dij4hhssa

July 28, 2023

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

[2]:
```
df=pd.read_csv("/content/6_Salesworkload1.csv")
df
```

[2]:
```
     MonthYear  Time index         Country  StoreID        City  Dept_ID  \
0      10.2016         1.0  United Kingdom  88253.0  London (I)      1.0
1      10.2016         1.0  United Kingdom  88253.0  London (I)      2.0
2      10.2016         1.0  United Kingdom  88253.0  London (I)      3.0
3      10.2016         1.0  United Kingdom  88253.0  London (I)      4.0
4      10.2016         1.0  United Kingdom  88253.0  London (I)      5.0
…          …          …               …        …          …        …
7653   06.2017         9.0          Sweden  29650.0  Gothenburg     12.0
7654   06.2017         9.0          Sweden  29650.0  Gothenburg     16.0
7655   06.2017         9.0          Sweden  29650.0  Gothenburg     11.0
7656   06.2017         9.0          Sweden  29650.0  Gothenburg     17.0
7657   06.2017         9.0          Sweden  29650.0  Gothenburg     18.0

                Dept. Name  HoursOwn  HoursLease  Sales units    Turnover  \
0                      Dry  3184.764         0.0     398560.0   1226244.0
1                   Frozen  1582.941         0.0      82725.0    387810.0
2                    other    47.205         0.0     438400.0    654657.0
3                     Fish  1623.852         0.0     309425.0    499434.0
4     Fruits & Vegetables  1759.173         0.0     165515.0    329397.0
…                       …        …           …           …           …
7653              Checkout  6322.323         0.0    3886530.0  14538825.0
7654     Customer Services  4270.479         0.0        245.0         0.0
7655              Delivery         0         0.0          0.0         0.0
7656                others  2224.929         0.0        245.0         0.0
7657                   all   39652.2         0.0    3886530.0  15056214.0

      Customer  Area (m2) Opening hours
0          NaN     953.04        Type A
1          NaN     720.48        Type A
```

```
2          NaN    966.72        Type A
3          NaN   1053.36        Type A
4          NaN   1053.36        Type A
…        …      …         …
7653       NaN       #NV        Type A
7654       NaN       #NV        Type A
7655       NaN       #NV        Type A
7656       NaN       #NV        Type A
7657       NaN       #NV        Type A

[7658 rows x 14 columns]
```

[3]:
```
df.head()
```

[3]:
```
  MonthYear  Time index         Country  StoreID       City  Dept_ID  \
0   10.2016         1.0  United Kingdom  88253.0  London (I)      1.0
1   10.2016         1.0  United Kingdom  88253.0  London (I)      2.0
2   10.2016         1.0  United Kingdom  88253.0  London (I)      3.0
3   10.2016         1.0  United Kingdom  88253.0  London (I)      4.0
4   10.2016         1.0  United Kingdom  88253.0  London (I)      5.0

            Dept. Name  HoursOwn  HoursLease  Sales units   Turnover  \
0                  Dry  3184.764         0.0     398560.0  1226244.0
1               Frozen  1582.941         0.0      82725.0   387810.0
2                other    47.205         0.0     438400.0   654657.0
3                 Fish  1623.852         0.0     309425.0   499434.0
4  Fruits & Vegetables  1759.173         0.0     165515.0   329397.0

  Customer Area (m2) Opening hours
0       NaN    953.04        Type A
1       NaN    720.48        Type A
2       NaN    966.72        Type A
3       NaN   1053.36        Type A
4       NaN   1053.36        Type A
```

1 DATA CLEANING AND DATA PREPROCESSING

[4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7658 entries, 0 to 7657
Data columns (total 14 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   MonthYear      7658 non-null   object
 1   Time index     7650 non-null   float64
 2   Country        7650 non-null   object
 3   StoreID        7650 non-null   float64
 4   City           7650 non-null   object
 5   Dept_ID        7650 non-null   float64
 6   Dept. Name     7650 non-null   object
 7   HoursOwn       7650 non-null   object
 8   HoursLease     7650 non-null   float64
 9   Sales units    7650 non-null   float64
 10  Turnover       7650 non-null   float64
 11  Customer       0 non-null      float64
 12  Area (m2)      7650 non-null   object
 13  Opening hours  7650 non-null   object
dtypes: float64(7), object(7)
memory usage: 837.7+ KB
```

[5]:
```
df.describe()
```

[5]:
```
        Time index       StoreID      Dept_ID   HoursLease   Sales units  \
count  7650.000000   7650.000000  7650.000000  7650.000000  7.650000e+03
mean      5.000000  61995.220000     9.470588    22.036078  1.076471e+06
std       2.582158  29924.581631     5.337429   133.299513  1.728113e+06
min       1.000000  12227.000000     1.000000     0.000000  0.000000e+00
25%       3.000000  29650.000000     5.000000     0.000000  5.457125e+04
50%       5.000000  75400.500000     9.000000     0.000000  2.932300e+05
75%       7.000000  87703.000000    14.000000     0.000000  9.175075e+05
max       9.000000  98422.000000    18.000000  3984.000000  1.124296e+07

           Turnover  Customer
count  7.650000e+03       0.0
mean   3.721393e+06       NaN
std    6.003380e+06       NaN
min    0.000000e+00       NaN
25%    2.726798e+05       NaN
50%    9.319575e+05       NaN
75%    3.264432e+06       NaN
max    4.271739e+07       NaN
```

[6]:
```
df.columns
```

[6]:
```
Index(['MonthYear', 'Time index', 'Country', 'StoreID', 'City', 'Dept_ID',
       'Dept. Name', 'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Customer', 'Area (m2)', 'Opening hours'],
      dtype='object')
```

[7]:
```
df1=df.fillna(1)
df1
```

[7]:
```
     MonthYear  Time index         Country  StoreID        City  Dept_ID  \
0      10.2016         1.0  United Kingdom  88253.0  London (I)      1.0
1      10.2016         1.0  United Kingdom  88253.0  London (I)      2.0
2      10.2016         1.0  United Kingdom  88253.0  London (I)      3.0
3      10.2016         1.0  United Kingdom  88253.0  London (I)      4.0
4      10.2016         1.0  United Kingdom  88253.0  London (I)      5.0
…          …         …             …        …           …
7653   06.2017         9.0          Sweden  29650.0  Gothenburg     12.0
7654   06.2017         9.0          Sweden  29650.0  Gothenburg     16.0
7655   06.2017         9.0          Sweden  29650.0  Gothenburg     11.0
7656   06.2017         9.0          Sweden  29650.0  Gothenburg     17.0
7657   06.2017         9.0          Sweden  29650.0  Gothenburg     18.0

               Dept. Name  HoursOwn  HoursLease  Sales units    Turnover  \
0                     Dry  3184.764         0.0     398560.0   1226244.0
1                  Frozen  1582.941         0.0      82725.0    387810.0
2                   other    47.205         0.0     438400.0    654657.0
3                    Fish  1623.852         0.0     309425.0    499434.0
4     Fruits & Vegetables  1759.173         0.0     165515.0    329397.0
…                     …       …         …          …          …
7653             Checkout  6322.323         0.0    3886530.0  14538825.0
7654    Customer Services  4270.479         0.0        245.0         0.0
7655             Delivery         0         0.0          0.0         0.0
7656               others  2224.929         0.0        245.0         0.0
7657                  all   39652.2         0.0    3886530.0  15056214.0

      Customer  Area (m2) Opening hours
0          1.0     953.04        Type A
1          1.0     720.48        Type A
2          1.0     966.72        Type A
3          1.0    1053.36        Type A
4          1.0    1053.36        Type A
…          …        …             …
7653       1.0        #NV        Type A
7654       1.0        #NV        Type A
7655       1.0        #NV        Type A
7656       1.0        #NV        Type A
7657       1.0        #NV        Type A

[7658 rows x 14 columns]
```

[8]:
```python
df1=df1.replace('#NV',1)
df1
```

[8]:
```
     MonthYear  Time index         Country  StoreID        City  Dept_ID  \
0      10.2016         1.0  United Kingdom  88253.0  London (I)      1.0
1      10.2016         1.0  United Kingdom  88253.0  London (I)      2.0
```

```
2      10.2016         1.0  United Kingdom  88253.0  London (I)      3.0
3      10.2016         1.0  United Kingdom  88253.0  London (I)      4.0
4      10.2016         1.0  United Kingdom  88253.0  London (I)      5.0
…         …          …             …      …          …      …
7653   06.2017         9.0          Sweden  29650.0  Gothenburg     12.0
7654   06.2017         9.0          Sweden  29650.0  Gothenburg     16.0
7655   06.2017         9.0          Sweden  29650.0  Gothenburg     11.0
7656   06.2017         9.0          Sweden  29650.0  Gothenburg     17.0
7657   06.2017         9.0          Sweden  29650.0  Gothenburg     18.0

               Dept. Name  HoursOwn  HoursLease  Sales units    Turnover  \
0                     Dry  3184.764         0.0     398560.0   1226244.0
1                  Frozen  1582.941         0.0      82725.0    387810.0
2                   other    47.205         0.0     438400.0    654657.0
3                    Fish  1623.852         0.0     309425.0    499434.0
4     Fruits & Vegetables  1759.173         0.0     165515.0    329397.0
…                     …         …          …            …          …
7653             Checkout  6322.323         0.0    3886530.0  14538825.0
7654    Customer Services  4270.479         0.0        245.0         0.0
7655             Delivery         0         0.0          0.0         0.0
7656               others  2224.929         0.0        245.0         0.0
7657                  all   39652.2         0.0    3886530.0  15056214.0

      Customer Area (m2) Opening hours
0          1.0    953.04        Type A
1          1.0    720.48        Type A
2          1.0    966.72        Type A
3          1.0   1053.36        Type A
4          1.0   1053.36        Type A
…         …       …             …
7653       1.0         1        Type A
7654       1.0         1        Type A
7655       1.0         1        Type A
7656       1.0         1        Type A
7657       1.0         1        Type A

[7658 rows x 14 columns]
```

[9]:
```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7658 entries, 0 to 7657
Data columns (total 14 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   MonthYear       7658 non-null   object
 1   Time index      7658 non-null   float64
 2   Country        7658 non-null   object
 3   StoreID        7658 non-null   float64
 4   City           7658 non-null   object
 5   Dept_ID        7658 non-null   float64
 6   Dept. Name     7658 non-null   object
 7   HoursOwn       7658 non-null   object
 8   HoursLease     7658 non-null   float64
 9   Sales units    7658 non-null   float64
 10  Turnover       7658 non-null   float64
 11  Customer       7658 non-null   float64
 12  Area (m2)      7658 non-null   object
 13  Opening hours  7658 non-null   object
dtypes: float64(7), object(7)
memory usage: 837.7+ KB
```

[10]:
```
df1.columns
```

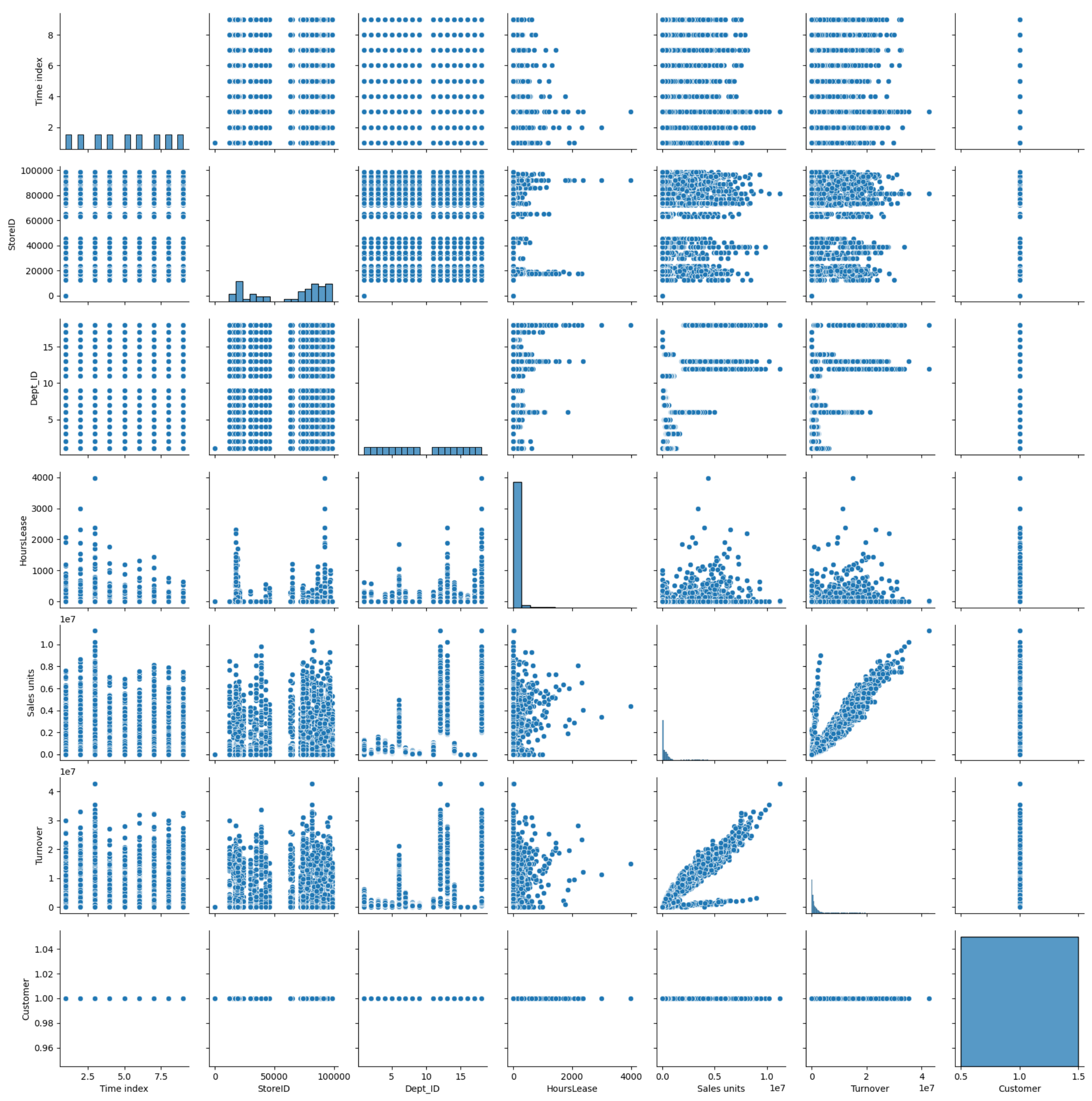
[10]:
```
Index(['MonthYear', 'Time index', 'Country', 'StoreID', 'City', 'Dept_ID',
       'Dept. Name', 'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Customer', 'Area (m2)', 'Opening hours'],
      dtype='object')
```

[11]:
```
df1=df1[[ 'Time index', 'StoreID', 'Dept_ID', 'HoursLease', 'Sales units',␣
 ↪'Turnover','Customer']]
```

2 EDA AND VISUALIZATION

[12]:
```
sns.pairplot(df1)
```

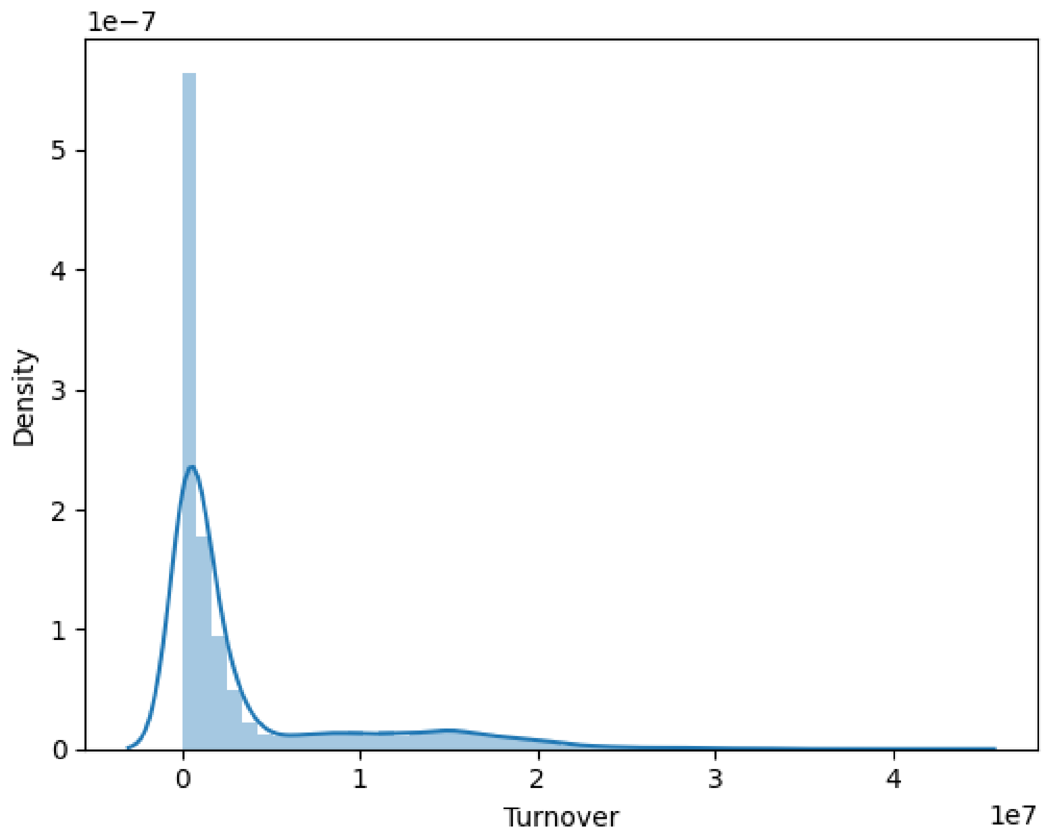
[12]:
```
<seaborn.axisgrid.PairGrid at 0x780cc4253610>
```



```
[13]: sns.distplot(df1['Turnover'])
```

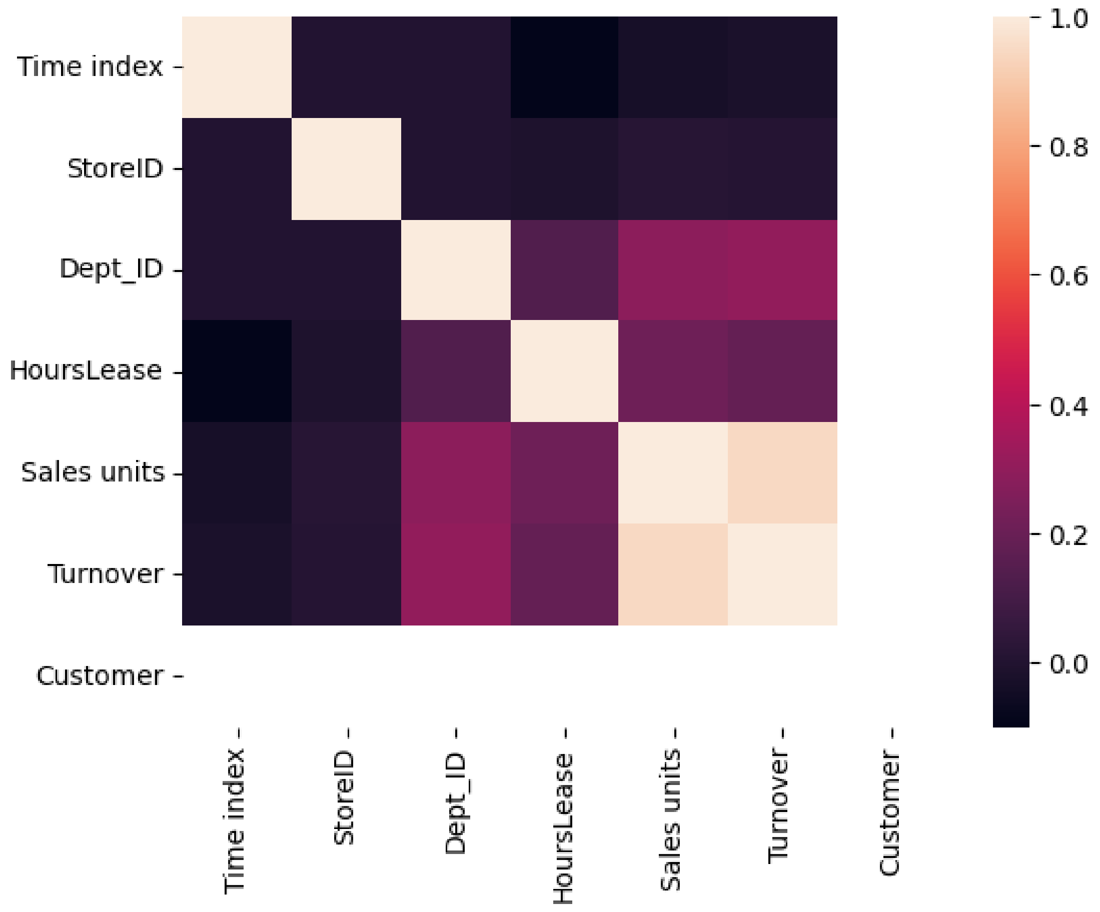
```
<ipython-input-13-098ec87212e1>:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(df1['Turnover'])
```

[13]: <Axes: xlabel='Turnover', ylabel='Density'>



[14]:
```
sns.heatmap(df1.corr())
```

[14]: <Axes: >



3 TO TRAIN THE MODEL AND MODEL BULDING

```
[15]: df1
```

```
[15]:       Time index  StoreID  Dept_ID  HoursLease  Sales units    Turnover  \
      0            1.0  88253.0      1.0         0.0     398560.0   1226244.0
      1            1.0  88253.0      2.0         0.0      82725.0    387810.0
      2            1.0  88253.0      3.0         0.0     438400.0    654657.0
      3            1.0  88253.0      4.0         0.0     309425.0    499434.0
      4            1.0  88253.0      5.0         0.0     165515.0    329397.0
      …              …        …        …           …           …
      7653         9.0  29650.0     12.0         0.0    3886530.0  14538825.0
      7654         9.0  29650.0     16.0         0.0        245.0         0.0
      7655         9.0  29650.0     11.0         0.0          0.0         0.0
      7656         9.0  29650.0     17.0         0.0        245.0         0.0
      7657         9.0  29650.0     18.0         0.0    3886530.0  15056214.0
      Customer
0          1.0
1          1.0
2          1.0
3          1.0
4          1.0
…        …
7653       1.0
7654       1.0
7655       1.0
7656       1.0
7657       1.0

[7658 rows x 7 columns]
```

[16]:
```
x=df1[[ 'Time index', 'StoreID', 'Dept_ID', 'HoursLease', 'Sales␣
 ↪units','Customer']]
y=df1['Turnover']
```

[17]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
```

[18]:
```
from sklearn.linear_model import LinearRegression
lr=LinearRegression()
lr.fit(x_train,y_train)
```

[18]:
```
LinearRegression()
```

[19]:
```
lr.intercept_
```

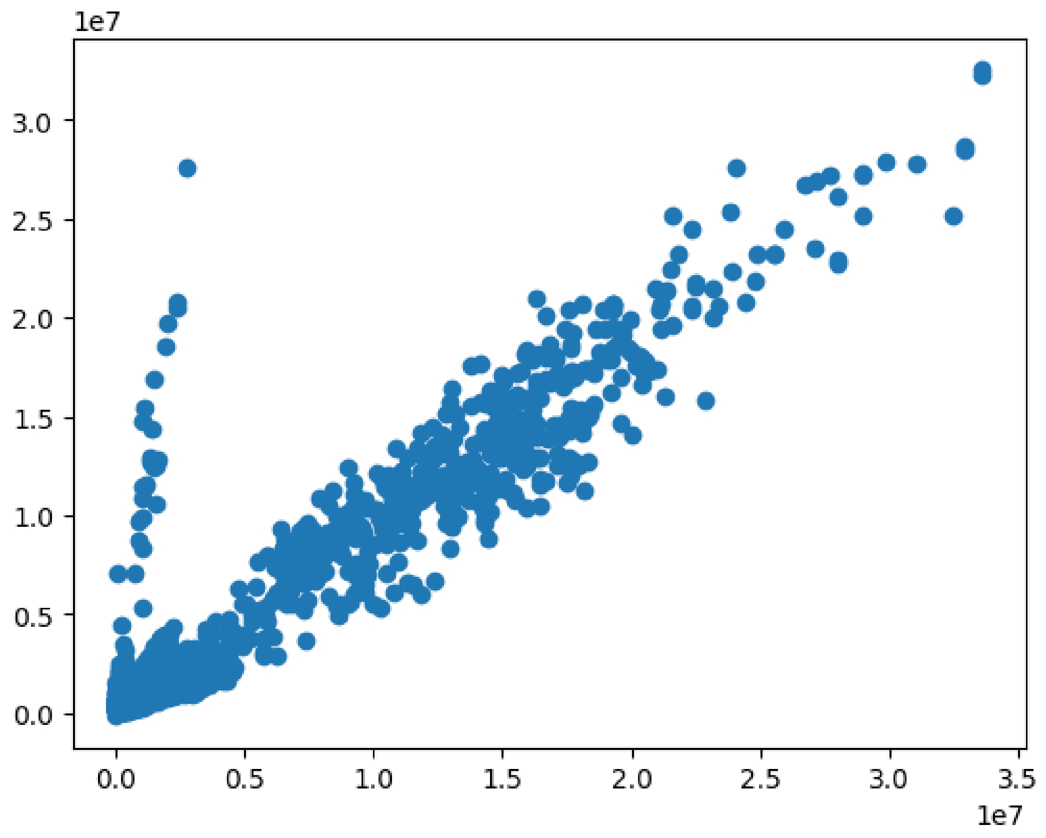
[19]:
```
-202426.9344045776
```

[20]:
```
coeff=pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
coeff
```

[20]:
```
             Co-efficient
Time index   19415.031816
StoreID         -0.565586
Dept_ID      38567.501936
HoursLease    -418.841876
Sales units      3.257696
Customer         0.000000
```

[21]:
```
prediction =lr.predict(x_test)
plt.scatter(y_test,prediction)
```

[21]:
```
<matplotlib.collections.PathCollection at 0x780cba97e6b0>
```



4 ACCURACY

[22]:
```
lr.score(x_test,y_test)
```

[22]:
```
0.9037629017073662
```

[23]:
```
lr.score(x_train,y_train)
```

[23]:
```
0.8968065682458092
```

[24]:
```
from sklearn.linear_model import Ridge,Lasso
rr=Ridge(alpha=10)
rr.fit(x_train,y_train)
```

[24]:
```
Ridge(alpha=10)
```

[25]:
```
rr.score(x_train,y_train)
```

[25]:
```
0.8968065682350416
```

```
[26]: rr.score(x_test,y_test)
```

```
[26]: 0.9037628899678056
```

```
[27]: la=Lasso(alpha=10)
      la.fit(x_train,y_train)
```

```
[27]: Lasso(alpha=10)
```

```
[28]: la.score(x_train,y_train)
```

```
[28]: 0.8968065682452937
```

```
[29]: la.score(x_test,y_test)
```

```
[29]: 0.9037628943044742
```