

```
In [48]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn import linear_model
import warnings
warnings.filterwarnings('ignore')
```

```
In [49]: data=pd.read_excel("C:/Users/jcadmin/Downloads/Loyalty.xls")
```

```
In [50]: pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)
```

```
In [51]: data.head()
```

Out[51]:

	CustomerID	Loyalty	Price	Quality	Community Outreach	Trust	Customer satifaction	Negative publicity
0	920	6.075547	10.0	0.918950	-0.235777	6.39	0.769072	0.328158
1	921	6.585246	10.0	0.926412	0.006779	6.44	0.818781	0.675122
2	923	6.377699	10.0	0.881912	NaN	6.49	0.768604	0.560424
3	924	6.221095	10.0	0.888917	NaN	6.52	0.934050	NaN
4	925	6.480031	10.0	0.861948	NaN	6.55	0.750525	NaN

```
In [52]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1949 entries, 0 to 1948
Data columns (total 8 columns):
#   Column                Non-Null Count  Dtype
---  -
0   CustomerID            1949 non-null   int64
1   Loyalty               1949 non-null   float64
2   Price                1913 non-null   float64
3   Quality              1936 non-null   float64
4   Community Outreach    1860 non-null   float64
5   Trust                1894 non-null   float64
6   Customer satifaction  1917 non-null   float64
7   Negative publicity    1839 non-null   float64
dtypes: float64(7), int64(1)
memory usage: 121.9 KB
```

```
In [53]: data.shape
```

```
Out[53]: (1949, 8)
```

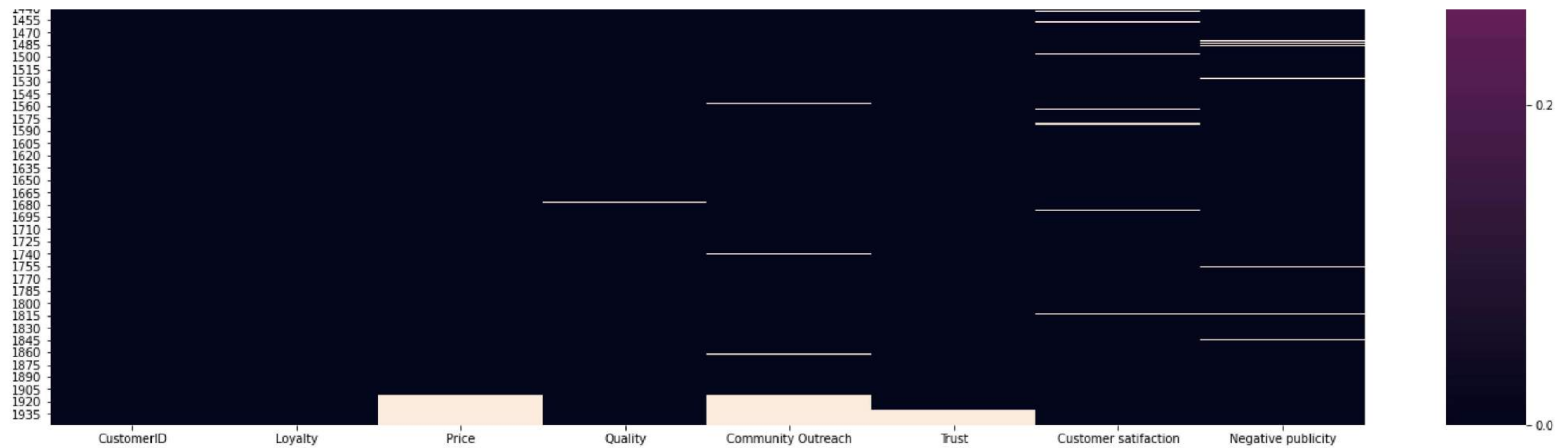
```
In [54]: data.isnull().sum()
```

```
Out[54]: CustomerID      0
Loyalty      0
Price       36
Quality      13
Community Outreach  89
Trust        55
Customer satifaction  32
Negative publicity  110
dtype: int64
```

```
In [55]: plt.figure(figsize=(25,25))
sns.heatmap(data.isnull())
```

Out[55]: <AxesSubplot:>





```
In [56]: null_var=data.isnull().sum()/data.shape[0]*100
null_var
```

```
Out[56]: CustomerID      0.000000
Loyalty      0.000000
Price       1.847101
Quality      0.667009
Community Outreach  4.566444
Trust        2.821960
Customer satisfaction  1.641868
Negative publicity  5.643920
dtype: float64
```

```
In [57]: data2=data.dropna()
```

```
In [58]: data2.shape
```

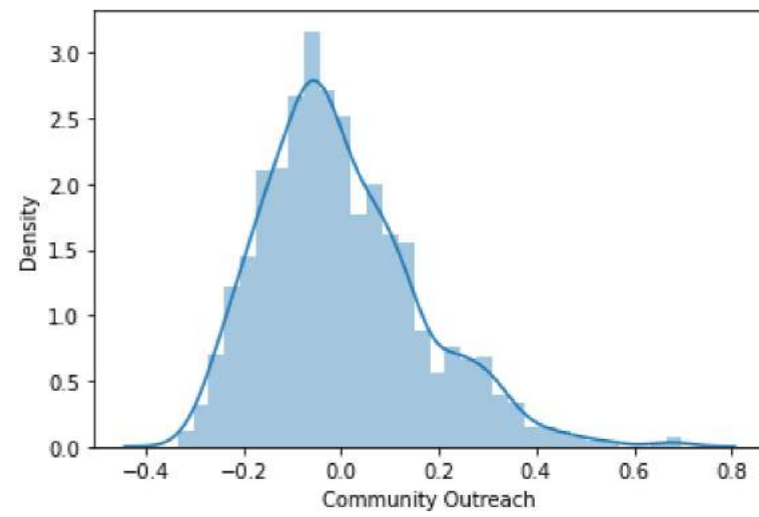
```
Out[58]: (1712, 8)
```

```
In [59]: null_var=data2.isnull().sum()/data2.shape[0]*100
null_var
```

```
Out[59]: CustomerID      0.0
Loyalty      0.0
Price       0.0
Quality      0.0
Community Outreach  0.0
Trust        0.0
Customer satisfaction  0.0
Negative publicity  0.0
dtype: float64
```

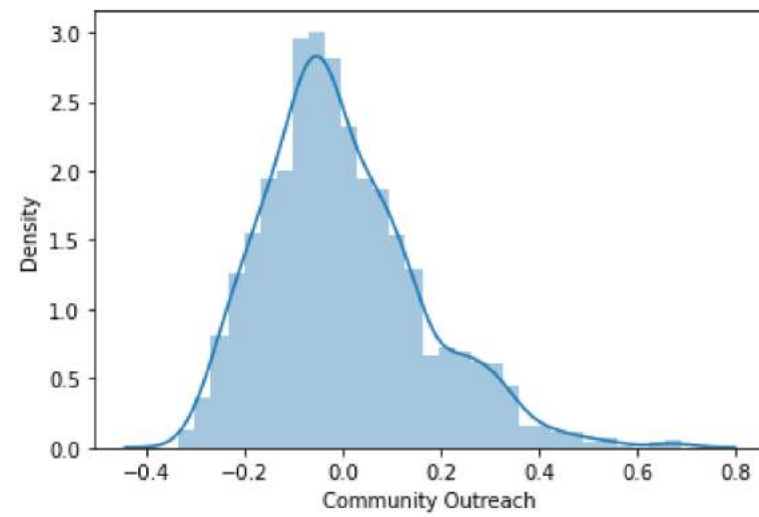
```
In [60]: sns.distplot(data['Community Outreach'])
```

```
Out[60]: <AxesSubplot:xlabel='Community Outreach', ylabel='Density'>
```



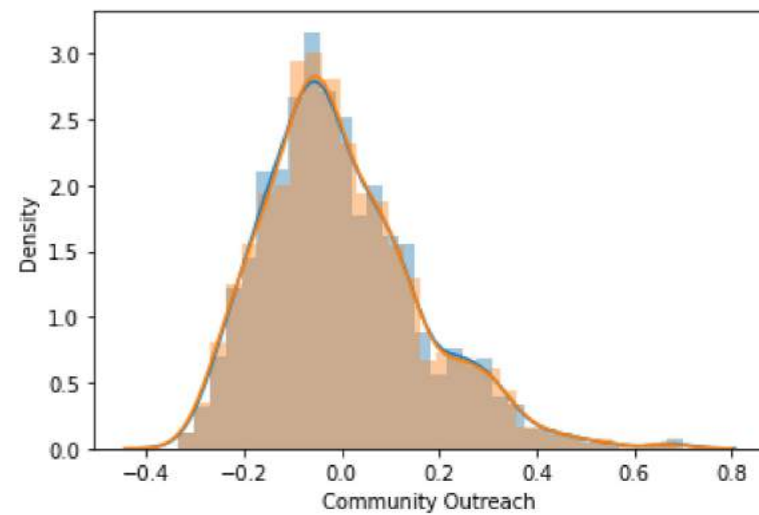
```
In [61]: sns.distplot(data2['Community Outreach'])
```

```
Out[61]: <AxesSubplot:xlabel='Community Outreach', ylabel='Density'>
```



```
In [62]: sns.distplot(data['Community Outreach'])  
sns.distplot(data2['Community Outreach'])
```

```
Out[62]: <AxesSubplot:xlabel='Community Outreach', ylabel='Density'>
```



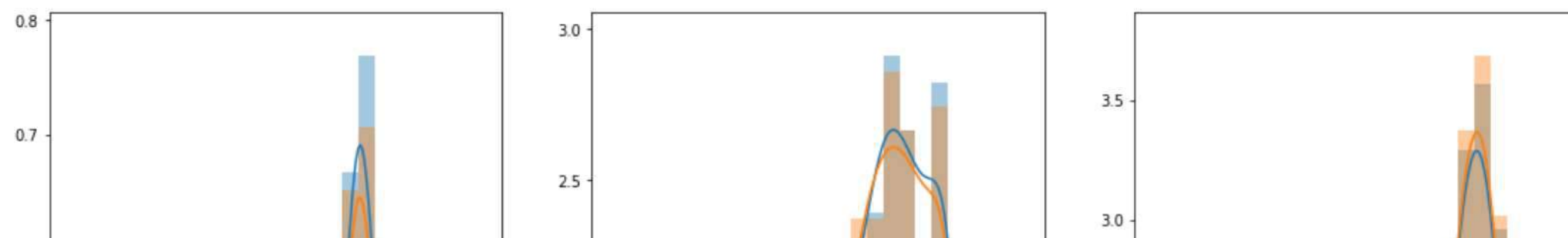
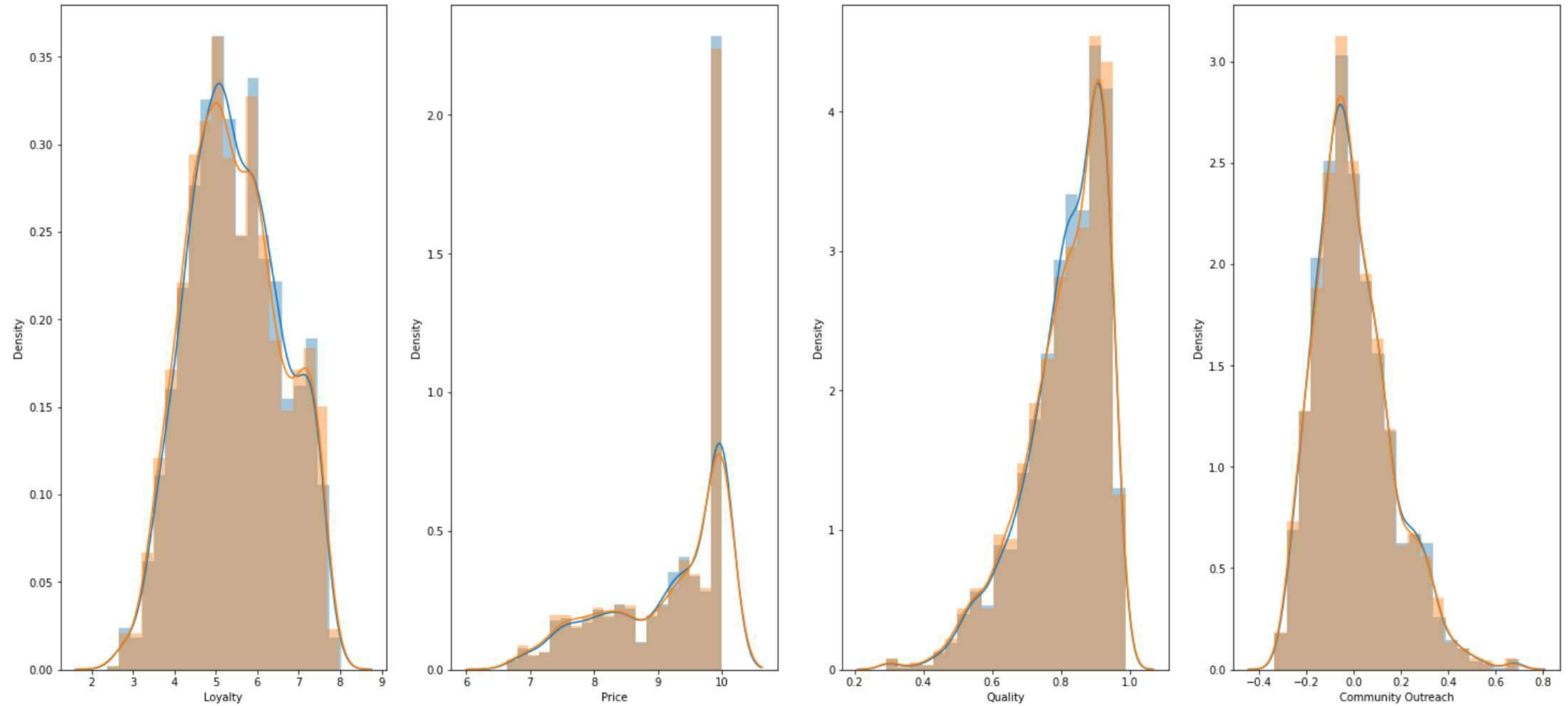
```
In [63]: data.columns
```

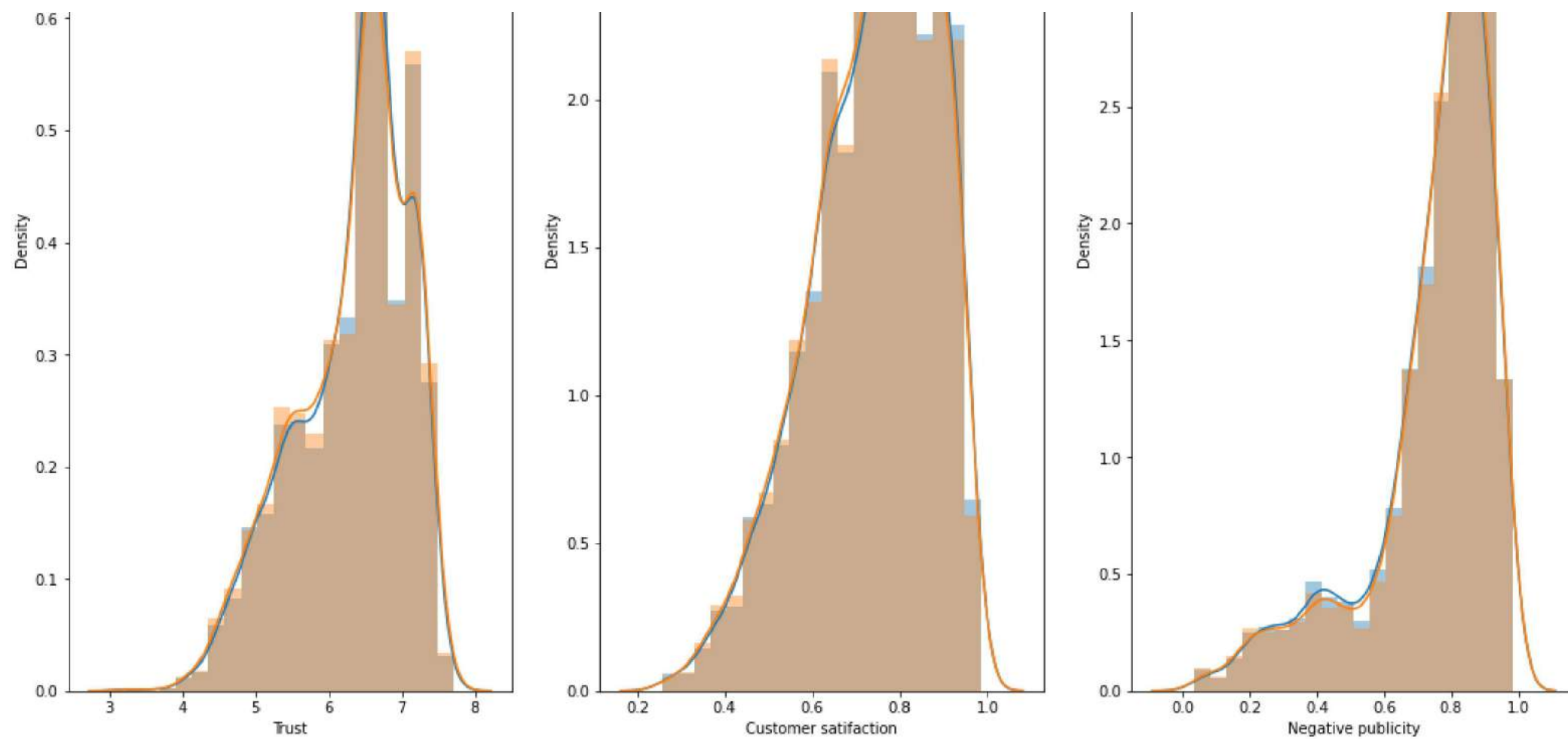
```
Out[63]: Index(['CustomerID', 'Loyalty', 'Price', 'Quality', 'Community Outreach',  
               'Trust', 'Customer satisfaction', 'Negative publicity'],
```

```
dtype='object')
```

```
In [64]: num_var = ['Loyalty', 'Price', 'Quality', 'Community Outreach',  
                  'Trust', 'Customer satisfaction', 'Negative publicity']
```

```
plt.figure(figsize=(25,25))  
for i,var in enumerate(num_var):  
    plt.subplot(2,4,i+1)  
    sns.distplot(data[var],bins=20)  
    sns.distplot(data2[var],bins=20)
```





```
In [65]: data2.head()
```

```
Out[65]:
```

	CustomerID	Loyalty	Price	Quality	Community Outreach	Trust	Customer satisfaction	Negative publicity
0	920	6.075547	10.0	0.918950	-0.235777	6.39	0.769072	0.328158
1	921	6.585246	10.0	0.926412	0.006779	6.44	0.818781	0.675122
6	1809	6.734222	10.0	0.903410	-0.032504	6.59	0.897557	0.203359
8	1810	6.866063	10.0	0.885089	0.019040	6.62	0.848822	0.338876
12	922	6.798151	10.0	0.892722	-0.031405	6.64	0.703020	0.486111

```
In [66]: data2.drop('CustomerID',axis=1, inplace=True)
```

```
In [67]: data2.head()
```

```
Out[67]:
```

	Loyalty	Price	Quality	Community Outreach	Trust	Customer satisfaction	Negative publicity
0	6.075547	10.0	0.918950	-0.235777	6.39	0.769072	0.328158
1	6.585246	10.0	0.926412	0.006779	6.44	0.818781	0.675122
6	6.734222	10.0	0.903410	-0.032504	6.59	0.897557	0.203359
8	6.866063	10.0	0.885089	0.019040	6.62	0.848822	0.338876
12	6.798151	10.0	0.892722	-0.031405	6.64	0.703020	0.486111

```
In [68]: # Splitting Data
X=data2.drop('Price',axis=1)
y=data2['Price']
```



```
print('Shape of X= ', X.shape)
print('Shape of y= ', y.shape)
```

```
Shape of X= (1712, 6)
Shape of y= (1712,)
```

```
In [69]: from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=10)
```

```
print('Shape of X_train= ', X_train.shape)
print('Shape of X_test= ', X_test.shape)
print('Shape of y_train= ', y_train.shape)
print('Shape of y_test= ', y_test.shape)
```

```
Shape of X_train= (1369, 6)
Shape of X_test= (343, 6)
Shape of y_train= (1369,)
Shape of y_test= (343,)
```

```
In [70]: # Feature Scaling
```

```
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
sc.fit(X_train)
X_train=sc.transform(X_train)
X_test=sc.transform(X_test)
```

```
In [71]: # Liner Regression
```

```
from sklearn.linear_model import LinearRegression
lr=LinearRegression()
lr.fit(X_train,y_train)
```

```
Out[71]: LinearRegression()
```

```
In [72]: lr.coef_
```

```
Out[72]: array([ 0.20473896,  0.20797974, -0.12690179,  0.54871668, -0.05638427,
  0.07922331])
```

```
In [73]: lr.intercept_
```

```
Out[73]: 9.143957927884978
```

```
In [74]: # Prediction
```

```
X_test[0,:]
```

```
Out[74]: array([-0.08627972, -0.17904533,  2.97602639, -1.15190472,  0.88643188,
 -0.95658324])
```

```
In [75]: lr.predict([X_test[0,:]])
```

```
Out[75]: array([7.95355839])
```

```
In [76]: lr.predict(X_test)
```

```
Out[76]: array([ 7.95355839, 10.32764103,  7.74815033,  9.83738099,  8.73260365,
  9.87019665,  9.06095481,  8.43180395,  9.88266293,  9.17575051,
  8.35535183,  6.69605092,  9.61804553,  8.48434735,  8.55728231,
  9.88087188,  9.93476972,  9.75422127,  9.10785099, 10.1097467 ,
  9.07715044,  7.71006981,  9.3898706 ,  8.38975579,  9.42650198,
  9.71530315,  9.87838615,  8.99714116,  8.33337732,  7.78466428,
 10.137551 ,  7.4611905 ,  9.28427096,  9.64327361,  9.81341832,
  8.33007884,  9.59332148,  8.53646921,  9.86557894,  9.11764208,
```

```

7.34217824, 9.94167884, 9.80150803, 9.55289154, 8.81110765,
7.51570511, 9.99054379, 10.01682985, 9.65098164, 9.55621179,
8.3866333 , 10.09406135, 7.98368815, 8.76806406, 7.55313216,
9.45812249, 10.0043343 , 10.07094677, 9.94598444, 9.44870255,
8.83061598, 7.92609172, 9.91623879, 9.92859318, 9.449307 ,
9.01158335, 9.32797696, 8.51127818, 9.87631598, 10.03887 ,
8.17236493, 7.53282115, 7.59367565, 9.33366884, 9.87057856,
9.23767366, 10.0557826 , 9.91626092, 8.25269522, 9.29132045,
9.39772293, 7.93891473, 8.69994843, 9.28133663, 9.53592349,
9.40429313, 9.82309066, 10.13576904, 9.36957909, 9.06023672,
10.1601913 , 7.73503448, 8.58333153, 9.65076739, 8.48637228,
9.91763139, 7.85774056, 7.25159098, 8.81648003, 9.651617 ,
9.86147634, 9.83848208, 7.55510419, 9.79919908, 9.55321543,
9.97525043, 9.74985386, 8.82441445, 8.13041058, 9.18915054,
8.99494065, 10.18305644, 9.94504718, 8.94971105, 10.05277752,
9.2088935 , 8.59871972, 8.63305563, 9.35576623, 8.71479671,
9.81584759, 9.83350274, 8.38169015, 9.17087946, 9.2748846 ,
8.14281167, 9.39107496, 9.88602071, 7.51359147, 7.73363769,
7.70251894, 9.66481737, 9.85497542, 9.78527157, 9.93886155,
9.65929218, 10.32000014, 9.10315059, 7.68856257, 8.19752083,
8.56639838, 9.86173022, 10.25294403, 8.27092354, 8.74571459,
9.33386842, 10.20795087, 10.14951001, 9.13592569, 8.68411798,
7.7766324 , 9.49839216, 9.68178263, 9.19506113, 9.46513586,
9.70963559, 9.61494801, 7.87835637, 7.78469726, 9.84886141,
9.64480812, 9.19155016, 6.20617034, 8.02171653, 7.58749882,
9.85602419, 9.44512991, 9.42088328, 9.0175225 , 10.11691316,
9.43408227, 9.38848068, 9.63295301, 9.33803157, 8.19014134,
8.18329841, 9.52369572, 10.18950648, 8.12209479, 8.10284137,
9.70933489, 9.29163361, 9.94709093, 9.87615346, 9.2940915 ,
9.28075535, 8.65577624, 8.20576562, 9.41689876, 9.11300748,
9.81651377, 8.28253478, 9.90562131, 10.24485602, 9.8712012 ,
8.68160993, 9.9579064 , 9.89043184, 7.97482012, 8.22798098,
9.84937299, 8.31697555, 9.50752048, 7.32881487, 10.40310704,
8.45995501, 9.32114615, 9.386495 , 9.33614761, 10.02351689,
10.27767761, 9.75043461, 9.96401851, 8.60422094, 7.59340323,
10.0087545 , 9.36311016, 8.27075521, 10.38363967, 9.84616427,
8.55324563, 9.36305801, 7.75722968, 7.68644706, 9.83979092,
8.73842765, 7.96813929, 9.25665374, 10.24519332, 9.93317543,
7.9885517 , 10.1001069 , 9.15690048, 9.42101937, 10.08500805,
9.3297259 , 9.29543006, 10.10564889, 9.25466659, 9.56339543,
10.09445298, 9.49510798, 9.16126485, 8.88633173, 9.48476006,
9.79946431, 8.04051762, 9.38120997, 9.62597657, 7.88407331,
9.19532623, 10.33237098, 7.98081537, 7.67325214, 8.60849679,
7.6945695 , 8.62119466, 7.81380228, 9.04163538, 7.86763291,
7.88518939, 8.78831164, 8.85527001, 10.09564456, 9.90493608,
8.91506471, 9.08930886, 7.87492774, 9.46336612, 9.07404088,
9.87456574, 8.32611704, 7.65943061, 8.69310541, 9.74097734,
8.58988263, 9.77321288, 10.06807144, 8.19488087, 8.51581899,
7.80788203, 9.9593149 , 9.74888584, 8.52388294, 9.52517943,
8.79925686, 9.73017023, 9.28136437, 8.02779193, 10.18419997,
8.00883028, 9.05601447, 9.68973751, 8.43423574, 9.06536926,
9.88631979, 9.27173972, 7.80239475, 8.99989862, 8.96866534,
9.24971488, 7.61608641, 8.6217122 , 8.44422943, 9.88309531,
8.45302404, 9.11915222, 7.92468789, 9.63052878, 9.96351407,
9.41591935, 9.42435646, 8.15518897, 9.44671115, 9.37117989,
8.54064632, 9.63083874, 8.86777879, 10.0860347 , 9.25599309,
9.67583233, 7.94465111, 8.78538889, 9.33377726, 7.14603405,
9.38598292, 8.85588407, 8.14856099, 9.42521841, 8.08862882,
9.74240302, 9.14787217, 9.41533263, 8.09597795, 10.11567163,
9.54862997, 9.13592003, 9.45573993, 10.2963604 , 9.44740218,
8.10629533, 9.3146725 , 9.34989059])

```

In [77]: y\_test

```

Out[77]: 1495      8.307173
         439      10.000000
         1803     7.416554
         289      10.000000
         974      9.443441

```



392	10.000000
1178	9.157819
1464	8.394273
778	9.763903
1287	8.904189
1501	8.281240
1901	6.816519
952	9.462110
1643	7.923776
1613	7.995122
367	10.000000
739	9.826082
149	10.000000
1011	9.385553
416	10.000000
788	9.742742
1842	7.306319
1116	9.250023
1333	8.726923
1159	9.190714
277	10.000000
59	10.000000
1437	8.460006
1446	8.444502
1774	7.522392
156	10.000000
1703	7.700000
896	9.561677
797	9.724202
520	10.000000
1837	7.334185
990	9.425749
1202	9.104139
561	10.000000
927	9.508475
1854	7.195504
93	10.000000
273	10.000000
205	10.000000
1131	9.240136
1783	7.477138
418	10.000000
430	10.000000
784	9.754926
1040	9.350784
1820	7.367975
496	10.000000
1778	7.486960
947	9.469912
1725	7.644764
222	10.000000
121	10.000000
317	10.000000
61	10.000000
1087	9.296339
938	9.488964
1666	7.859404
556	10.000000
60	10.000000
890	9.567513
918	9.520327
1245	9.002746
793	9.728311
84	10.000000
326	10.000000
1615	7.992339
1762	7.567404
1817	7.369865
239	10.000000

55	10.000000
1209	9.073888
786	9.751308
98	10.000000
1623	7.980955
800	9.715486
1137	9.230624
1878	6.965846
1719	7.664672
894	9.563725
1350	8.647322
665	9.975006
785	9.752354
533	10.000000
1371	8.568552
911	9.540022
72	10.000000
1779	7.485086
1699	7.710983
249	10.000000
1264	8.965257
348	10.000000
1694	7.721042
1648	7.915053
1467	8.386811
265	10.000000
88	10.000000
701	9.890728
1473	8.363639
51	10.000000
1	10.000000
126	10.000000
403	10.000000
948	9.465227
1696	7.717912
951	9.462235
1512	8.257814
133	10.000000
497	10.000000
1649	7.910819
140	10.000000
889	9.567953
1548	8.161031
1175	9.166805
250	10.000000
1399	8.526330
873	9.583272
423	10.000000
863	9.600382
1490	8.328712
1158	9.191901
1877	6.970958
815	9.687102
444	10.000000
1825	7.362847
1895	6.880663
1786	7.475525
1017	9.382366
356	10.000000
582	10.000000
522	10.000000
1003	9.399179
589	10.000000
981	9.437311
1898	6.838264
1609	8.015738
1520	8.225224
227	10.000000
636	10.000000

1331	8.730042
1171	9.173384
1053	9.336946
541	10.000000
467	10.000000
1534	8.192730
1587	8.072124
1905	6.775823
168	10.000000
1062	9.331056
1295	8.891179
1367	8.585228
685	9.931132
857	9.606989
1839	7.324065
1601	8.034303
157	10.000000
666	9.972017
760	9.797085
1811	7.384417
1634	7.951781
1849	7.253870
485	10.000000
923	9.514919
1057	9.333239
928	9.508361
426	10.000000
1348	8.653117
906	9.544080
861	9.604883
259	10.000000
1621	7.984372
1743	7.611118
1141	9.225117
446	10.000000
1804	7.412543
1864	7.105849
946	9.471291
1157	9.192277
80	10.000000
577	10.000000
1130	9.240366
1115	9.256032
966	9.449658
1499	8.289218
821	9.672178
697	9.899062
505	10.000000
1620	7.985391
380	10.000000
91	10.000000
434	10.000000
1685	7.764844
377	10.000000
151	10.000000
1375	8.562601
1343	8.672601
519	10.000000
1407	8.506342
1072	9.312170
1893	6.887672
524	10.000000
1572	8.110683
901	9.555448
1086	9.296691
169	10.000000
759	9.799487
152	10.000000
368	10.000000

540	10.000000
842	9.632069
1529	8.208836
120	10.000000
1114	9.258847
1505	8.276015
398	10.000000
58	10.000000
1589	8.069572
1092	9.283942
1873	7.001983
1821	7.366805
454	10.000000
1354	8.631698
1545	8.167479
1096	9.277973
610	10.000000
321	10.000000
1870	7.047224
111	10.000000
755	9.804373
256	10.000000
145	10.000000
1322	8.782446
790	9.739010
399	10.000000
1456	8.406804
727	9.839491
627	10.000000
1023	9.376698
1273	8.935841
1193	9.118978
1146	9.216966
48	10.000000
1536	8.191727
1199	9.110837
314	10.000000
1421	8.482758
936	9.489464
637	10.000000
1793	7.449177
1818	7.369620
950	9.463746
1738	7.621565
1680	7.797446
1808	7.403108
1313	8.829243
1908	6.728164
1764	7.558751
1196	9.113834
836	9.639439
498	10.000000
109	10.000000
864	9.598550
1020	9.378244
1763	7.562871
720	9.855708
1306	8.865225
753	9.808065
1391	8.538408
1710	7.691767
1509	8.273924
878	9.578201
1271	8.943453
876	9.578836
350	10.000000
1518	8.236007
1731	7.637837
1768	7.546011

```
311    10.000000
733     9.832432
1828    7.356195
241     10.000000
1603     8.028671
853     9.608767
802     9.711485
1780    7.484139
135     10.000000
1879    6.965763
758     9.800110
708     9.883226
1567    8.116580
1347    8.653676
159     10.000000
924     9.513014
1575    8.102292
1560    8.136457
932     9.496163
728     9.839272
1652    7.903917
1061    9.332182
1431    8.469553
29      10.000000
1714    7.684450
849     9.617004
1433    8.463774
257     10.000000
480     10.000000
761     9.795103
985     9.430825
1629    7.964951
1144    9.221612
792     9.729001
1625    7.976440
704     9.884724
1148    9.213439
134     10.000000
1448    8.440616
200     10.000000
1857    7.157471
1174    9.167186
840     9.637460
1796    7.436831
1422    8.482665
1132    9.240006
1720    7.664604
172     10.000000
1833    7.342895
278     10.000000
171     10.000000
179     10.000000
1673    7.828794
493     10.000000
1219    9.061327
1449    8.439887
1024    9.374015
599     10.000000
817     9.680673
1675    7.823416
1346    8.659472
1067    9.320656
Name: Price, dtype: float64
```

```
In [78]: lr.score(X_test,y_test)
```

```
Out[78]: 0.7874244361795553
```

```
In [79]: #Evaluating the model
y_pred=lr.predict(X_test)
y_pred
```

```
Out[79]: array([ 7.95355839, 10.32764103,  7.74815033,  9.83738099,  8.73260365,
  9.87019665,  9.06095481,  8.43180395,  9.88266293,  9.17575051,
  8.35535183,  6.69605092,  9.61804553,  8.48434735,  8.55728231,
  9.88087188,  9.93476972,  9.75422127,  9.10785099, 10.1097467 ,
  9.07715044,  7.71006981,  9.3898706 ,  8.38975579,  9.42650198,
  9.71530315,  9.87838615,  8.99714116,  8.33337732,  7.78466428,
 10.137551 ,  7.4611905 ,  9.28427096,  9.64327361,  9.81341832,
  8.33007884,  9.59332148,  8.53646921,  9.86557894,  9.11764208,
  7.34217824,  9.94167884,  9.80150803,  9.55289154,  8.81110765,
  7.51570511,  9.99054379, 10.01682985,  9.65098164,  9.55621179,
  8.3866333 , 10.09406135,  7.98368815,  8.76806406,  7.55313216,
  9.45812249, 10.0043343 , 10.07094677,  9.94598444,  9.44870255,
  8.83061598,  7.92609172,  9.91623879,  9.92859318,  9.449307 ,
  9.01158335,  9.32797696,  8.51127818,  9.87631598, 10.03887 ,
  8.17236493,  7.53282115,  7.59367565,  9.33366884,  9.87057856,
  9.23767366, 10.0557826 ,  9.91626092,  8.25269522,  9.29132045,
  9.39772293,  7.93891473,  8.69994843,  9.28133663,  9.53592349,
  9.40429313,  9.82309066, 10.13576904,  9.36957909,  9.06023672,
 10.1601913 ,  7.73503448,  8.58333153,  9.65076739,  8.48637228,
  9.91763139,  7.85774056,  7.25159098,  8.81648003,  9.651617 ,
  9.86147634,  9.83848208,  7.55510419,  9.79919908,  9.55321543,
  9.97525043,  9.74985386,  8.82441445,  8.13041058,  9.18915054,
  8.99494065, 10.18305644,  9.94504718,  8.94971105, 10.05277752,
  9.2088935 ,  8.59871972,  8.63305563,  9.35576623,  8.71479671,
  9.81584759,  9.83350274,  8.38169015,  9.17087946,  9.2748846 ,
  8.14281167,  9.39107496,  9.88602071,  7.51359147,  7.73363769,
  7.70251894,  9.66481737,  9.85497542,  9.78527157,  9.93886155,
  9.65929218, 10.32000014,  9.10315059,  7.68856257,  8.19752083,
  8.56639838,  9.86173022, 10.25294403,  8.27092354,  8.74571459,
  9.33386842, 10.20795087, 10.14951001,  9.13592569,  8.68411798,
  7.7766324 ,  9.49839216,  9.68178263,  9.19506113,  9.46513586,
  9.70963559,  9.61494801,  7.87835637,  7.78469726,  9.84886141,
  9.64480812,  9.19155016,  6.20617034,  8.02171653,  7.58749882,
  9.85602419,  9.44512991,  9.42088328,  9.0175225 , 10.11691316,
  9.43408227,  9.38848068,  9.63295301,  9.33803157,  8.19014134,
  8.18329841,  9.52369572, 10.18950648,  8.12209479,  8.10284137,
  9.70933489,  9.29163361,  9.94709093,  9.87615346,  9.2940915 ,
  9.28075535,  8.65577624,  8.20576562,  9.41689876,  9.11300748,
  9.81651377,  8.28253478,  9.90562131, 10.24485602,  9.8712012 ,
  8.68160993,  9.9579064 ,  9.89043184,  7.97482012,  8.22798098,
  9.84937299,  8.31697555,  9.50752048,  7.32881487, 10.40310704,
  8.45995501,  9.32114615,  9.386495 ,  9.33614761, 10.02351689,
 10.27767761,  9.75043461,  9.96401851,  8.60422094,  7.59340323,
 10.0087545 ,  9.36311016,  8.27075521, 10.38363967,  9.84616427,
  8.55324563,  9.36305801,  7.75722968,  7.68644706,  9.83979092,
  8.73842765,  7.96813929,  9.25665374, 10.24519332,  9.93317543,
  7.9885517 , 10.1001069 ,  9.15690048,  9.42101937, 10.08500805,
  9.3297259 ,  9.29543006, 10.10564889,  9.25466659,  9.56339543,
 10.09445298,  9.49510798,  9.16126485,  8.88633173,  9.48476006,
  9.79946431,  8.04051762,  9.38120997,  9.62597657,  7.88407331,
  9.19532623, 10.33237098,  7.98081537,  7.67325214,  8.60849679,
  7.6945695 ,  8.62119466,  7.81380228,  9.04163538,  7.86763291,
  7.88518939,  8.78831164,  8.85527001, 10.09564456,  9.90493608,
  8.91506471,  9.08930886,  7.87492774,  9.46336612,  9.07404088,
  9.87456574,  8.32611704,  7.65943061,  8.69310541,  9.74097734,
  8.58988263,  9.77321288, 10.06807144,  8.19488087,  8.51581899,
  7.80788203,  9.9593149 ,  9.74888584,  8.52388294,  9.52517943,
  8.79925686,  9.73017023,  9.28136437,  8.02779193, 10.18419997,
  8.00883028,  9.05601447,  9.68973751,  8.43423574,  9.06536926,
  9.88631979,  9.27173972,  7.80239475,  8.99989862,  8.96866534,
  9.24971488,  7.61608641,  8.6217122 ,  8.44422943,  9.88309531,
  8.45302404,  9.11915222,  7.92468789,  9.63052878,  9.96351407,
  9.41591935,  9.42435646,  8.15518897,  9.44671115,  9.37117989,
  8.54064632,  9.63083874,  8.86777879, 10.0860347 ,  9.25599309,
  9.67583233,  7.94465111,  8.78538889,  9.33377726,  7.14603405,
```



```
9.38598292, 8.85588407, 8.14856099, 9.42521841, 8.08862882,  
9.74240302, 9.14787217, 9.41533263, 8.09597795, 10.11567163,  
9.54862997, 9.13592003, 9.45573993, 10.2963604 , 9.44740218,  
8.10629533, 9.3146725 , 9.34989059])
```

```
In [80]: y_test
```

```
Out[80]: 1495      8.307173  
439      10.000000  
1803      7.416554  
289      10.000000  
974      9.443441  
392      10.000000  
1178      9.157819  
1464      8.394273  
778      9.763903  
1287      8.904189  
1501      8.281240  
1901      6.816519  
952      9.462110  
1643      7.923776  
1613      7.995122  
367      10.000000  
739      9.826082  
149      10.000000  
1011      9.385553  
416      10.000000  
788      9.742742  
1842      7.306319  
1116      9.250023  
1333      8.726923  
1159      9.190714  
277      10.000000  
59      10.000000  
1437      8.460006  
1446      8.444502  
1774      7.522392  
156      10.000000  
1703      7.700000  
896      9.561677  
797      9.724202  
520      10.000000  
1837      7.334185  
990      9.425749  
1202      9.104139  
561      10.000000  
927      9.508475  
1854      7.195504  
93      10.000000  
273      10.000000  
205      10.000000  
1131      9.240136  
1783      7.477138  
418      10.000000  
430      10.000000  
784      9.754926  
1040      9.350784  
1820      7.367975  
496      10.000000  
1778      7.486960  
947      9.469912  
1725      7.644764  
222      10.000000  
121      10.000000  
317      10.000000  
61      10.000000  
1087      9.296339  
938      9.488964  
1666      7.859404
```

556	10.000000
60	10.000000
890	9.567513
918	9.520327
1245	9.002746
793	9.728311
84	10.000000
326	10.000000
1615	7.992339
1762	7.567404
1817	7.369865
239	10.000000
55	10.000000
1209	9.073888
786	9.751308
98	10.000000
1623	7.980955
800	9.715486
1137	9.230624
1878	6.965846
1719	7.664672
894	9.563725
1350	8.647322
665	9.975006
785	9.752354
533	10.000000
1371	8.568552
911	9.540022
72	10.000000
1779	7.485086
1699	7.710983
249	10.000000
1264	8.965257
348	10.000000
1694	7.721042
1648	7.915053
1467	8.386811
265	10.000000
88	10.000000
701	9.890728
1473	8.363639
51	10.000000
1	10.000000
126	10.000000
403	10.000000
948	9.465227
1696	7.717912
951	9.462235
1512	8.257814
133	10.000000
497	10.000000
1649	7.910819
140	10.000000
889	9.567953
1548	8.161031
1175	9.166805
250	10.000000
1399	8.526330
873	9.583272
423	10.000000
863	9.600382
1490	8.328712
1158	9.191901
1877	6.970958
815	9.687102
444	10.000000
1825	7.362847
1895	6.880663
1786	7.475525

1017	9.382366
356	10.000000
582	10.000000
522	10.000000
1003	9.399179
589	10.000000
981	9.437311
1898	6.838264
1609	8.015738
1520	8.225224
227	10.000000
636	10.000000
1331	8.730042
1171	9.173384
1053	9.336946
541	10.000000
467	10.000000
1534	8.192730
1587	8.072124
1905	6.775823
168	10.000000
1062	9.331056
1295	8.891179
1367	8.585228
685	9.931132
857	9.606989
1839	7.324065
1601	8.034303
157	10.000000
666	9.972017
760	9.797085
1811	7.384417
1634	7.951781
1849	7.253870
485	10.000000
923	9.514919
1057	9.333239
928	9.508361
426	10.000000
1348	8.653117
906	9.544080
861	9.604883
259	10.000000
1621	7.984372
1743	7.611118
1141	9.225117
446	10.000000
1804	7.412543
1864	7.105849
946	9.471291
1157	9.192277
80	10.000000
577	10.000000
1130	9.240366
1115	9.256032
966	9.449658
1499	8.289218
821	9.672178
697	9.899062
505	10.000000
1620	7.985391
380	10.000000
91	10.000000
434	10.000000
1685	7.764844
377	10.000000
151	10.000000
1375	8.562601
1343	8.672601

519	10.000000
1407	8.506342
1072	9.312170
1893	6.887672
524	10.000000
1572	8.110683
901	9.555448
1086	9.296691
169	10.000000
759	9.799487
152	10.000000
368	10.000000
540	10.000000
842	9.632069
1529	8.208836
120	10.000000
1114	9.258847
1505	8.276015
398	10.000000
58	10.000000
1589	8.069572
1092	9.283942
1873	7.001983
1821	7.366805
454	10.000000
1354	8.631698
1545	8.167479
1096	9.277973
610	10.000000
321	10.000000
1870	7.047224
111	10.000000
755	9.804373
256	10.000000
145	10.000000
1322	8.782446
790	9.739010
399	10.000000
1456	8.406804
727	9.839491
627	10.000000
1023	9.376698
1273	8.935841
1193	9.118978
1146	9.216966
48	10.000000
1536	8.191727
1199	9.110837
314	10.000000
1421	8.482758
936	9.489464
637	10.000000
1793	7.449177
1818	7.369620
950	9.463746
1738	7.621565
1680	7.797446
1808	7.403108
1313	8.829243
1908	6.728164
1764	7.558751
1196	9.113834
836	9.639439
498	10.000000
109	10.000000
864	9.598550
1020	9.378244
1763	7.562871
720	9.855708

1306	8.865225
753	9.808065
1391	8.538408
1710	7.691767
1509	8.273924
878	9.578201
1271	8.943453
876	9.578836
350	10.000000
1518	8.236007
1731	7.637837
1768	7.546011
311	10.000000
733	9.832432
1828	7.356195
241	10.000000
1603	8.028671
853	9.608767
802	9.711485
1780	7.484139
135	10.000000
1879	6.965763
758	9.800110
708	9.883226
1567	8.116580
1347	8.653676
159	10.000000
924	9.513014
1575	8.102292
1560	8.136457
932	9.496163
728	9.839272
1652	7.903917
1061	9.332182
1431	8.469553
29	10.000000
1714	7.684450
849	9.617004
1433	8.463774
257	10.000000
480	10.000000
761	9.795103
985	9.430825
1629	7.964951
1144	9.221612
792	9.729001
1625	7.976440
704	9.884724
1148	9.213439
134	10.000000
1448	8.440616
200	10.000000
1857	7.157471
1174	9.167186
840	9.637460
1796	7.436831
1422	8.482665
1132	9.240006
1720	7.664604
172	10.000000
1833	7.342895
278	10.000000
171	10.000000
179	10.000000
1673	7.828794
493	10.000000
1219	9.061327
1449	8.439887
1024	9.374015

```
599      10.000000
817       9.680673
1675      7.823416
1346      8.659472
1067      9.320656
Name: Price, dtype: float64
```

```
In [81]: from sklearn.metrics import mean_squared_error
import numpy as np
```

```
In [82]: mse= mean_squared_error(y_test,y_pred)
root_mse=np.sqrt(mse)

print('MSE = ',mse)
print('Root_mse = ',root_mse)
```

```
MSE = 0.20223212146149883
Root_mse = 0.44970225867956104
```

```
In [ ]:
```