GNP vs Employed Regression Report

Python Script

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import statsmodels.api as sm
import subprocess
import os

# Load input data
df = pd.read_csv("C:/Users/Robert/Desktop/longley.csv", index_col=0)

x = df[["Employed"]]
y = df["GNP"]

x = sm.add_constant(x)

lr_model = sm.OLS(y, x).fit()
print(lr_model.summary())
print(lr_model.params)

# We pick 100 points equally spaced from the min to the max
x_prime = np.linspace(x["Employed"].min(), x["Employed"].max(), 100)
x_prime = sm.add_constant(x_prime)  # Add constant for prediction


# We calculate the predicted value
y_hat = lr_model.predict(x_prime)

# Plot data
plt.figure()
plt.scatter(df["Employed"], df["GNP"], label="Actual Data")
plt.xlabel("Total Employment")
plt.ylabel("Gross National Product")
plt.plot(x_prime[:, 1], y_hat, color="red", alpha=0.9, label="Regression Line")
plt.legend()
plt.show()
```

Regression Model Summary

```
                            OLS Regression Results
==============================================================================
```

Regression Plot

Figure 1: Regression Plot

Dep. Variable:	GNP	R-squared:	0.967
Model:	OLS	Adj. R-squared:	0.965
Method:	Least Squares	F-statistic:	415.1
Date:	Fri, 21 Feb 2025	Prob (F-statistic):	8.36e-12
Time:	12:17:12	Log-Likelihood:	-68.391
No. Observations:	16	AIC:	140.8
Df Residuals:	14	BIC:	142.3
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-1430.4823	89.361	-16.008	0.000	-1622.142	-1238.822
Employed	27.8363	1.366	20.374	0.000	24.906	30.767

Omnibus:	1.033	Durbin-Watson:	1.530
Prob(Omnibus):	0.597	Jarque-Bera (JB):	0.836
Skew:	-0.499	Prob(JB):	0.658
Kurtosis:	2.491	Cond. No.	1.26e+03

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 1.26e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Model Coefficients

```
const      -1430.482314
Employed      27.836256
dtype: float64
```

Regression Plot