Problem Statement

Linear Regression

Import Libraries

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

In [2]:
```
a=pd.read_csv("2015.csv")
a
```

Out[2]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedo
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.665
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.628
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.649
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.669
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.632
...	...	...	...	...	...	...	...	...	
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.592
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.484
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.156
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.118
157	Togo	Sub-Saharan Africa	158	2.839	0.06727	0.20868	0.13995	0.28443	0.364

158 rows × 12 columns

To display top 10 rows

In [3]:

```
c=a.head(15)
c
```

Out[3]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedo
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.665
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.628
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.649
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.669
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.632
5	Finland	Western Europe	6	7.406	0.03140	1.29025	1.31826	0.88911	0.641
6	Netherlands	Western Europe	7	7.378	0.02799	1.32944	1.28017	0.89284	0.615
7	Sweden	Western Europe	8	7.364	0.03157	1.33171	1.28907	0.91087	0.659
8	New Zealand	Australia and New Zealand	9	7.286	0.03371	1.25018	1.31967	0.90837	0.639
9	Australia	Australia and New Zealand	10	7.284	0.04083	1.33358	1.30923	0.93156	0.651
10	Israel	Middle East and Northern Africa	11	7.278	0.03470	1.22857	1.22393	0.91387	0.413
11	Costa Rica	Latin America and Caribbean	12	7.226	0.04454	0.95578	1.23788	0.86027	0.633
12	Austria	Western Europe	13	7.200	0.03751	1.33723	1.29704	0.89042	0.624
13	Mexico	Latin America and Caribbean	14	7.187	0.04176	1.02054	0.91451	0.81444	0.481

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedo
14	United States	North America	15	7.119	0.03839	1.39451	1.24711	0.86179	0.546

To find Missing values

In [4]:

```
c.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15 entries, 0 to 14
Data columns (total 12 columns):
 #   Column                         Non-Null Count  Dtype  
---  ------                         --------------  -----  
 0   Country                        15 non-null     object 
 1   Region                         15 non-null     object 
 2   Happiness Rank                 15 non-null     int64  
 3   Happiness Score                15 non-null     float64
 4   Standard Error                 15 non-null     float64
 5   Economy (GDP per Capita)       15 non-null     float64
 6   Family                         15 non-null     float64
 7   Health (Life Expectancy)       15 non-null     float64
 8   Freedom                        15 non-null     float64
 9   Trust (Government Corruption)  15 non-null     float64
 10  Generosity                     15 non-null     float64
 11  Dystopia Residual              15 non-null     float64
dtypes: float64(9), int64(1), object(2)
memory usage: 1.5+ KB
```

To display summary of statistics

In [5]:

```
a.describe()
```

Out[5]:

	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom	(Govern Corrup
count	158.000000	158.000000	158.000000	158.000000	158.000000	158.000000	158.000000	158.00
mean	79.493671	5.375734	0.047885	0.846137	0.991046	0.630259	0.428615	0.14
std	45.754363	1.145010	0.017146	0.403121	0.272369	0.247078	0.150693	0.12
min	1.000000	2.839000	0.018480	0.000000	0.000000	0.000000	0.000000	0.00
25%	40.250000	4.526000	0.037268	0.545808	0.856823	0.439185	0.328330	0.06
50%	79.500000	5.232500	0.043940	0.910245	1.029510	0.696705	0.435515	0.10
75%	118.750000	6.243750	0.052300	1.158448	1.214405	0.811013	0.549092	0.18
max	158.000000	7.587000	0.136930	1.690420	1.402230	1.025250	0.669730	0.55

To display column heading

In [6]:

```
a.columns
```

Out[6]:

```
Index(['Country', 'Region', 'Happiness Rank', 'Happiness Score',
       'Standard Error', 'Economy (GDP per Capita)', 'Family',
       'Health (Life Expectancy)', 'Freedom', 'Trust (Government Corruption)',
       'Generosity', 'Dystopia Residual'],
      dtype='object')
```

Pairplot

In [7]:

```
s=a.dropna(axis=1)
s
```

Out[7]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedo
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.6655
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.6287
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.6493
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.6697
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.6329
...	...	...	...	...	...	...	...	...	
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.4845
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.1185
157	Togo	Sub-Saharan Africa	158	2.839	0.06727	0.20868	0.13995	0.28443	0.3645

158 rows × 12 columns

In [8]:

```
s.columns
```

Out[8]:

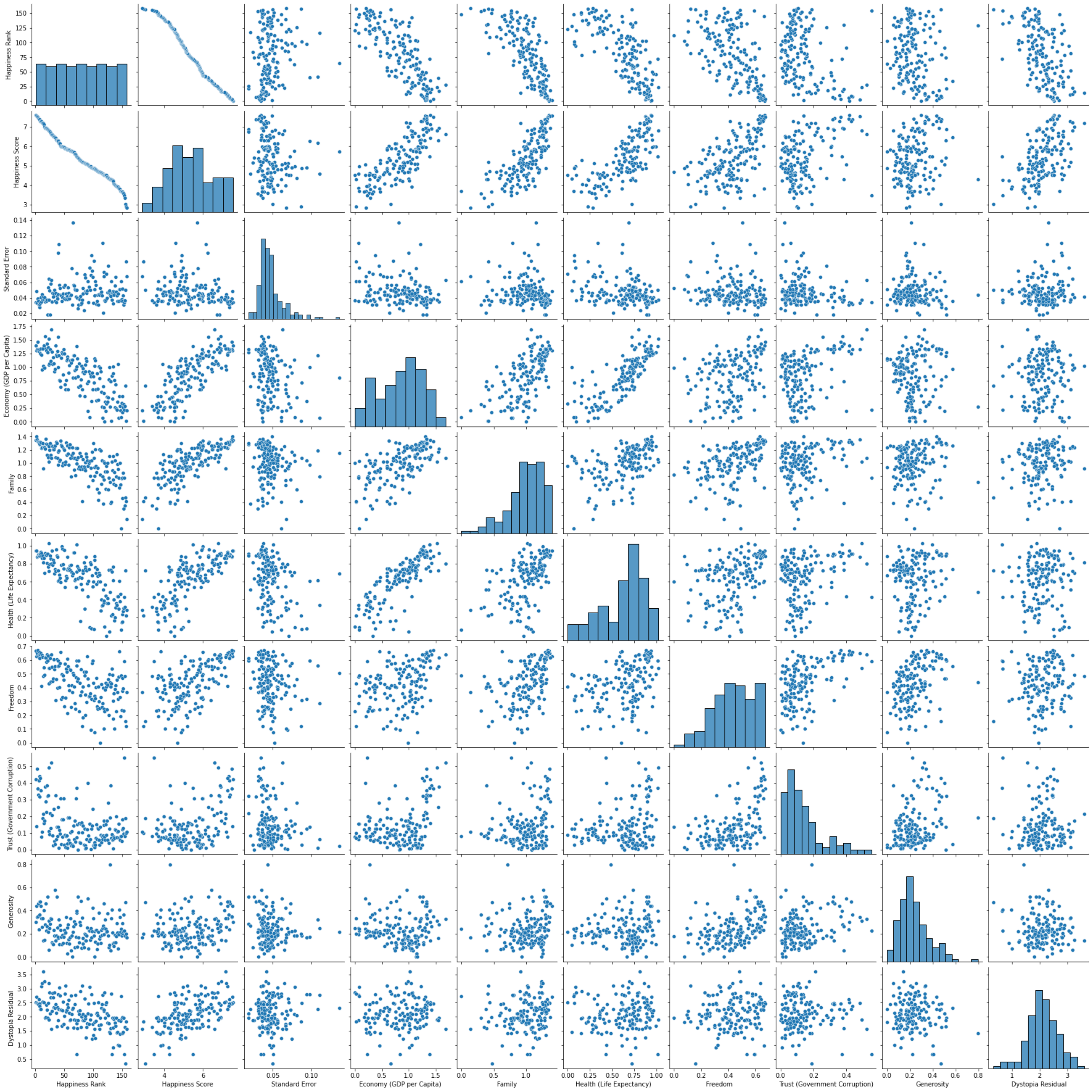
```
Index(['Country', 'Region', 'Happiness Rank', 'Happiness Score',
       'Standard Error', 'Economy (GDP per Capita)', 'Family',
       'Health (Life Expectancy)', 'Freedom', 'Trust (Government Corruption)',
       'Generosity', 'Dystopia Residual'],
      dtype='object')
```

In [9]:

```
sns.pairplot(a)
```

Out[9]:

```
<seaborn.axisgrid.PairGrid at 0x19cff321cd0>
```



Distribution Plot

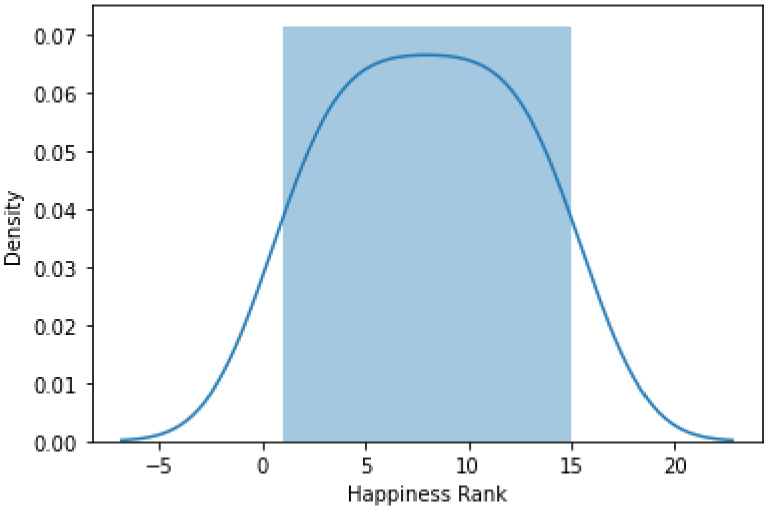
In [10]:

```
sns.distplot(c['Happiness Rank'])
```

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

Out[10]:

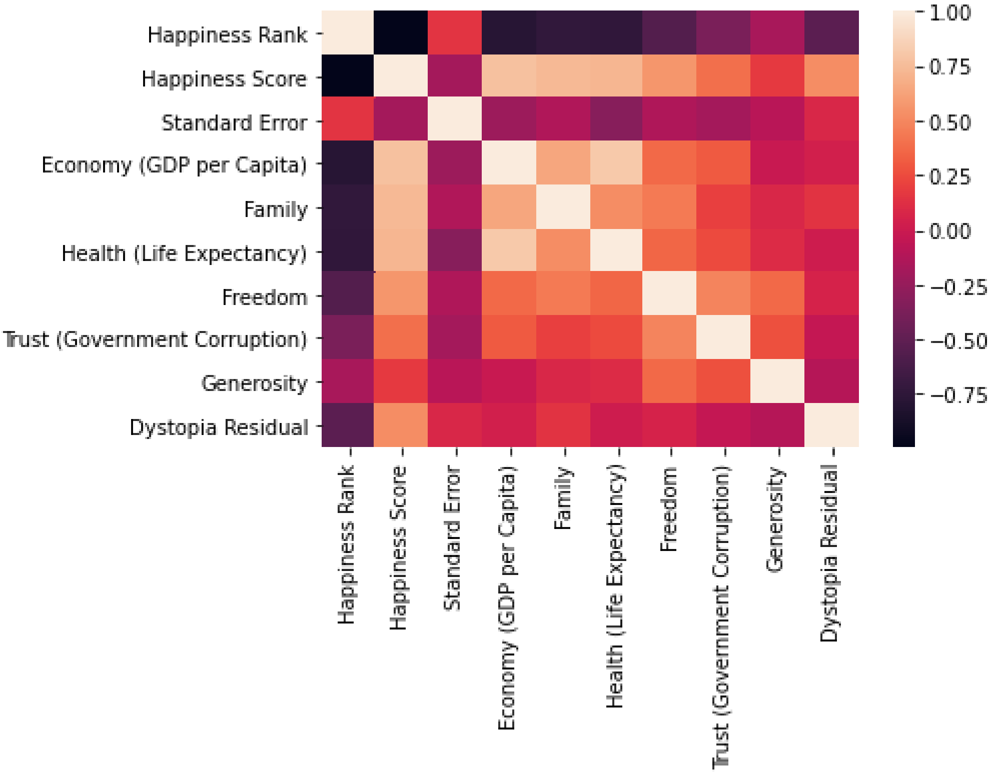
```
<AxesSubplot:xlabel='Happiness Rank', ylabel='Density'>
```



Correlation

In [11]:
```
b=a[['Country', 'Region', 'Happiness Rank', 'Happiness Score',
       'Standard Error', 'Economy (GDP per Capita)', 'Family',
       'Health (Life Expectancy)', 'Freedom', 'Trust (Government Corruption)',
       'Generosity', 'Dystopia Residual']]
sns.heatmap(b.corr())
```

Out[11]:
```
<AxesSubplot:>
```



Train the model - Model Building

In [12]:
```
g=c[['Happiness Rank']]
h=c['Happiness Rank']
```

To split dataset into training end test

In [13]:

```
from sklearn.model_selection import train_test_split
g_train,g_test,h_train,h_test=train_test_split(g,h,test_size=0.6)
```

To run the model

In [14]:

```
from sklearn.linear_model import LinearRegression
```

In [15]:

```
lr=LinearRegression()
lr.fit(g_train,h_train)
```

Out[15]:

```
LinearRegression()
```

In [16]:

```
print(lr.intercept_)
```

```
1.7763568394002505e-15
```

Coeffecient

In [17]:

```
coeff=pd.DataFrame(lr.coef_,g.columns,columns=['Co-effecient'])
coeff
```

Out[17]:

	Co-effecient
Happiness Rank	1.0

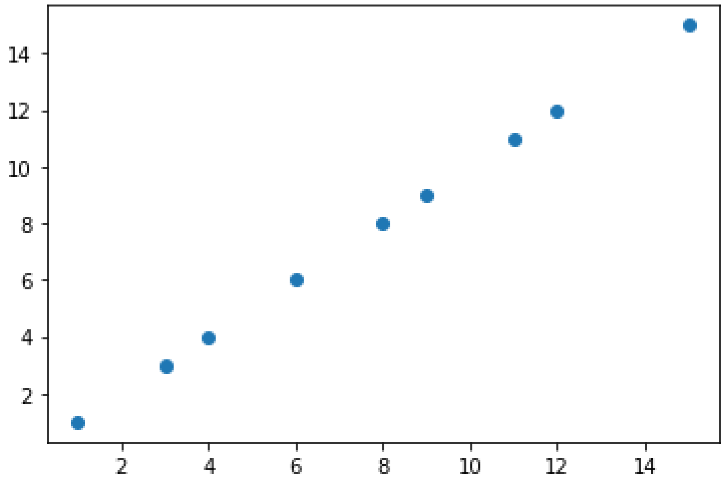
Best Fit line

In [18]:

```
prediction=lr.predict(g_test)
plt.scatter(h_test,prediction)
```

Out[18]:

```
<matplotlib.collections.PathCollection at 0x19c85d75cd0>
```



To find score

In [19]:

```
print(lr.score(g_test,h_test))
```

```
1.0
```

Import Lasso and ridge

In [20]:

```
from sklearn.linear_model import Ridge,Lasso
```

Ridge

In [21]:

```
ri=Ridge(alpha=5)
ri.fit(g_train,h_train)
```

Out[21]:

```
Ridge(alpha=5)
```

In [22]:

```
ri.score(g_test,h_test)
```

Out[22]:

```
0.998022153694719
```

In [23]:

```
ri.score(g_train,h_train)
```

Out[23]:

```
0.9980930950973474
```

Lasso

In [24]:

```
l=Lasso(alpha=6)
l.fit(g_train,h_train)
```

Out[24]:

```
Lasso(alpha=6)
```

In [25]:

```
l.score(g_test,h_test)
```

Out[25]:

```
0.8878910543387931
```

In [26]:

```
ri.score(g_train,h_train)
```

Out[26]:

```
0.9980930950973474
```

In [ ]: