Phase-2

Data Preprocessing

Market Basket Analysis:

Date	08 Oct 2023
Team ID	Proj-212168-Team-1
Project Name	Market Basket Insights
Maximum Mark	

Data preprocessing is an important step in the data mining process. It refers to the cleaning, transforming, and integrating of data in order to make it ready for analysis. The goal of data preprocessing is to improve the quality of the data and to make it more suitable for the specific data mining taks.

Program:

#Import package:

Explaination:

- Numpy :(import numpy as np) a library for mathematical operations and handling arrays.
- pandas :(import pandas as pd) a library for data manipulation and analysis.
- Matplotlib.pyplot: (import as plt) a library for creating visualization.
- Seaborn :as a library for creating additional data visualization.
- mlxtend.frquent_patterns: a module for performing frequent itemset mining and association rule leaening.

```
In [20]:  0.002 seconds
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from mlxtend.frequent_patterns import apriori
from mlxtend.frequent_patterns import association_rules
```

-

```
In [21]:  1.098 seconds  Explain...  Format  Copy  5
dataset=pd.read_csv('insights.csv')

Out[21]: /tmp/ipykernel_376/4147191086.py:1: DtypeWarning: Columns (0) have mixed types. Specify dtype
option on import or set low_memory=False.
  dataset=pd.read_csv('insights.csv')
```

This code reads contents of a csv file called "insights.csv" and saves it a variable called"dataset".The "pd" modul is already imported.

-

```
In [22]: dataset.head()
```

Out[22]:

	BillNo	Itemname	Quantity	Date	Price	CustomerID	Country
0	536365	WHITE HANGING HEART T-LIGHT HOLDER	6	12/1/2010 8:26	2.55	17850.0	United Kingdom
1	536365	WHITE METAL LANTERN	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
2	536365	CREAM CUPID HEARTS COAT HANGER	8	12/1/2010 8:26	2.75	17850.0	United Kingdom
3	536365	KNITTED UNION FLAG HOT WATER BOTTLE	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
4	536365	RED WOOLLY HOTTIE WHITE HEART.	6	12/1/2010 8:26	3.39	17850.0	United Kingdom

The code dataset.head() is calling th head() function on the dataset onjecr.the head() function is used display first few rows of a data set.

```
In [26]: dataset.isnull().sum()

Out[26]: BillNo          0
         Itemname      1455
         Quantity         0
         Date             0
         Price            0
         CustomerID  134041
         Country          0
         dtype: int64
```

- The given code is used to find the number of missing values in column of a dataset.The sum() function is count the number of missing values.

```
In [24]: dataset.info()

Out[24]: <class 'pandas.core.frame.DataFrame'>
         RangeIndex: 522064 entries, 0 to 522063
         Data columns (total 7 columns):
          #   Column      Non-Null Count   Dtype
         ---  ------      --------------   -----
          0   BillNo      522064 non-null  object
          1   Itemname    520609 non-null  object
          2   Quantity    522064 non-null  int64
          3   Date        522064 non-null  object
          4   Price       522064 non-null  float64
          5   CustomerID  388023 non-null  float64
          6   Country     522064 non-null  object
         dtypes: float64(2), int64(1), object(4)
         memory usage: 27.9+ MB
```

- The code dataset.info() is a method call in python to display the information about data set.The .info() method provides such as number of columns and rows datatypes of columns and memory usage of the dataset.

In [25]:
```
df=dataset.fillna({'Itemname':'abcd'})
df
```

Out[25]:

	BillNo	Itemname	Quantity	Date	Price	CustomerID	Country
0	536365	WHITE HANGING HEART T-LIGHT HOLDER	6	12/1/2010 8:26	2.55	17850.0	United Kingdom
1	536365	WHITE METAL LANTERN	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
2	536365	CREAM CUPID HEARTS COAT HANGER	8	12/1/2010 8:26	2.75	17850.0	United Kingdom
3	536365	KNITTED UNION FLAG HOT WATER BOTTLE	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
4	536365	RED WOOLLY HOTTIE WHITE HEART.	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
...	...	...	...	...	...	...	...
522059	581587	PACK OF 20 SPACEBOY NAPKINS	12	12/9/2011 12:50	0.85	12680.0	France
522060	581587	CHILDREN'S APRON DOLLY GIRL	6	12/9/2011 12:50	2.10	12680.0	France
522061	581587	CHILDRENS CUTLERY DOLLY GIRL	4	12/9/2011 12:50	4.15	12680.0	France
522062	581587	CHILDRENS CUTLERY CIRCUS PARADE	4	12/9/2011 12:50	4.15	12680.0	France
522063	581587	BAKING SET 9 PIECE RETROSPOT	3	12/9/2011 12:50	4.95	12680.0	France

522064 rows × 7 columns

- This code is filling the missing values in the columns "itemname" of the dataframe "dataset" with the value "abcd".The filled dataframe is then displayed.

-

```
n [27]: df1=dataset.fillna(value=dataset['CustomerID'].mean())
        df1
```

ut[27]:

	BillNo	Itemname	Quantity	Date	Price	CustomerID	Country
0	536365	WHITE HANGING HEART T-LIGHT HOLDER	6	12/1/2010 8:26	2.55	17850.0	United Kingdom
1	536365	WHITE METAL LANTERN	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
2	536365	CREAM CUPID HEARTS COAT HANGER	8	12/1/2010 8:26	2.75	17850.0	United Kingdom
3	536365	KNITTED UNION FLAG HOT WATER BOTTLE	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
4	536365	RED WOOLLY HOTTIE WHITE HEART.	6	12/1/2010 8:26	3.39	17850.0	United Kingdom
...	...	...	...	...	...	...	...
522059	581587	PACK OF 20 SPACEBOY NAPKINS	12	12/9/2011 12:50	0.85	12680.0	France
522060	581587	CHILDREN'S APRON DOLLY GIRL	6	12/9/2011 12:50	2.10	12680.0	France
522061	581587	CHILDRENS CUTLERY DOLLY GIRL	4	12/9/2011 12:50	4.15	12680.0	France
522062	581587	CHILDRENS CUTLERY CIRCUS PARADE	4	12/9/2011 12:50	4.15	12680.0	France
522063	581587	BAKING SET 9 PIECE RETROSPOT	3	12/9/2011 12:50	4.95	12680.0	France

522064 rows × 7 columns

This code is fiils the missing values in a dataframe calles dataset,using the mean of the "CustomerID" column.The filled dataframe than assigned variable df1and displayed.

```
In [28]: df1.isnull().sum()

Out[28]: BillNo        0
         Itemname      0
         Quantity      0
         Date          0
         Price         0
         CustomerID    0
         Country       0
         dtype: int64
```

- The given code is used to find the number of missing values in column of a dataset.The sum() function is count the number of missing values.

-

```
In [29]: print("Highest allowed",df1['Price'].mean()+3*df1['Price'].std())
         print("Lowest allowed",df1['Price'].mean()-3*df1['Price'].std())

Out[29]: Highest allowed 129.52859810696216
         Lowest allowed -121.87499535327679
```

This code is printing the highest and lowest allowed values based on statistical calculation.It calculates the mean and standared diviation of column called "price" in dataframe calld df1.

•

```
In [30]: df1[(df1['Price']>129.52)|(df1['Price']<-121.87)]
```

Out[30]:

	BillNo	Itemname	Quantity	Date	Price	CustomerID	Country
237	536392	RUSTIC SEVENTEEN DRAWER SIDEBOARD	1	12/1/2010 10:29	165.00	13705.00000	United Kingdom
1781	536544	DOTCOM POSTAGE	1	12/1/2010 14:32	569.77	15316.93171	United Kingdom
2994	536592	DOTCOM POSTAGE	1	12/1/2010 17:06	607.49	15316.93171	United Kingdom
4897	536835	VINTAGE RED KITCHEN CABINET	1	12/2/2010 18:06	295.00	13145.00000	United Kingdom
5348	536862	DOTCOM POSTAGE	1	12/3/2010 11:13	254.43	15316.93171	United Kingdom
...	...	...	...	...	...	...	...
517135	581219	DOTCOM POSTAGE	1	12/8/2011 9:28	1008.96	15316.93171	United Kingdom
517534	581238	DOTCOM POSTAGE	1	12/8/2011 10:53	1683.75	15316.93171	United Kingdom
519549	581439	DOTCOM POSTAGE	1	12/8/2011 16:30	938.59	15316.93171	United Kingdom
521067	581492	DOTCOM POSTAGE	1	12/9/2011 10:03	933.17	15316.93171	United Kingdom
521699	581498	DOTCOM POSTAGE	1	12/9/2011 10:26	1714.17	15316.93171	United Kingdom

668 rows × 7 columns

The code is filtering a dataframe df1 based on a condition.

In [31]:
```
Q1=df1['Quantity'].quantile(0.25)
Q3=df1['Price'].quantile(0.75)
IQR=Q3-Q1
lower_bound=Q1-1.5*IQR
upper_bound=Q3+1.5*IQR
outliers=df1[(df1['Quantity']<lower_bound)|(df1['Price']>upper_bound)]
print(outliers)
```

Out[31]:

	BillNo	Itemname	Quantity	Date	\
16	536367	BOX OF VINTAGE ALPHABET BLOCKS	2	12/1/2010 8:34	
45	536370	POSTAGE	3	12/1/2010 8:45	
65	536374	VICTORIAN SEWING BOX LARGE	32	12/1/2010 9:09	
150	536382	3 TIER CAKE TIN GREEN AND CREAM	2	12/1/2010 9:45	
151	536382	3 TIER CAKE TIN RED AND CREAM	2	12/1/2010 9:45	
...	...	...	...	...	
521922	581574	POSTAGE	2	12/9/2011 12:09	
521923	581578	POSTAGE	3	12/9/2011 12:16	
521941	581578	BOX OF VINTAGE ALPHABET BLOCKS	6	12/9/2011 12:16	
522004	581580	TABLECLOTH RED APPLES DESIGN	2	12/9/2011 12:20	
522047	581586	RED RETROSPOT ROUND CAKE TINS	24	12/9/2011 12:49	

	Price	CustomerID	Country
16	9.95	13047.0	United Kingdom
45	18.00	12583.0	France
65	10.95	15100.0	United Kingdom

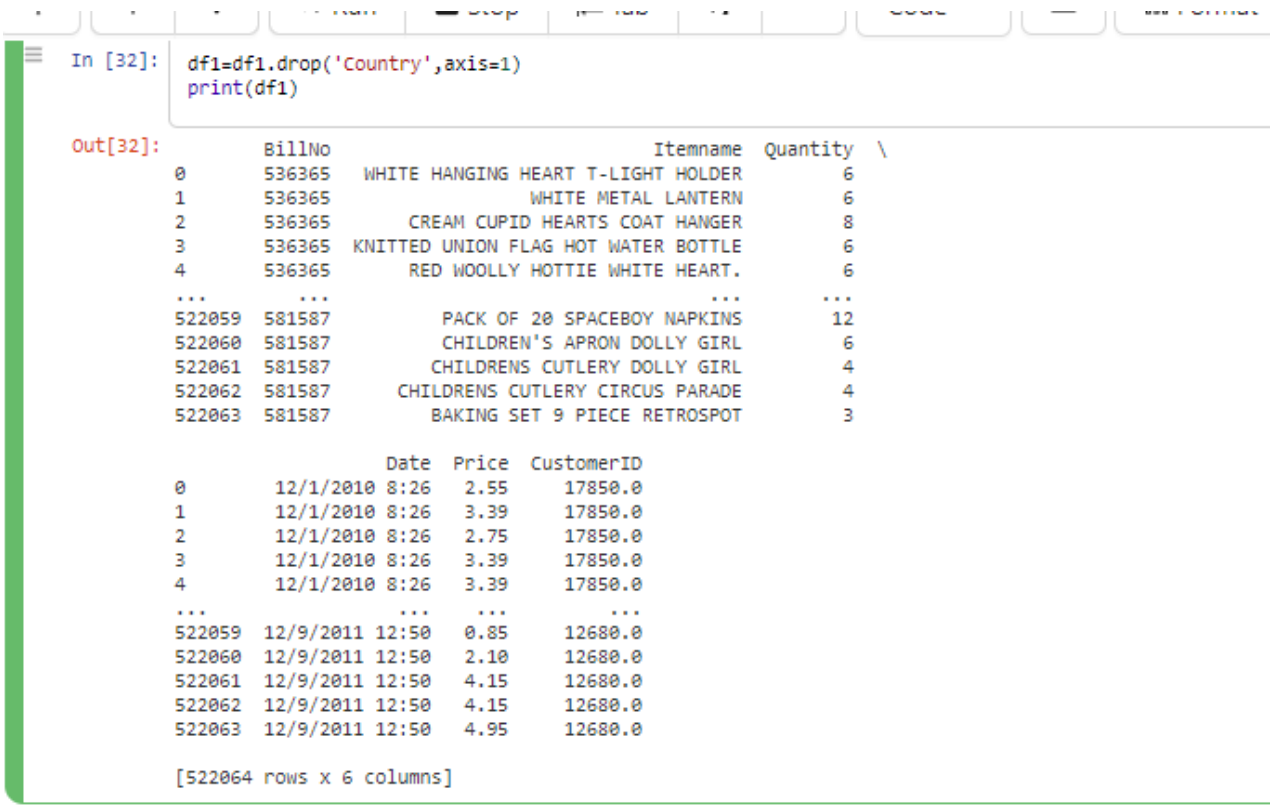
- Q1 and Q3 are the first and third quartiles of the 'Quantity' and 'Price' columns, respectively.

- IQR is the interquartile range, calculated as the difference between Q3 and Q1.

- lower_bound and upper_bound are the lower and upper bounds, respectively, for identifying outliers. They are calculated as Q1 - 1.5 * IQR and Q3 + 1.5 * IQR.

- outliers is a DataFrame containing the rows from df1 where either the 'Quantity' is less than lower_bound or the 'Price' is greater than upper_bound.

- Finally, the code prints out the outliers DataFrame.



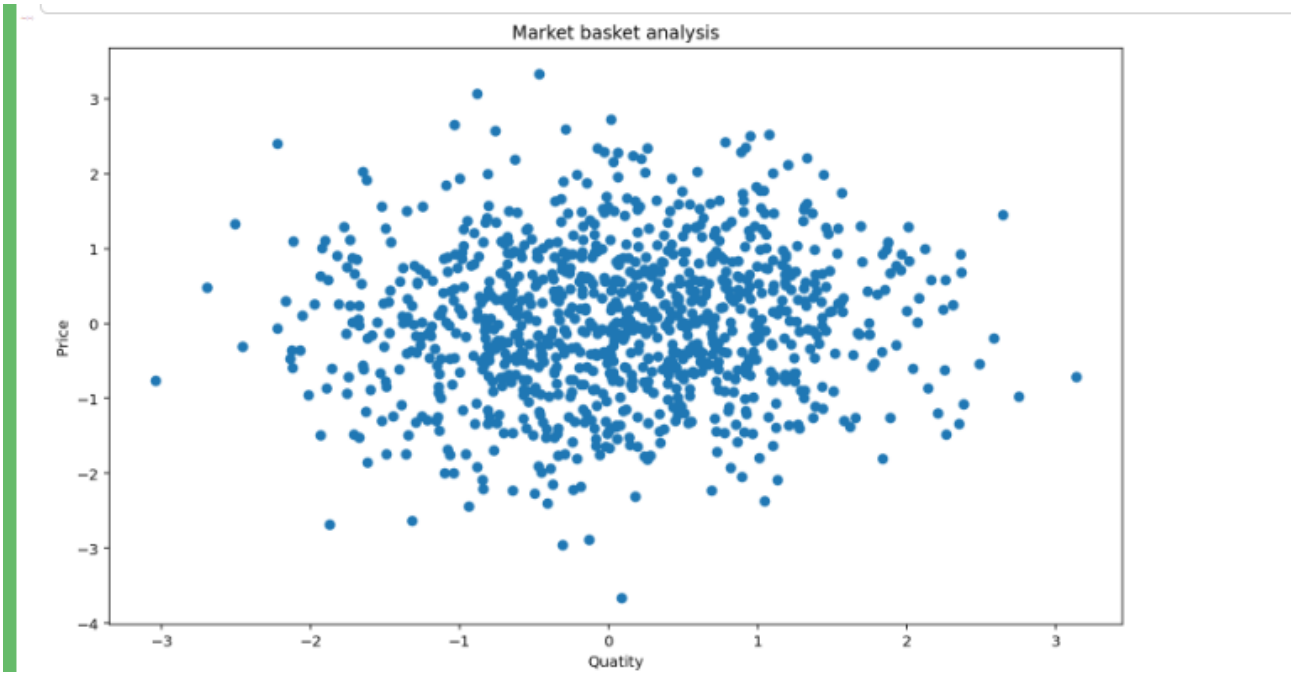
```
In [32]: df1=df1.drop('Country',axis=1)
         print(df1)
```

```
Out[32]:        BillNo                            Itemname  Quantity  \
0       536365   WHITE HANGING HEART T-LIGHT HOLDER         6
1       536365                  WHITE METAL LANTERN         6
2       536365       CREAM CUPID HEARTS COAT HANGER         8
3       536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
4       536365       RED WOOLLY HOTTIE WHITE HEART.         6
...        ...                                  ...       ...
522059  581587          PACK OF 20 SPACEBOY NAPKINS        12
522060  581587          CHILDREN'S APRON DOLLY GIRL         6
522061  581587         CHILDRENS CUTLERY DOLLY GIRL         4
522062  581587      CHILDRENS CUTLERY CIRCUS PARADE         4
522063  581587         BAKING SET 9 PIECE RETROSPOT         3

                     Date  Price  CustomerID
0        12/1/2010 8:26   2.55     17850.0
1        12/1/2010 8:26   3.39     17850.0
2        12/1/2010 8:26   2.75     17850.0
3        12/1/2010 8:26   3.39     17850.0
4        12/1/2010 8:26   3.39     17850.0
...                 ...    ...         ...
522059  12/9/2011 12:50   0.85     12680.0
522060  12/9/2011 12:50   2.10     12680.0
522061  12/9/2011 12:50   4.15     12680.0
522062  12/9/2011 12:50   4.15     12680.0
522063  12/9/2011 12:50   4.95     12680.0

[522064 rows x 6 columns]
```

- The code is using the pandas library in Python to drop the 'Country' column from a DataFrame called df1. The 'axis=1' parameter specifies that the column is being dropped.

- After dropping the column, the code then prints the updated DataFrame.

```
In [33]: x=np.random.normal(0,1,1000)
         y=np.random.normal(0,1,1000)
         plt.scatter(x,y)
         plt.xlabel('Quatity')
         plt.ylabel('Price')
         plt.title('Market basket analysis')
         plt.show()
```



- This code generates two arrays of random numbers with a normal distribution, assigns them to the variables x and y, plots them as a scatterplot using the scatter() function from the pyplot module of the matplotlib library, adds labels to the x-axis and y-axis, sets a title the

plot, and displays the plot.