Poly_4_Weight-Height

February 6, 2025

[166]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import PolynomialFeatures
from sklearn.metrics import mean_squared_error, r2_score, mean_absolute_error
import math
```

[167]:
```
url = r"Practice-2 Weight-Height Polynomial Dataset.csv"

df = pd.read_csv(url)

df.head()
```

[167]:

	Weight	Height
0	69.963210	96.644532
1	116.057145	196.156340
2	98.559515	145.862047
3	87.892679	121.157923
4	52.481491	68.971292

1 Data Preprocessing

Checking for null values

[168]:
```
df.isna().sum()
```

[168]:
```
Weight    0
Height    0
dtype: int64
```

Checking Statistics

[169]:
```
df.describe(include='all')
```

[169]:

	Weight	Height
count	50.000000	50.000000
mean	75.673912	111.473633
std	23.110656	39.493803
min	41.646760	68.971292
25%	54.701360	79.966731
50%	74.883900	98.819101
75%	91.988395	129.709758
max	117.592788	202.663424

Checking Info

[170]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 50 entries, 0 to 49
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   Weight  50 non-null     float64
 1   Height  50 non-null     float64
dtypes: float64(2)
memory usage: 932.0 bytes
```

Checking Shape

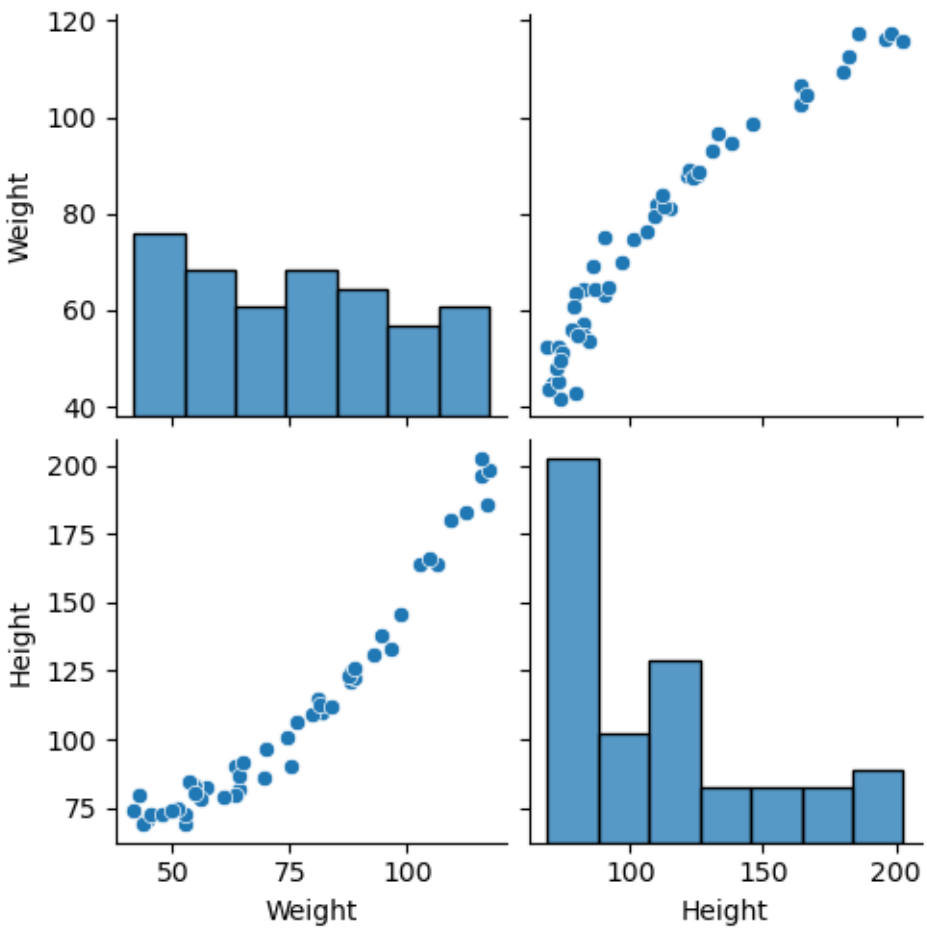
[171]:
```
df.shape
```

[171]:
```
(50, 2)
```

Visualizing the Data

[172]:
```
sns.pairplot(df)
```

[172]:
```
<seaborn.axisgrid.PairGrid at 0x252f1d9db50>
```



Scaling the data

[173]:
```
sca = StandardScaler()
X = df['Weight'].values.reshape(-1,1)
```

Creating X and y

[174]:
```
X = df.Weight.values
y = df.Height.values
```

Train Test Split

[175]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
↪random_state=42)
```

Reshaping the data

[176]:
```
X_train = X_train.reshape(-1, 1)
X_test = X_test.reshape(-1, 1)
```

```
#y_train=y_train.reshape(-1,1)
#y_test=y_test.reshape(-1,1)
print(f"X_train shape: {X_train.shape}")
print(f"X_test shape: {X_test.shape}")
print(f"y_train shape: {y_train.shape}")
print(f"y_test shape: {y_test.shape}")
```

```
X_train shape: (40, 1)
X_test shape: (10, 1)
y_train shape: (40,)
y_test shape: (10,)
```

Model Creation

Simple Linear Regression

[177]:
```
linear = LinearRegression()
linear.fit(X_train.reshape(-1,1), y_train)
```

[177]:
```
LinearRegression()
```

Predcicting using Simple Linear Regression

[178]:
```
pred_linear = linear.predict(X_test.reshape(-1,1))
```

Evaluating Simple Linear Regression

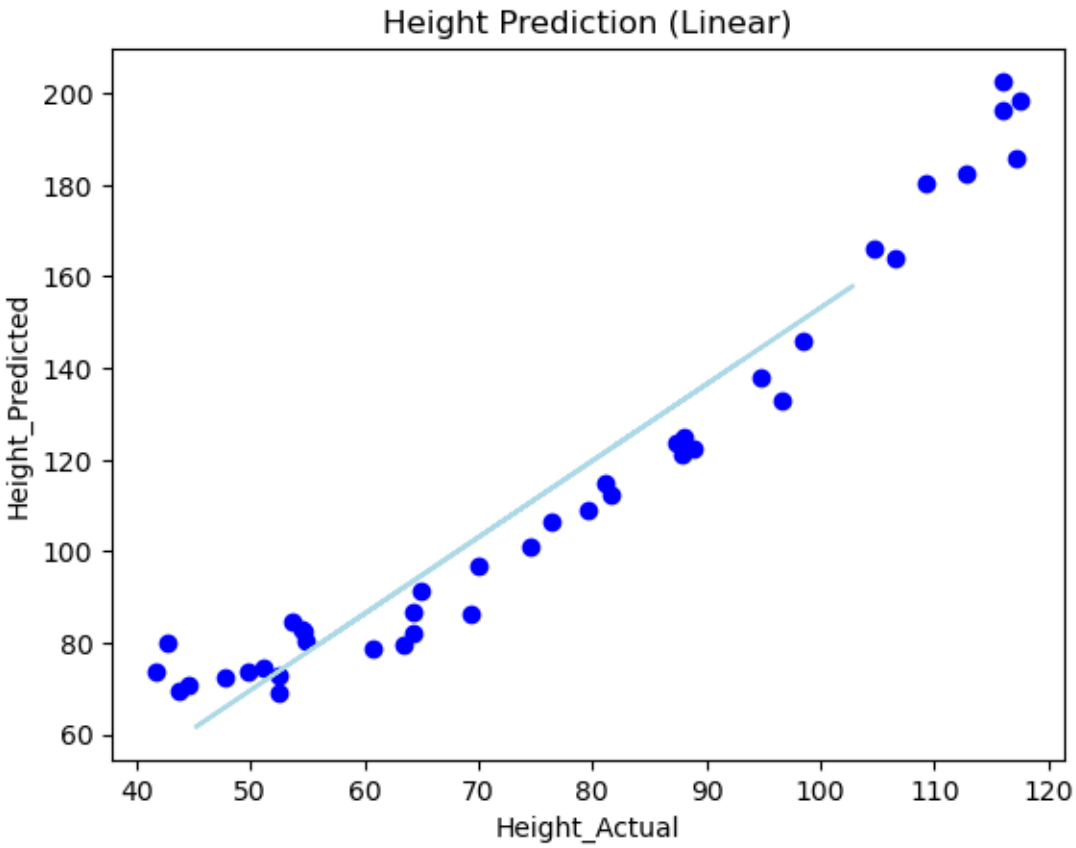
[179]:
```
mse = mean_squared_error(y_test, pred_linear)
rmse = math.sqrt(mse)
r2 = r2_score(y_test, pred_linear)
mae = mean_absolute_error(y_test, pred_linear)

print('MSE:', mse)
print('RMSE:', rmse)
print('R2:', r2)
print('MAE:', mae)
```

```
MSE: 117.22192004841368
RMSE: 10.826907224522323
R2: 0.8403417139170934
MAE: 8.882234589447728
```

Visualizing Using Simple Linear Regression

[180]:
```
plt.scatter(X_train, y_train, color = 'blue')
plt.plot(X_test, pred_linear, color = 'lightblue')
plt.title("Height Prediction (Linear)")
plt.xlabel("Height_Actual")
plt.ylabel('Height_Predicted')
plt.show()
```



2 Using Polynomial Regression

[181]:
```
Poly = PolynomialFeatures(degree=2)
```

Transforming the data

[182]:
```
X_train_poly = Poly.fit_transform(X_train)
X_test_poly = Poly.fit_transform(X_test)
#y_train=y_train.reshape(-1,1)
#y_test=y_test.reshape(-1,1)
```

Training the Model

[183]:
```
lin = LinearRegression()

lin.fit(X_train_poly, y_train)
```

[183]:
```
LinearRegression()
```

Getting Predictions

[184]:
```
y_pred = lin.predict(X_test_poly)
```

Evaluating the Model

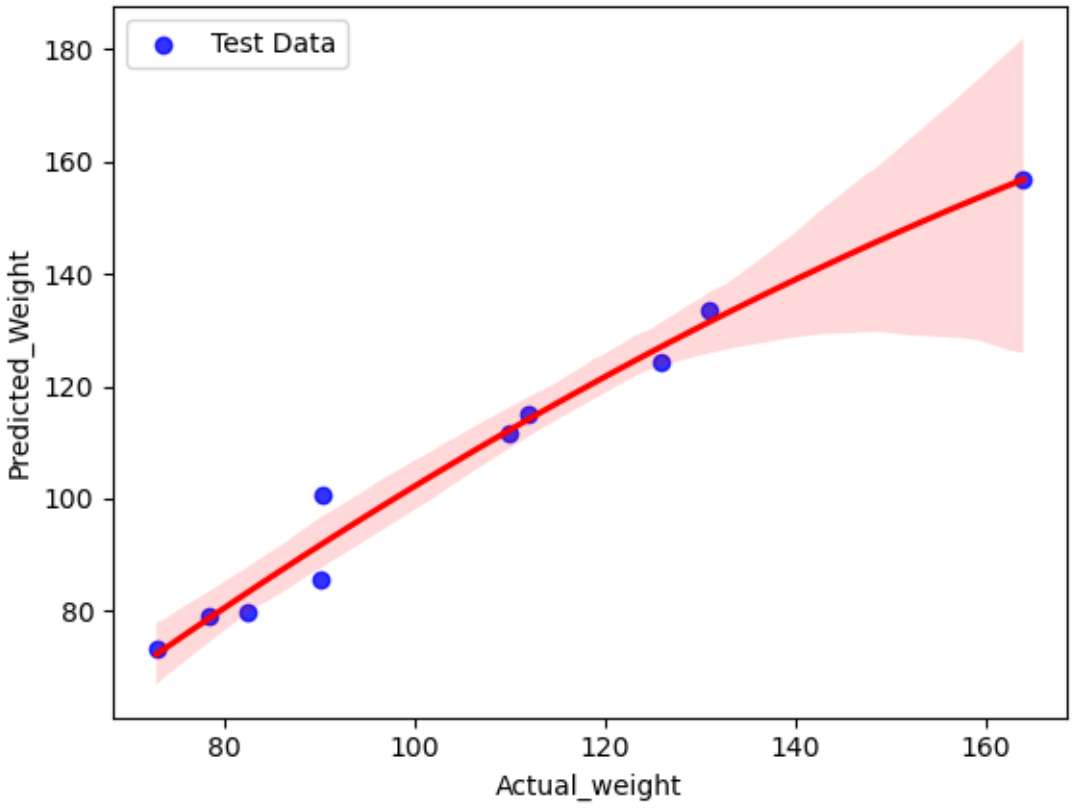
[185]:
```
r2 = r2_score(y_test, y_pred)
mse = mean_squared_error(y_test, y_pred)
mae = mean_absolute_error(y_test,y_pred)
rmse = math.sqrt(mse)

print(f"R2 Score: {r2}")
print(f"Mean Squared Error: {mse}")
print(f"Mean Absolute Error: {mae}")
print(f"Root Mean Squared Error: {rmse}")
```

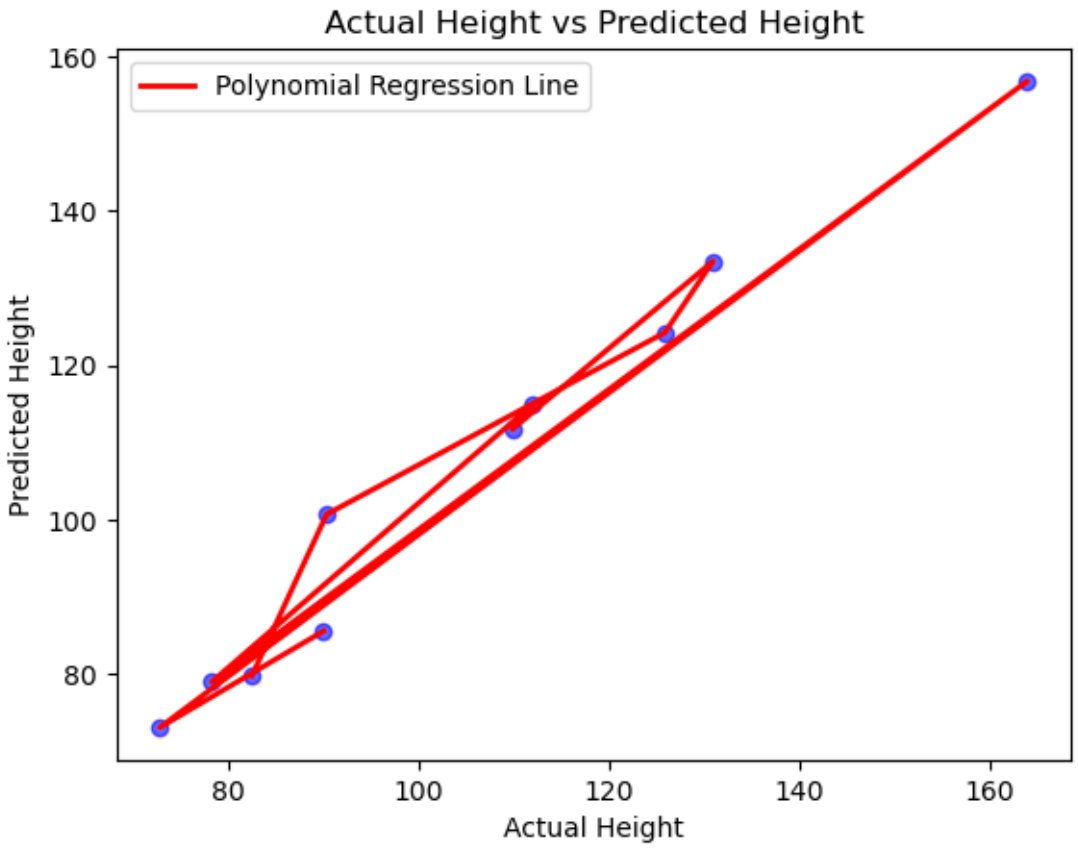
```
R2 Score: 0.9717532753949885
Mean Squared Error: 20.73888787431194
Mean Absolute Error: 3.461429854635168
Root Mean Squared Error: 4.553996911978745
```

Visualizing the Predicitons

[186]:
```
sns.regplot(x=y_test, y=y_pred,  data=df, scatter_kws={"color": "blue"},␣
↪line_kws={"color": "red"}, order=2, label="Test Data")
plt.xlabel('Actual_weight')
plt.ylabel('Predicted_Weight')
plt.legend()
plt.show()
```

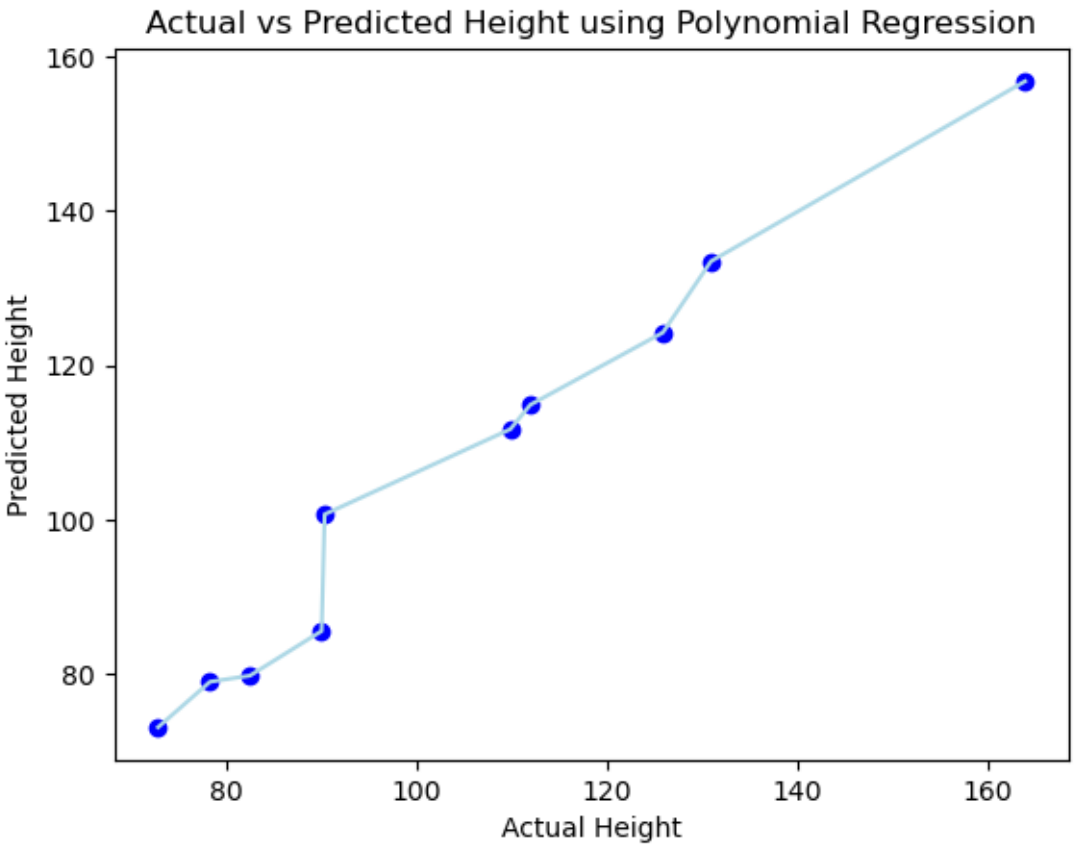


[187]:
```
plt.scatter(y_test,y_pred, color='blue',alpha=0.6)
plt.plot(y_test, y_pred, color='red', linewidth=2, label='Polynomial Regression␣
↪Line')
plt.xlabel('Actual Height')
plt.ylabel('Predicted Height')
plt.title('Actual Height vs Predicted Height')
plt.legend()
plt.show()
```



[188]:
```
import numpy as np
sorted_idx = np.argsort(y_test)
Y_test_sorted = np.array(y_test)[sorted_idx]
y_pred_sorted = y_pred[sorted_idx]

plt.scatter(y_test, y_pred, color='blue')
plt.plot(Y_test_sorted, y_pred_sorted, color='lightblue')
plt.title("Actual vs Predicted Height using Polynomial Regression")
plt.xlabel("Actual Height")
plt.ylabel("Predicted Height")
plt.show()
```


Actual vs Predicted Height using Polynomial Regression
Predicted Height
Actual Height
160
140
120
100
80
80
100
120
140
160