In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:

```
df = pd.read_csv('temperatures.csv')
```

In [4]:

```
df.head()
```

Out[4]:

	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	J
0	1901	22.40	24.14	29.07	31.91	33.41	33.18	31.21	30.39	30.47	29.97	27.31	24.49	28.96	2
1	1902	24.93	26.58	29.77	31.78	33.73	32.91	30.92	30.73	29.80	29.12	26.31	24.04	29.22	2
2	1903	23.44	25.03	27.83	31.39	32.91	33.00	31.34	29.98	29.85	29.04	26.08	23.65	28.47	2
3	1904	22.50	24.73	28.21	32.02	32.64	32.07	30.36	30.09	30.04	29.20	26.36	23.63	28.49	2
4	1905	22.00	22.83	26.68	30.01	33.32	33.25	31.44	30.68	30.12	30.67	27.52	23.82	28.30	2

In [5]:

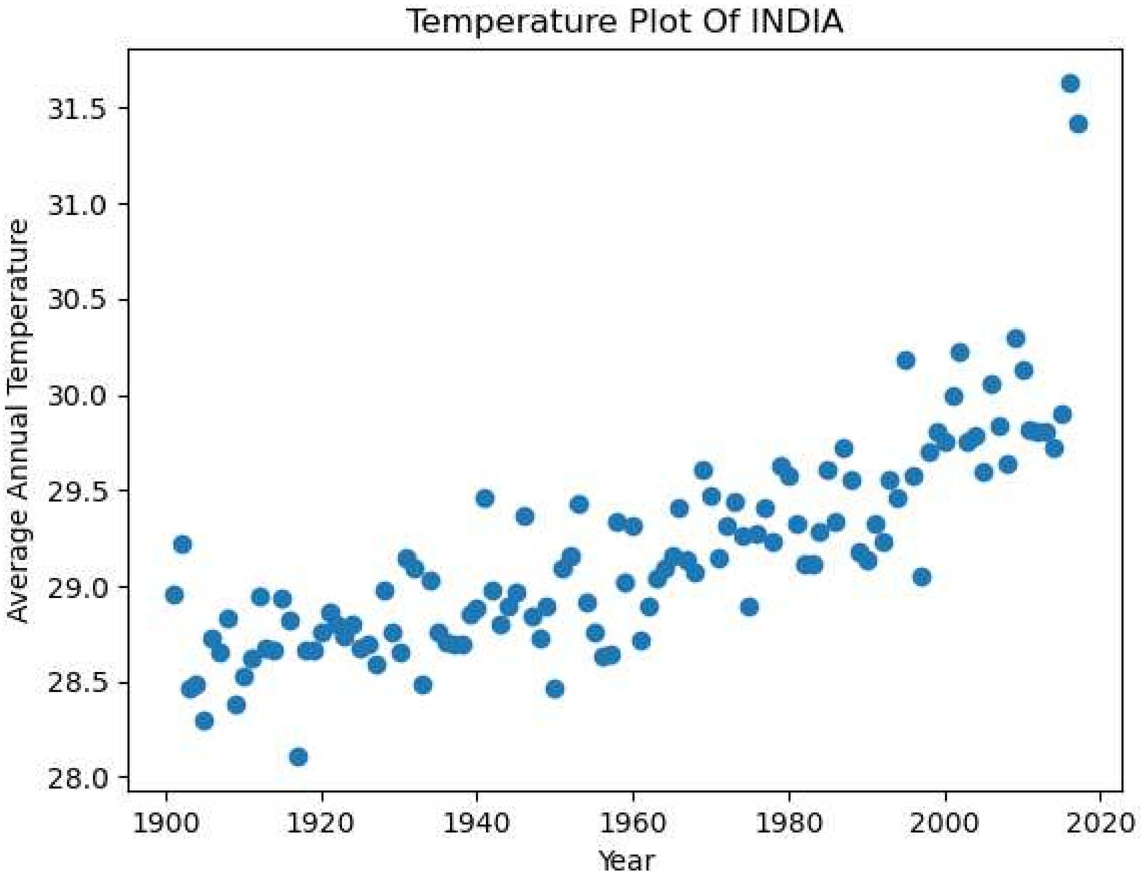
```
# input data
x = df['YEAR']
# output data
y = df['ANNUAL']
```

In [7]:

```
#plt.figure(figsize=(16,9))
plt.title('Temperature Plot Of INDIA')
plt.xlabel('Year')
plt.ylabel('Average Annual Temperature')
plt.scatter(x, y)
```

Out[7]:

```
<matplotlib.collections.PathCollection at 0x1a93ef9b090>
```



In [8]:
```
x.shape
```

Out[8]:
```
(117,)
```

In [9]:
```
x = x.values
```

In [10]:
```
x = x.reshape(117,1)
```

In [11]:
```
x.shape
```

Out[11]:
```
(117, 1)
```

In [12]:
```
from sklearn.linear_model import LinearRegression
```

In [13]:
```
regressor = LinearRegression()
```

In [14]:
```
regressor.fit(x, y)
```

Out[14]:
```
▾ LinearRegression
LinearRegression()
```

In [15]:
```
regressor.coef_
```

Out[15]:
```
array([0.01312158])
```

In [16]:
```
regressor.intercept_
```

Out[16]:
```
3.4761897126187087
```

In [17]:
```
regressor.predict([[2024]])
```

Out[17]:
```
array([30.03427031])
```

In [18]:
```
predicted = regressor.predict(x)
```

In [19]:
```
predicted
```

Out[19]:
```
array([28.4203158 , 28.43343739, 28.44655897, 28.45968055, 28.47280213,
       28.48592371, 28.49904529, 28.51216687, 28.52528846, 28.53841004,
       28.55153162, 28.5646532 , 28.57777478, 28.59089636, 28.60401794,
       28.61713952, 28.63026111, 28.64338269, 28.65650427, 28.66962585,
       28.68274743, 28.69586901, 28.70899059, 28.72211218, 28.73523376,
       28.74835534, 28.76147692, 28.7745985 , 28.78772008, 28.80084166,
       28.81396324, 28.82708483, 28.84020641, 28.85332799, 28.86644957,
       28.87957115, 28.89269273, 28.90581431, 28.91893589, 28.93205748,
       28.94517906, 28.95830064, 28.97142222, 28.9845438 , 28.99766538,
       29.01078696, 29.02390855, 29.03703013, 29.05015171, 29.06327329,
       29.07639487, 29.08951645, 29.10263803, 29.11575961, 29.1288812 ,
       29.14200278, 29.15512436, 29.16824594, 29.18136752, 29.1944891 ,
       29.20761068, 29.22073227, 29.23385385, 29.24697543, 29.26009701,
       29.27321859, 29.28634017, 29.29946175, 29.31258333, 29.32570492,
       29.3388265 , 29.35194808, 29.36506966, 29.37819124, 29.39131282,
       29.4044344 , 29.41755599, 29.43067757, 29.44379915, 29.45692073,
       29.47004231, 29.48316389, 29.49628547, 29.50940705, 29.52252864,
       29.53565022, 29.5487718 , 29.56189338, 29.57501496, 29.58813654,
       29.60125812, 29.6143797 , 29.62750129, 29.64062287, 29.65374445,
       29.66686603, 29.67998761, 29.69310919, 29.70623077, 29.71935236,
       29.73247394, 29.74559552, 29.7587171 , 29.77183868, 29.78496026,
       29.79808184, 29.81120342, 29.82432501, 29.83744659, 29.85056817,
       29.86368975, 29.87681133, 29.88993291, 29.90305449, 29.91617608,
       29.92929766, 29.94241924])
```

In [20]:
```
y
```

Out[20]:
```
0      28.96
1      29.22
2      28.47
3      28.49
4      28.30
       ...  
112    29.81
113    29.72
114    29.90
115    31.63
116    31.42
Name: ANNUAL, Length: 117, dtype: float64
```

In [21]:
```
x
```

```
Out[21]: array([[1901],
                [1902],
                [1903],
                [1904],
                [1905],
                [1906],
                [1907],
                [1908],
                [1909],
                [1910],
                [1911],
                [1912],
                [1913],
                [1914],
                [1915],
                [1916],
                [1917],
                [1918],
                [1919],
                [1920],
                [1921],
                [1922],
                [1923],
                [1924],
                [1925],
                [1926],
                [1927],
                [1928],
                [1929],
                [1930],
                [1931],
                [1932],
                [1933],
                [1934],
                [1935],
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                [1941],
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                [1943],
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       [2008],
       [2009],
       [2010],
       [2011],
       [2012],
       [2013],
       [2014],
       [2015],
       [2016],
       [2017]], dtype=int64)
```

In [23]:

```
# mean absolute error
```

```
abs(y - predicted)
```

Out[23]:

```
0      0.539684
1      0.786563
2      0.023441
3      0.030319
4      0.172802
         ...   
112    0.079933
113    0.183054
114    0.016176
115    1.700702
116    1.477581
Name: ANNUAL, Length: 117, dtype: float64
```

In [24]:

```
import numpy as np
```

In [25]:

```
#mean absolute error
np.mean(abs(y - predicted))
```

Out[25]:

```
0.22535284978630418
```

In [27]:

```
from sklearn.metrics import mean_absolute_error
mean_absolute_error(y, predicted)
```

Out[27]:

```
0.22535284978630418
```

In [28]:

```
# mean squared error
np.mean((y - predicted) ** 2)
```

Out[28]:

```
0.10960795229110358
```

In [31]:

```
from sklearn.metrics import mean_squared_error
mean_squared_error(y, predicted)
```

Out[31]:

```
0.10960795229110358
```

In [32]:

```
from sklearn.metrics import r2_score
r2_score(y, predicted)
```

Out[32]:

```
0.641807891278368
```

In [34]:

```
regressor.score(x, y)
```

Out[34]:

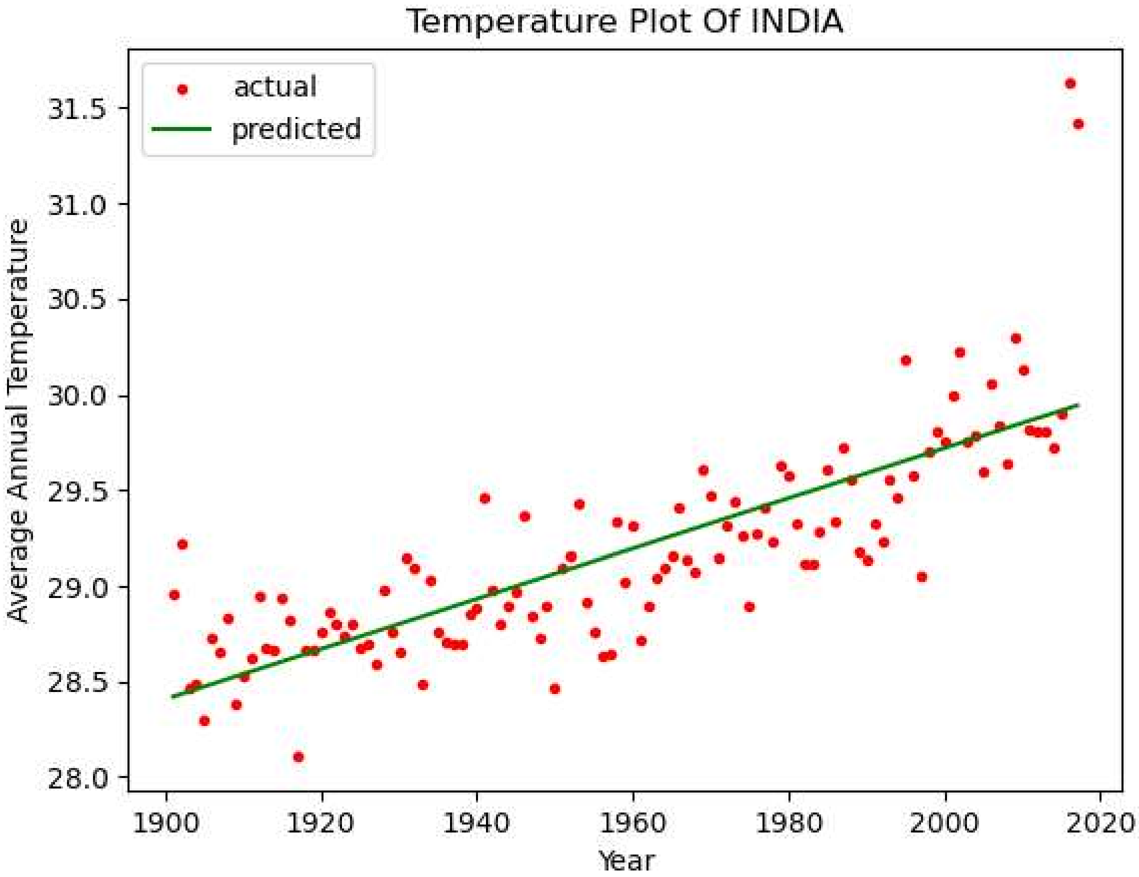
```
0.641807891278368
```

In [35]:

```
#plt.figure(figsize=(16,9))
plt.title('Temperature Plot Of INDIA')
plt.xlabel('Year')
plt.ylabel('Average Annual Temperature')
plt.scatter(x, y, label = 'actual', color = 'r', marker = '.')
plt.plot(x, predicted, label = 'predicted', color = 'g')
plt.legend()
```

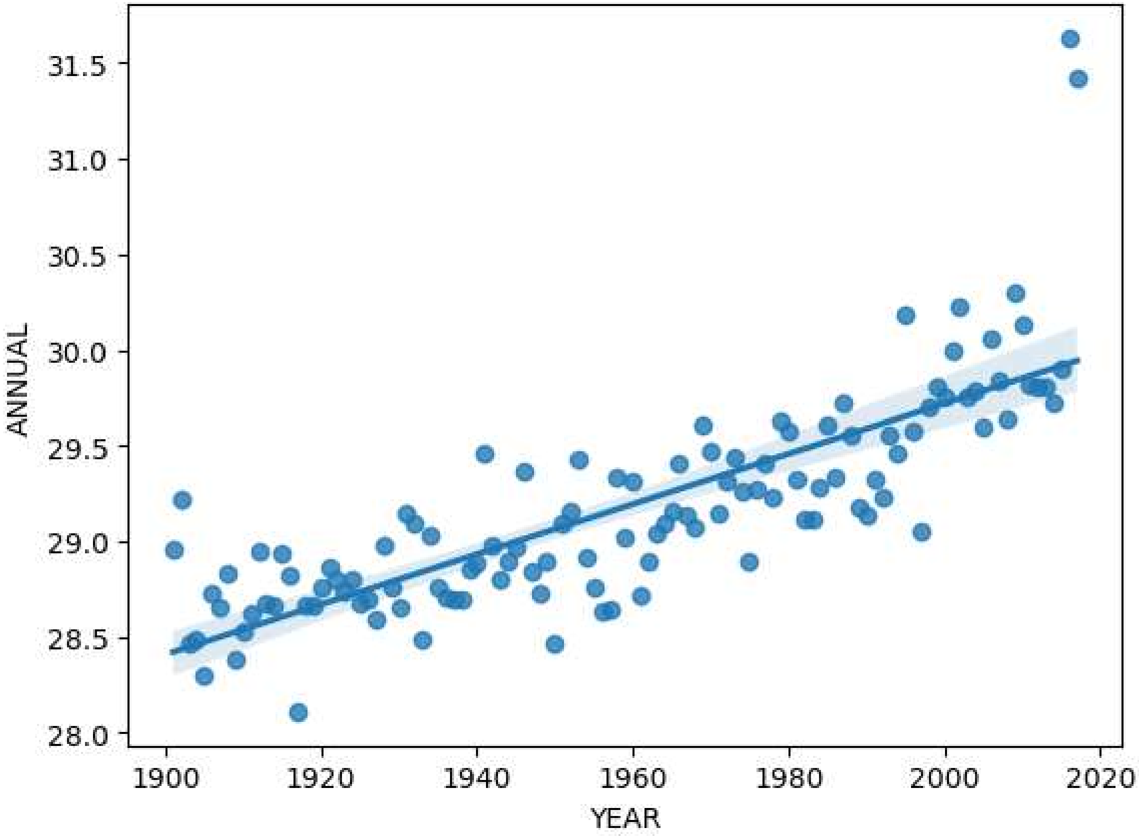
Out[35]:

```
<matplotlib.legend.Legend at 0x1a93fb407d0>
```



In [36]:
```
sns.regplot(x = 'YEAR', y = 'ANNUAL', data = df)
```

Out[36]:
```
<Axes: xlabel='YEAR', ylabel='ANNUAL'>
```



In [ ]:

```
```