Miniproject-5

Problem statement:The transactions made by a UK-based, registered, non-store online retailer between December 1, 2010, and December 9,2011, are all included in the transnational data set known as online retail. The company primarily offers one-of-a-kind gifts for every occasion. The company has a large number of wholesalers as clients.Company ObjectiveUsing the global online retail dataset, we will design a clustering model and select the ideal group of clients for the business to target.

In [1]:

```
import pandas as pd
from matplotlib import pyplot as plt
%matplotlib inline
```

In [2]:
```
df=pd.read_csv(r"C:\Users\LENOVO\Downloads\Online Retail.csv")
df
```

Out[2]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Cour
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	17850.0	Uni Kingd
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	17850.0	Uni Kingd
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	17850.0	Uni Kingd
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	17850.0	Uni Kingd
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	17850.0	Uni Kingd
...	...	...	...	...	...	...	...	
541904	581587	22613	PACK OF 20 SPACEBOY NAPKINS	12	09-12-2011 12:50	0.85	12680.0	Fra
541905	581587	22899	CHILDREN'S APRON DOLLY GIRL	6	09-12-2011 12:50	2.10	12680.0	Fra
541906	581587	23254	CHILDRENS CUTLERY DOLLY GIRL	4	09-12-2011 12:50	4.15	12680.0	Fra
541907	581587	23255	CHILDRENS CUTLERY CIRCUS PARADE	4	09-12-2011 12:50	4.15	12680.0	Fra
541908	581587	22138	BAKING SET 9 PIECE RETROSPOT	3	09-12-2011 12:50	4.95	12680.0	Fra

541909 rows × 8 columns

In [3]:

```
df.describe
```

Out[3]:

```
<bound method NDFrame.describe of        InvoiceNo StockCode
Description  Quantity
0         536365    85123A   WHITE HANGING HEART T-LIGHT HOLDER         6  \
1         536365     71053                  WHITE METAL LANTERN         6
2         536365    84406B       CREAM CUPID HEARTS COAT HANGER         8
3         536365    84029G  KNITTED UNION FLAG HOT WATER BOTTLE         6
4         536365    84029E       RED WOOLLY HOTTIE WHITE HEART.         6
...          ...       ...                                  ...       ...
541904    581587     22613          PACK OF 20 SPACEBOY NAPKINS        12
541905    581587     22899         CHILDREN'S APRON DOLLY GIRL          6
541906    581587     23254        CHILDRENS CUTLERY DOLLY GIRL          4
541907    581587     23255      CHILDRENS CUTLERY CIRCUS PARADE         4
541908    581587     22138        BAKING SET 9 PIECE RETROSPOT          3

             InvoiceDate  UnitPrice  CustomerID         Country
0       01-12-2010 08:26       2.55     17850.0  United Kingdom
1       01-12-2010 08:26       3.39     17850.0  United Kingdom
2       01-12-2010 08:26       2.75     17850.0  United Kingdom
3       01-12-2010 08:26       3.39     17850.0  United Kingdom
4       01-12-2010 08:26       3.39     17850.0  United Kingdom
...                  ...        ...         ...             ...
541904  09-12-2011 12:50       0.85     12680.0          France
541905  09-12-2011 12:50       2.10     12680.0          France
541906  09-12-2011 12:50       4.15     12680.0          France
541907  09-12-2011 12:50       4.15     12680.0          France
541908  09-12-2011 12:50       4.95     12680.0          France

[541909 rows x 8 columns]>
```

In [4]:
```
df.head()
```

Out[4]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	17850.0	United Kingdom
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	17850.0	United Kingdom
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	17850.0	United Kingdom
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	17850.0	United Kingdom
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	17850.0	United Kingdom

In [5]:
```
df.tail()
```

Out[5]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Coun
541904	581587	22613	PACK OF 20 SPACEBOY NAPKINS	12	09-12-2011 12:50	0.85	12680.0	Fra
541905	581587	22899	CHILDREN'S APRON DOLLY GIRL	6	09-12-2011 12:50	2.10	12680.0	Fra
541906	581587	23254	CHILDRENS CUTLERY DOLLY GIRL	4	09-12-2011 12:50	4.15	12680.0	Fra
541907	581587	23255	CHILDRENS CUTLERY CIRCUS PARADE	4	09-12-2011 12:50	4.15	12680.0	Fra
541908	581587	22138	BAKING SET 9 PIECE RETROSPOT	3	09-12-2011 12:50	4.95	12680.0	Fra

In [6]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 541909 entries, 0 to 541908
Data columns (total 8 columns):
 #   Column       Non-Null Count   Dtype  
---  ------       --------------   -----  
 0   InvoiceNo    541909 non-null  object 
 1   StockCode    541909 non-null  object 
 2   Description  540455 non-null  object 
 3   Quantity     541909 non-null  int64  
 4   InvoiceDate  541909 non-null  object 
 5   UnitPrice    541909 non-null  float64
 6   CustomerID   406829 non-null  float64
 7   Country      541909 non-null  object 
dtypes: float64(2), int64(1), object(5)
memory usage: 33.1+ MB
```

In [7]:

```
df.fillna(method="ffill",inplace=True)
df
```

Out[7]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Cour
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	17850.0	Uni Kingd
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	17850.0	Uni Kingd
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	17850.0	Uni Kingd
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	17850.0	Uni Kingd
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	17850.0	Uni Kingd
...	...	...	...	...	...	...	...	
541904	581587	22613	PACK OF 20 SPACEBOY NAPKINS	12	09-12-2011 12:50	0.85	12680.0	Fra
541905	581587	22899	CHILDREN'S APRON DOLLY GIRL	6	09-12-2011 12:50	2.10	12680.0	Fra
541906	581587	23254	CHILDRENS CUTLERY DOLLY GIRL	4	09-12-2011 12:50	4.15	12680.0	Fra
541907	581587	23255	CHILDRENS CUTLERY CIRCUS PARADE	4	09-12-2011 12:50	4.15	12680.0	Fra
541908	581587	22138	BAKING SET 9 PIECE RETROSPOT	3	09-12-2011 12:50	4.95	12680.0	Fra

541909 rows × 8 columns

In [8]:

```
df.isna().sum()
```

Out[8]:

```
InvoiceNo      0
StockCode      0
Description    0
Quantity       0
InvoiceDate    0
UnitPrice      0
CustomerID     0
Country        0
dtype: int64
```

In [9]:

```
df.info()
```

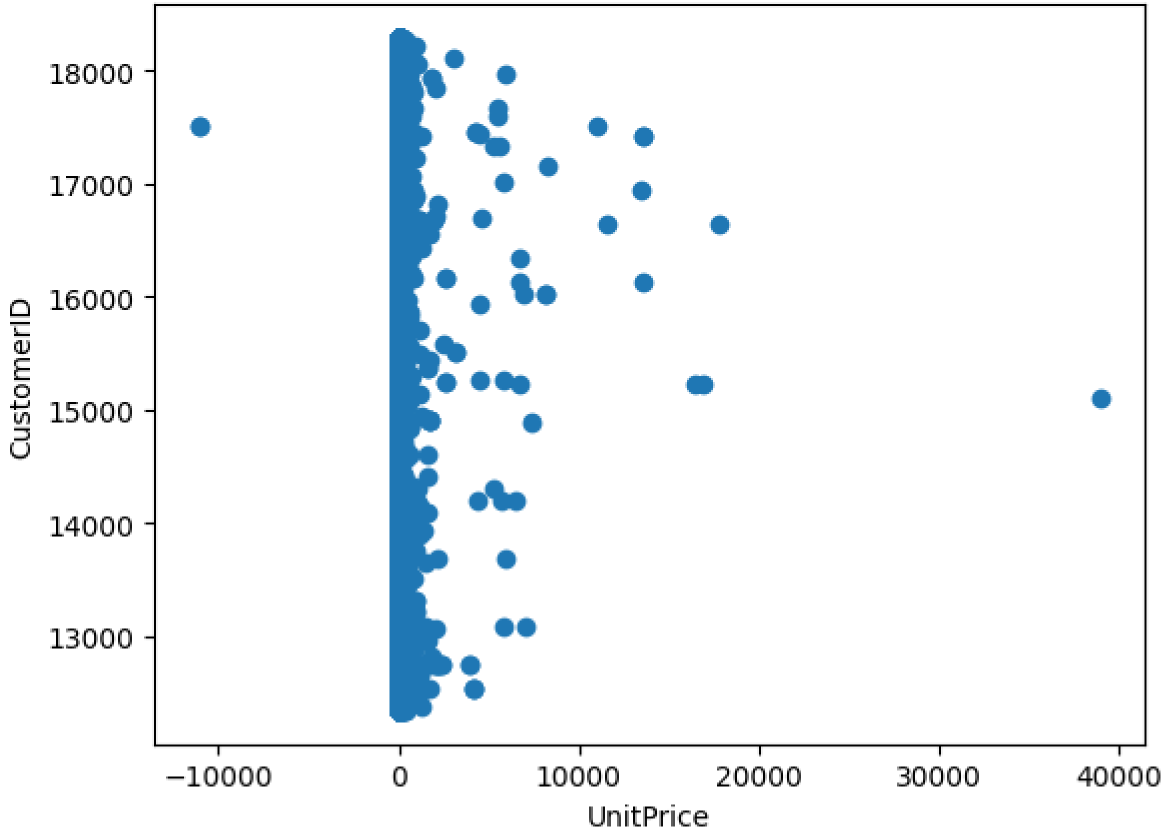
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 541909 entries, 0 to 541908
Data columns (total 8 columns):
 #   Column       Non-Null Count   Dtype  
---  ------       --------------   -----  
 0   InvoiceNo    541909 non-null  object 
 1   StockCode    541909 non-null  object 
 2   Description  541909 non-null  object 
 3   Quantity     541909 non-null  int64  
 4   InvoiceDate  541909 non-null  object 
 5   UnitPrice    541909 non-null  float64
 6   CustomerID   541909 non-null  float64
 7   Country      541909 non-null  object 
dtypes: float64(2), int64(1), object(5)
memory usage: 33.1+ MB
```

In [10]:

```
plt.scatter(df["UnitPrice"],df["CustomerID"])
plt.xlabel("UnitPrice")
plt.ylabel("CustomerID")
```

Out[10]:

```
Text(0, 0.5, 'CustomerID')
```



In [12]:

```
from sklearn.cluster import KMeans
km=KMeans()
km
```

Out[12]:

```
KMeans()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [13]:

```
y_predicted=km.fit_predict(df[["UnitPrice","CustomerID"]])
y_predicted
```

```
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
```

Out[13]:

```
array([5, 5, 5, ..., 1, 1, 1])
```

In [14]:
```
df["cluster"]=y_predicted
df.head()
```

Out[14]:

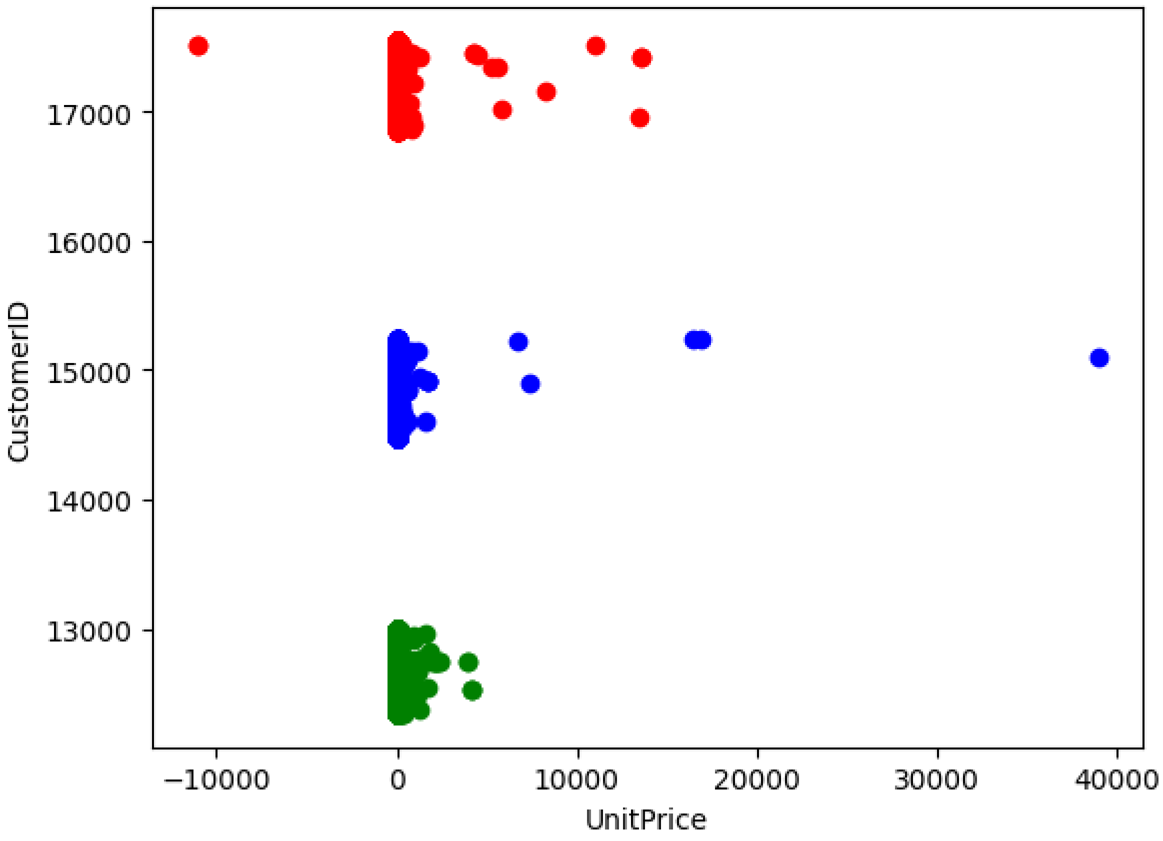
	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cl
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	17850.0	United Kingdom	
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	17850.0	United Kingdom	
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	17850.0	United Kingdom	
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	17850.0	United Kingdom	
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	17850.0	United Kingdom	

In [15]:

```
df1=df[df.cluster==0]
df2=df[df.cluster==1]
df3=df[df.cluster==2]
plt.scatter(df1["UnitPrice"],df1["CustomerID"],color="red")
plt.scatter(df2["UnitPrice"],df2["CustomerID"],color="green")
plt.scatter(df3["UnitPrice"],df3["CustomerID"],color="blue")
plt.xlabel("UnitPrice")
plt.ylabel("CustomerID")
```

Out[15]:

```
Text(0, 0.5, 'CustomerID')
```



In [16]:
```
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler()
scaler.fit(df[["CustomerID"]])
df["CustomerID"]=scaler.transform(df[["CustomerID"]])
df.head()
```

Out[16]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cl
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	0.926443	United Kingdom	
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	0.926443	United Kingdom	
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	0.926443	United Kingdom	
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	0.926443	United Kingdom	
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	0.926443	United Kingdom	

In [17]:

```
scaler.fit(df[["UnitPrice"]])
df["UnitPrice"]=scaler.transform(df[["UnitPrice"]])
df.head()
```

Out[17]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cl
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	0.221150	0.926443	United Kingdom	
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	0.221167	0.926443	United Kingdom	
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	0.221154	0.926443	United Kingdom	
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	0.221167	0.926443	United Kingdom	
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	0.221167	0.926443	United Kingdom	

In [18]:

```
km=KMeans()
```

In [19]:

```
y_predicted=km.fit_predict(df[["UnitPrice","CustomerID"]])
y_predicted
```

```
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
```

Out[19]:

```
array([2, 2, 2, ..., 5, 5, 5])
```

In [20]:

```
df["New Cluster"]=y_predicted
df.head()
```

Out[20]:

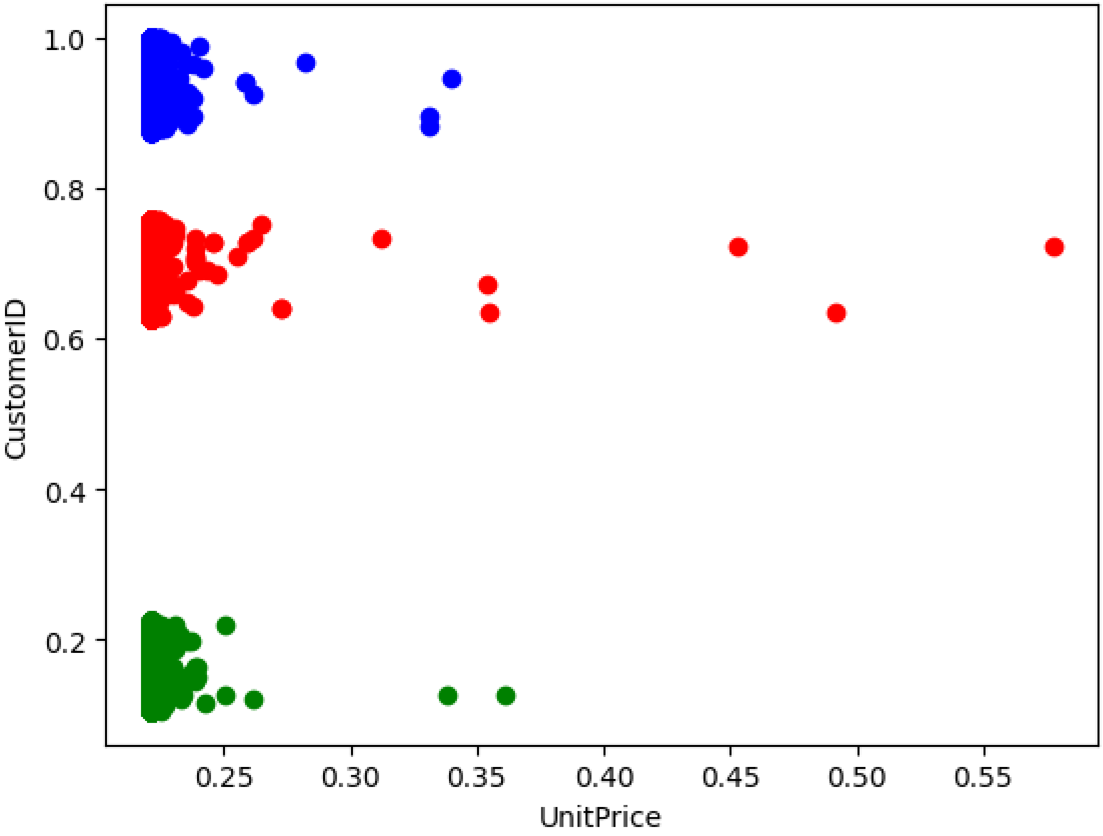
	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cl
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	0.221150	0.926443	United Kingdom	
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	0.221167	0.926443	United Kingdom	
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	0.221154	0.926443	United Kingdom	
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	0.221167	0.926443	United Kingdom	
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	0.221167	0.926443	United Kingdom	

In [21]:

```
df1=df[df["New Cluster"]==0]
df2=df[df["New Cluster"]==1]
df3=df[df["New Cluster"]==2]
plt.scatter(df1["UnitPrice"],df1["CustomerID"],color="r")
plt.scatter(df2["UnitPrice"],df2["CustomerID"],color="green")
plt.scatter(df3["UnitPrice"],df3["CustomerID"],color="blue")
plt.xlabel("UnitPrice")
plt.ylabel("CustomerID")
```

Out[21]:

```
Text(0, 0.5, 'CustomerID')
```



In [22]:

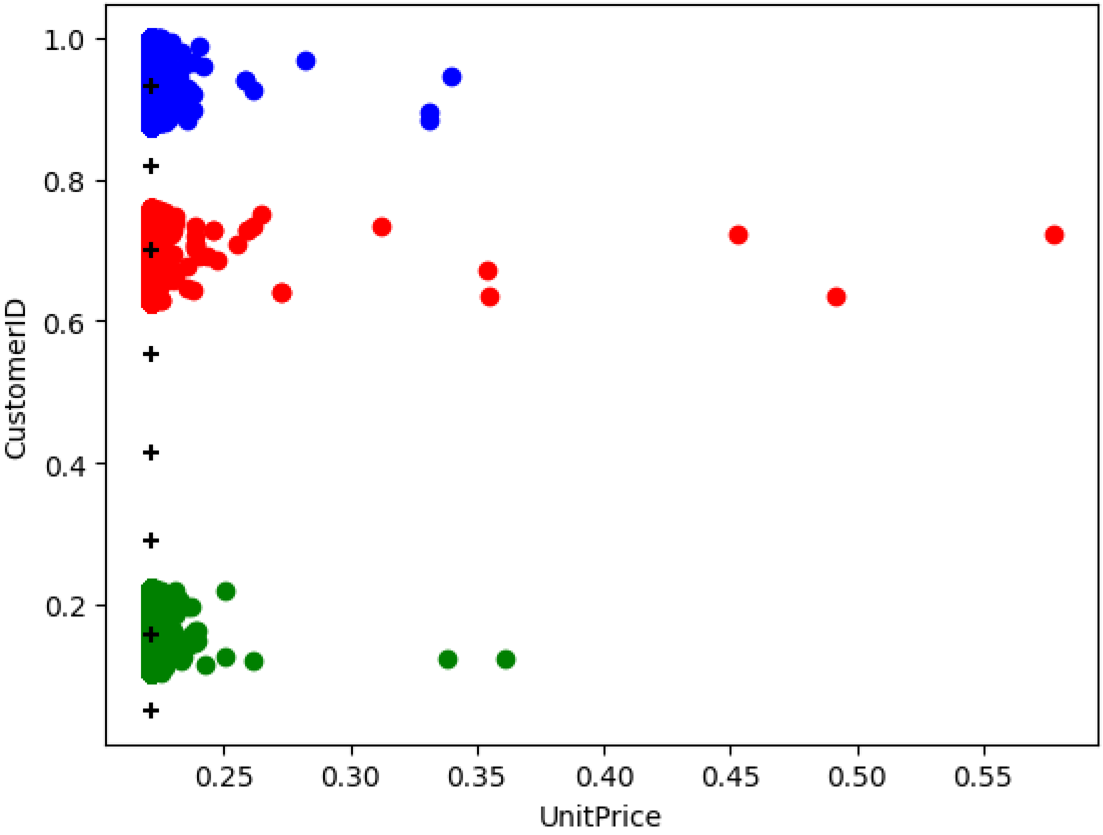
```
km.cluster_centers_
```

Out[22]:

```
array([[0.2211979 , 0.69959256],
       [0.2211822 , 0.15893953],
       [0.2211783 , 0.93299701],
       [0.22118451, 0.41407851],
       [0.22119899, 0.5523978 ],
       [0.22120352, 0.05056666],
       [0.22119949, 0.81774878],
       [0.22119073, 0.28944002]])
```

In [23]:
```
df1=df[df["New Cluster"]==0]
df2=df[df["New Cluster"]==1]
df3=df[df["New Cluster"]==2]
plt.scatter(df1["UnitPrice"],df1["CustomerID"],color="red")
plt.scatter(df2["UnitPrice"],df2["CustomerID"],color="green")
plt.scatter(df3["UnitPrice"],df3["CustomerID"],color="blue")
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color="black",ma
plt.xlabel("UnitPrice")
plt.ylabel("CustomerID")
```

Out[23]:
```
Text(0, 0.5, 'CustomerID')
```



In [24]:

```
k_rng=range(1,10)
sse=[]
for k in k_rng:
    km=KMeans(n_clusters=k)
    km.fit(df[["UnitPrice","CustomerID"]])
    sse.append(km.inertia_) #km.inertia_ will give you the value of sum of squ
print(sse)
plt.plot(k_rng,sse)
plt.xlabel("K")
plt.ylabel("Sum of Squared Error")
```

```
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
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ppress the warning
  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
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l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
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l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
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earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skl
earn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_init` wil
l change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to su
ppress the warning
  warnings.warn(

[46375.89020547866, 11337.110496294004, 4922.070144891326, 2724.563781877139
7, 1696.5129440430824, 1179.5364277462713, 903.6402640978915, 677.89745890048
93, 531.9668573302044]
```
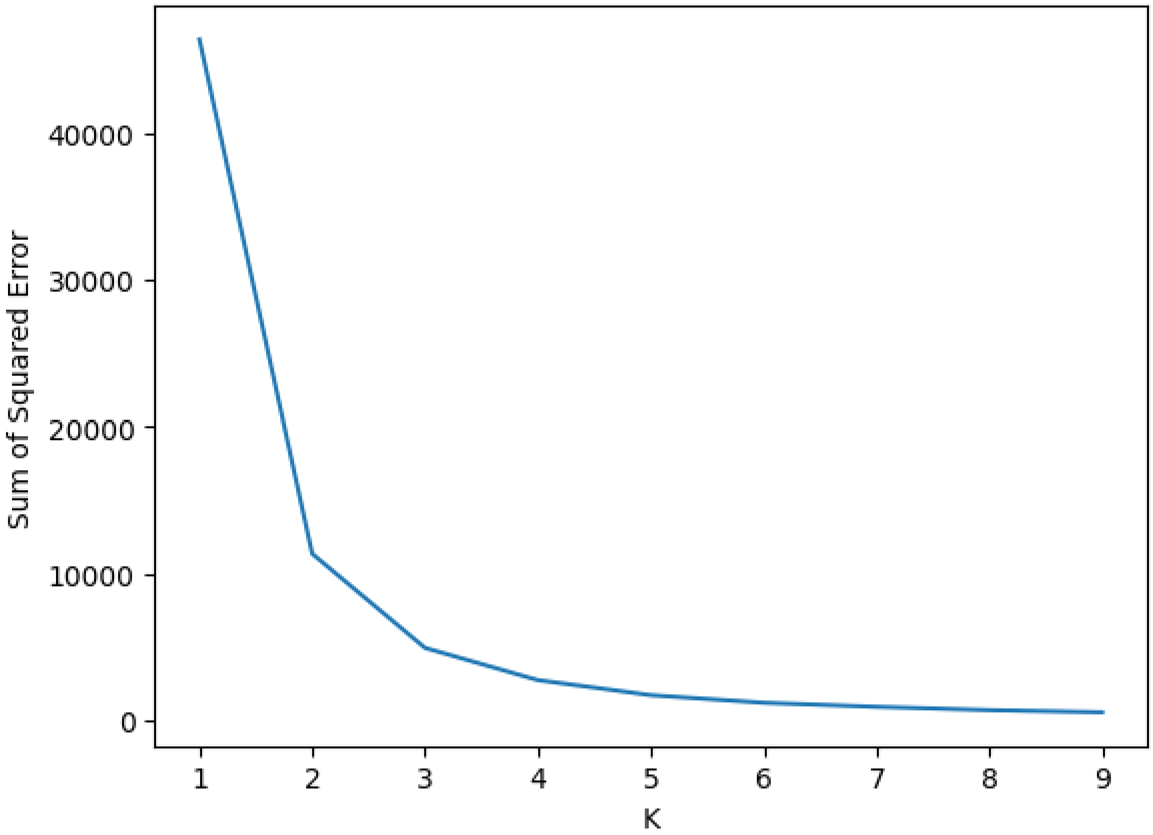

```
Out[24]: Text(0, 0.5, 'Sum of Squared Error')
```



Conclusion:For the above dataset we use K-means Clustering and performed the grouping based on the given data,In the above dataset we will take unit price and customerid based on that we make the clusters. When the K-value is low error rate is more and the K-value is high error rate is very high. So,finally we can Conclude the above dataset is bestfit for K-Means.

In [ ]: