SUMESH R -20104169

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
```

In [2]:
```
df = pd.read_csv("6_Salesworkload1.csv")
df = df[['MonthYear', 'Time index', 'Country', 'StoreID', 'City', 'Dept_ID',
       'Dept. Name', 'HoursOwn', 'HoursLease', 'Sales units', 'Turnover', 'Area (m2)',
df
```

Out[2]:

	MonthYear	Time index	Country	StoreID	City	Dept_ID	Dept. Name	HoursOwn	HoursLease	
0	10.2016	1.0	United Kingdom	88253.0	London (I)	1.0	Dry	3184.764	0.0	
1	10.2016	1.0	United Kingdom	88253.0	London (I)	2.0	Frozen	1582.941	0.0	
2	10.2016	1.0	United Kingdom	88253.0	London (I)	3.0	other	47.205	0.0	
3	10.2016	1.0	United Kingdom	88253.0	London (I)	4.0	Fish	1623.852	0.0	
4	10.2016	1.0	United Kingdom	88253.0	London (I)	5.0	Fruits & Vegetables	1759.173	0.0	
...	...	...	...	...	...	...	...	...	...	
7653	06.2017	9.0	Sweden	29650.0	Gothenburg	12.0	Checkout	6322.323	0.0	3
7654	06.2017	9.0	Sweden	29650.0	Gothenburg	16.0	Customer Services	4270.479	0.0	
7655	06.2017	9.0	Sweden	29650.0	Gothenburg	11.0	Delivery	0	0.0	
7656	06.2017	9.0	Sweden	29650.0	Gothenburg	17.0	others	2224.929	0.0	
7657	06.2017	9.0	Sweden	29650.0	Gothenburg	18.0	all	39652.2	0.0	3

7650 rows × 13 columns

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

Out[3]:

	MonthYear	Time index	Country	StoreID	City	Dept_ID	Dept. Name	HoursOwn	HoursLease	Sales units
0	10.2016	1.0	United Kingdom	88253.0	London (I)	1.0	Dry	3184.764	0.0	398560.0

	MonthYear	Time index	Country	StoreID	City	Dept_ID	Dept. Name	HoursOwn	HoursLease	Sales units
1	10.2016	1.0	United Kingdom	88253.0	London (I)	2.0	Frozen	1582.941	0.0	82725.0
2	10.2016	1.0	United Kingdom	88253.0	London (I)	3.0	other	47.205	0.0	438400.0
3	10.2016	1.0	United Kingdom	88253.0	London (I)	4.0	Fish	1623.852	0.0	309425.0
4	10.2016	1.0	United Kingdom	88253.0	London (I)	5.0	Fruits & Vegetables	1759.173	0.0	165515.0

Data cleaning and pre processing

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

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7650 entries, 0 to 7657
Data columns (total 13 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   MonthYear      7650 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  Area (m2)      7650 non-null   object 
 12  Opening hours  7650 non-null   object 
dtypes: float64(6), object(7)
memory usage: 836.7+ KB
```

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

Out[5]:

	Time index	StoreID	Dept_ID	HoursLease	Sales units	Turnover
count	7650.000000	7650.000000	7650.000000	7650.000000	7.650000e+03	7.650000e+03
mean	5.000000	61995.220000	9.470588	22.036078	1.076471e+06	3.721393e+06
std	2.582158	29924.581631	5.337429	133.299513	1.728113e+06	6.003380e+06
min	1.000000	12227.000000	1.000000	0.000000	0.000000e+00	0.000000e+00
25%	3.000000	29650.000000	5.000000	0.000000	5.457125e+04	2.726798e+05
50%	5.000000	75400.500000	9.000000	0.000000	2.932300e+05	9.319575e+05
75%	7.000000	87703.000000	14.000000	0.000000	9.175075e+05	3.264432e+06
max	9.000000	98422.000000	18.000000	3984.000000	1.124296e+07	4.271739e+07

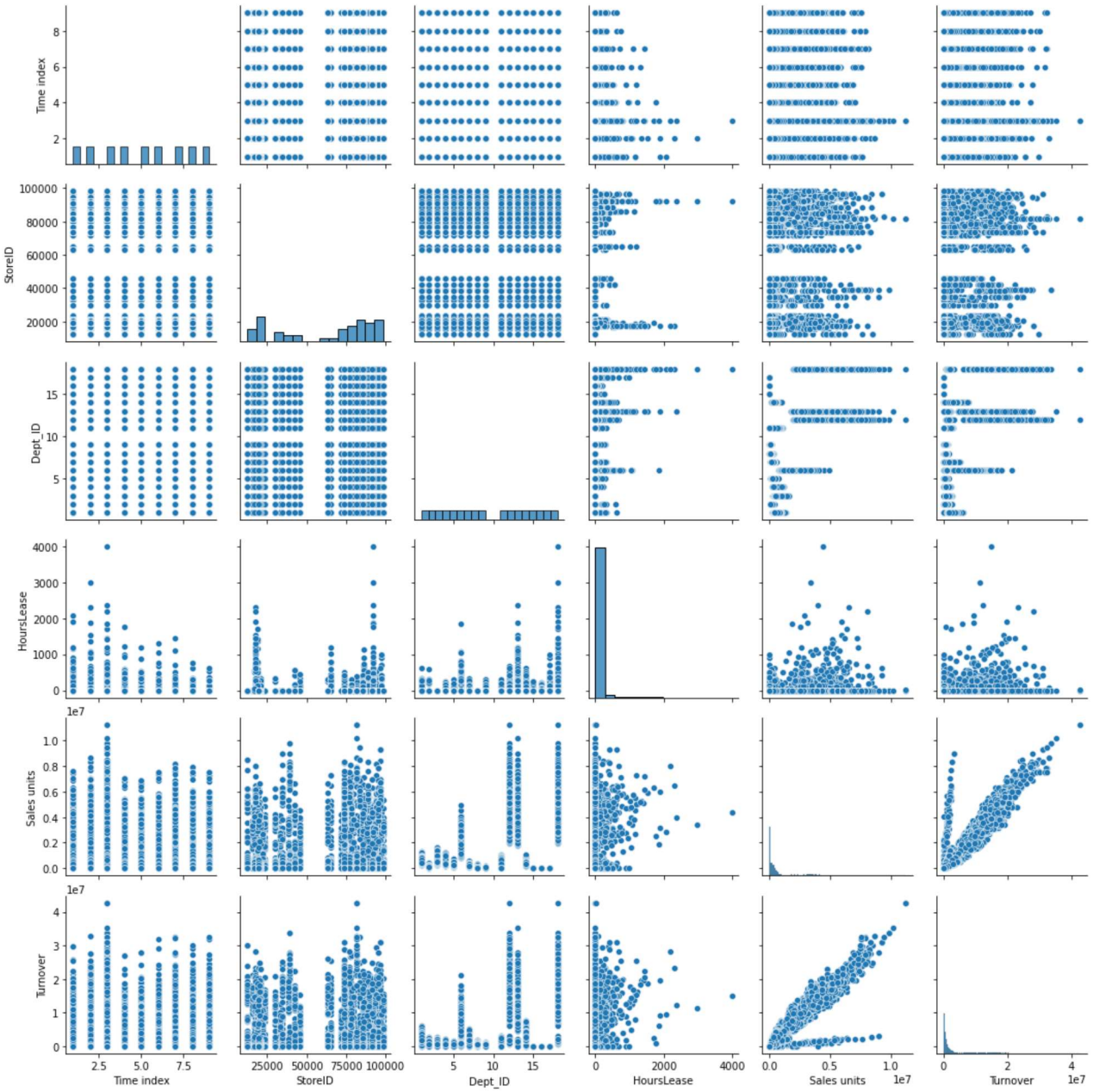
In [6]:
```
df.columns
```

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

EDA and VISUALIZATION

In [7]:
```
sns.pairplot(df)
```

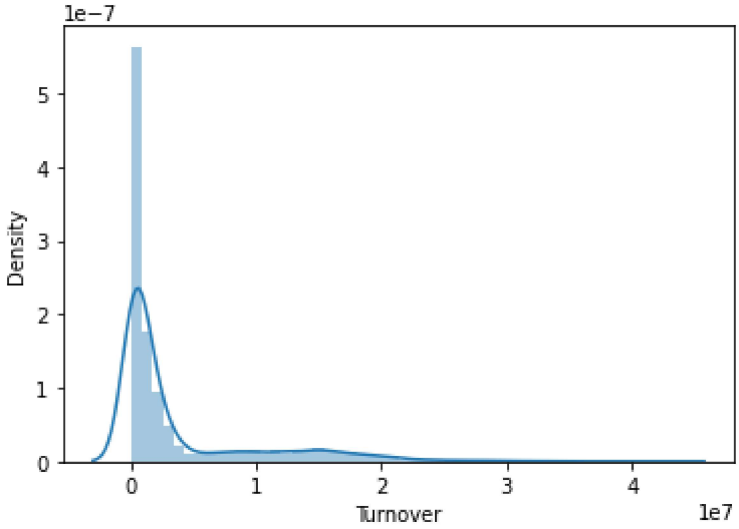
Out[7]:
```
<seaborn.axisgrid.PairGrid at 0x2a8cf9fedc0>
```



In [8]:
```
sns.distplot(df["Turnover"])
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning:
`distplot` is a deprecated function and will be removed in a future version. Please adap
t your code to use either `displot` (a figure-level function with similar flexibility) o
r `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

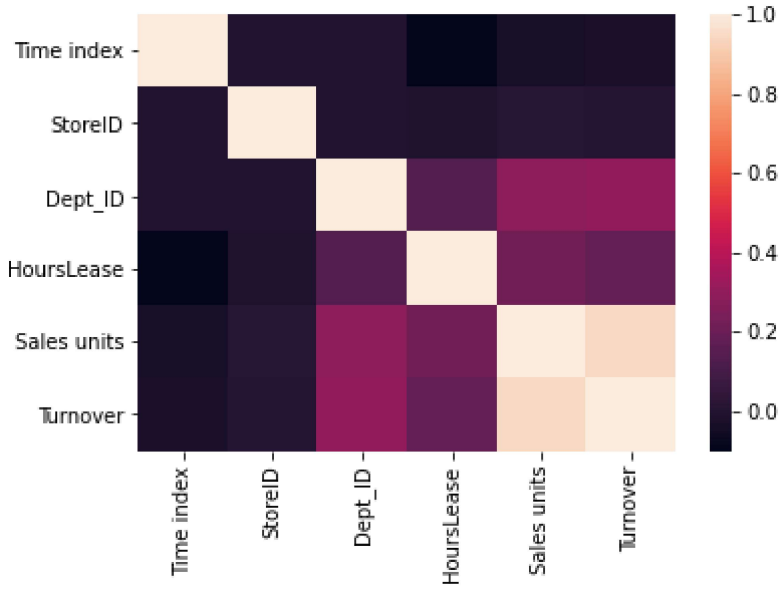
Out[8]: <AxesSubplot:xlabel='Turnover', ylabel='Density'>



In [9]:
```
df1 = df[['MonthYear', 'Time index', 'Country', 'StoreID', 'City', 'Dept_ID',
       'Dept. Name', 'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Area (m2)', 'Opening hours']]
```

In [10]:
```
sns.heatmap(df1.corr())
```

Out[10]: <AxesSubplot:>



In [11]:
```
df1.fillna(1)
```

Out[11]:

	MonthYear	Time index	Country	StoreID	City	Dept_ID	Dept. Name	HoursOwn	HoursLease
0	10.2016	1.0	United Kingdom	88253.0	London (I)	1.0	Dry	3184.764	0.0
1	10.2016	1.0	United Kingdom	88253.0	London (I)	2.0	Frozen	1582.941	0.0

	MonthYear	Time index	Country	StoreID	City	Dept_ID	Dept. Name	HoursOwn	HoursLease	
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3	10.2016	1.0	United Kingdom	88253.0	London (I)	4.0	Fish	1623.852	0.0	
4	10.2016	1.0	United Kingdom	88253.0	London (I)	5.0	Fruits & Vegetables	1759.173	0.0	
...	...	...	...	...	...	...	...	...	...	
7653	06.2017	9.0	Sweden	29650.0	Gothenburg	12.0	Checkout	6322.323	0.0	3
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7656	06.2017	9.0	Sweden	29650.0	Gothenburg	17.0	others	2224.929	0.0	
7657	06.2017	9.0	Sweden	29650.0	Gothenburg	18.0	all	39652.2	0.0	3

7650 rows × 13 columns

In [12]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7650 entries, 0 to 7657
Data columns (total 13 columns):
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 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  Area (m2)      7650 non-null   object 
 12  Opening hours  7650 non-null   object 
dtypes: float64(6), object(7)
memory usage: 836.7+ KB
```

In [13]:
```
x = df1[[ 'Time index', 'StoreID', 'Dept_ID',
        'HoursLease', 'Sales units']]
y = df1['Turnover']
```

split the data into training and test data

In [14]:
```
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.3)
```

In [15]:
```
lr = LinearRegression()
lr.fit(x_train, y_train)
```

Out[15]:
```
LinearRegression()
```

In [16]:
```
lr.intercept_
```

Out[16]:
```
-232128.03611873696
```

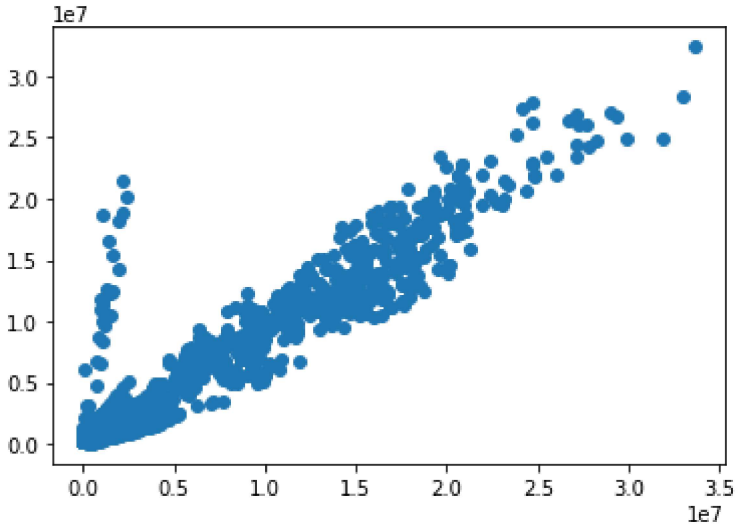
In [17]:
```
coeff = pd.DataFrame(lr.coef_, x.columns, columns =['Co-efficient'])
coeff
```

Out[17]:

	Co-efficient
Time index	25022.645451
StoreID	-0.388014
Dept_ID	36768.421426
HoursLease	-525.132851
Sales units	3.246580

In [18]:
```
prediction = lr.predict(x_test)
plt.scatter(y_test, prediction)
```

Out[18]:
```
<matplotlib.collections.PathCollection at 0x2a8d2b87880>
```



In [19]:
```
lr.score(x_test,y_test)
```

Out[19]:
```
0.912993028532293
```