In [1]:

```
##Import useful modules

import numpy as np
import pandas as pd
import statsmodels.formula.api as smf
from matplotlib import pyplot as plt
```

In [2]:

```
#Import dataset and look at first few entries

dataset = pd.read_csv('PressureSensorData.csv')
dataset.head()
```

Out[2]:

	test_id	pt_psia	pa_psia	pd_volts
0	1.0	5	4	0.2834
1	1.0	10	10	0.3655
2	1.0	15	14	0.4469
3	1.0	35	34	0.7752
4	1.0	55	56	1.1028

In [3]:

```
##Create numpy arrays from the columns of our dataset

transPressure = np.array(dataset['pt_psia'])
anaPressure = np.array(dataset['pa_psia'])
voltage = np.array(dataset['pd_volts'])
```

In [4]:

```
dataset.cov()
```

Out[4]:

	test_id	pt_psia	pa_psia	pd_volts
test_id	6.782931	0.797038	0.128020	0.014653
pt_psia	0.797038	3415.478972	3402.745327	55.991599

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	test_id	pt_psia	pa_psia	pd_volts
pa_psia	0.128020	3402.745327	3391.423589	55.783689
pd_volts	0.014653	55.991599	55.783689	0.917949

In [5]:

```
##Look at the correlation of our different columns

dataset.corr(method ='pearson')
```

Out[5]:

	test_id	pt_psia	pa_psia	pd_volts
test_id	1.000000	0.005257	0.000847	0.005896
pt_psia	0.005257	1.000000	0.999799	0.999972
pa_psia	0.000847	0.999799	1.000000	0.999786
pd_volts	0.005896	0.999972	0.999786	1.000000

In [7]:

```
##Create and print model of true pressure as a function of voltage

model = smf.ols('pt_psia ~ pd_volts', data=dataset)
model = model.fit()
print(model.params)

transPressure_pred = model.predict()


plt.figure(figsize=(12, 6))
plt.plot(dataset['pd_volts'], dataset['pt_psia'], 'o')
plt.plot(dataset['pd_volts'], transPressure_pred, 'r', linewidth=2)
plt.xlabel('Voltage')
plt.ylabel('Pressure')
plt.title('Predicting True Pressure using Voltage')

plt.show()
```

```
Intercept   -12.354751
pd_volts     60.996438
```

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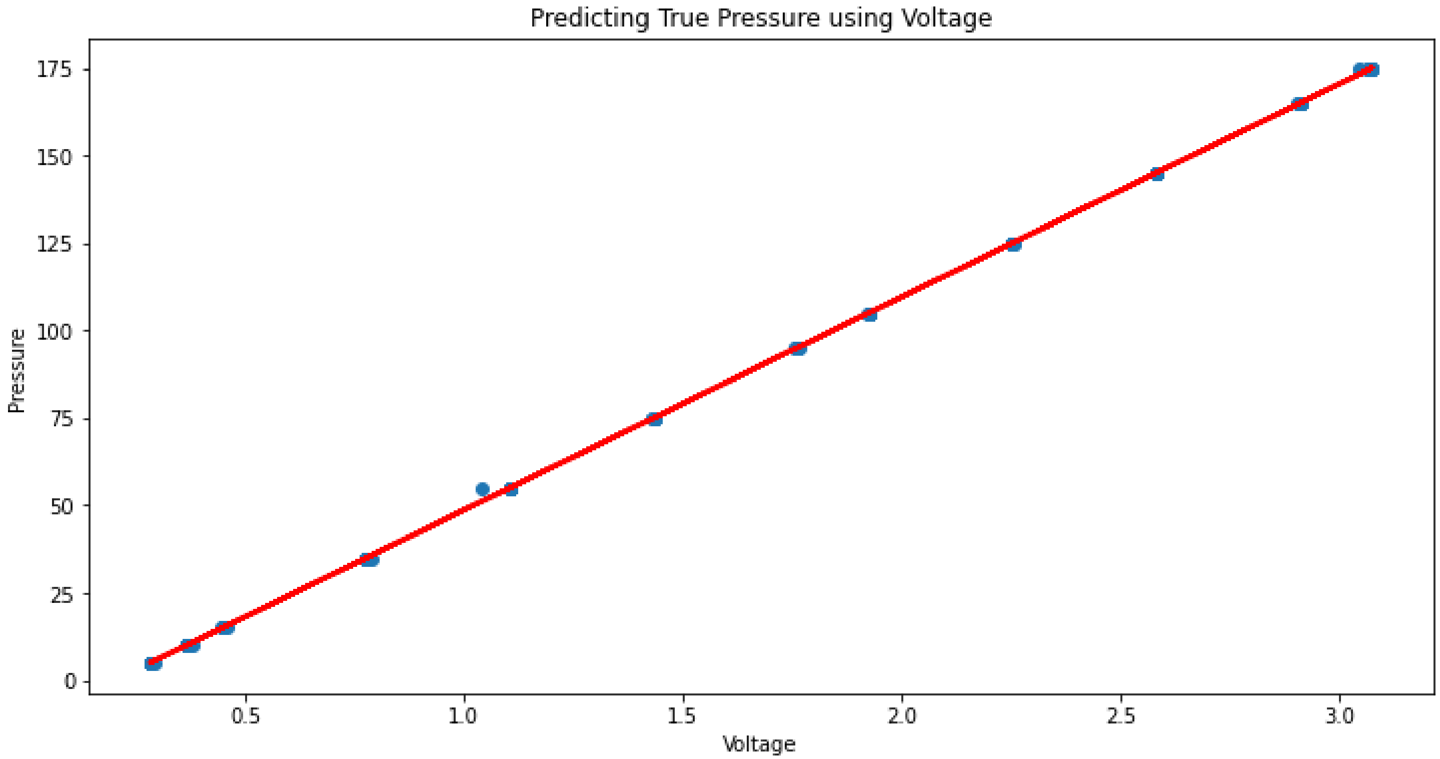
```
dtype: float64
```



In [8]:

```
##Create and print model of analogue pressure as a function of voltage

model1 = smf.ols('pa_psia ~ pd_volts', data=dataset)
model1 = model1.fit()
print(model1.params)

anaPressure_pred = model1.predict()

plt.figure(figsize=(12, 6))
plt.plot(dataset['pd_volts'], dataset['pa_psia'], 'o')
plt.plot(dataset['pd_volts'], transPressure_pred, 'r', linewidth=2)
plt.xlabel('Voltage')
plt.ylabel('Analog Pressure Reading')
plt.title('Predicting Analog Pressure Reading using Voltage')
```

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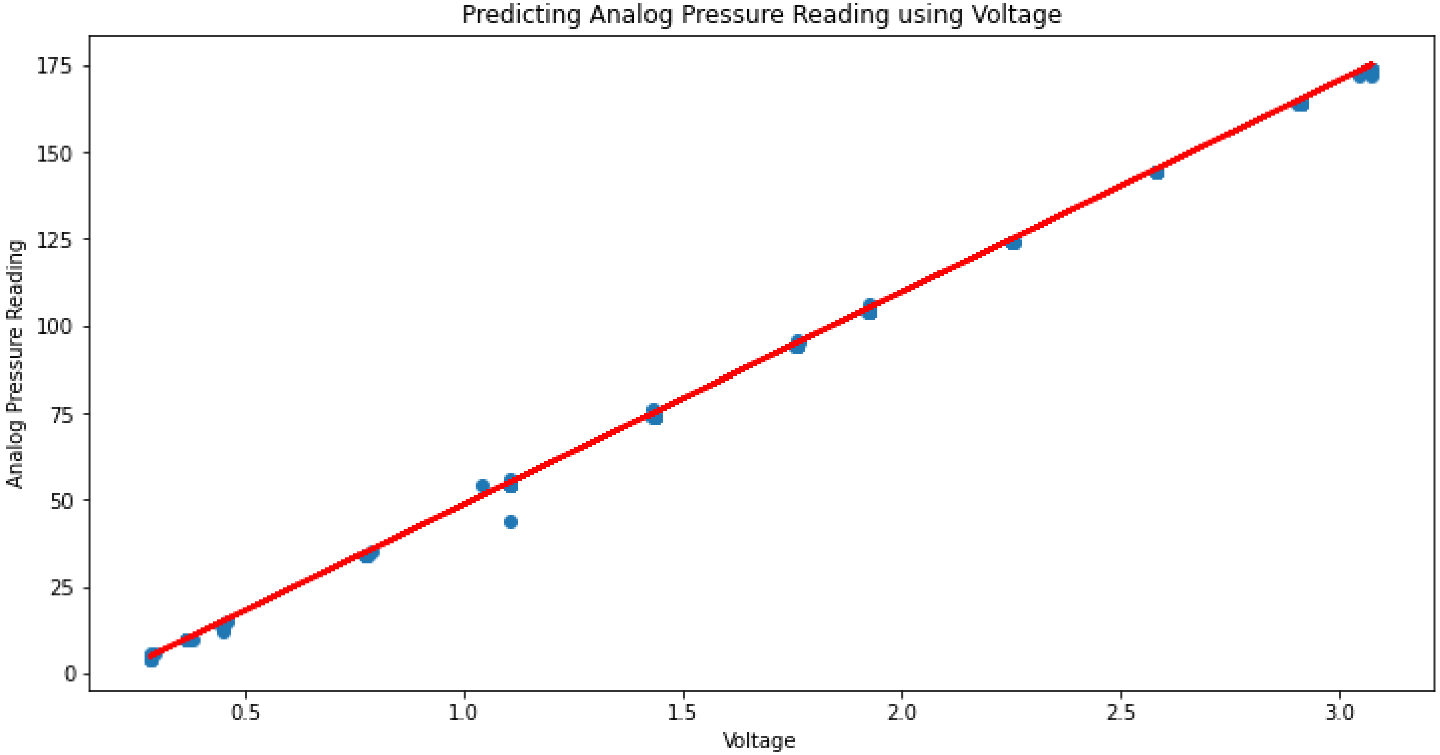
```
plt.show()
```

```
Intercept   -12.905299
pd_volts     60.769944
dtype: float64
```



In [9]:

```
#using lab 18, speed time example, form a line fomrmula and ask user for input voltage to predict pressure
```

In [10]:

```
import sklearn.metrics as metrics
from scipy.stats import pearsonr
from hydroeval import *

testId = np.array(dataset["test_id"])
trueP = np.array(dataset["pt_psia"])
anaP = np.array(dataset["pa_psia"])
```

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```
volts = np.array(dataset["pd_volts"])

model_trueP = smf.ols('pt_psia ~ pd_volts', data=dataset)
model_trueP = model_trueP.fit()
trueP_pred = model_trueP.predict()


#Error testing for a linear regression model

print("RMSE for voltage as predictor for True Pressure is ",np.sqrt(metrics.mean_squared_error(trueP, trueP_pred)))
print("R2 for voltage as predictor for True Pressure is ",metrics.r2_score(trueP, trueP_pred))
trueP_r = pearsonr(trueP_pred, trueP)
print("Pearson's r for voltage as predictor for True Pressure is ",trueP_r[0])
trueP_nse = evaluator(nse, trueP_pred, trueP)
print("NSE for voltage as predictor for True Pressure ",trueP_nse)
trueP_kge = evaluator(kgeprime, trueP_pred, trueP)
print("KGE for voltage as predictor for True Pressure is ",trueP_kge)
```

```
RMSE for voltage as predictor for True Pressure is  0.4348920898366701
R2 for voltage as predictor for True Pressure is  0.9999441077775557
Pearson's r for voltage as predictor for True Pressure is  0.9999720534982746
NSE for voltage as predictor for True Pressure  [0.99994411]
KGE for voltage as predictor for True Pressure is  [[0.99996048]
 [0.99997205]
 [0.99997205]
 [1.        ]]
```

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