EXPEREIMENT : 1

A PYTHON PROGRAM USING UNIVARIATE, BIVARIATE AND MULTIVARIATE REGRESSION

AIM:

To implement a python program using univariate, bivariate and multivariate regression
features for a given iris dataset.

ALGORITHM:

Step 1: Import necessary libraries:

- **pandas for data manipulation, numpy for numeri cal operations, and matplotlib.pyplot for plotting.**

Step 2: Read the dataset:

- **Use the pandas `read_csv` function to read the dataset.**
- **Store the dataset in a variable (e.g., `data`).**

Step 3: Prepare the data:

- **Extract the independent variable(s) (X) and dependent variable (y) from the dataset.**

- **Reshape X and y to be 2D arrays if needed.**

Step 4:Univariate Regression:

- **For univariate regression, use only one independent variable.**
- **Fit a linear regression model to the data using numpy's polyfit function or sklearn's LinearRegression class.**
- **Make predictions using the model.**
- **Calculate the R-squared value to evaluate the model's performance.**

Step 5: Bivariate Regression:

- **For bivariate regression, use two independent variables.**
- **Fit a linear regression model to the data using numpy's `polyfit` function or sklearn's `LinearRegression` class.**
- **Make predictions using the model.**
- **Calculate the R-squared value to evaluate the model's performance.**

Step 6: Multivariate Regression:

- **For multivariate regression, use more than two independent variables.**

- **Fit a linear regression model to the data using sklearn's `LinearRegression` class.**
- **Make predictions using the model.**
- **Calculate the R-squared value to evaluate the model's performance.**

Step 7: Plot the results:

- **For univariate regression, plot the original data points (X, y) as a scatter plot and the regression line as a line plot.**
- **For bivariate regression, plot the original data points (X1, X2, y) as a 3D scatter plot and the regression plane.**
- **For multivariate regression, plot the predicted values against the actual values.**

Step 8: Display the results:

- **Print the coefficients (slope) and intercept for each regression model.**
- **Print the R-squared value for each regression model.**

Step 9: Complete the program:

- **Combine all the steps into a Python program.**
- **Run the program to perform univariate, bivariate, and multivariate regression on the dataset.**

CODE 1:

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

df = pd.read_csv('../input/iris-dataset/iris.csv')
df.head(5)
```

OUTPUT 1:

	Sepal.length	sepal.width	petal.length	petal.width	variety
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa

CODE 2:

```
df.shape
```

OUTPUT 2:

```
(150, 5)
```

CODE 3:

```
df_Setosa = df.loc[df['variety'] == 'Setosa']

df_Virginica = df.loc[df['variety'] == 'Virginica']

df_Versicolor = df.loc[df['variety'] == 'Versicolor']


plt.scatter(df_Setosa['sepal.width'],
np.zeros_like(df_Setosa['sepal.width']), label='Setosa')

plt.scatter(df_Virginica['sepal.width'],
np.zeros_like(df_Virginica['sepal.width']), label='Virginica')

plt.scatter(df_Versicolor['sepal.width'],
np.zeros_like(df_Versicolor['sepal.width']), label='Versicolor')

plt.xlabel('Sepal Width')

plt.legend()

plt.title('Univariate Analysis: Sepal Width')

plt.show
```

CODE 4:

```
plt.scatter(df_Setosa['sepal.length'],
np.zeros_like(df_Setosa['sepal.length']), label='Setosa')
```

```
plt.scatter(df_Virginica['sepal.length'],
np.zeros_like(df_Virginica['sepal.length']), label='Virginica')

plt.scatter(df_Versicolor['sepal.length'],
np.zeros_like(df_Versicolor['sepal.length']), label='Versicolor')

plt.xlabel('Sepal Length')

plt.legend()

plt.title('Univariate Analysis: Sepal Length')

plt.show()
```

CODE 5:

```
plt.scatter(df_Setosa['petal.width'],
np.zeros_like(df_Setosa['petal.width']), label='Setosa')

plt.scatter(df_Virginica['petal.width'],
np.zeros_like(df_Virginica['petal.width']), label='Virginica')

plt.scatter(df_Versicolor['petal.width'],
np.zeros_like(df_Versicolor['petal.width']), label='Versicolor')

plt.xlabel('Petal Width')

plt.legend()

plt.title('Univariate Analysis: Petal Width')

plt.show()
```

CODE 6:

```
plt.scatter(df_Setosa['petal.length'],
np.zeros_like(df_Setosa['petal.length']), label='Setosa')
```

```
plt.scatter(df_Virginica['petal.length'],
np.zeros_like(df_Virginica['petal.length']), label='Virginica')

plt.scatter(df_Versicolor['petal.length'],
np.zeros_like(df_Versicolor['petal.length']), label='Versicolor')

plt.xlabel('Petal Length')

plt.legend()

plt.title('Univariate Analysis: Petal Length')

plt.show()
```

CODE 7:

```
sns.FacetGrid(df, hue='variety', height=5).map(plt.scatter,
"sepal.width", "petal.width").add_legend()

plt.title('Bivariate Analysis: Sepal Width vs Petal Width')

plt.show()
```

CODE 8:

```
sns.FacetGrid(df, hue='variety', height=5).map(plt.scatter,
"sepal.length", "petal.length").add_legend()

plt.title('Bivariate Analysis: Sepal Length vs Petal Length')

plt.show()
```

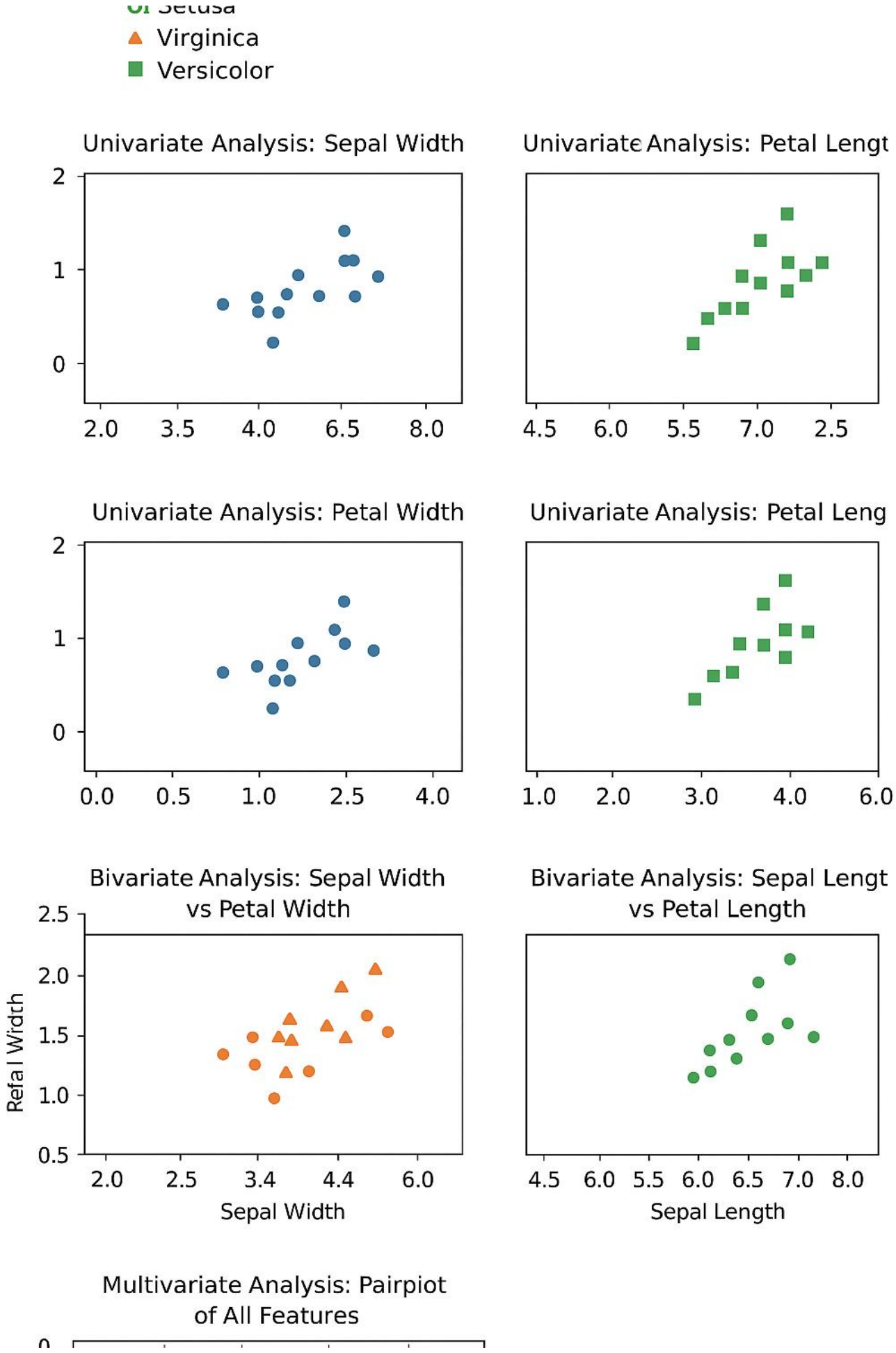
CODE 9:

```
sns.pairplot(df, hue="variety", height=2)
```

plt.suptitle("Multivariate Analysis: Pairplot of All Features", y=1.02)

plt.show()

OUTPUT:


Setusa
Virginica
Versicolor
Univariate Analysis: Sepal Width
Univariate Analysis: Petal Lengt
Univariate Analysis: Petal Width
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Bivariate Analysis: Sepal Width
vs Petal Width
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vs Petal Length
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Sepal Width
Sepal Length
Multivariate Analysis: Pairpiot
of All Features

RESULT:

Thus a python program to implement univariate, bivariate and multivariate regression features for a given iris dataset is written and the output ius verified.