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Indian movies IMDb rating predictions using Machine Learning Model.

Problem Statement – The prediction of success of movie with good accuracy is needed in the film industry which helps different people working in the film industry manly for the investors.

The aim of this project is to create a movie rating prediction system which will predict a rating of the movie which will use to determine that should he gives his time on a particular movie or should go for any other movie. Instead of getting a review from a particular person, we will provide it by using algorithms of machine learning and dataset from previous experience of users.

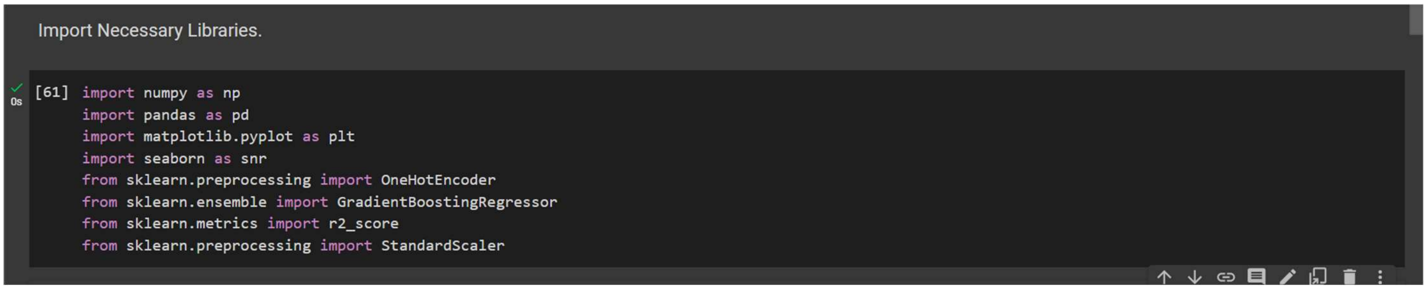
Steps to be taken in the Project is sub-divided into the following sections. These are:

- Loading necessary libraries such as numpy , pandas , sklearn etc.
- Loading the dataset as CSV file and showing first 10 rows.
- Calculate statistical values and round them up to 3 decimal places.
- Checking for null values and return their sum of numbers of true values in each column.
- Drop all the null values from data.
- Extracting all information about data.
- Checking Shape of Data.
- Replacing string values available in column values by changing their datatypes.
- Checking for the null values in dataset.
- Drop the unnecessary columns from dataset.
- Visualization of Sales by different source of Indian movies IMDb data using Python data visualization.
- Data preprocessing or (Data cleaning) performed by the one hot encoding in this process we change categorical data into numerical data and the technique is called feature Engineering.
- Splitting the cleaned data into dependent and independent variables.
- Splitting the data into train and test sets with train_test_split using sklearn library.
- Import different kind of Regression Models and Train that model with the help of .fit().
- Predicting the trained models and then checking their accuracy of the model using accuracy score.
- Then recall the train_test_split and split the data into training and testing set

with different models.

- Then predicting the trained models and checking the accuracy of model and print the accuracy.

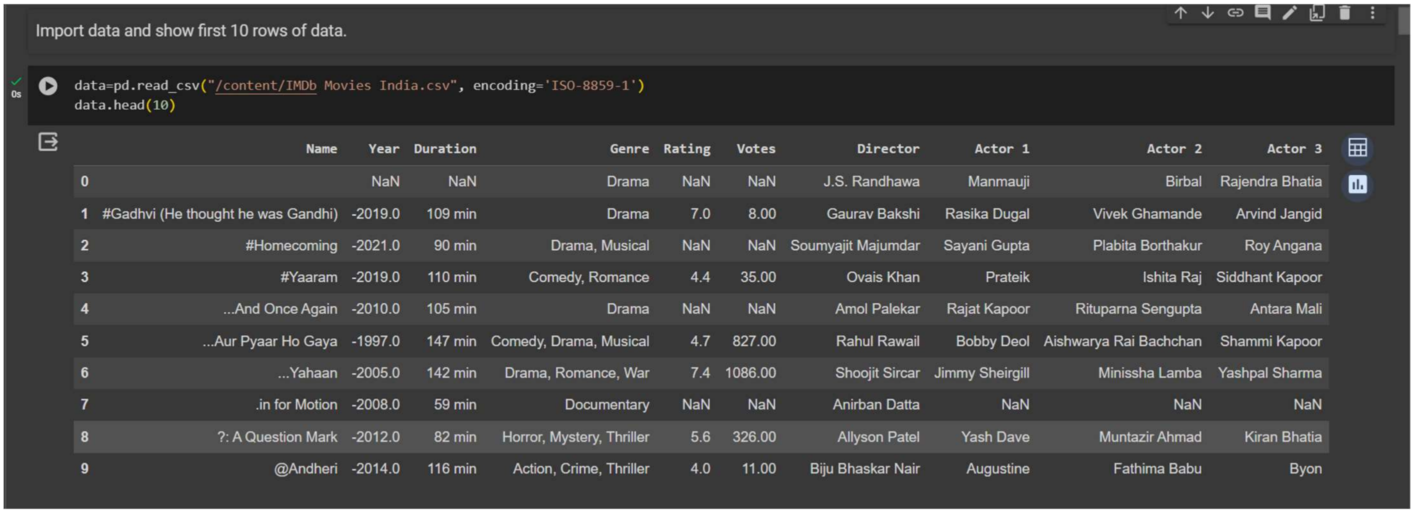
- **Step-1 –** Loading Necessary Libraries used in machine learning.



Import Necessary Libraries.

```
[61] import numpy as np
     import pandas as pd
     import matplotlib.pyplot as plt
     import seaborn as snr
     from sklearn.preprocessing import OneHotEncoder
     from sklearn.ensemble import GradientBoostingRegressor
     from sklearn.metrics import r2_score
     from sklearn.preprocessing import StandardScaler
```

- **Step-2 –** Loading the dataset as csv file and showing first ten rows.



Import data and show first 10 rows of data.

```
data=pd.read_csv("/content/IMDb Movies India.csv", encoding='ISO-8859-1')
data.head(10)
```

	Name	Year	Duration	Genre	Rating	Votes	Director	Actor 1	Actor 2	Actor 3
0		NaN	NaN	Drama	NaN	NaN	J.S. Randhawa	Manmauji	Birbal	Rajendra Bhatia
1	#Gadhvi (He thought he was Gandhi)	-2019.0	109 min	Drama	7.0	8.00	Gaurav Bakshi	Rasika Dugal	Vivek Ghamande	Arvind Jangid
2	#Homecoming	-2021.0	90 min	Drama, Musical	NaN	NaN	Soumyajit Majumdar	Sayani Gupta	Plabita Borthakur	Roy Angana
3	#Yaaram	-2019.0	110 min	Comedy, Romance	4.4	35.00	Ovais Khan	Prateik	Ishita Raj	Siddhant Kapoor
4	...And Once Again	-2010.0	105 min	Drama	NaN	NaN	Amol Palekar	Rajat Kapoor	Rituparna Sengupta	Antara Mali
5	...Aur Pyaar Ho Gaya	-1997.0	147 min	Comedy, Drama, Musical	4.7	827.00	Rahul Rawail	Bobby Deol	Aishwarya Rai Bachchan	Shammi Kapoor
6	...Yahaan	-2005.0	142 min	Drama, Romance, War	7.4	1086.00	Shoojit Sircar	Jimmy Sheirgill	Minissha Lamba	Yashpal Sharma
7	.in for Motion	-2008.0	59 min	Documentary	NaN	NaN	Anirban Datta	NaN	NaN	NaN
8	?: A Question Mark	-2012.0	82 min	Horror, Mystery, Thriller	5.6	326.00	Allyson Patel	Yash Dave	Muntazir Ahmad	Kiran Bhatia
9	@Andheri	-2014.0	116 min	Action, Crime, Thriller	4.0	11.00	Biju Bhaskar Nair	Augustine	Fathima Babu	Byon

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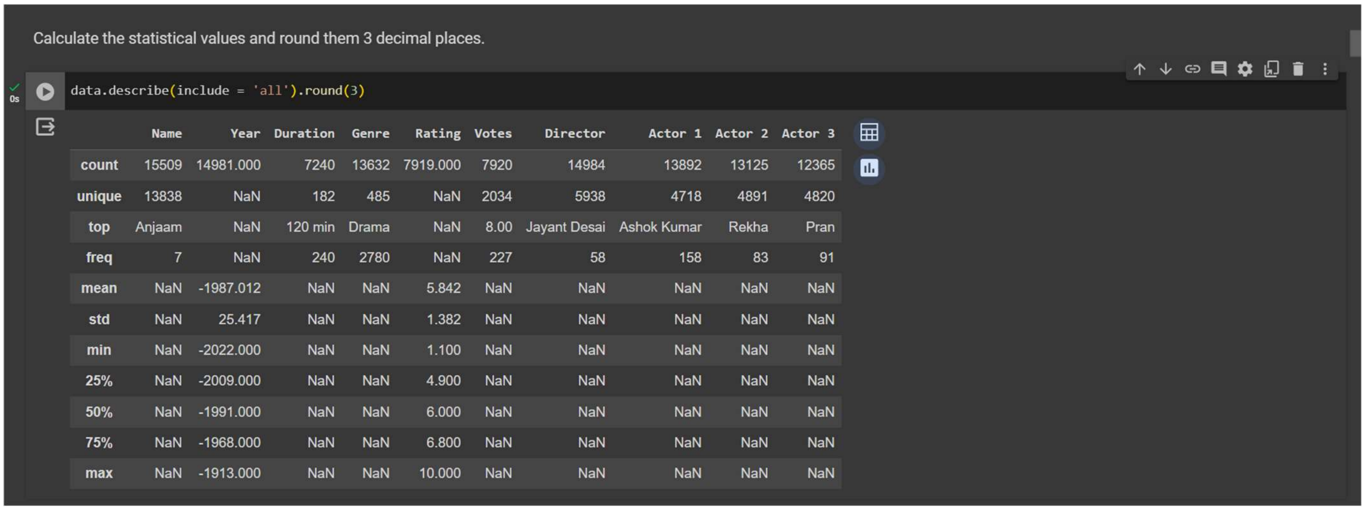
Step-3 – Calculate statistical values and round them up to 3 decimal places.

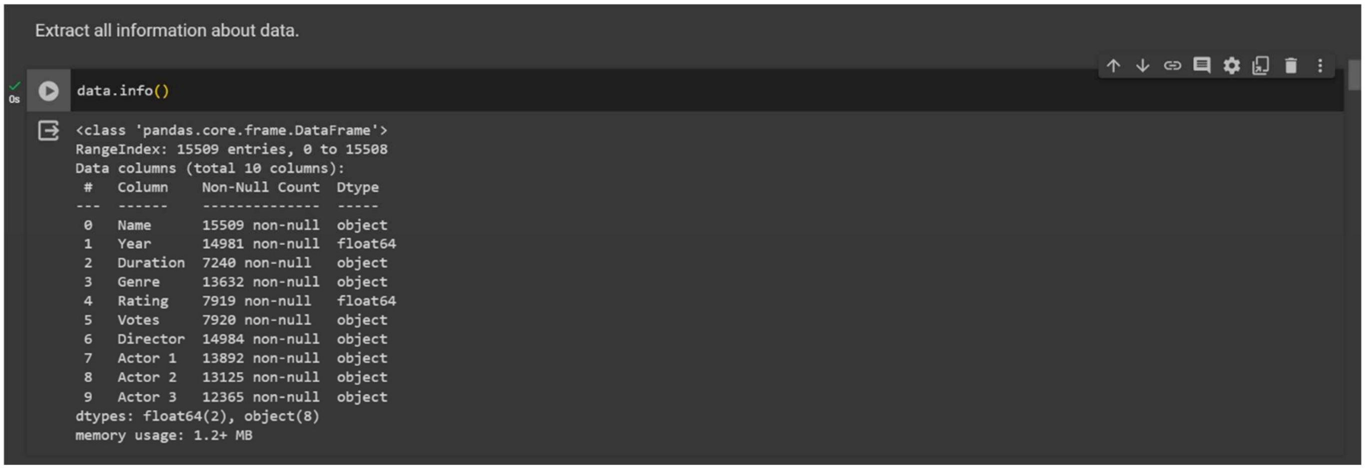


Calculate the statistical values and round them 3 decimal places.

```
data.describe(include = 'all').round(3)
```

	Name	Year	Duration	Genre	Rating	Votes	Director	Actor 1	Actor 2	Actor 3
count	15509	14981.000	7240	13632	7919.000	7920	14984	13892	13125	12365
unique	13838	NaN	182	485	NaN	2034	5938	4718	4891	4820
top	Anjaam	NaN	120 min	Drama	NaN	8.00	Jayant Desai	Ashok Kumar	Rekha	Pran
freq	7	NaN	240	2780	NaN	227	58	158	83	91
mean	NaN	-1987.012	NaN	NaN	5.842	NaN	NaN	NaN	NaN	NaN
std	NaN	25.417	NaN	NaN	1.382	NaN	NaN	NaN	NaN	NaN
min	NaN	-2022.000	NaN	NaN	1.100	NaN	NaN	NaN	NaN	NaN
25%	NaN	-2009.000	NaN	NaN	4.900	NaN	NaN	NaN	NaN	NaN
50%	NaN	-1991.000	NaN	NaN	6.000	NaN	NaN	NaN	NaN	NaN
75%	NaN	-1968.000	NaN	NaN	6.800	NaN	NaN	NaN	NaN	NaN
max	NaN	-1913.000	NaN	NaN	10.000	NaN	NaN	NaN	NaN	NaN

- ➢ **Step-4** – Extracting all information about data.

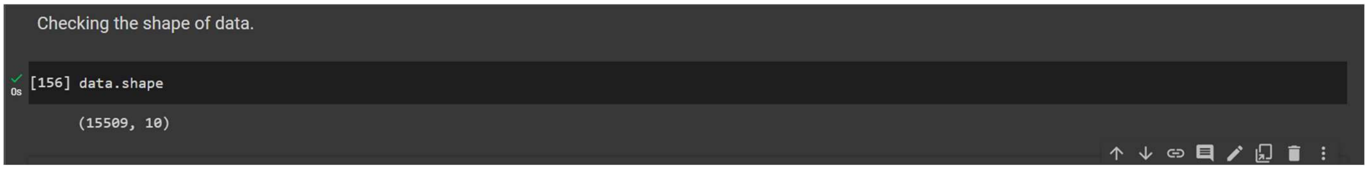


Extract all information about data.

```
data.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
```

- ➢ **Step-5** – Checking Shape of data.

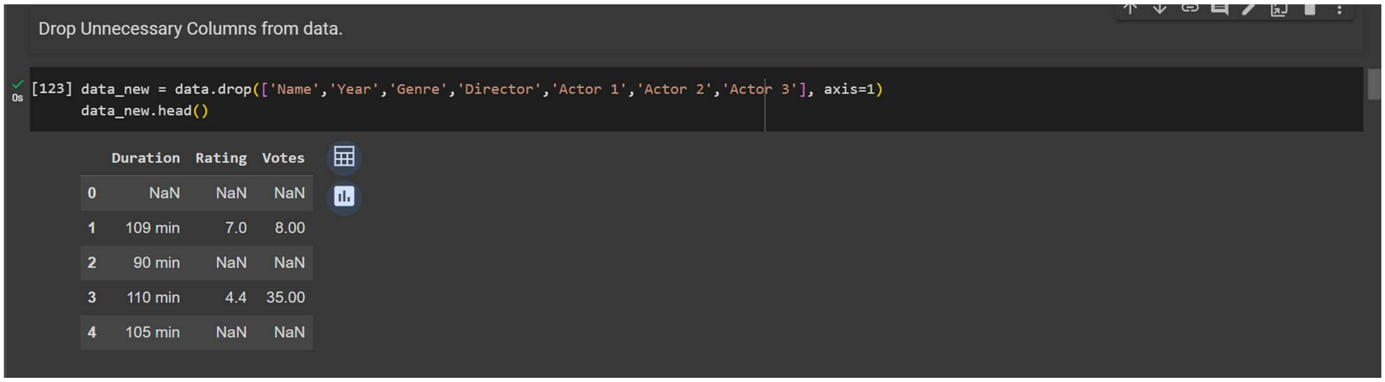


Checking the shape of data.

```
[156] data.shape
```

```
(15509, 10)
```

- **Step-6** – Drop the unnecessary columns from dataset.

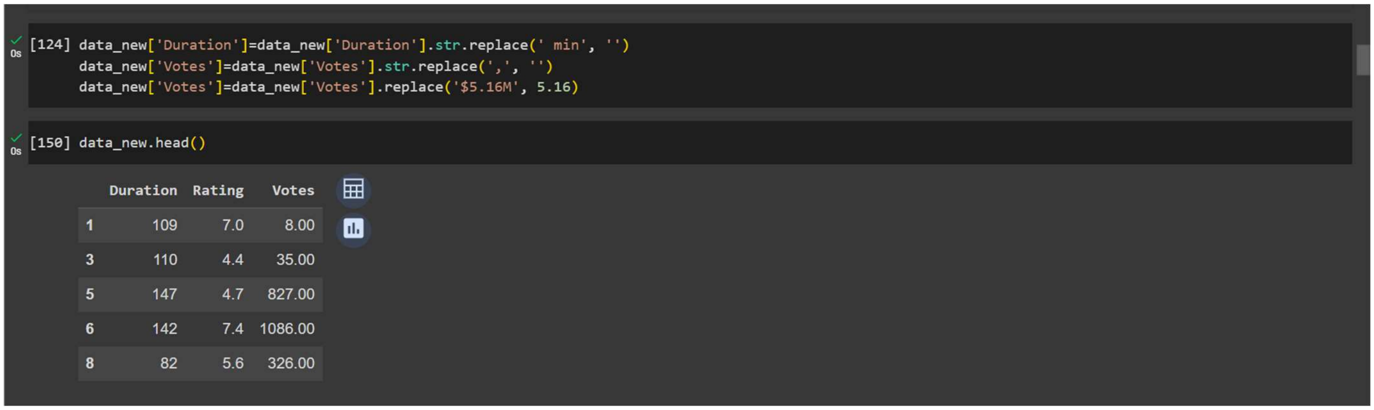


Drop Unnecessary Columns from data.

```
[123] data_new = data.drop(['Name','Year','Genre','Director','Actor 1','Actor 2','Actor 3'], axis=1)
      data_new.head()
```

	Duration	Rating	Votes
0	NaN	NaN	NaN
1	109 min	7.0	8.00
2	90 min	NaN	NaN
3	110 min	4.4	35.00
4	105 min	NaN	NaN

- **Step-7** – Replacing string values available in column values by changing their datatypes.

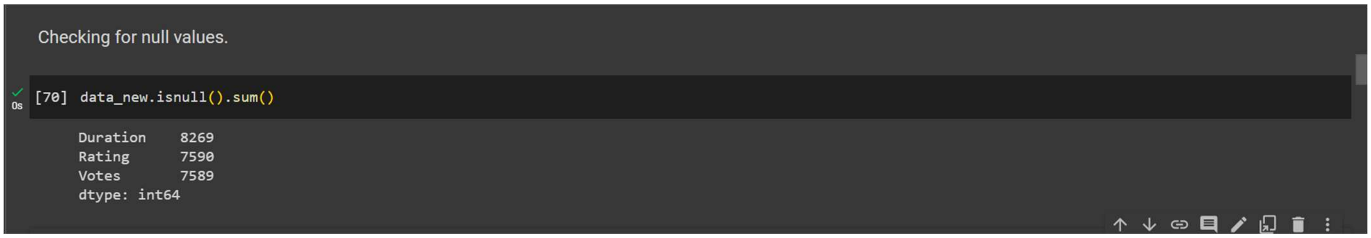


```
[124] data_new['Duration']=data_new['Duration'].str.replace(' min', '')
      data_new['Votes']=data_new['Votes'].str.replace(',', '')
      data_new['Votes']=data_new['Votes'].replace('$5.16M', 5.16)
```

```
[150] data_new.head()
```

	Duration	Rating	Votes
1	109	7.0	8.00
3	110	4.4	35.00
5	147	4.7	827.00
6	142	7.4	1086.00
8	82	5.6	326.00

Step-6 – Checking for null values and return their sum of numbers of true values in each column.

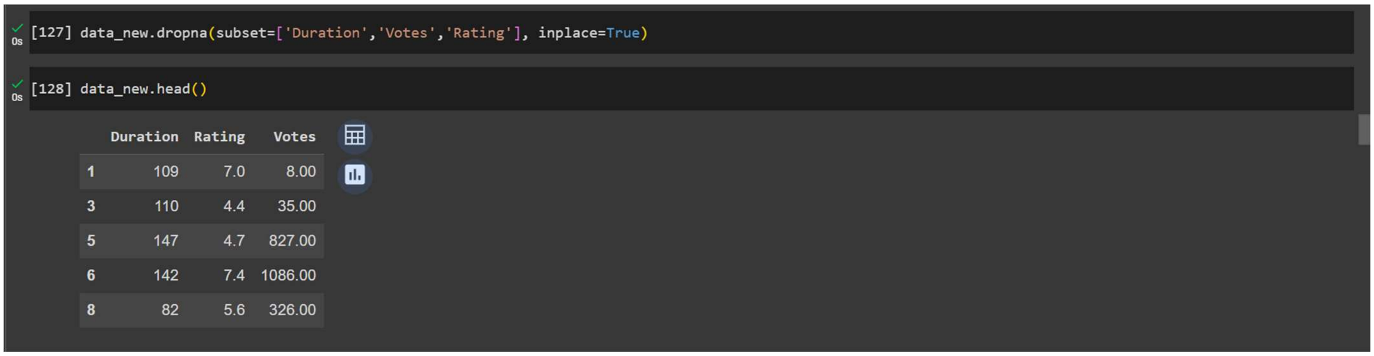


Checking for null values.

```
[70] data_new.isnull().sum()

     Duration    8269
     Rating      7590
     Votes       7589
     dtype: int64
```

- **Step-7** – Drop all the null values from data.

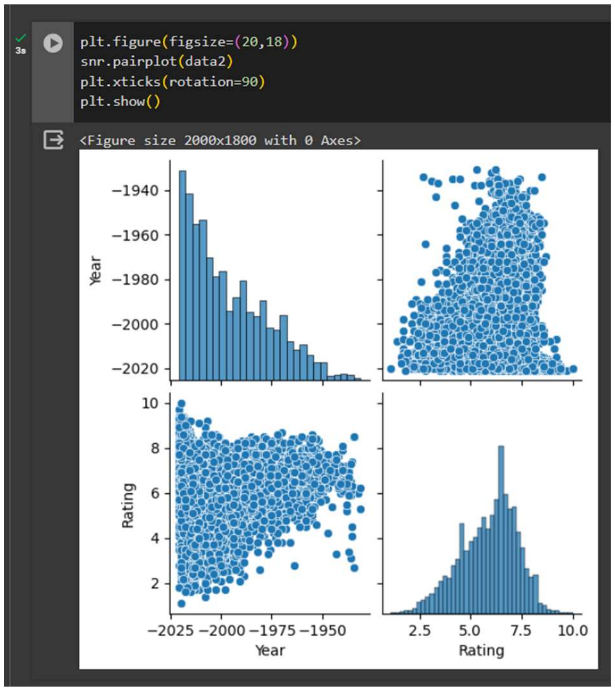


```
[127] data_new.dropna(subset=['Duration','Votes','Rating'], inplace=True)
```

```
[128] data_new.head()
```

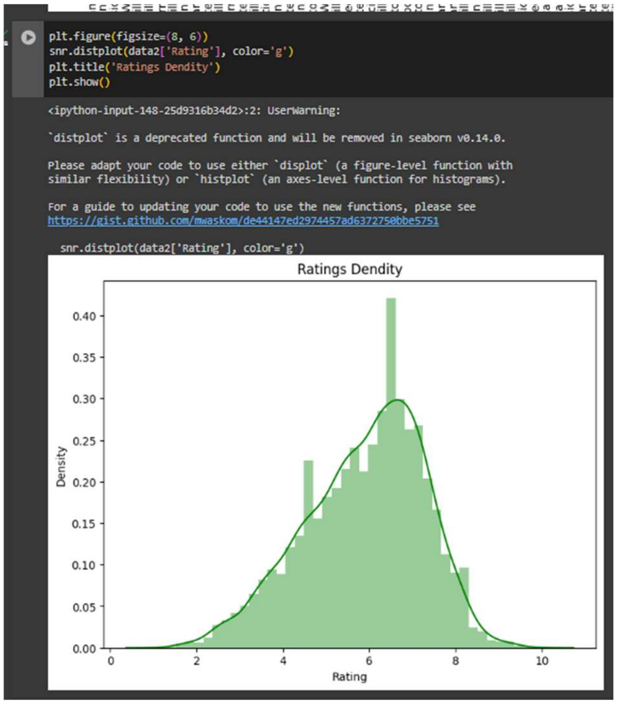
	Duration	Rating	Votes
1	109	7.0	8.00
3	110	4.4	35.00
5	147	4.7	827.00
6	142	7.4	1086.00
8	82	5.6	326.00

Step-8 – Visualization of Sales by different source of Indian movies IMDb data using Python data visualization.



```
plt.figure(figsize=(20,18))
snr.pairplot(data2)
plt.xticks(rotation=90)
plt.show()
```

```
<Figure size 2000x1800 with 0 Axes>
```



```
plt.figure(figsize=(8, 6))
snr.distplot(data2['Rating'], color='g')
plt.title('Ratings Dendity')
plt.show()
```

```
<ipython-input-148-25d9316b34d2>:2: 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

  snr.distplot(data2['Rating'], color='g')
```

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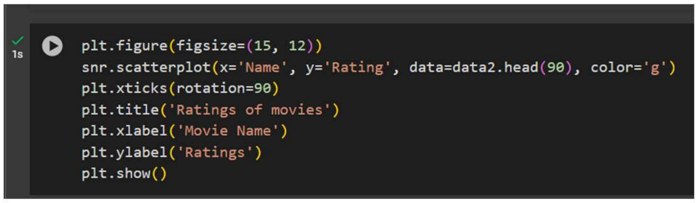
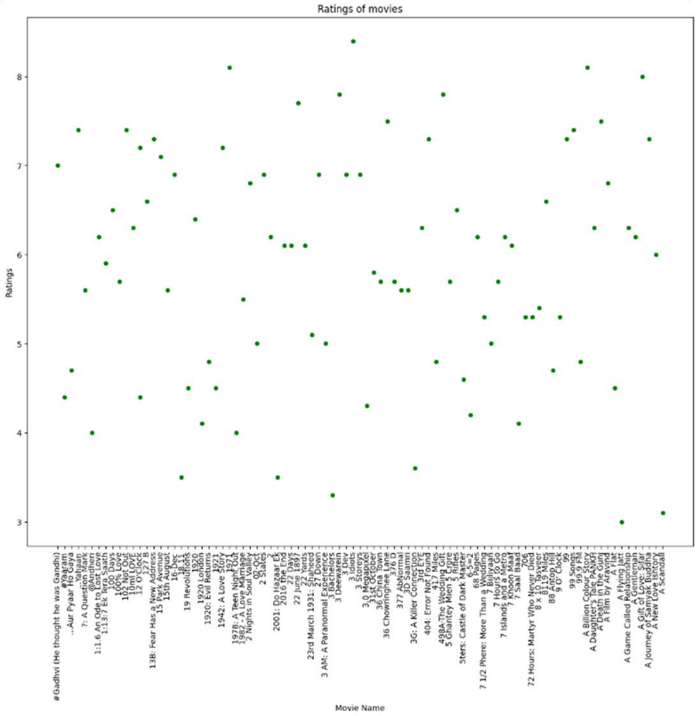
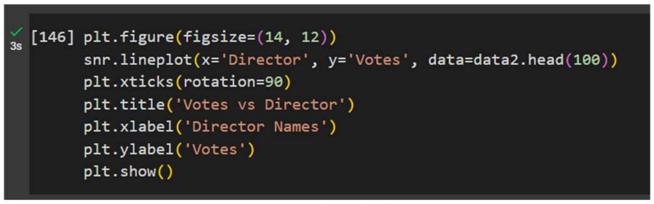
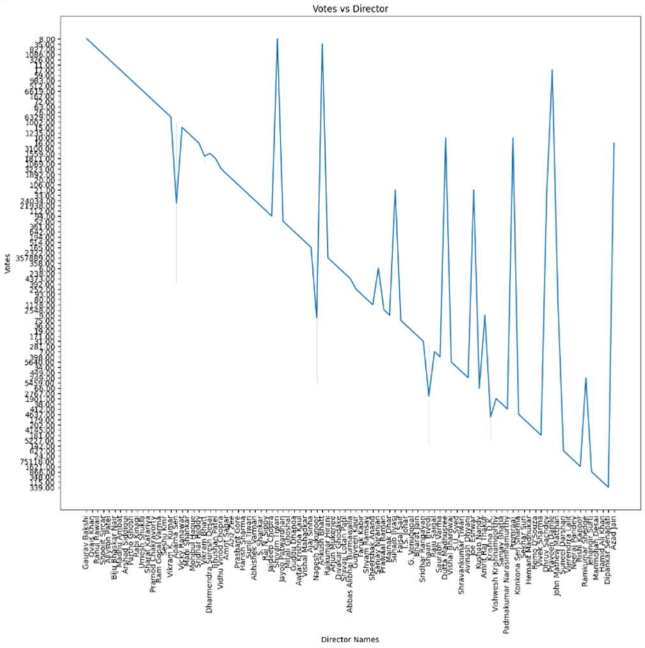


```
plt.figure(figsize=(15, 12))
snr.scatterplot(x='Name', y='Rating', data=data2.head(90), color='g')
plt.xticks(rotation=90)
plt.title('Ratings of movies')
plt.xlabel('Movie Name')
plt.ylabel('Ratings')
plt.show()
```





```
[146] plt.figure(figsize=(14, 12))
      snr.lineplot(x='Director', y='Votes', data=data2.head(100))
      plt.xticks(rotation=90)
      plt.title('Votes vs Director')
      plt.xlabel('Director Names')
      plt.ylabel('Votes')
      plt.show()
```



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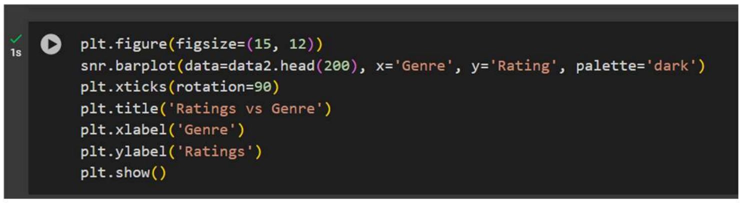
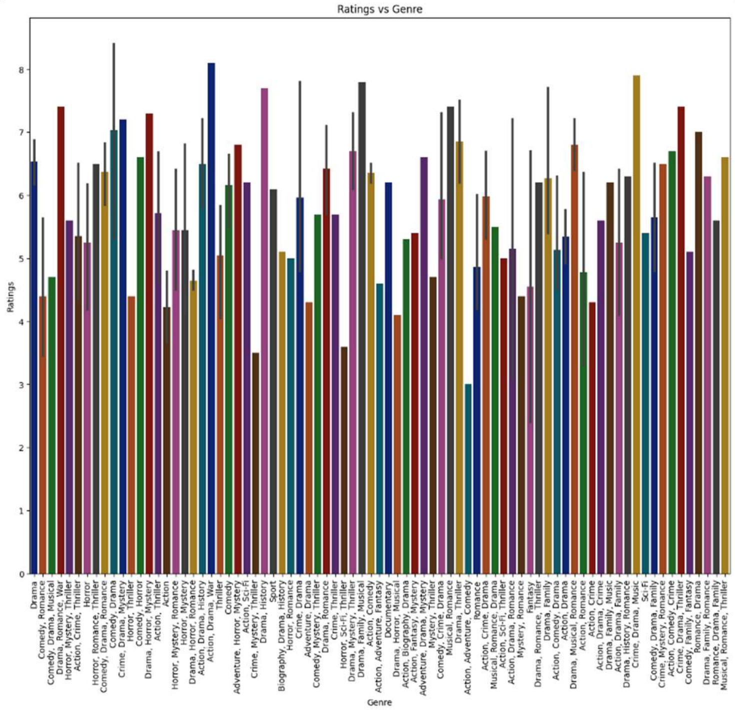
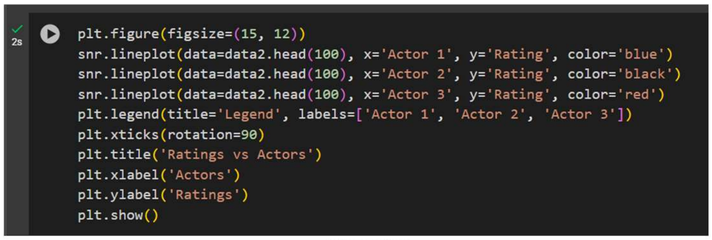
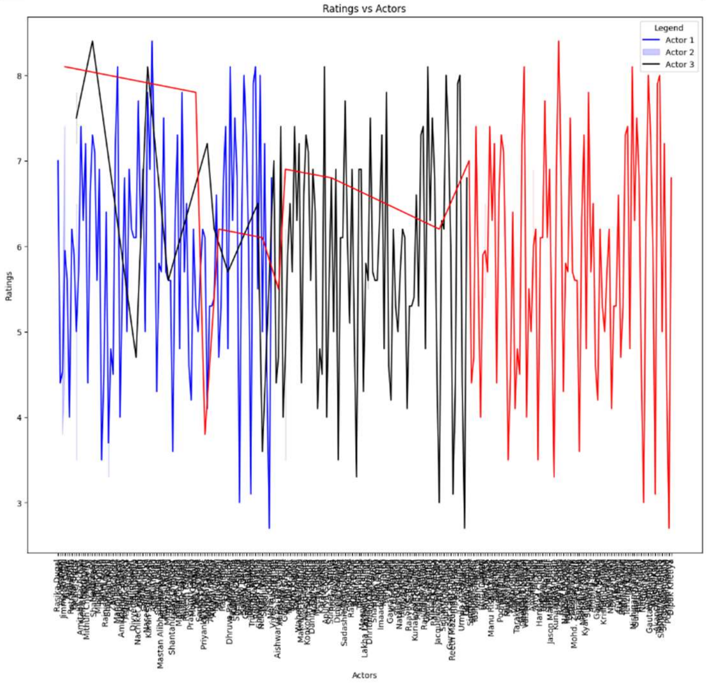


```
plt.figure(figsize=(15, 12))
snr.barplot(data=data2.head(200), x='Genre', y='Rating', palette='dark')
plt.xticks(rotation=90)
plt.title('Ratings vs Genre')
plt.xlabel('Genre')
plt.ylabel('Ratings')
plt.show()
```

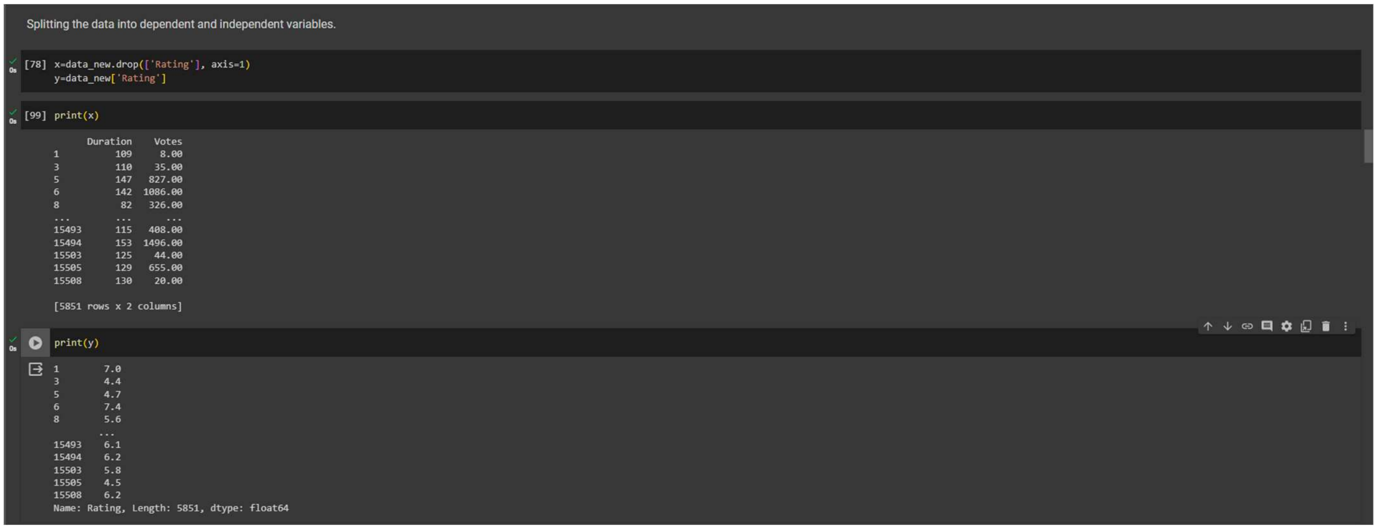




```
plt.figure(figsize=(15, 12))
snr.lineplot(data=data2.head(100), x='Actor 1', y='Rating', color='blue')
snr.lineplot(data=data2.head(100), x='Actor 2', y='Rating', color='black')
snr.lineplot(data=data2.head(100), x='Actor 3', y='Rating', color='red')
plt.legend(title='Legend', labels=['Actor 1', 'Actor 2', 'Actor 3'])
plt.xticks(rotation=90)
plt.title('Ratings vs Actors')
plt.xlabel('Actors')
plt.ylabel('Ratings')
plt.show()
```



- **<u>Step-9</u> –** Splitting the data into dependent and independent variables.



Splitting the data into dependent and independent variables.

```
[78] x=data_new.drop(['Rating'], axis=1)
     y=data_new['Rating']
```

```
[99] print(x)
```

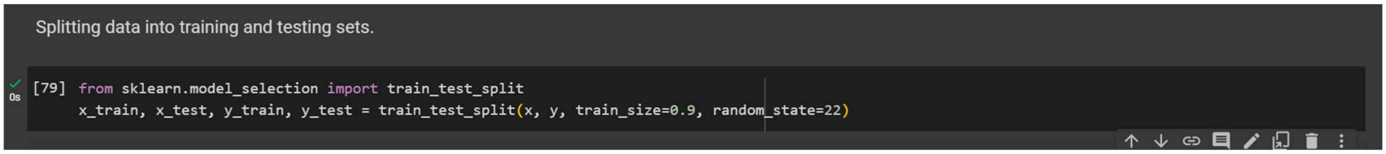
```
       Duration    Votes
1           109     8.00
3           110    35.00
5           147   827.00
6           142  1086.00
8            82   326.00
...         ...      ...
15493       115   408.00
15494       153  1496.00
15503       125    44.00
15505       129   655.00
15508       130    20.00

[5851 rows x 2 columns]
```

```
print(y)
```

```
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: 5851, dtype: float64
```

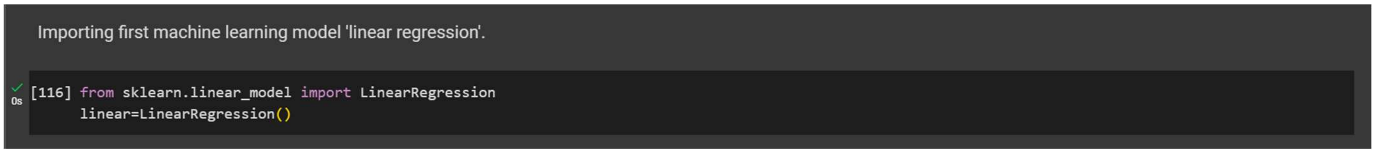
- **<u>Step-10</u> –** Splitting the data into training and testing sets.



Splitting data into training and testing sets.

```
[79] from sklearn.model_selection import train_test_split
     x_train, x_test, y_train, y_test = train_test_split(x, y, train_size=0.9, random_state=22)
```

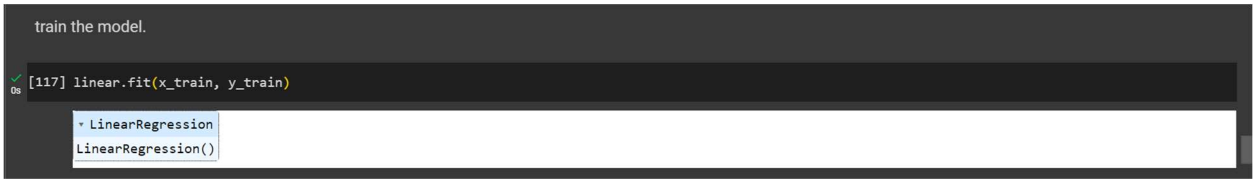
- **<u>Step-11</u> –** Import first machine learning model ‘Linear Regression’.



Importing first machine learning model 'linear regression'.

```
[116] from sklearn.linear_model import LinearRegression
      linear=LinearRegression()
```

- **<u>Step-12</u> –** Train the model.

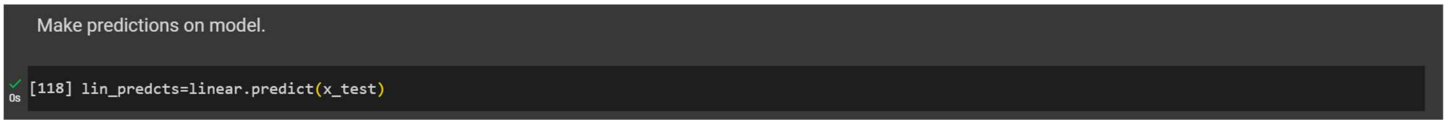


train the model.

```
[117] linear.fit(x_train, y_train)
```

```
▾ LinearRegression
LinearRegression()
```

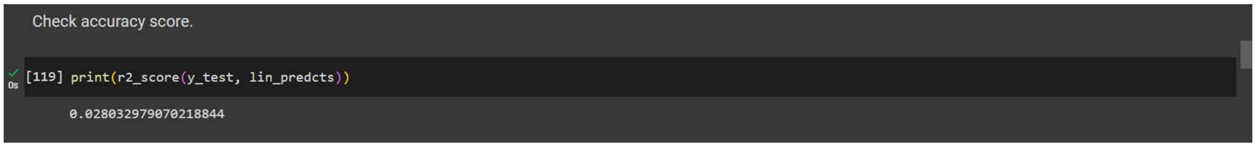
- **<u>Step-13</u> –** Make predictions on model.



Make predictions on model.

```
[118] lin_predcts=linear.predict(x_test)
```

- **<u>Step-14</u> –** Checking accuracy score.

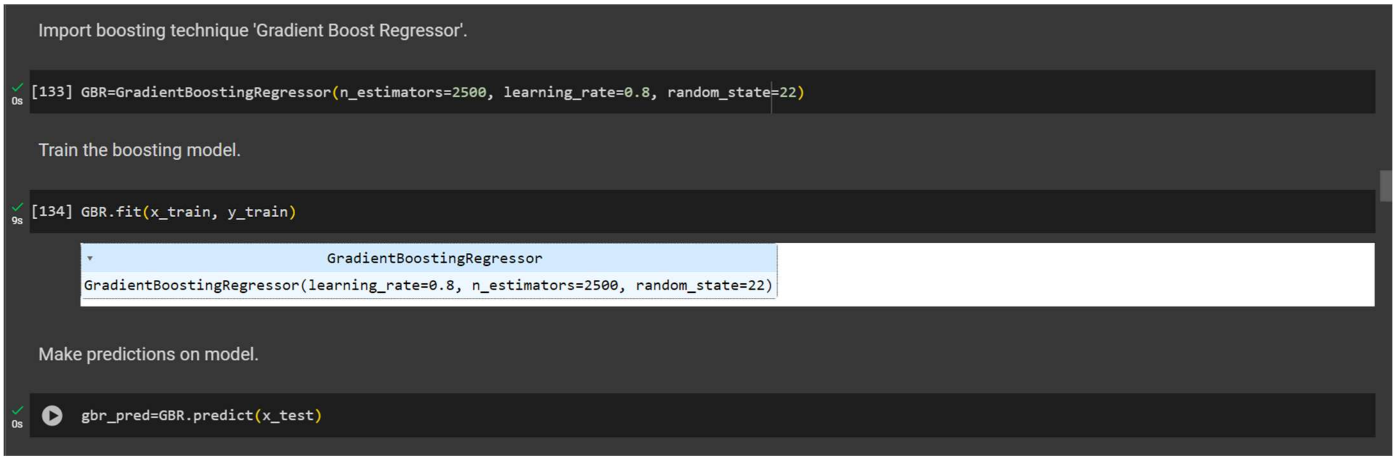


Check accuracy score.

```
[119] print(r2_score(y_test, lin_predcts))

      0.028032979070218844
```

- **<u>Step-15</u> –** Import the Machine Learning Gradient Boost Model and train model and then make prediction.



Import boosting technique 'Gradient Boost Regressor'.

```
[133] GBR=GradientBoostingRegressor(n_estimators=2500, learning_rate=0.8, random_state=22)
```

Train the boosting model.

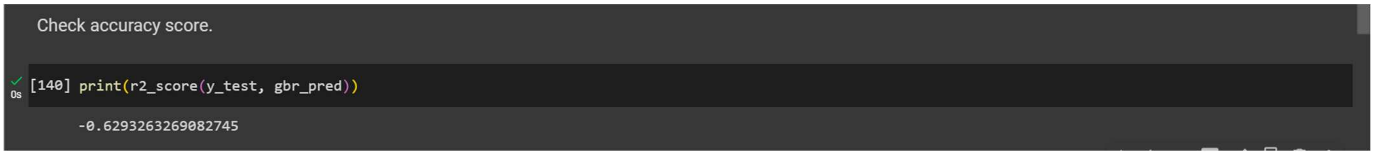
```
[134] GBR.fit(x_train, y_train)

                    GradientBoostingRegressor
      GradientBoostingRegressor(learning_rate=0.8, n_estimators=2500, random_state=22)
```

Make predictions on model.

```
gbr_pred=GBR.predict(x_test)
```

- **<u>Step-16</u> –** Check accuracy score of boosting algorithm.

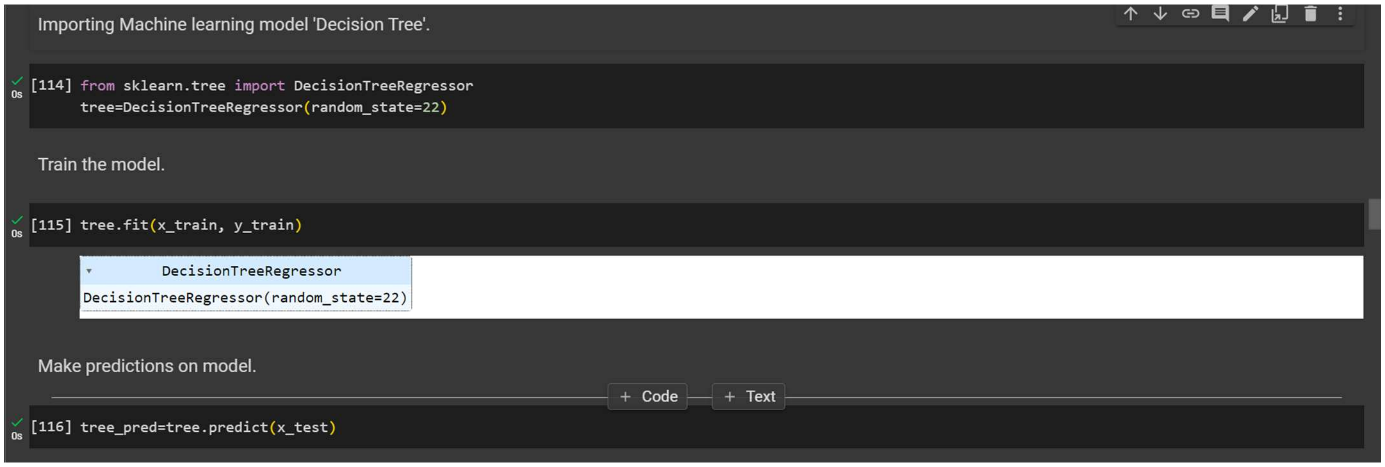


Check accuracy score.

```
[140] print(r2_score(y_test, gbr_pred))

      -0.6293263269082745
```

- **Step-17 –** Import Decision Tree regressor Machine Learning Model and train model and then make prediction.



Importing Machine learning model 'Decision Tree'.

```
[114] from sklearn.tree import DecisionTreeRegressor
      tree=DecisionTreeRegressor(random_state=22)
```

Train the model.

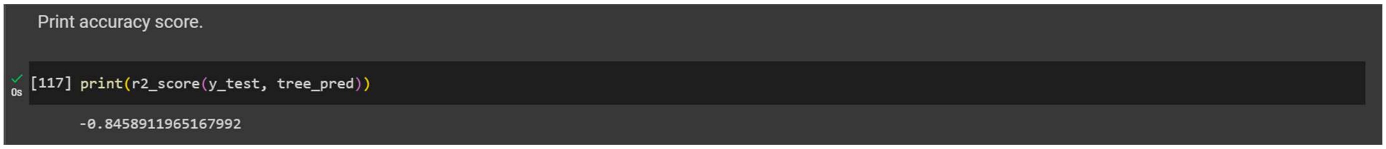
```
[115] tree.fit(x_train, y_train)
```

```
DecisionTreeRegressor
DecisionTreeRegressor(random_state=22)
```

Make predictions on model.

```
[116] tree_pred=tree.predict(x_test)
```

- **Step-18 –** Check accuracy score of Decision tree model.



Print accuracy score.

```
[117] print(r2_score(y_test, tree_pred))

      -0.8458911965167992
```

Conclusion – Accurately predicting IMDb ratings of new movies is challenging. I needed to analyze combinations of features because no single feature can accurately predict ratings of new movies. Yet, there were numerous combinations of features that can affect IMDb ratings differently than the individual values would indicate. I performed a lot of data processing and two machine learning regression algorithms with Gradient Boosting technique. With Linear Regression algorithm, I got 2.80% of accuracy, then by using Gradient Boosting technique, I got 62% of accuracy and finally by using Decision Tree Regressor, I got 84% of accuracy. With this technique, I complete my machine learning model for prediction of movie rating with 84% of accuracy.