GRIPAUGUST21- The Sparks Foundation

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Data Science and Business Analytics Internship Task

Task 1:Prediction Using Supervised Machine Learning

Task Description: Predicting the percentage of a student based on the number of study hours

Importing the Required Libraries

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sn
%matplotlib inline
```

Reading the data

In [2]:

```
url= "http://bit.ly/w-data"
data=pd.read_csv(url)
data
```

Out[2]:

	Hours	Scores
0	2.5	21
1	5.1	47
2	3.2	27
3	8.5	75
4	3.5	30
5	1.5	20
6	9.2	88
7	5.5	60
8	8.3	81
9	2.7	25
10	7.7	85
11	5.9	62
12	4.5	41
13	3.3	42
14	1.1	17
15	8.9	95
16	2.5	30
17	1.9	24
18	6.1	67
19	7.4	69
20	2.7	30
21	4.8	54
22	3.8	35
23	6.9	76
24	7.8	86

Data Preprocessing

In [3]:

```
data.head()
```

Out[3]:

	Hours	Scores
0	2.5	21
1	5.1	47
2	3.2	27
3	8.5	75
4	3.5	30

In [4]:

```
data.shape
```

Out[4]:

```
(25, 2)
```

In [5]:

```
data.columns
```

Out[5]:

```
Index(['Hours', 'Scores'], dtype='object')
```

In [6]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 25 entries, 0 to 24
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   Hours   25 non-null     float64
 1   Scores  25 non-null     int64  
dtypes: float64(1), int64(1)
memory usage: 528.0 bytes
```

In [7]:

```
data.describe()
```

Out[7]:

	Hours	Scores
count	25.000000	25.000000
mean	5.012000	51.480000
std	2.525094	25.286887
min	1.100000	17.000000
25%	2.700000	30.000000
50%	4.800000	47.000000
75%	7.400000	75.000000
max	9.200000	95.000000

In [8]:

```
data.isnull().sum()
```

Out[8]:

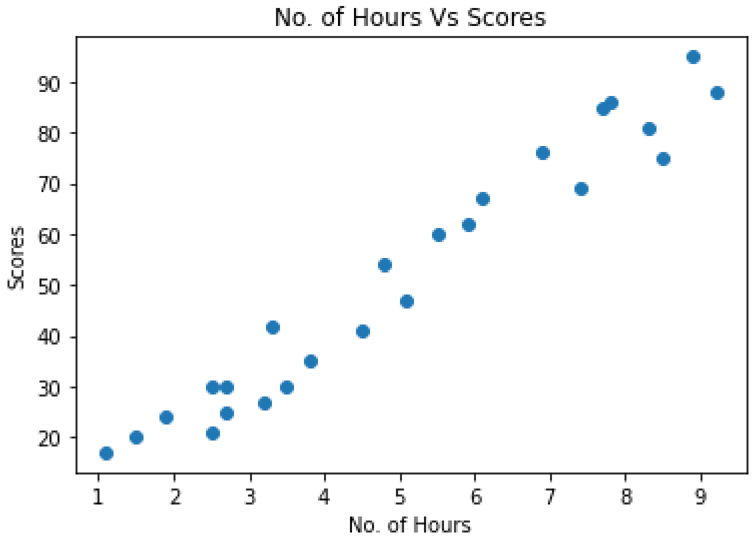
```
Hours     0
Scores    0
dtype: int64
```

Data Visualization

Scatter Plots

In [9]:

```
plt.scatter(x="Hours",y="Scores",data=data)
plt.xlabel("No. of Hours")
plt.ylabel("Scores")
plt.title("No. of Hours Vs Scores")
plt.show()
```

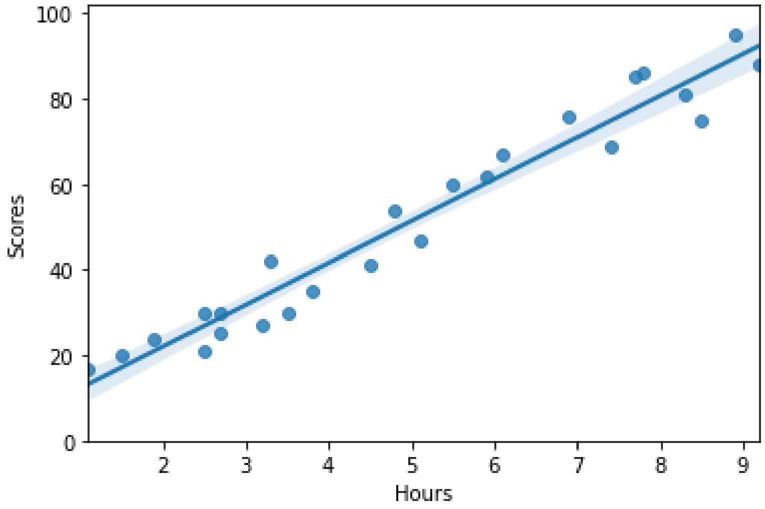


In [10]:

```
sn.regplot(x="Hours",y="Scores",data=data)
plt.ylim(0,)
```

Out[10]:

```
(0.0, 101.92080464224475)
```



Correlation Heatmap

In [11]:

```
data.corr()
```

Out[11]:

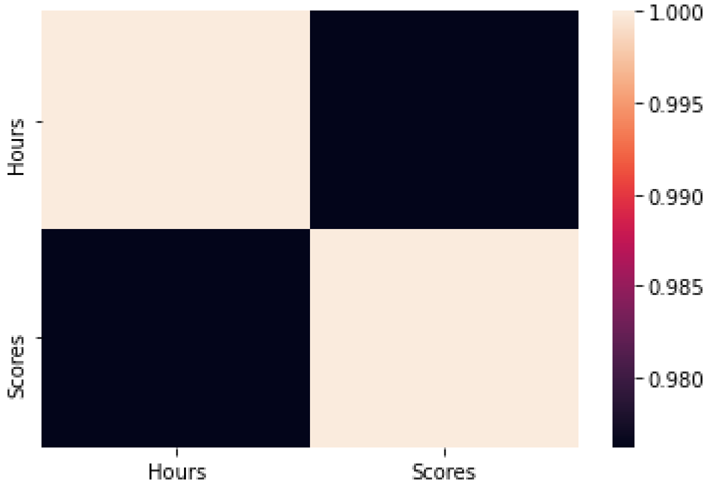
	Hours	Scores
Hours	1.000000	0.976191
Scores	0.976191	1.000000

In [12]:

```
sn.heatmap(data.corr())
```

Out[12]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x260c5382b50>
```



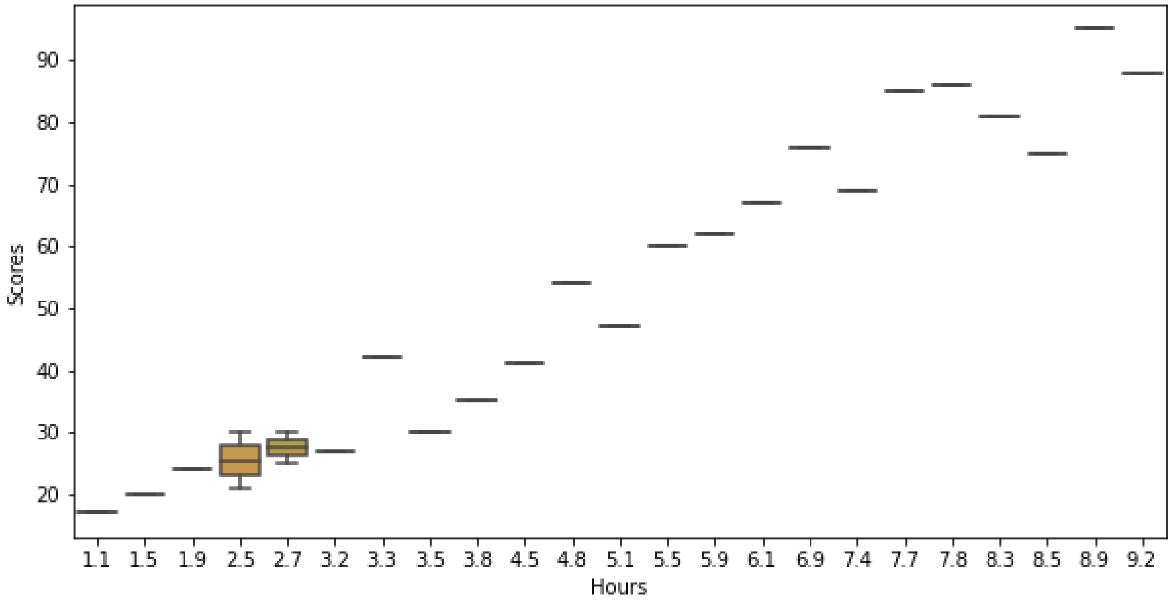
Boxplot

In [13]:

```
plt.figure(figsize=(10,5))
sn.boxplot(x="Hours",y="Scores",data=data)
```

Out[13]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x260c5424d00>
```



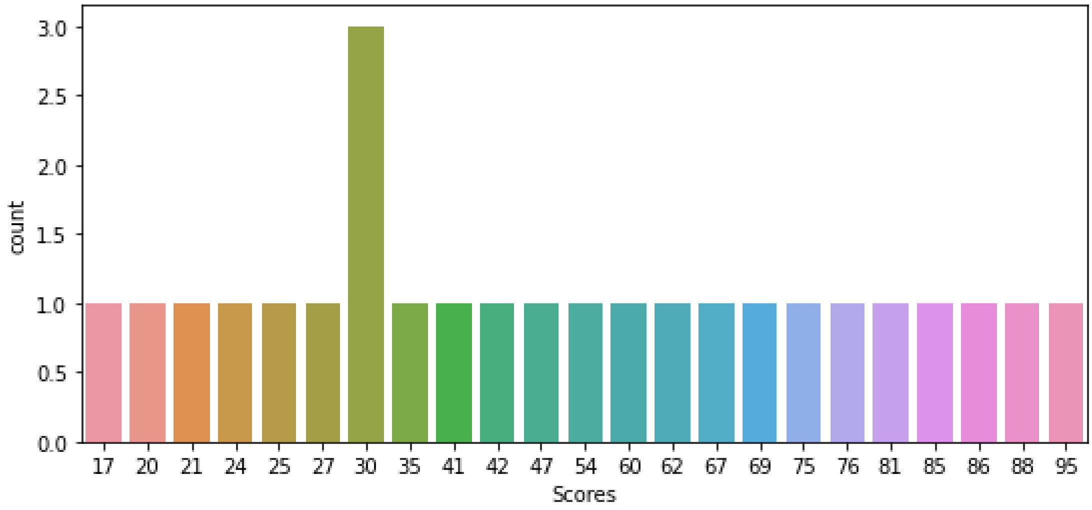
Countplots

In [14]:

```
plt.figure(figsize=(9,4))
sn.countplot(x="Scores",data=data)
```

Out[14]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x260c56619d0>
```



Thus 3 students have the same score as 30

Pairplot

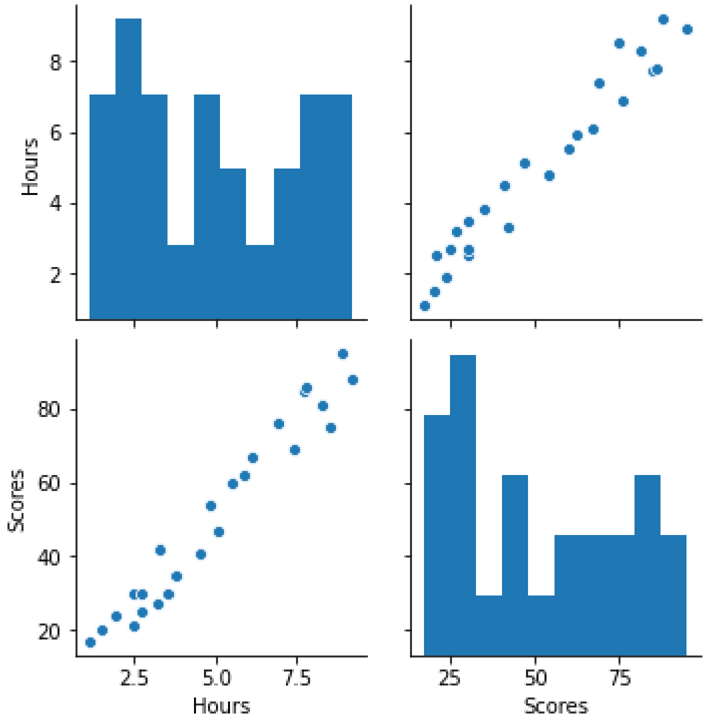
Pairplot

In [15]:

```
sn.pairplot(data)
```

Out[15]:

```
<seaborn.axisgrid.PairGrid at 0x260c5711340>
```



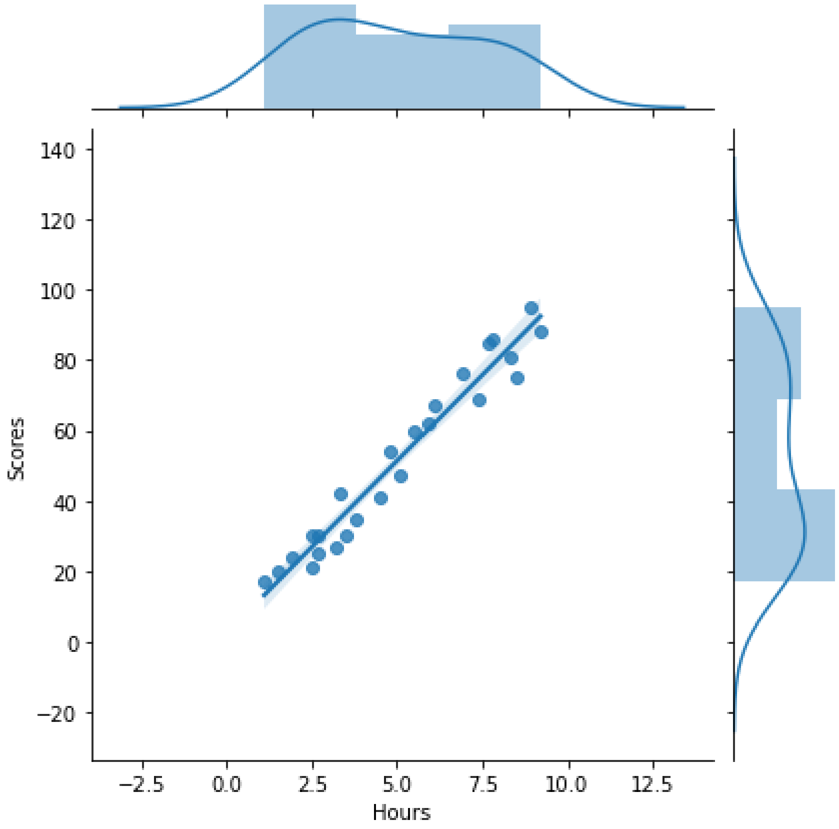
Jointplots

In [16]:

```
sn.jointplot(x="Hours",y="Scores",data=data,kind='reg')
```

Out[16]:

```
<seaborn.axisgrid.JointGrid at 0x260c58e7cd0>
```



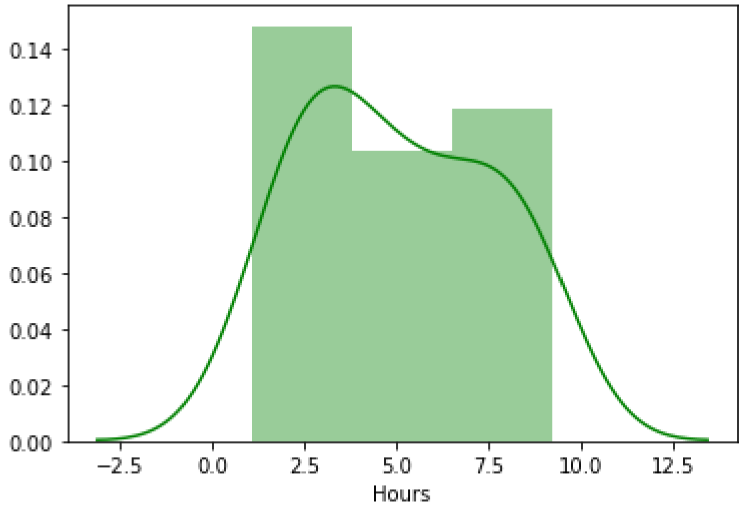
Distribution Plots

In [17]:

```
sn.distplot(data["Hours"],color='green')
```

Out[17]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x260c5352340>
```

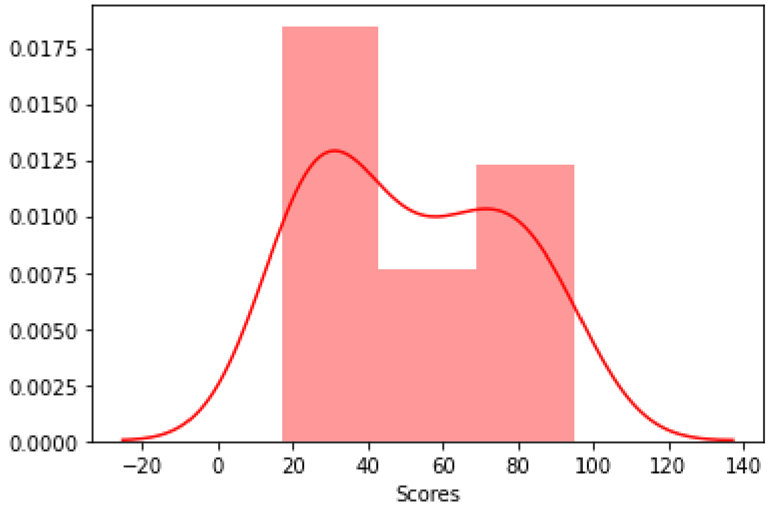


In [18]:

```
sn.distplot(data["Scores"],color='red')
```

Out[18]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x260c534eca0>
```



Linear Regression Model

In [19]:

```
import statsmodels.api as sm
from sklearn.model_selection import train_test_split
```

In [20]:

```
X=sm.add_constant(data["Hours"])
Y=data["Scores"]

train_X,test_X,train_Y,test_Y=train_test_split(X,Y,train_size=0.75,random_state=100)

model=sm.OLS(train_Y,train_X).fit()
model.summary2()
```

```
C:\Users\Admin\anaconda3\lib\site-packages\scipy\stats\stats.py:1603: UserWa
rning: kurtosistest only valid for n>=20 ... continuing anyway, n=18
  warnings.warn("kurtosistest only valid for n>=20 ... continuing "
```

Out[20]:

```
             Model:              OLS      Adj. R-squared:     0.952
Dependent Variable:           Scores                 AIC:  116.6082
              Date: 2021-08-06 10:58                 BIC:  118.3889
  No. Observations:               18      Log-Likelihood:   -56.304
          Df Model:                1         F-statistic:     340.0
      Df Residuals:               16  Prob (F-statistic):  3.34e-12
         R-squared:            0.955               Scale:    34.326

         Coef.  Std.Err.        t    P>|t|   [0.025    0.975]
 const  1.8709    3.1086   0.6018   0.5557  -4.7191    8.4609
 Hours  9.8542    0.5344  18.4382   0.0000   8.7212   10.9872

       Omnibus:  4.767     Durbin-Watson:  2.014
Prob(Omnibus):  0.092  Jarque-Bera (JB):  1.657
          Skew: -0.293          Prob(JB):  0.437
      Kurtosis:  1.634      Condition No.:    13
```

Thus the linear regression model is

Score = 1.8709 + 9.8542 * (Hours)

In [21]:

```
model.params
```

Out[21]:

```
const    1.870904
Hours    9.854197
dtype: float64
```

In [22]:

```
train_Y
```

Out[22]:

```
21    54
6     88
12    41
4     30
24    86
0     21
1     47
20    30
14    17
17    24
18    67
2     27
10    85
16    30
15    95
7     60
3     75
8     81
Name: Scores, dtype: int64
```

In [23]:

```
test_Y
```

Out[23]:

```
9     25
22    35
13    42
11    62
5     20
19    69
23    76
Name: Scores, dtype: int64
```

Predicted Values

In [24]:

```
pred_Y=model.predict(test_X)
print(pred_Y)
```

```
9     28.477237
22    39.316855
13    34.389756
11    60.010669
5     16.652200
19    74.791966
23    69.864867
dtype: float64
```

In [25]:

```
df=pd.DataFrame({"Actual_Value":test_Y,"Predicted_Value":pred_Y})
df
```

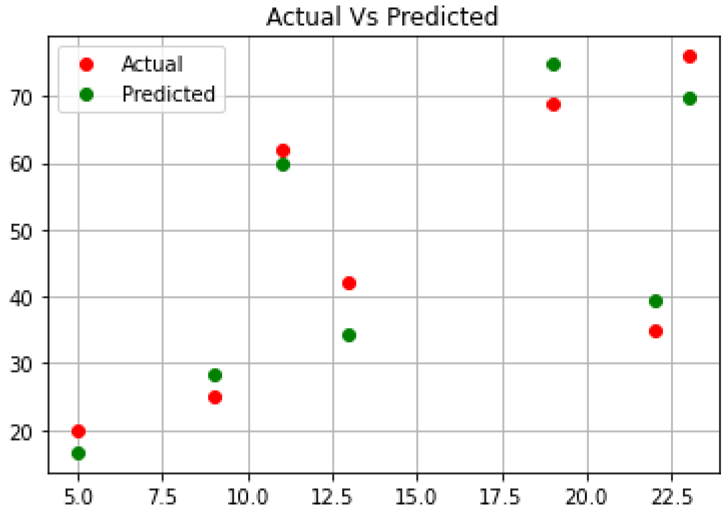
Out[25]:

	Actual_Value	Predicted_Value
9	25	28.477237
22	35	39.316855
13	42	34.389756
11	62	60.010669
5	20	16.652200
19	69	74.791966
23	76	69.864867

The below plot shows the deviation of predicted values from the actual values

In [32]:

```
plt.plot(df['Actual_Value'],'ro',label='Actual')
plt.plot(df['Predicted_Value'],'go',label='Predicted')
plt.title('Actual Vs Predicted')
plt.grid()
plt.legend(loc='upper left')
plt.show()
```



Performance Metrics

In [27]:

```
from sklearn import metrics

rmse=np.sqrt(metrics.mean_squared_error(pred_Y,test_Y))
print("Root Mean Squared Error is",rmse)
```

```
Root Mean Squared Error is 4.9999164513728935
```

In [28]:

```
mae=metrics.mean_absolute_error(pred_Y,test_Y)
print("Mean Absolute Error is",mae)
```

```
Mean Absolute Error is 4.66693786982249
```

What will be predicted score if a student studies for 9.25 hrs/ day?

In [29]:

```
hours=[1,9.25]
pred_value=model.predict(hours)
print("Predicted Score corresponding to 9.25 hrs/day = {}".format(pred_value[0]))
```

```
Predicted Score corresponding to 9.25 hrs/day = 93.02223095414203
```