

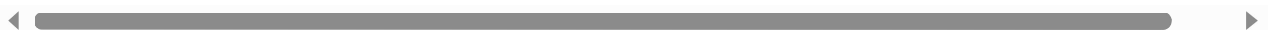
```
In [1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as py
import seaborn as sns
```

```
In [2]: d=pd.read_csv(r"C:\Users\user\Downloads\11_winequality-red - 11_winequality-red.csv")
d
```

```
Out[2]:
```

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	qu
0	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4	
1	7.8	0.880	0.00	2.6	0.098	25.0	67.0	0.99680	3.20	0.68	9.8	
2	7.8	0.760	0.04	2.3	0.092	15.0	54.0	0.99700	3.26	0.65	9.8	
3	11.2	0.280	0.56	1.9	0.075	17.0	60.0	0.99800	3.16	0.58	9.8	
4	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4	
...	...	...	...	...	...	...	...	...	...	...	...	...
1594	6.2	0.600	0.08	2.0	0.090	32.0	44.0	0.99490	3.45	0.58	10.5	
1595	5.9	0.550	0.10	2.2	0.062	39.0	51.0	0.99512	3.52	0.76	11.2	
1596	6.3	0.510	0.13	2.3	0.076	29.0	40.0	0.99574	3.42	0.75	11.0	
1597	5.9	0.645	0.12	2.0	0.075	32.0	44.0	0.99547	3.57	0.71	10.2	
1598	6.0	0.310	0.47	3.6	0.067	18.0	42.0	0.99549	3.39	0.66	11.0	

1599 rows × 12 columns



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

```
Out[3]:
```

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	qualit
0	7.4	0.70	0.00	1.9	0.076	11.0	34.0	0.9978	3.51	0.56	9.4	
1	7.8	0.88	0.00	2.6	0.098	25.0	67.0	0.9968	3.20	0.68	9.8	
2	7.8	0.76	0.04	2.3	0.092	15.0	54.0	0.9970	3.26	0.65	9.8	
3	11.2	0.28	0.56	1.9	0.075	17.0	60.0	0.9980	3.16	0.58	9.8	
4	7.4	0.70	0.00	1.9	0.076	11.0	34.0	0.9978	3.51	0.56	9.4	



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

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1599 entries, 0 to 1598
Data columns (total 12 columns):
#   Column                Non-Null Count  Dtype
---  -
0   fixed acidity          1599 non-null   float64
1   volatile acidity       1599 non-null   float64
2   citric acid            1599 non-null   float64
3   residual sugar         1599 non-null   float64
4   chlorides              1599 non-null   float64
5   free sulfur dioxide    1599 non-null   float64
6   total sulfur dioxide   1599 non-null   float64
7   density                1599 non-null   float64
8   pH                    1599 non-null   float64
9   sulphates              1599 non-null   float64
10  alcohol                1599 non-null   float64
11  quality                1599 non-null   int64
dtypes: float64(11), int64(1)
memory usage: 150.0 KB

```

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

```
Out[5]:
```

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	
<b>count</b>	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.
<b>mean</b>	8.319637	0.527821	0.270976	2.538806	0.087467	15.874922	46.467792	0.
<b>std</b>	1.741096	0.179060	0.194801	1.409928	0.047065	10.460157	32.895324	0.
<b>min</b>	4.600000	0.120000	0.000000	0.900000	0.012000	1.000000	6.000000	0.
<b>25%</b>	7.100000	0.390000	0.090000	1.900000	0.070000	7.000000	22.000000	0.
<b>50%</b>	7.900000	0.520000	0.260000	2.200000	0.079000	14.000000	38.000000	0.
<b>75%</b>	9.200000	0.640000	0.420000	2.600000	0.090000	21.000000	62.000000	0.
<b>max</b>	15.900000	1.580000	1.000000	15.500000	0.611000	72.000000	289.000000	1.

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

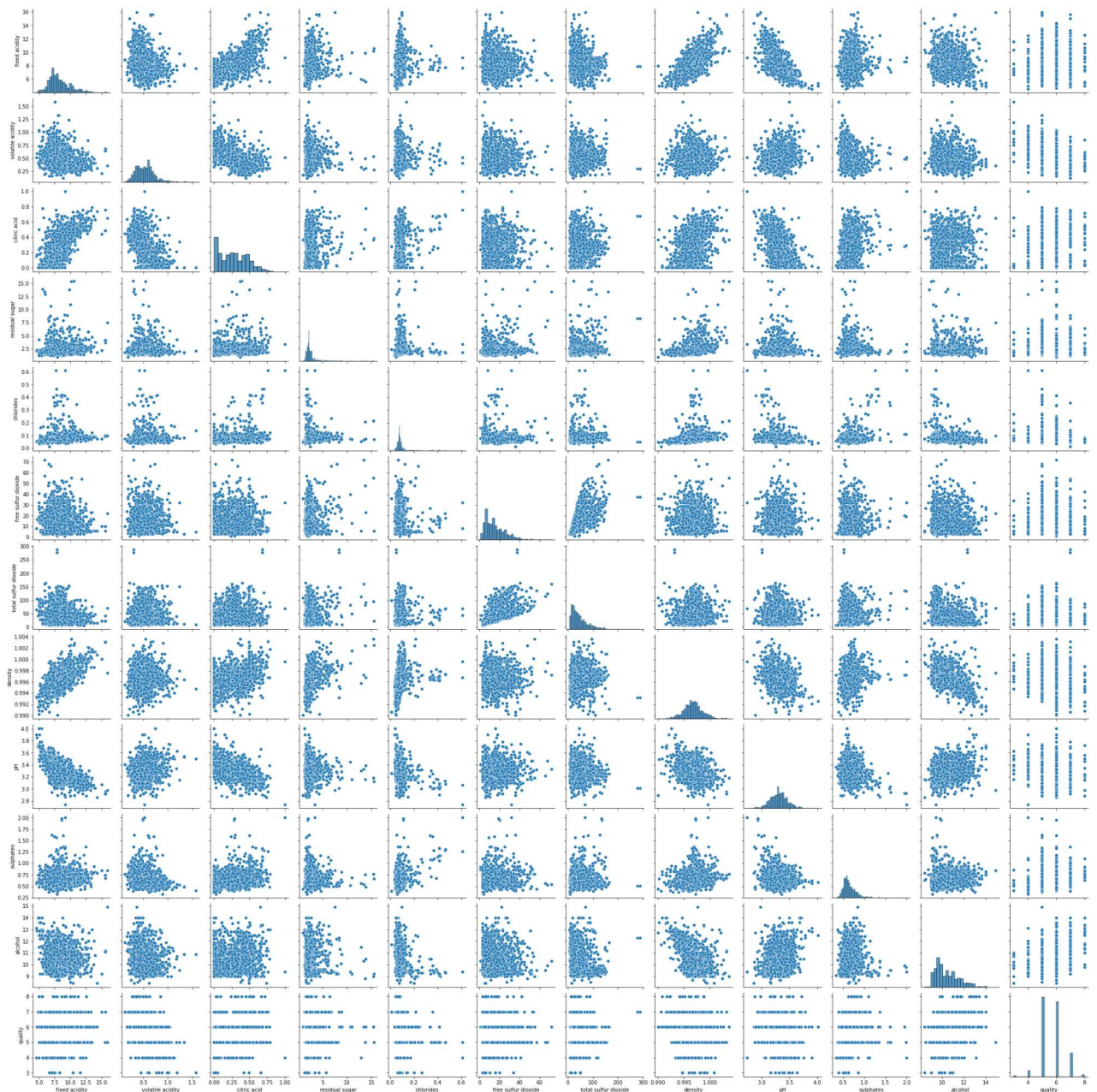
```
Out[6]: Index(['fixed acidity', 'volatile acidity', 'citric acid', 'residual sugar',
              'chlorides', 'free sulfur dioxide', 'total sulfur dioxide', 'density',
              'pH', 'sulphates', 'alcohol', 'quality'],
              dtype='object')
```

```
In [7]: d.index
```

```
Out[7]: RangeIndex(start=0, stop=1599, step=1)
```

```
In [8]: sns.pairplot(d)
```

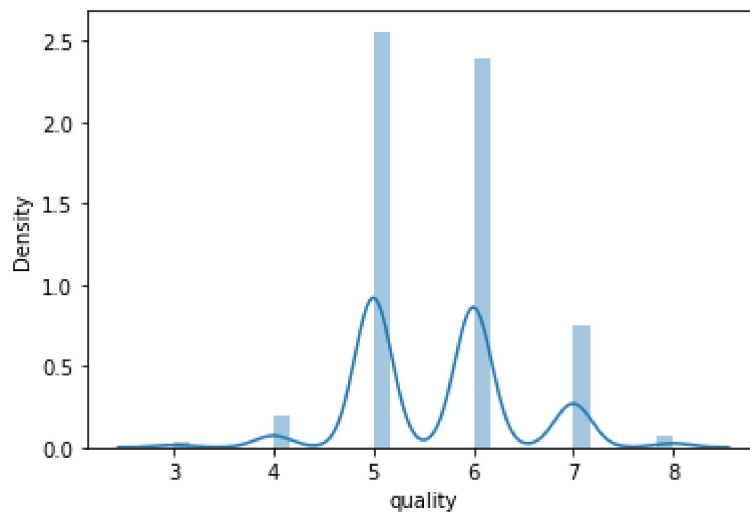
```
Out[8]: <seaborn.axisgrid.PairGrid at 0x1c5ae898280>
```



```
In [9]: sns.distplot(d['quality'])
```

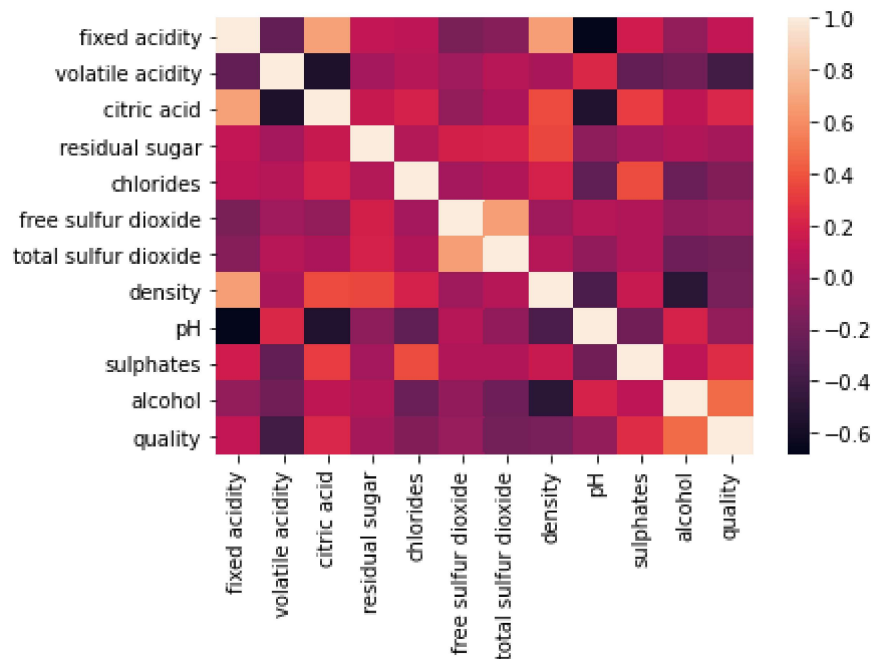
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function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

```
Out[9]: <AxesSubplot:xlabel='quality', ylabel='Density'>
```



```
In [10]: d1=d[['fixed acidity', 'volatile acidity', 'citric acid', 'residual sugar',
               'chlorides', 'free sulfur dioxide', 'total sulfur dioxide', 'density',
               'pH', 'sulphates', 'alcohol', 'quality']]
sns.heatmap(d1.corr())
```

Out[10]: <AxesSubplot:>



```
In [19]: x=d1[['fixed acidity', 'volatile acidity', 'citric acid', 'residual sugar',
               'chlorides', 'free sulfur dioxide', 'total sulfur dioxide', 'density',
               'pH', 'sulphates', 'alcohol']]
y =d1['quality']
```

```
In [20]: 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)
```

```
In [21]: from sklearn.linear_model import LinearRegression
```

```
In [22]: lr=LinearRegression()  
lr.fit(x_train,y_train)
```

```
Out[22]: LinearRegression()
```

```
In [23]: print(lr.intercept_)
```

35.300550591624024

```
In [24]: coeff =pd.DataFrame(lr.coef_,x.columns,columns=["Co-efficient"])  
coeff
```

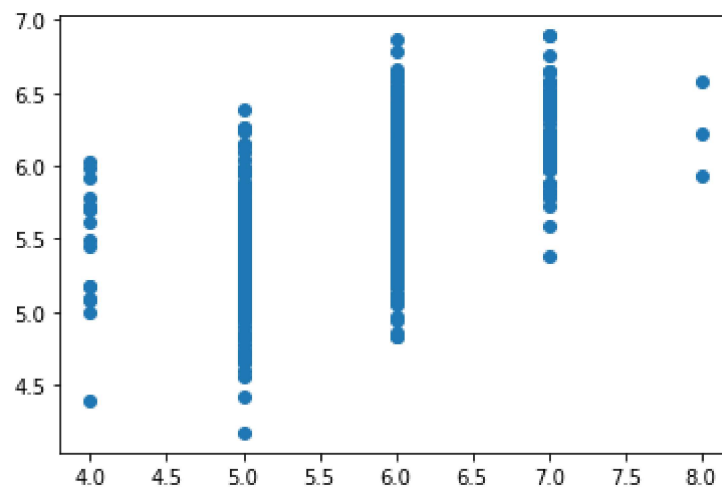
```
Out[24]:
```

	Co-efficient
--	--------------

<b>fixed acidity</b>	0.042962
<b>volatile acidity</b>	-1.251997
<b>citric acid</b>	-0.380490
<b>residual sugar</b>	0.023293
<b>chlorides</b>	-1.783075
<b>free sulfur dioxide</b>	0.004000
<b>total sulfur dioxide</b>	-0.003188
<b>density</b>	-31.262242
<b>pH</b>	-0.367712
<b>sulphates</b>	0.959485
<b>alcohol</b>	0.255995

```
In [25]: prediction =lr.predict(x_test)  
py.scatter(y_test,prediction)
```

```
Out[25]: <matplotlib.collections.PathCollection at 0x1c5b71e41f0>
```



In [26]: `print(lr.score(x_test,y_test))`

0.3677100493242411

In [ ]: