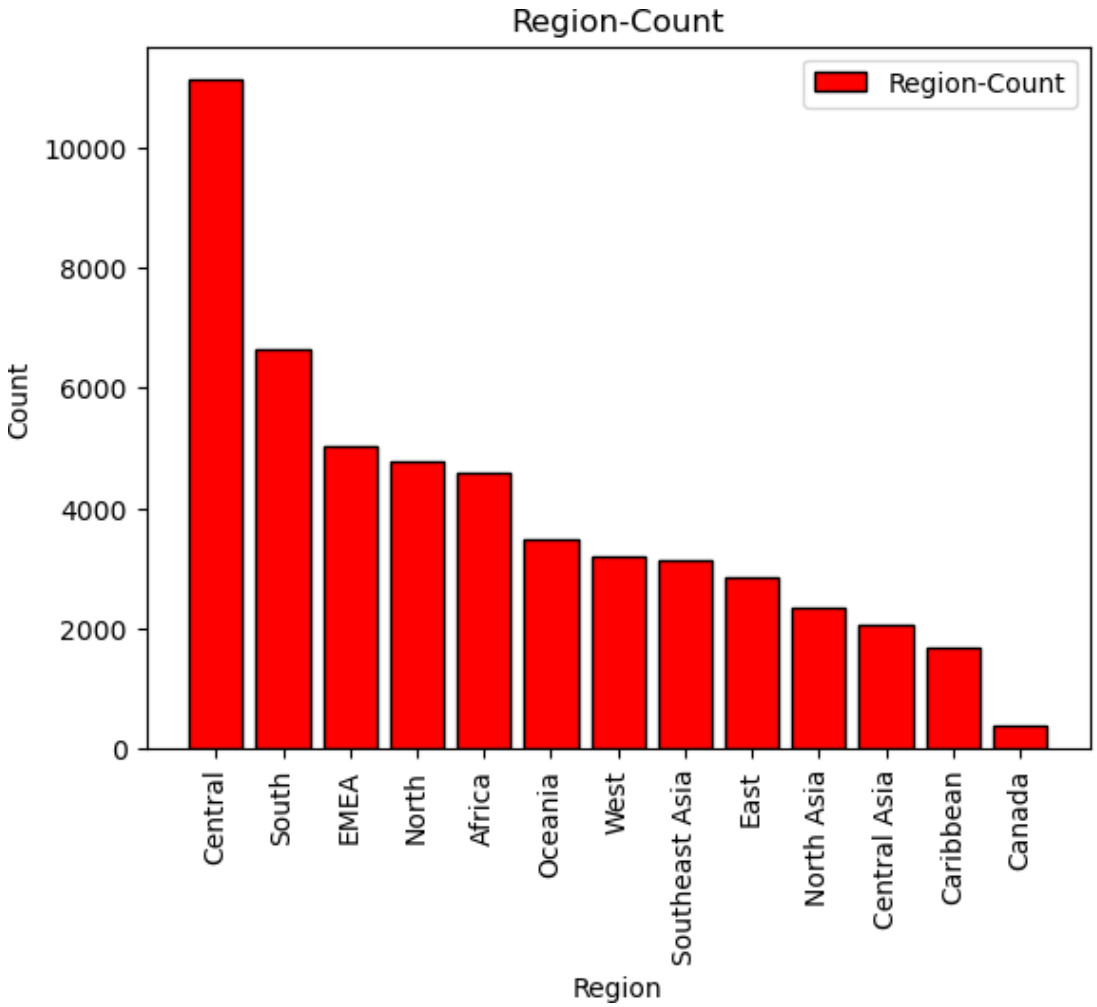
[19] :
```
a4=df['Region'].value_counts()
a4
```

[19]:

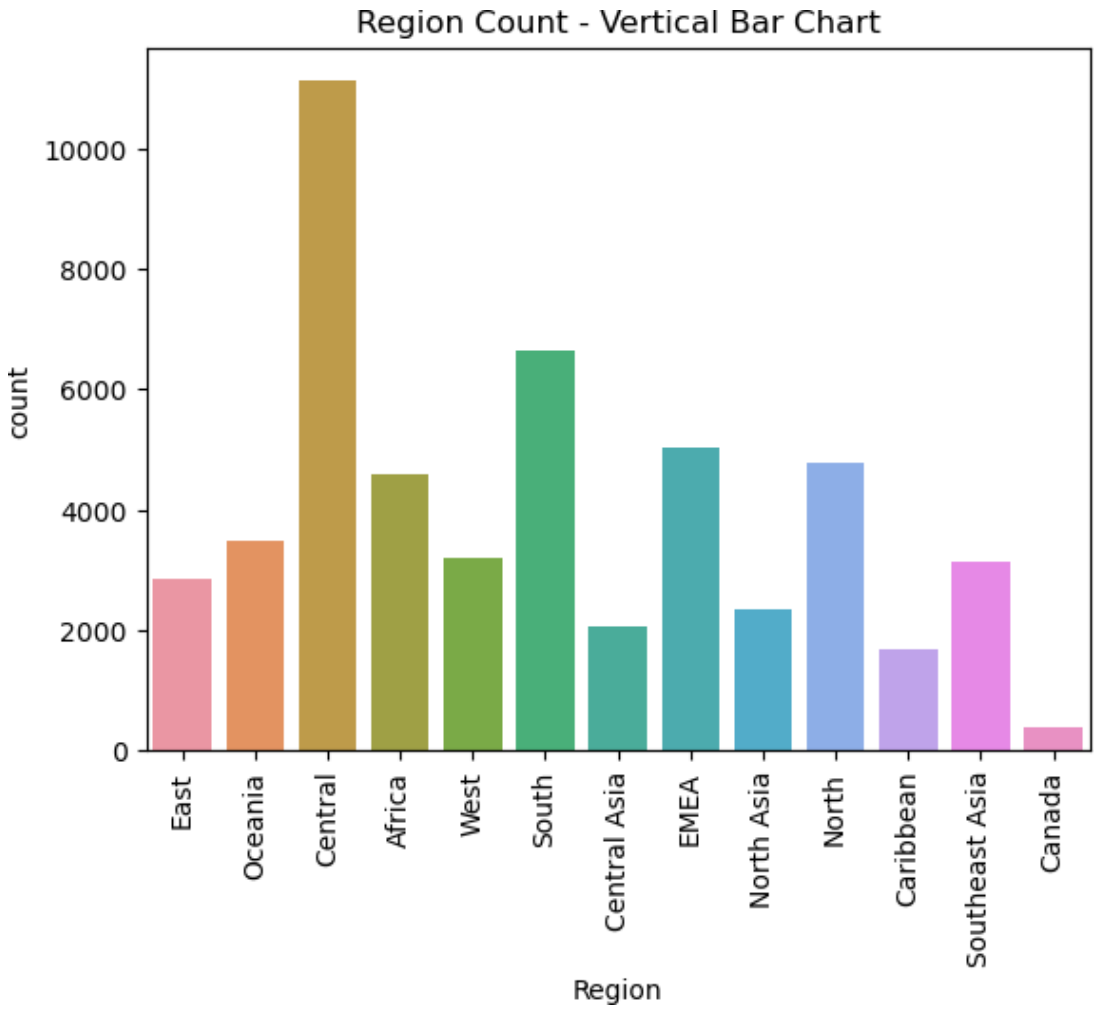
Central	11117
South	6645
EMEA	5029
North	4785
Africa	4587
Oceania	3487
West	3203
Southeast Asia	3129
East	2848
North Asia	2338
Central Asia	2048
Caribbean	1690

```
Canada                  384
Name: Region, dtype: int64
```

[20] :
```
plt.bar(a4.index,a4.values,color='red',edgecolor='black',label='Region-Count')
plt.xlabel('Region')
plt.ylabel('Count')
plt.title('Region-Count')
plt.xticks(rotation=90)
plt.legend()
plt.show()
```



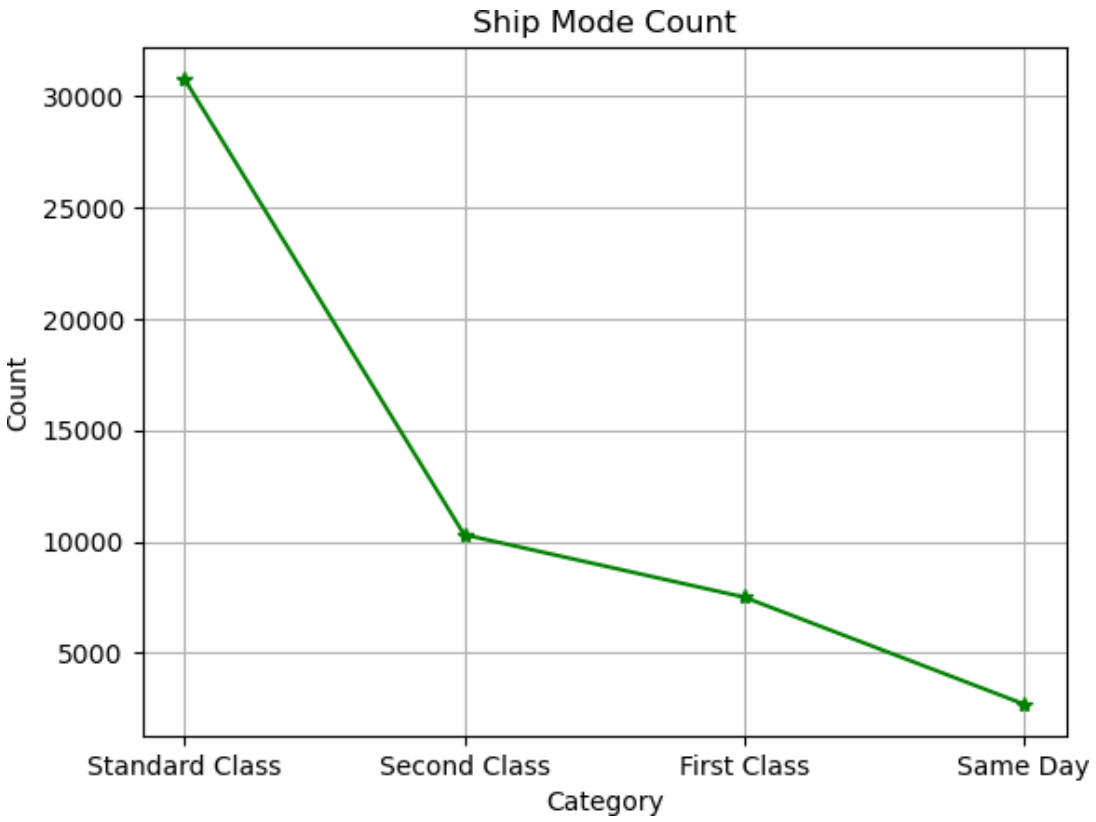
[21] :
```
sns.countplot(x=df['Region'])
plt.title('Region Count - Vertical Bar Chart')
plt.xticks(rotation=90)
plt.show()
```



[22] :
```
a5=df['Ship Mode'].value_counts()
a5
```

[22] :
```
Standard Class    30775
Second Class      10309
First Class        7505
Same Day           2701
Name: Ship Mode, dtype: int64
```

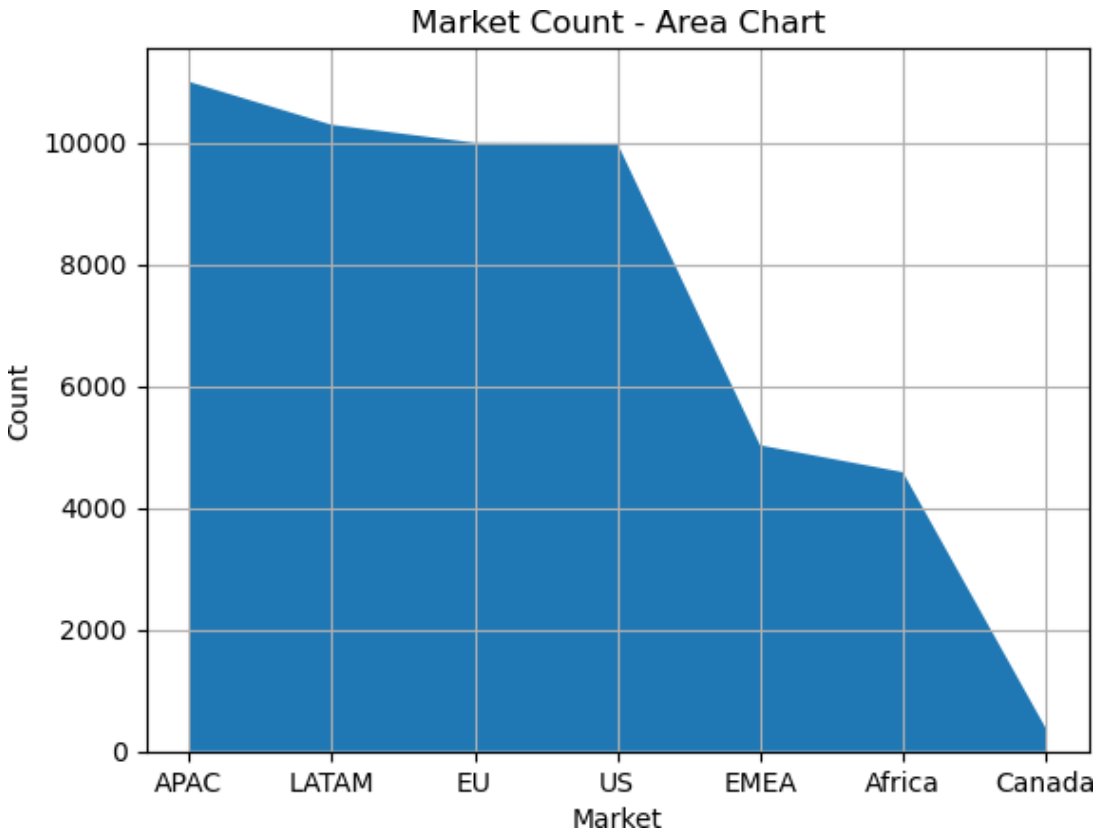
[23] :
```
plt.plot(a5.index,a5.values,color='green',marker='*')
plt.xlabel('Category')
plt.ylabel('Count')
plt.title('Ship Mode Count')
plt.grid()
plt.show()
```



[24] :
```
a6=df['Market'].value_counts()
a6
```

[24] :
```
APAC      11002
LATAM     10294
EU        10000
US         9994
EMEA       5029
Africa     4587
Canada      384
Name: Market, dtype: int64
```

[25] :
```
plt.stackplot(a6.index,a6.values)
plt.xlabel('Market')
plt.ylabel('Count')
plt.title('Market Count - Area Chart')
plt.grid()
plt.show()
```



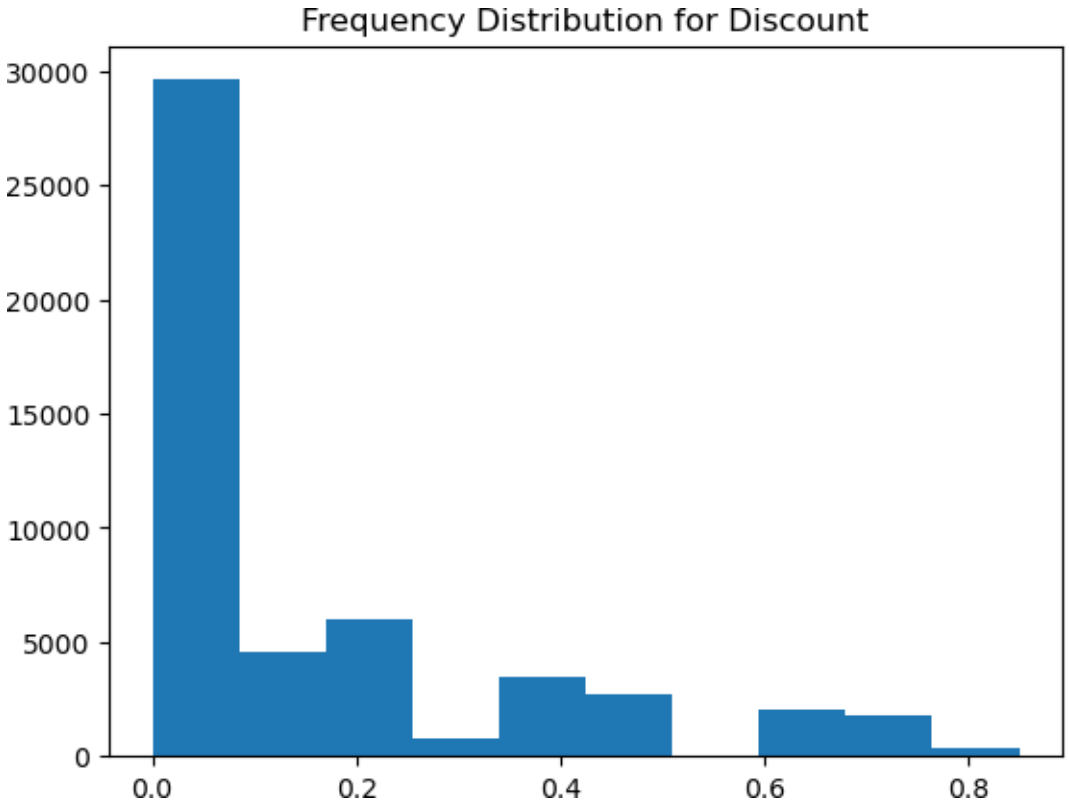
2.2 2). Plot the following:-

a). Histogram for discount b).Displot for quantity

[26] :
```
df['Discount']
```

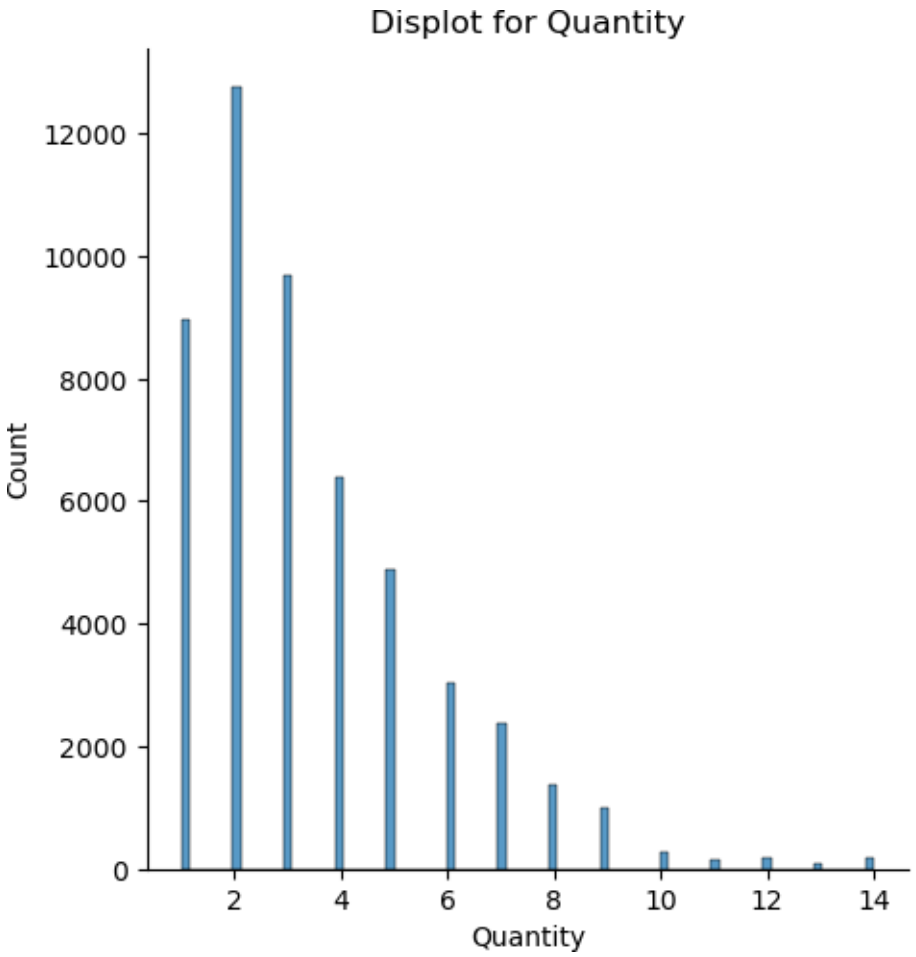
[26]:
```
0        0.0
1        0.1
2        0.1
3        0.1
4        0.0
        ...
51285    0.0
51286    0.8
51287    0.0
51288    0.0
51289    0.0
Name: Discount, Length: 51290, dtype: float64
```

[27] :
```
plt.hist(df['Discount'])
plt.title('Frequency Distribution for Discount')
plt.show()
```



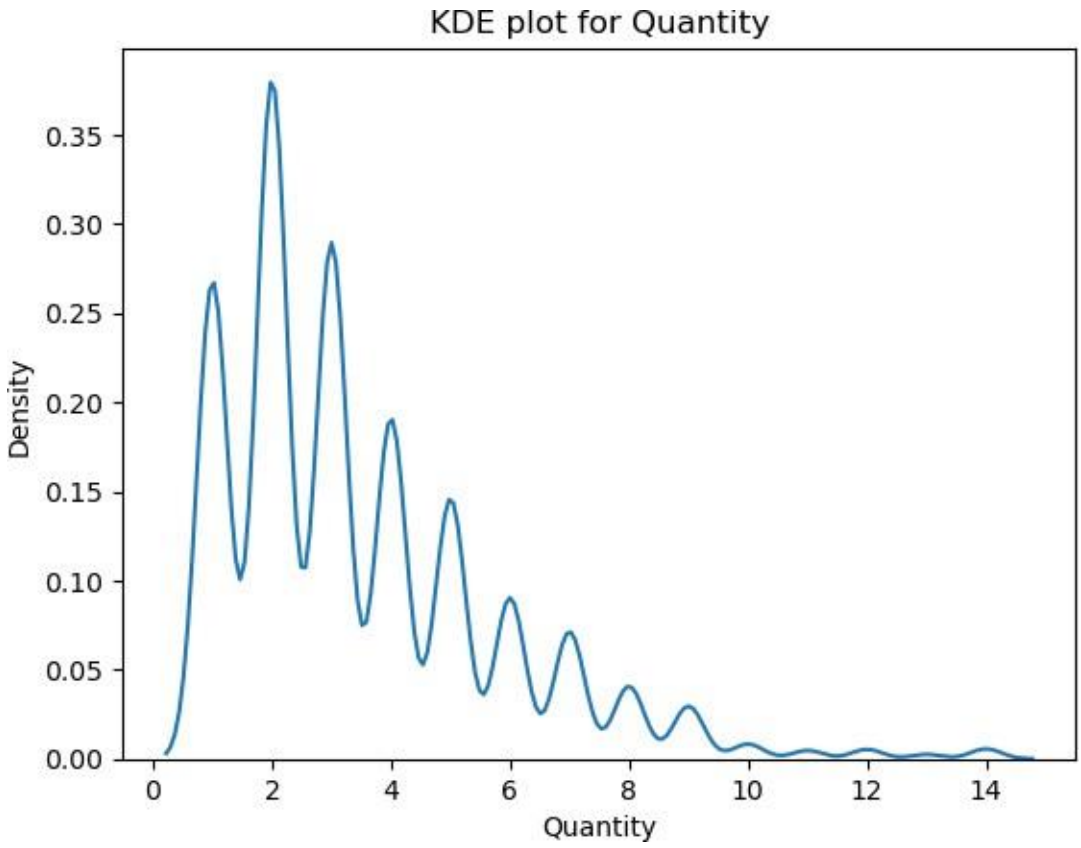
[28] :
```
sns.displot(x=df['Quantity'])
plt.title('Displot for Quantity')
plt.show
```

[28] : <function matplotlib.pyplot.show(close=None, block=None)>



[29] :
```
sns.kdeplot(x=df['Quantity'])
plt.title('KDE plot for Quantity')
plt.show
```

[29] : <function matplotlib.pyplot.show(close=None, block=None)>



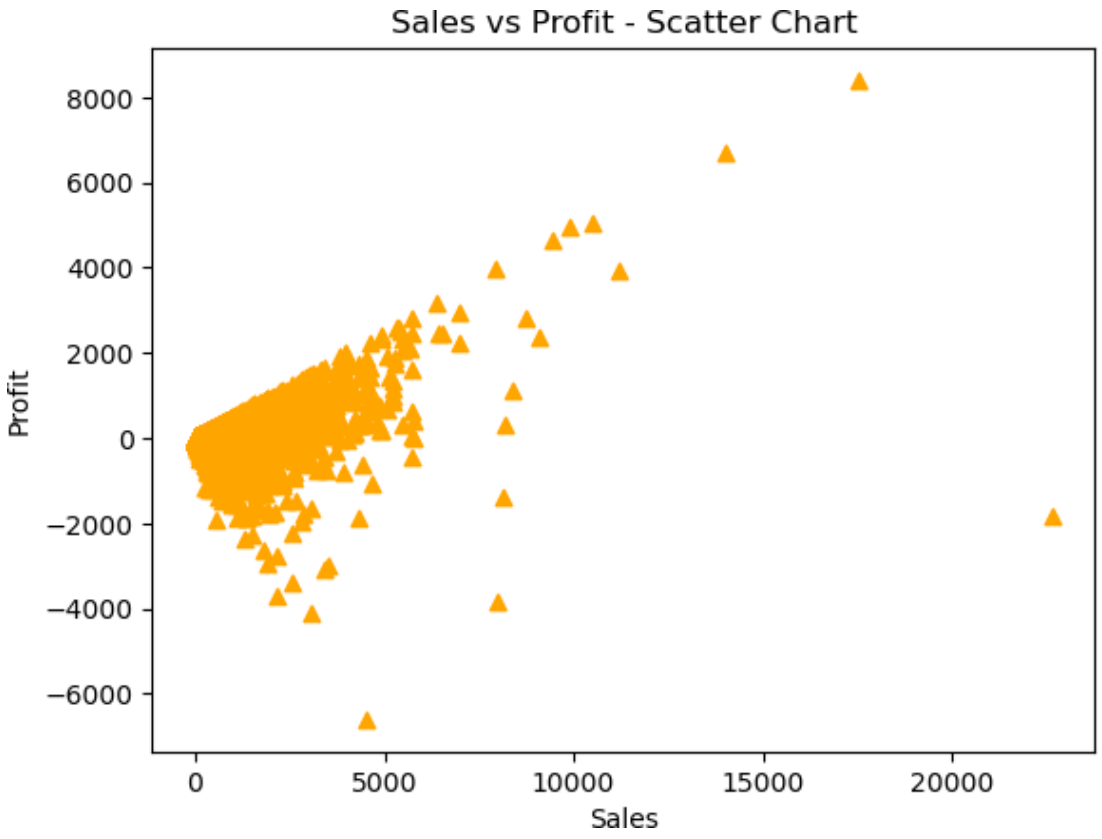
3 B). Bivariate EDA

Statistical or visual analysis of 2 variable.

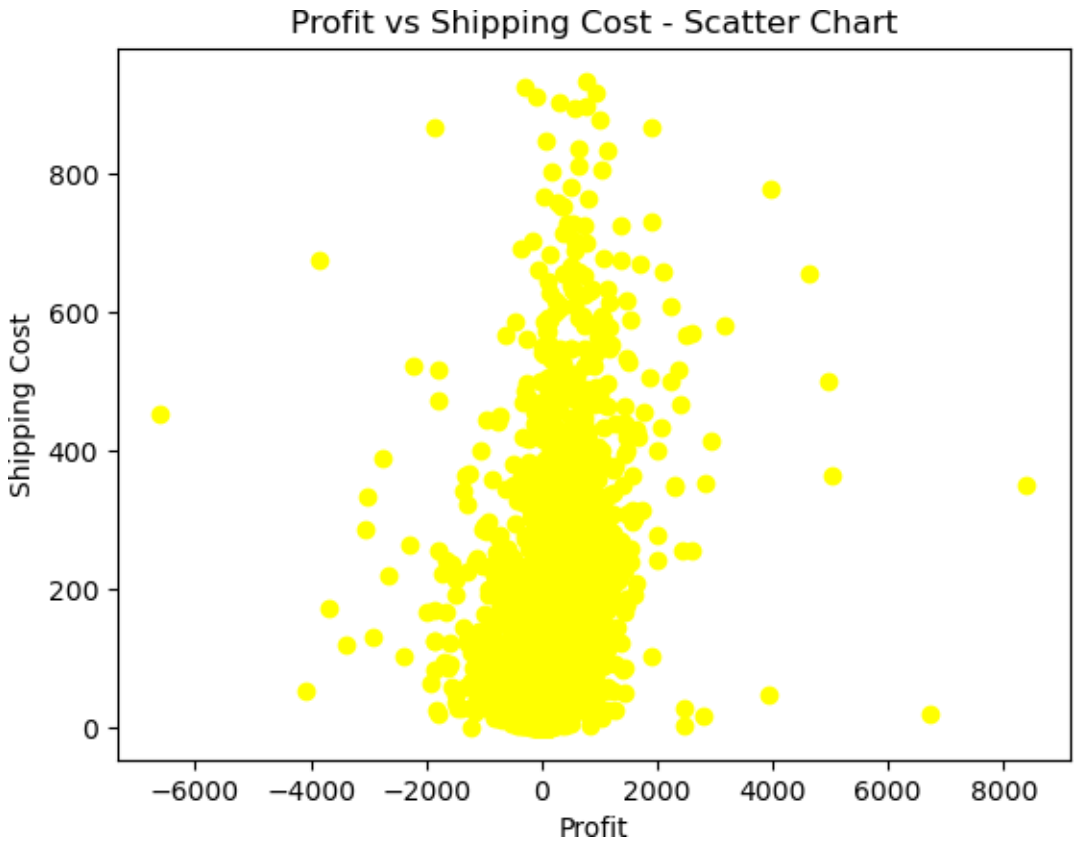
3.1 1). Depict the following on Scatter Plot

a). Sales vs Profit b).Profit vs Shipping Cost

[30] :
```
plt.scatter(x=df['Sales'],y=df['Profit'],color='orange',marker='^')
plt.xlabel('Sales')
plt.ylabel('Profit')
plt.title('Sales vs Profit – Scatter Chart')
plt.show()
```



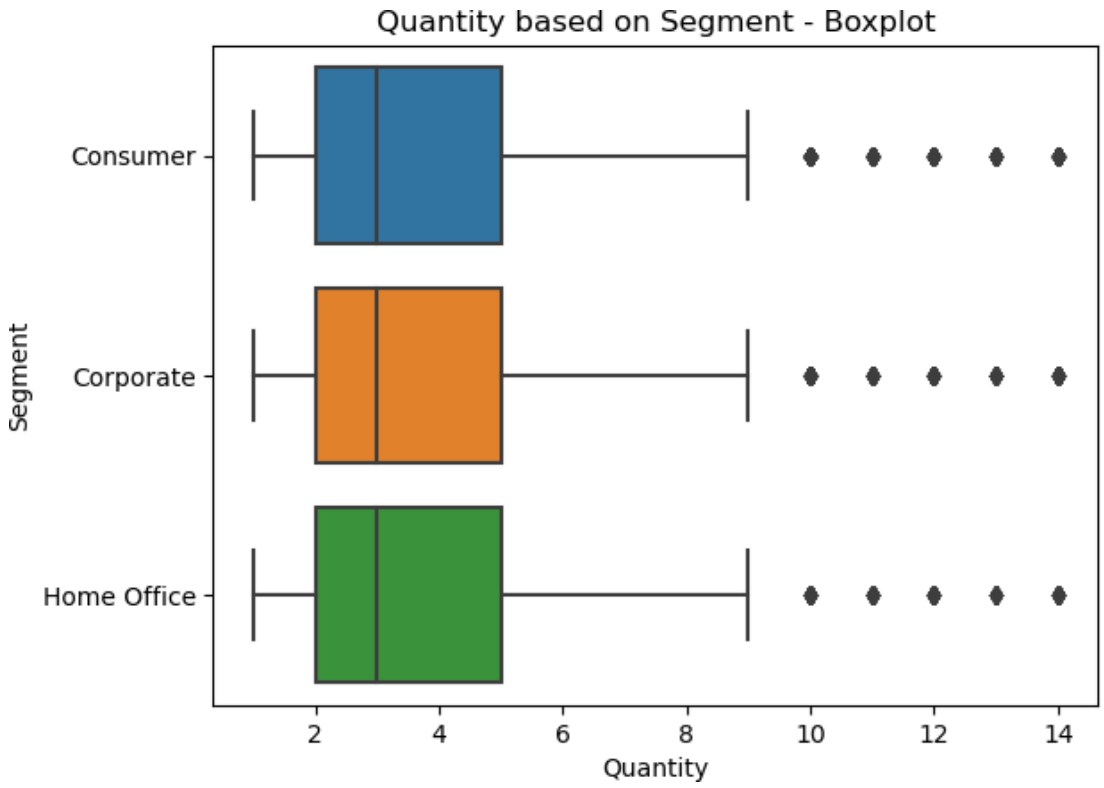
[31] :
```
plt.scatter(x=df['Profit'],y=df['Shipping Cost'],color='yellow',marker='o')
plt.xlabel('Profit')
plt.ylabel('Shipping  Cost')
plt.title('Profit vs Shipping Cost – Scatter Chart')
plt.show()
```



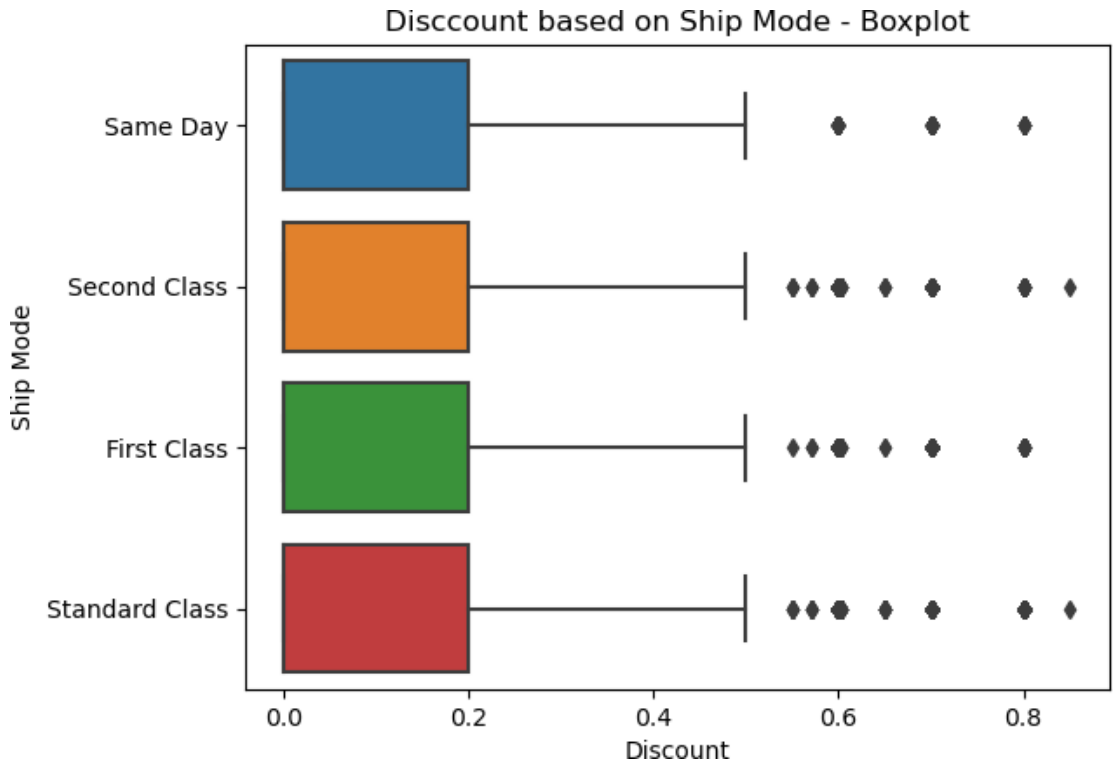
3.2 2). Depict the boxplot for the following:-

a).Quantity based on Segment. b).Discount based on ship mode.

[32] :
```
sns.boxplot(x=df['Quantity'],y=df['Segment'])
plt.title('Quantity based on Segment - Boxplot')
plt.show()
```



[33] :
```
sns.boxplot(x=df['Discount'],y=df['Ship Mode'])
plt.title('Disccount based on Ship Mode - Boxplot')
plt.show()
```

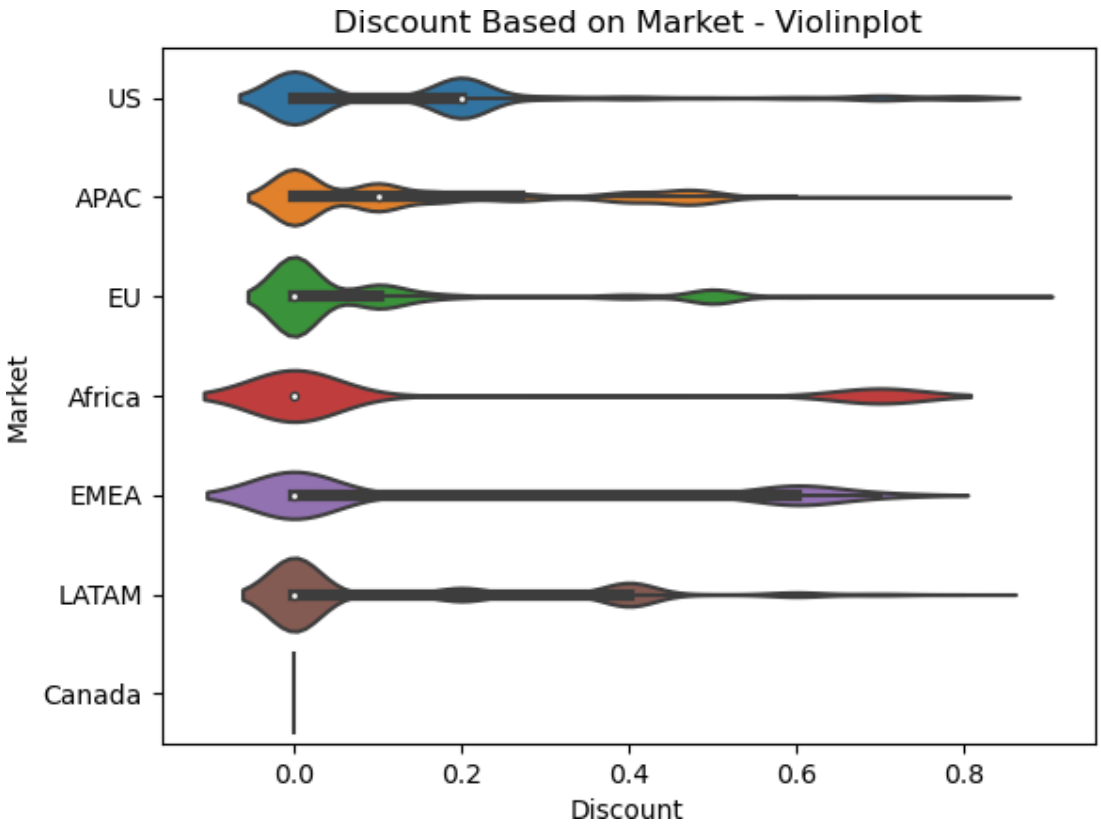


3.3 3). Depict the following on Violin Plot

a).Discount vs Market b).Quantity vs Category Cost

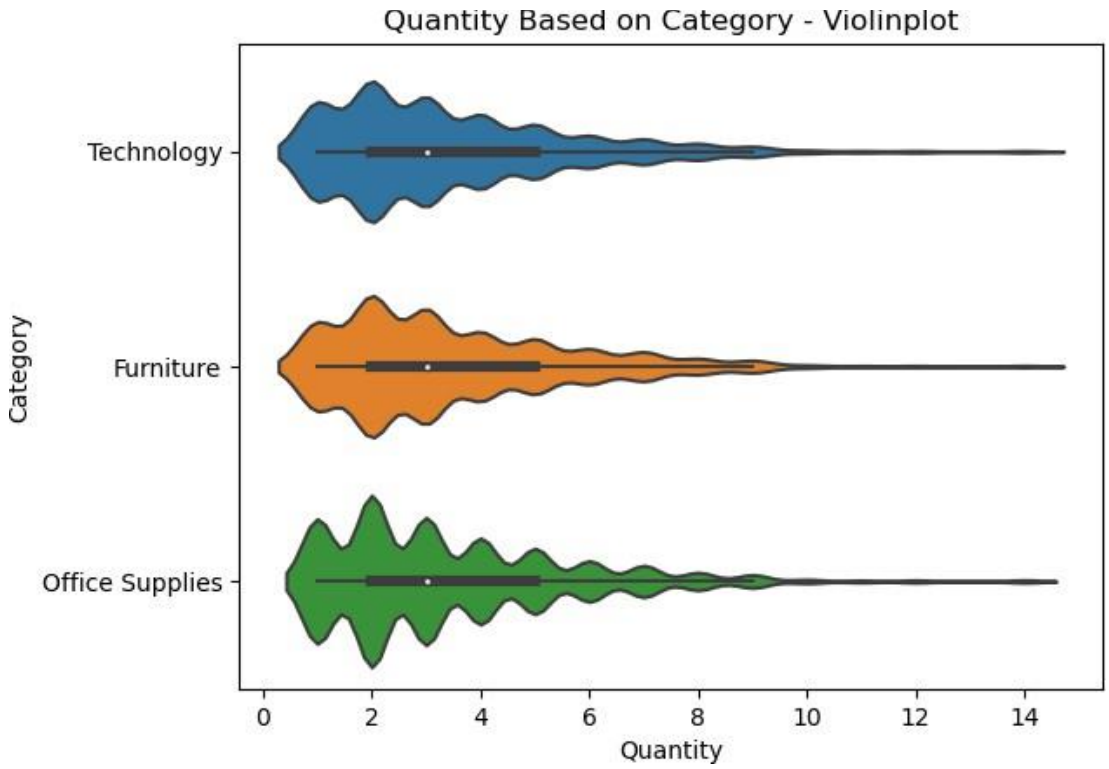
[34] :
```
sns.violinplot(x=df['Discount'],y=df['Market'])
plt.title('Discount Based on Market – Violinplot')
plt.show
```

[34]: <function matplotlib.pyplot.show(close=None, block=None)>



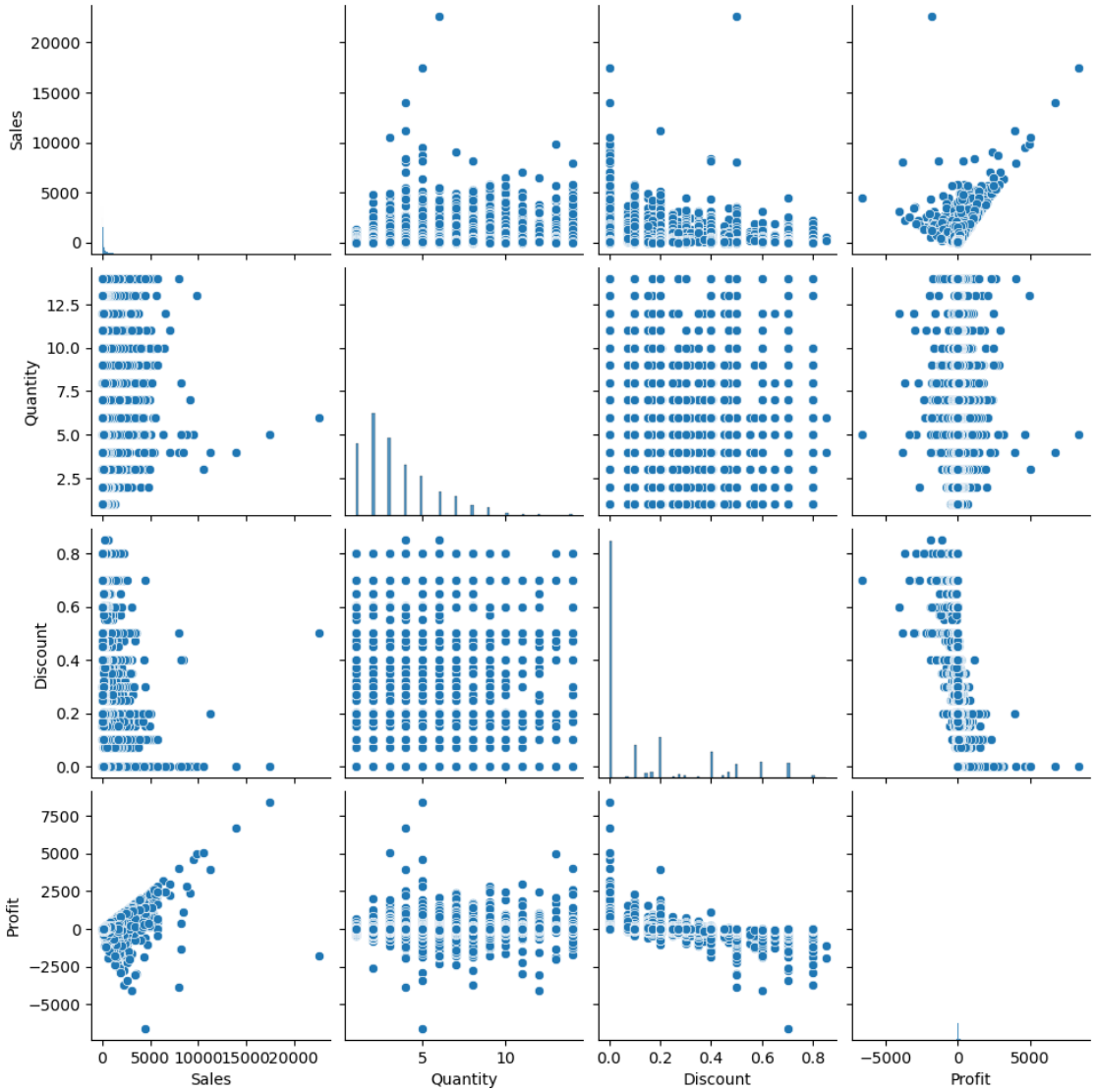
[35]:
```
sns.violinplot(x=df['Quantity'],y=df['Category'])
plt.title('Quantity Based on Category - Violinplot')
plt.show
```

[35]: <function matplotlib.pyplot.show(close=None, block=None)>



3.4 4). Plot the pairplot for all the categorical variables including ['Sales', 'Quantity', 'Discount', 'Profit'].

[38]:
```
sns.pairplot(df, vars = ['Sales', 'Quantity', 'Discount', 'Profit'])
plt.show()
```



3.5 5). Depict Correlation on a heatmap.

[41]:
```
corr= df.corr()
corr
```

C:\Users\SUDARSHAN PANDEY\AppData\Local\Temp\ipykernel_18172\98420504.py:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future version, it will default to False. Select only valid columns or specify the value of numeric_only to silence this warning.
  corr= df.corr()

[41]:

	Row ID	Sales	Quantity	Discount	Profit	Shipping Cost
Row ID	1.000000	-0.043889	-0.173483	0.087594	-0.019037	-0.039076
Sales	-0.043889	1.000000	0.313577	-0.086722	0.484918	0.768073
Quantity	-0.173483	0.313577	1.000000	-0.019875	0.104365	0.272649
Discount	0.087594	-0.086722	-0.019875	1.000000	-0.316490	-0.079055
Profit	-0.019037	0.484918	0.104365	-0.316490	1.000000	0.354441
Shipping Cost	-0.039076	0.768073	0.272649	-0.079055	0.354441	1.000000

[42]:
```
corr= df.corr()
sns.heatmap(corr,annot=True,cmap='coolwarm')
plt.show()
```

C:\Users\SUDARSHAN PANDEY\AppData\Local\Temp\ipykernel_18172\3787342265.py:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future version, it will default to False. Select only valid columns or specify the value of numeric_only to silence this warning.
  corr= df.corr()