movies-rating-prediction

January 28, 2024

[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, cross_val_score
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.neighbors import KNeighborsClassifier
import warnings
warnings.filterwarnings("ignore")
```

[2]:
```
df=pd.read_csv(r'Movies.csv')
df
```

[2]:

	Name	Year	Duration	Genre	Rating	Votes	Director	Actor 1	Actor 2
0		NaN	NaN	Drama	NaN	NaN	J.S. Randhawa	Manmauji	Birbal
1	#Gadhvi (He thought he was Gandhi)	-2019.0	109 min	Drama	7.0	8	Gaurav Bakshi	Rasika Dugal	Vivek Ghamande
2	#Homecoming	-2021.0	90 min	Drama, Musical	NaN	NaN	Soumyajit Majumdar	Sayani Gupta	Plabita Borthakur
3	#Yaaram	-2019.0	110 min	Comedy, Romance	4.4	35	Ovais Khan	Prateik	Ishita Raj
4	…And Once Again	-2010.0	105 min	Drama	NaN	NaN	Amol Palekar	Rajat Kapoor	Rituparna Sengupta
…	…	…	…	…	…	…	…	…	…
15504	Zulm Ko Jala Doonga	-1988.0	NaN	Action	4.6	11	Mahendra Shah	Naseeruddin Shah	Sumeet Saigal
15505	Zulmi	-1999.0	129 min	Action, Drama	4.5	655	Kuku Kohli	Akshay Kumar	Twinkle Khanna
15506	Zulmi Raj	-2005.0	NaN	Action	NaN	NaN	Kiran Thej	Sangeeta Tiwari	NaN
15507	Zulmi Shikari	-1988.0	NaN	Action					
15508	Zulm-O-Sitam	-1998.0	130 min	Action, Drama					

```
15507     NaN   NaN                 NaN               NaN                  NaN
15508     6.2    20       K.C. Bokadia       Dharmendra          Jaya Prada

                Actor 3
0       Rajendra Bhatia
1         Arvind Jangid
2            Roy Angana
3       Siddhant Kapoor
4           Antara Mali
…                   …
15504     Suparna Anand
15505       Aruna Irani
15506               NaN
15507               NaN
15508       Arjun Sarja

[15509 rows x 10 columns]
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15509 entries, 0 to 15508
Data columns (total 10 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Name      15509 non-null  object
 1   Year      14981 non-null  float64
 2   Duration  7240 non-null   object
 3   Genre     13632 non-null  object
 4   Rating    7919 non-null   float64
 5   Votes     7920 non-null   object
 6   Director  14984 non-null  object
 7   Actor 1   13892 non-null  object
 8   Actor 2   13125 non-null  object
 9   Actor 3   12365 non-null  object
dtypes: float64(2), object(8)
memory usage: 1.2+ MB
```

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

[4]:
```
                Year       Rating
count  14981.000000  7919.000000
mean   -1987.012215     5.841621
std       25.416689     1.381777
min    -2022.000000     1.100000
25%    -2009.000000     4.900000
50%    -1991.000000     6.000000
```

```
75%    -1968.000000     6.800000
max    -1913.000000    10.000000
```

[5]:
```
df.isnull().sum()
```

[5]:
```
Name           0
Year         528
Duration    8269
Genre       1877
Rating      7590
Votes       7589
Director     525
Actor 1     1617
Actor 2     2384
Actor 3     3144
dtype: int64
```

[6]:
```
df.dropna(inplace=True)
```

[7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 5659 entries, 1 to 15508
Data columns (total 10 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Name      5659 non-null   object
 1   Year      5659 non-null   float64
 2   Duration  5659 non-null   object
 3   Genre     5659 non-null   object
 4   Rating    5659 non-null   float64
 5   Votes     5659 non-null   object
 6   Director  5659 non-null   object
 7   Actor 1   5659 non-null   object
 8   Actor 2   5659 non-null   object
 9   Actor 3   5659 non-null   object
dtypes: float64(2), object(8)
memory usage: 486.3+ KB
```

[8]:
```
obj=df.select_dtypes(['object'])
obj
```

[8]:
```
                                    Name Duration                      Genre  \
1      #Gadhvi (He thought he was Gandhi)  109 min                      Drama
3                                 #Yaaram  110 min            Comedy, Romance
5                    …Aur Pyaar Ho Gaya  147 min     Comedy, Drama, Musical
6                                …Yahaan  142 min        Drama, Romance, War
```

```
8                      ?: A Question Mark   82 min  Horror, Mystery, Thriller
…                                     …      …                          …
15493                             Zubaan  115 min                      Drama
15494                           Zubeidaa  153 min  Biography, Drama, History
15503                 Zulm Ki Zanjeer  125 min       Action, Crime, Drama
15505                           Zulmi  129 min              Action, Drama
15508                      Zulm-O-Sitam  130 min              Action, Drama

       Votes         Director          Actor 1                Actor 2  \
1          8    Gaurav Bakshi     Rasika Dugal          Vivek Ghamande
3         35       Ovais Khan          Prateik              Ishita Raj
5        827     Rahul Rawail       Bobby Deol  Aishwarya Rai Bachchan
6      1,086   Shoojit Sircar  Jimmy Sheirgill          Minissha Lamba
8        326    Allyson Patel        Yash Dave          Muntazir Ahmad
…        …              …                …                       …
15493    408      Mozez Singh    Vicky Kaushal         Sarah Jane Dias
15494  1,496    Shyam Benegal   Karisma Kapoor                   Rekha
15503     44  S.P. Muthuraman      Chiranjeevi              Jayamalini
15505    655       Kuku Kohli     Akshay Kumar          Twinkle Khanna
15508     20     K.C. Bokadia       Dharmendra              Jaya Prada

                Actor 3
1          Arvind Jangid
3        Siddhant Kapoor
5          Shammi Kapoor
6         Yashpal Sharma
8           Kiran Bhatia
…                    …
15493  Raaghavv Chanana
15494    Manoj Bajpayee
15503       Rajinikanth
15505       Aruna Irani
15508       Arjun Sarja

[5659 rows x 8 columns]
```

[9]:
```
num=df.select_dtypes(['int','float64'])
num
```

[9]:
```
          Year  Rating
1     -2019.0     7.0
3     -2019.0     4.4
5     -1997.0     4.7
6     -2005.0     7.4
8     -2012.0     5.6
…        …      …
15493 -2015.0     6.1
```

```
15494 -2001.0     6.2
15503 -1989.0     5.8
15505 -1999.0     4.5
15508 -1998.0     6.2

[5659 rows x 2 columns]
```

Label Encoding

[10]:
```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

[11]:
```
for i in obj:
    obj[i]=le.fit_transform(obj[i])
obj
```

[11]:

	Name	Duration	Genre	Votes	Director	Actor 1	Actor 2	Actor 3
1	0	9	229	1843	629	1352	2272	319
3	1	10	184	1165	1335	1198	719	2148
5	3	47	157	1892	1530	378	75	2045
6	4	42	289	36	2044	692	1112	2524
8	76	156	320	1134	135	1934	1175	1013
…	…	…	…	…	…	…	…	…
15493	5380	15	229	1312	1223	1861	1801	1615
15494	5381	53	133	182	2059	763	1619	1184
15503	5382	25	28	1348	1793	406	754	1685
15505	5384	29	38	1681	1025	112	2164	314
15508	5383	30	38	793	895	468	753	303

[5659 rows x 8 columns]

[12]:
```
df_new=pd.concat([num,obj],axis=1)
df_new
```

[12]:

	Year	Rating	Name	Duration	Genre	Votes	Director	Actor 1	\
1	-2019.0	7.0	0	9	229	1843	629	1352	
3	-2019.0	4.4	1	10	184	1165	1335	1198	
5	-1997.0	4.7	3	47	157	1892	1530	378	
6	-2005.0	7.4	4	42	289	36	2044	692	
8	-2012.0	5.6	76	156	320	1134	135	1934	
…	…	…	…	…	…	…	…	…	
15493	-2015.0	6.1	5380	15	229	1312	1223	1861	
15494	-2001.0	6.2	5381	53	133	182	2059	763	
15503	-1989.0	5.8	5382	25	28	1348	1793	406	
15505	-1999.0	4.5	5384	29	38	1681	1025	112	
15508	-1998.0	6.2	5383	30	38	793	895	468	

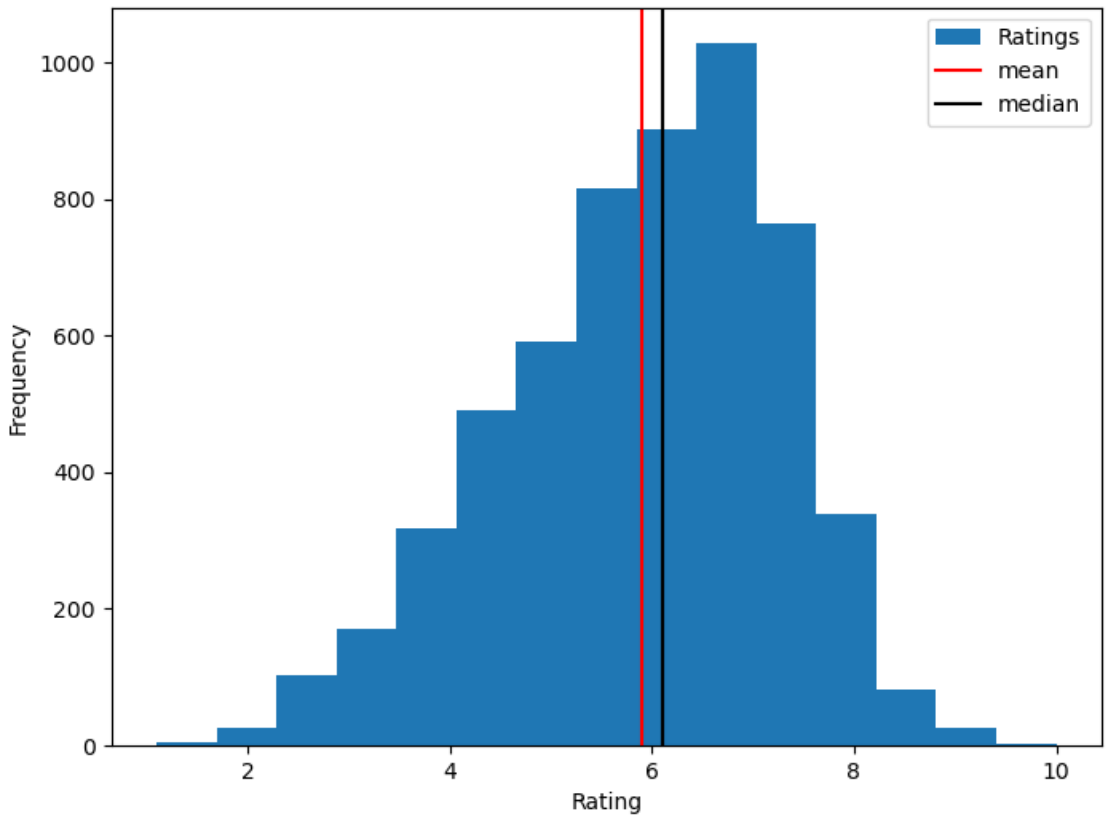
```
       Actor 2  Actor 3
1         2272      319
3          719     2148
5           75     2045
6         1112     2524
8         1175     1013
…          …        …
15493     1801     1615
15494     1619     1184
15503      754     1685
15505     2164      314
15508      753      303

[5659 rows x 10 columns]
```

[13]:
```
df_new.drop(['Year'],axis=1,inplace=True)
```

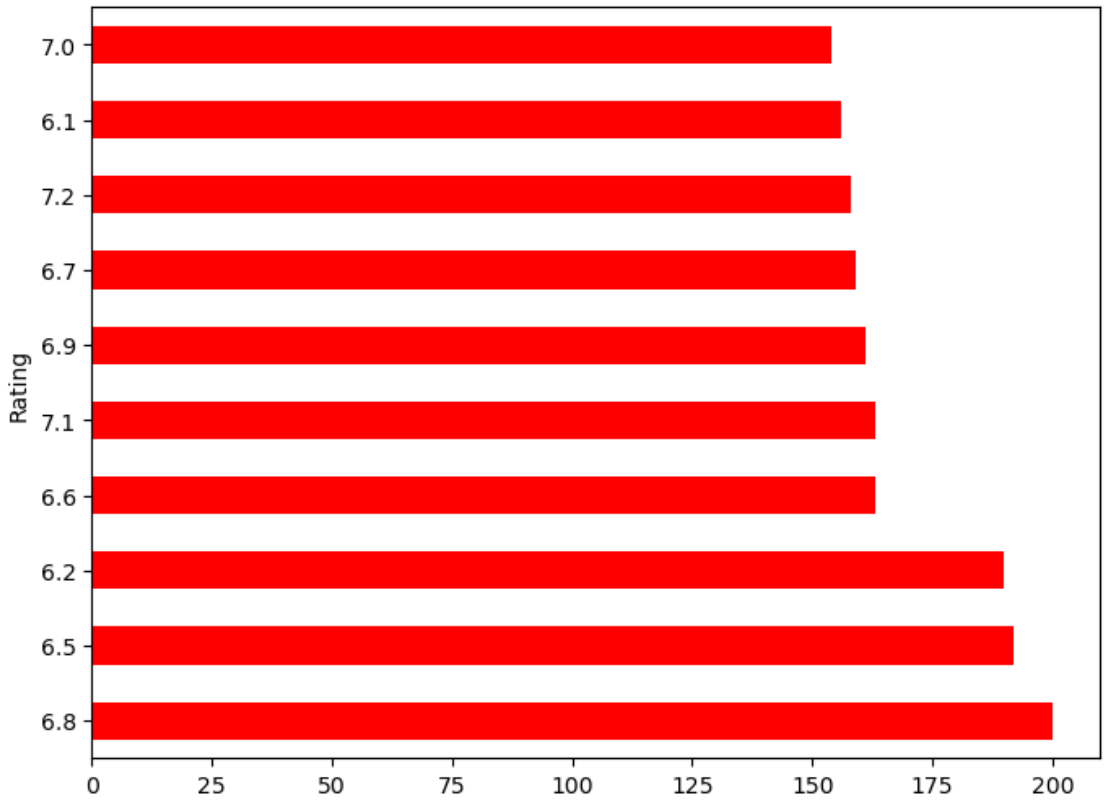
[14]:
```
df_new.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 5659 entries, 1 to 15508
Data columns (total 9 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Rating    5659 non-null   float64
 1   Name      5659 non-null   int32
 2   Duration  5659 non-null   int32
 3   Genre     5659 non-null   int32
 4   Votes     5659 non-null   int32
 5   Director  5659 non-null   int32
 6   Actor 1   5659 non-null   int32
 7   Actor 2   5659 non-null   int32
 8   Actor 3   5659 non-null   int32
dtypes: float64(1), int32(8)
memory usage: 265.3 KB
```

[15]:
```
plt.figure(figsize=(8,6))
plt.hist(df_new['Rating'],bins=15,label='Ratings')
plt.xlabel('Rating')
plt.ylabel('Frequency')
plt.axvline(df_new['Rating'].mean(),color='red',label='mean')
plt.axvline(df_new['Rating'].median(),color='black',label='median')
plt.legend()
plt.show()
```



[16]:
```
plt.figure(figsize=(8,6))
df_new['Rating'].value_counts().head(10).plot(kind='barh', color='red')
plt.show()
```



[17]:
```
df_new.corr()
```

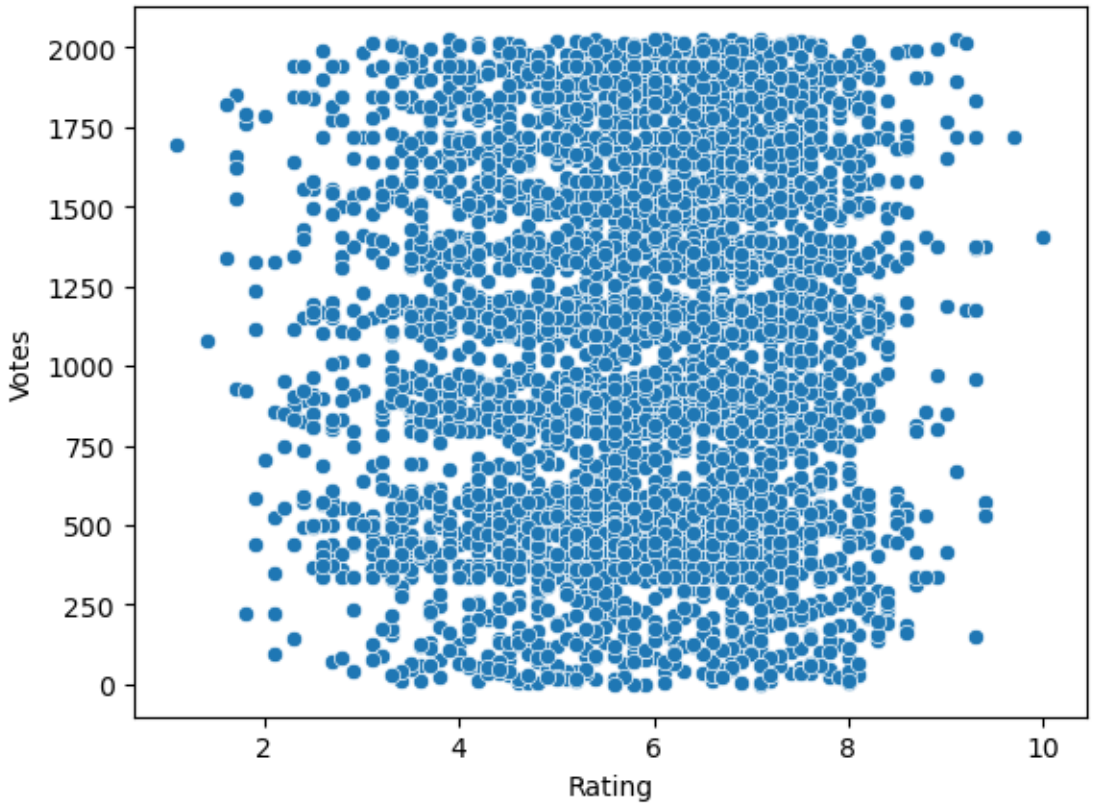
[17]:

	Rating	Name	Duration	Genre	Votes	Director	Actor 1	Actor 2	Actor 3
Rating	1.000000	0.000771	0.078761	0.121796	0.040630	-0.006824	0.023430	0.041353	0.042413
Name	0.000771	1.000000	-0.000381	0.007046	-0.001721	-0.008213	0.022061	0.002465	0.004073
Duration	0.078761	-0.000381	1.000000	0.021134	-0.013365	-0.001212	-0.016749	0.010311	-0.027461
Genre	0.121796	0.007046	0.021134	1.000000	-0.001320	-0.017921	0.042745	0.028168	0.007474
Votes	0.040630	-0.001721	-0.013365	-0.001320	1.000000	0.028163	-0.001337	0.000050	-0.019281
Director	-0.006824	-0.008213	-0.001212	-0.017921	0.028163	1.000000	0.022918	0.018039	0.017915
Actor 1	0.023430	0.022061	-0.016749	0.042745	-0.001337	0.022918	1.000000	-0.000642	0.013170

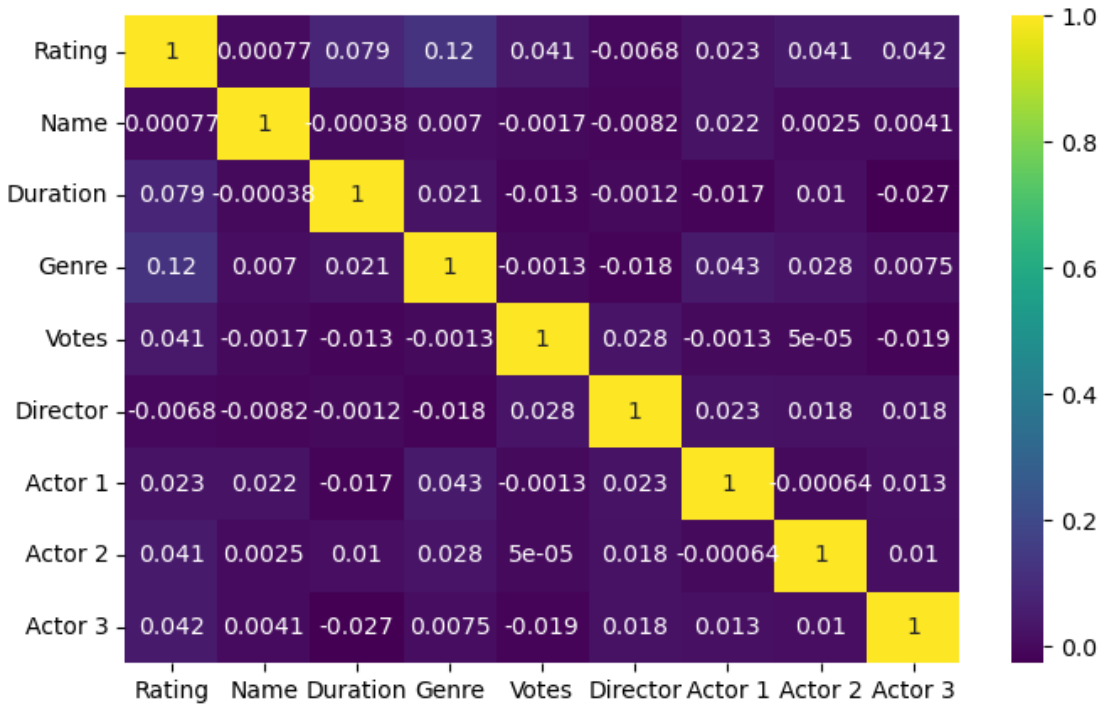
```
Actor 2   -0.000642   1.000000   0.010439
Actor 3    0.013170   0.010439   1.000000
```

[18]:
```
sns.scatterplot(data=df_new,x='Rating', y='Votes')
```

[18]:
```
<Axes: xlabel='Rating', ylabel='Votes'>
```



[41]:
```
plt.figure(figsize=(8,5))
sns.heatmap(df_new.corr(),annot=True,cmap='viridis')
plt.show()
```



Data Scaling

[20]:
```
x=df_new[['Genre','Duration','Votes','Director','Actor 1','Actor 2','Actor 3']]
y=df_new['Rating']
```

[21]:
```
x
```

[21]:

	Genre	Duration	Votes	Director	Actor 1	Actor 2	Actor 3
1	229	9	1843	629	1352	2272	319
3	184	10	1165	1335	1198	719	2148
5	157	47	1892	1530	378	75	2045
6	289	42	36	2044	692	1112	2524
8	320	156	1134	135	1934	1175	1013
…	…	…	…	…	…	…	…
15493	229	15	1312	1223	1861	1801	1615
15494	133	53	182	2059	763	1619	1184
15503	28	25	1348	1793	406	754	1685
15505	38	29	1681	1025	112	2164	314
15508	38	30	793	895	468	753	303

[5659 rows x 7 columns]

[22]:
```
y
```

[22]:
```
1        7.0
3        4.4
5        4.7
6        7.4
8        5.6
        …
15493    6.1
15494    6.2
15503    5.8
15505    4.5
15508    6.2
Name: Rating, Length: 5659, dtype: float64
```

[23]:
```
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
```

[24]:
```
std=sc.fit_transform(x)
```

[25]:
```
print(std)
```

```
[[ 0.52931791 -0.99753391  1.43549689 …  0.6816723   1.63359215
  -1.32934107]
 [ 0.11341838 -0.97302839  0.20375098 …  0.40902916 -0.69552904
   1.21099562]
 [-0.13612133 -0.06632385  1.52451688 … -1.04270705 -1.66137196
   1.06793675]
 …
 [-1.32836665 -0.60544547  0.53621337 … -0.99313557 -0.64303758
   0.56792515]
 [-1.23594453 -0.50742335  1.14118592 … -1.51363611  1.47161849
  -1.33628568]
 [-1.23594453 -0.48291783 -0.47207421 … -0.88337015 -0.64453734
  -1.35156381]]
```

[26]:
```
x=std
```

[27]:
```
x
```

[27]:
```
array([[ 0.52931791, -0.99753391,  1.43549689, …,  0.6816723 ,
         1.63359215, -1.32934107],
       [ 0.11341838, -0.97302839,  0.20375098, …,  0.40902916,
        -0.69552904,  1.21099562],
       [-0.13612133, -0.06632385,  1.52451688, …, -1.04270705,
        -1.66137196,  1.06793675],
       …,
       [-1.32836665, -0.60544547,  0.53621337, …, -0.99313557,
        -0.64303758,  0.56792515],
```

```
       [-1.23594453, -0.50742335,  1.14118592, …, -1.51363611,
         1.47161849, -1.33628568],
       [-1.23594453, -0.48291783, -0.47207421, …, -0.88337015,
        -0.64453734, -1.35156381]])
```

[28]:
```
from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.25,random_state=1)
```

[29]:
```
print(x.shape,xtrain.shape,xtest.shape)
```

```
(5659, 7) (4244, 7) (1415, 7)
```

[ ]:
```

```

Model Building

[30]:
```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error,mean_squared_error,r2_score,␣
 ↪classification_report, accuracy_score
linreg=LinearRegression()
linreg.fit(xtrain,ytrain)
ypred=linreg.predict(xtest)
mae = mean_absolute_error(ytest,ypred)
mse = mean_squared_error(ytest,ypred)
r2 = r2_score(ytest,ypred)
RMSE_test=(np.sqrt(mse))
print("RMSE TestData = ",str(RMSE_test))
print('-'*45)
print('RSquared value on test:',linreg.score(xtest, ytest))
print('-'*45)
print(f"MAE:- {mae}\nMSE:- {mse}\nAccuracy :- {r2}")
```

```
RMSE TestData =  1.3529212746502624
---------------------------------------------
RSquared value on test: 0.023116283933336534
---------------------------------------------
MAE:- 1.0872814162543032
MSE:- 1.8303959754012906
Accuracy :- 0.023116283933336534
```

[31]:
```
errors=abs(ypred-ytest)
mape= (errors/ytest)*100
accuracy=100-np.mean(mape)
print('Linreg Accuracy : ',round(accuracy,2),'%')
```

```
Linreg Accuracy :  77.55 %
```

Decision Tree

[ ]:

[32]:
```
from sklearn.tree import DecisionTreeRegressor
DT=DecisionTreeRegressor(max_depth=9)
DT.fit(xtrain,ytrain)
ypred1=DT.predict(xtest)
mae1 = mean_absolute_error(ytest,ypred1)
mse1 = mean_squared_error(ytest,ypred1)
RMSE_test=(np.sqrt(mse1))
print("RMSE TestData = ",str(RMSE_test))
print('-'*45)
print('RSquared value on test:',DT.score(xtest, ytest))
print('-'*45)
print(f"MAE:- {mae1}\n MSE:- {mse1}")
```

```
RMSE TestData =  1.469279533496292
---------------------------------------------
RSquared value on test: -0.15214377118179123
---------------------------------------------
MAE:- 1.1336897308854395
 MSE:- 2.1587823475510817
```

[33]:
```
errors=abs(ypred1-ytest)
mape= (errors/ytest)*100
accuracy1=100-np.mean(mape)
print('DT Accuracy : ',round(accuracy1,2),'%')
```

```
DT Accuracy :  76.91 %
```

RandomForest

[34]:
```
from sklearn.ensemble import RandomForestRegressor
RF=RandomForestRegressor()
RF.fit(xtrain,ytrain)
ypred2=RF.predict(xtest)
mae2 = mean_absolute_error(ytest,ypred2)
mse2 = mean_squared_error(ytest,ypred2)
RMSE_test=(np.sqrt(mse2))
print("RMSE TestData = ",str(RMSE_test))
print('-'*45)
print('RSquared value on test:',RF.score(xtest, ytest))
print('-'*45)
print(f"MAE:- {mae2}\n MSE:- {mse2}")
```

```
RMSE TestData =  1.3107508788595548
---------------------------------------------
RSquared value on test: 0.08306588062401354
---------------------------------------------
```

```
MAE:- 1.0337505300353358
 MSE:- 1.7180678664310953
```

[35]:
```
errors=abs(ypred2-ytest)
mape= (errors/ytest)*100
accuracy2=100-np.mean(mape)
print('RF Accuracy : ',round(accuracy2,2),'%')
```

```
RF Accuracy :  78.86 %
```

[ ]:
```

```

[36]:
```
from sklearn.linear_model import LassoCV
lasso = LassoCV(cv=10).fit(xtrain, ytrain)
ypred3=lasso.predict(xtest)
mae3 = mean_absolute_error(ytest,ypred3)
mse3 = mean_squared_error(ytest,ypred3)
RMSE_test=(np.sqrt(mse3))
print("RMSE TestData = ",str(RMSE_test))
print('-'*50)
print('RSquared value on test:',lasso.score(xtest, ytest))
print('-'*50)
print(f"MAE:- {mae3}\n MSE:- {mse3}")
```

```
RMSE TestData =  1.353304360147412
--------------------------------------------------
RSquared value on test: 0.02256298793089051
--------------------------------------------------
MAE:- 1.0879472530085716
 MSE:- 1.831432691193996
```

[37]:
```
errors=abs(ypred3-ytest)
mape= (errors/ytest)*100
accuracy3=100-np.mean(mape)
print('Lasso Accuracy : ',round(accuracy3,2),'%')
```

```
Lasso Accuracy :  77.54 %
```

Create Dataframe

[38]:
```
Newdf=pd.DataFrame({'Model':('Linear regression','Decision Tree','Random␣
 ↪Forest','Lasso'),'Accuracy':(accuracy,accuracy1,accuracy2,accuracy3)})
Newdf
```

[38]:

	Model	Accuracy
0	Linear regression	77.552911
1	Decision Tree	76.906344
2	Random Forest	78.860096
3	Lasso	77.537172

From the following we can get the best accuracy and We can find Random Forest as best Model to implement