Machine Learning

UNIVERSITY OF
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Assignment 1

Prepared By

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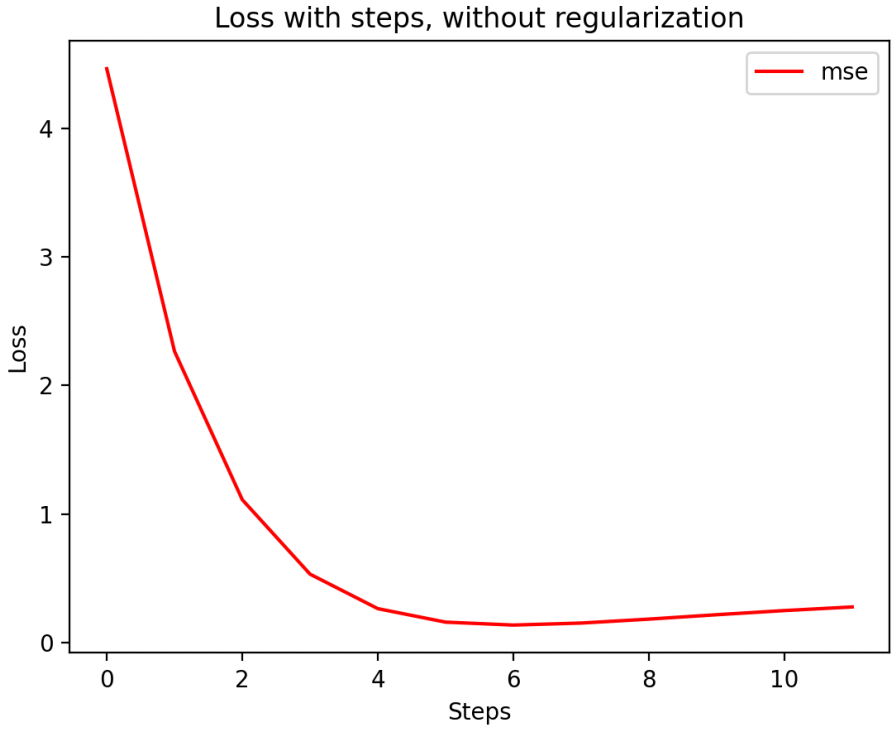
1. Linear Regression:

In this assignment, I have implemented Linear Regression from scratch in Python without using pre-existing packages.

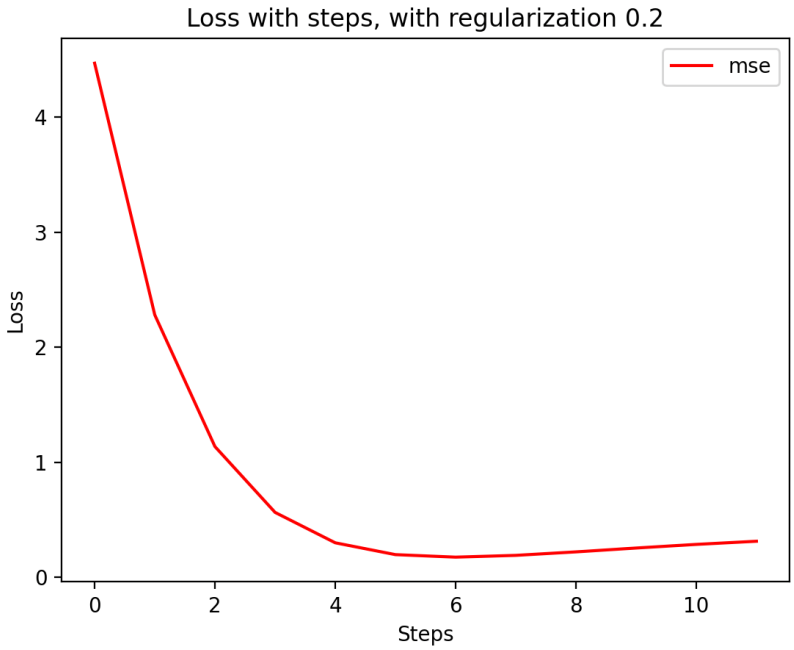
Here are the graphs for models plotting no of steps vs mean square loss.

Model 1.1: Comparing Sepal Length, Sepal Width and calculating error without regularization



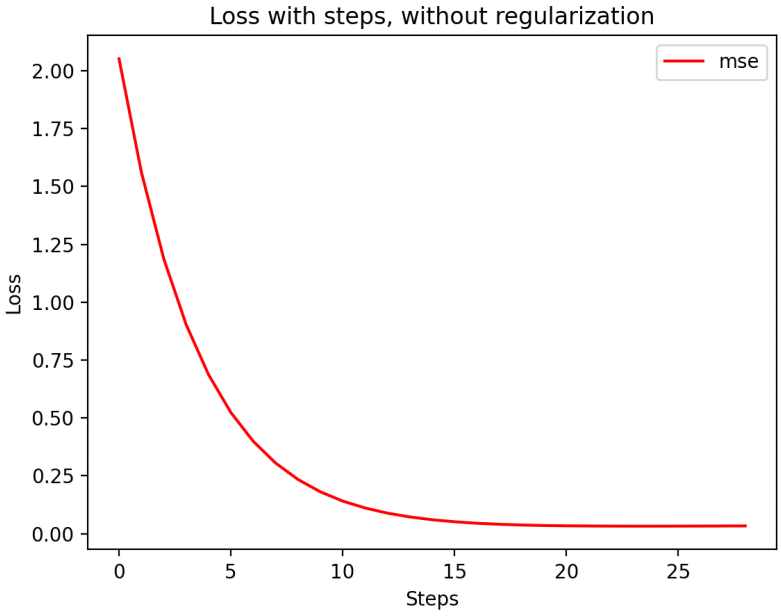

```
Mean Squared Error: 0.8356492906388883
```

Model 1.2: Comparing Sepal Length, Sepal Width and calculating error with regularization 0.2



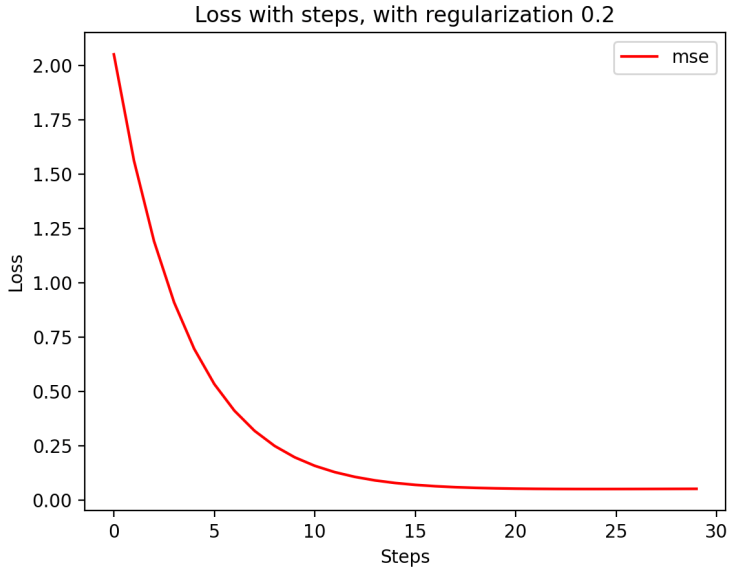
Mean Squared Error: 0.8656393099995793

Model 1.3: Comparing Petal Length, Petal Width and calculating error without regularization



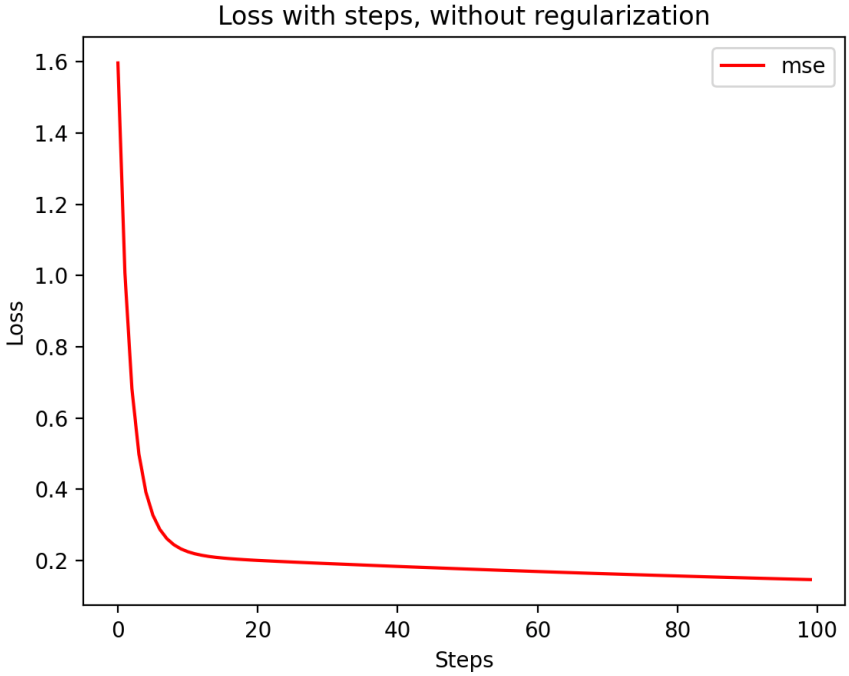
Mean Squared Error: 0.3107241703275187

Model 1.4: Comparing Petal Length, Petal Width and calculating error with regularization 0.2



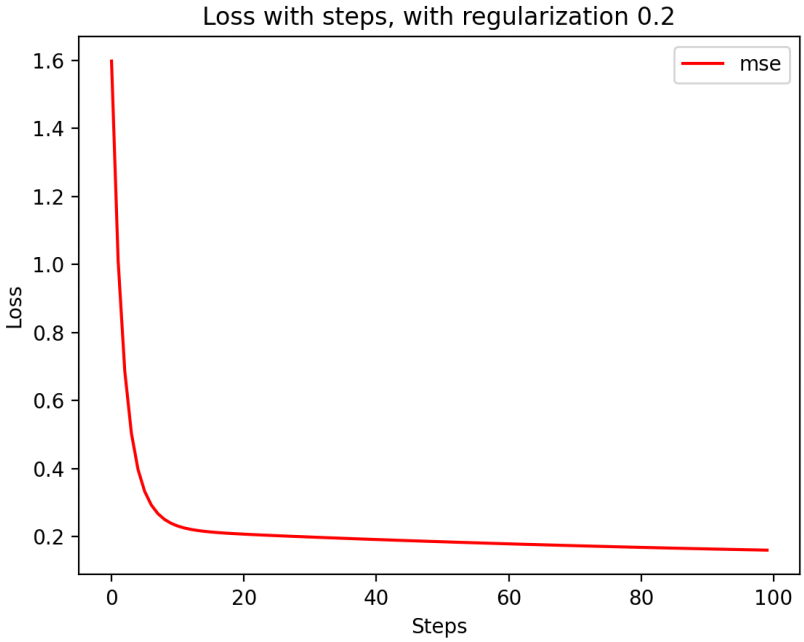
Mean Squared Error: 0.31756194455440784

Model 1.5: Comparing Sepal Length and Sepal Width , Petal Width and calculating error without regularization



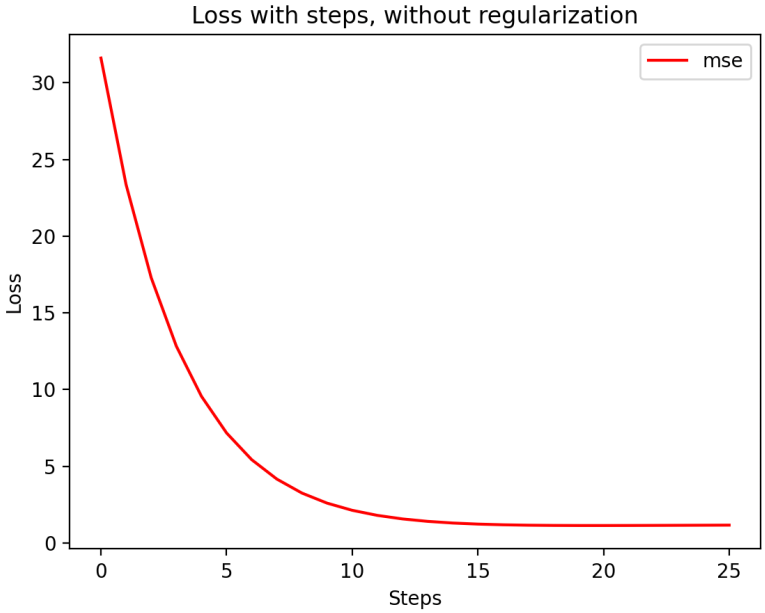
Mean Squared Error: 0.21296932327993845

Model 1.6: Comparing Sepal Length and Sepal Width , Petal Width and calculating error with regularization 0.2



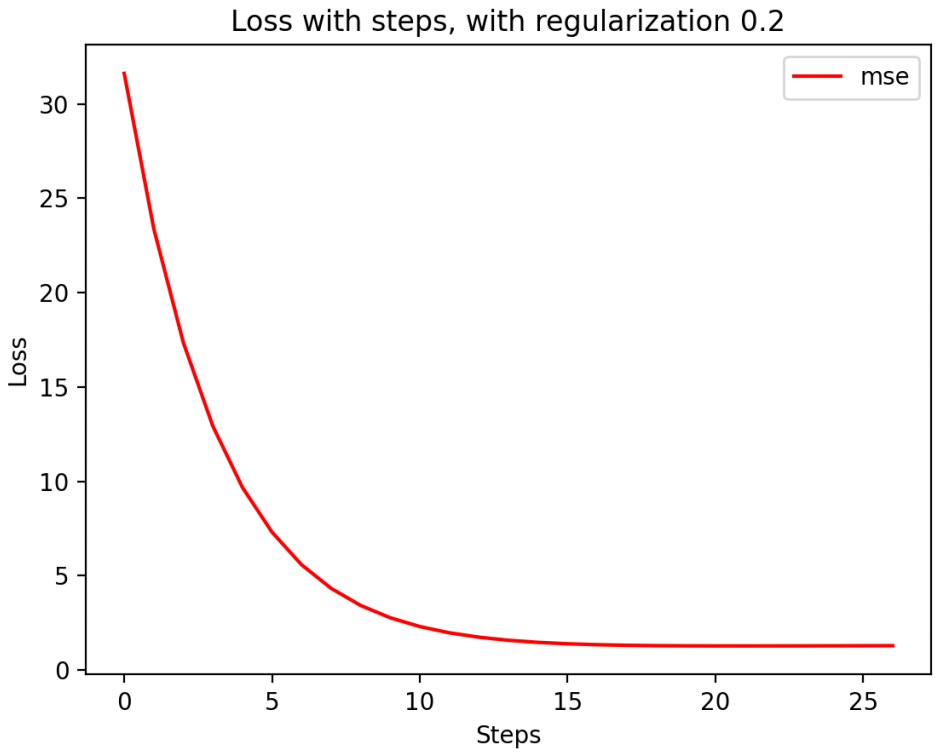

```
Mean Squared Error: 0.22222719143124248
```

Model 1.7: Comparing Petal Length and Petal Width, Sepal Length and calculating error without regularization




```
Mean Squared Error: 5.322112922472693 5
```

Model 1.8: Comparing Petal Length and Petal Width, Sepal Length and calculating error with regularization 0.2




```
Mean Squared Error: 5.291541908915519
```

Summarize results in table:

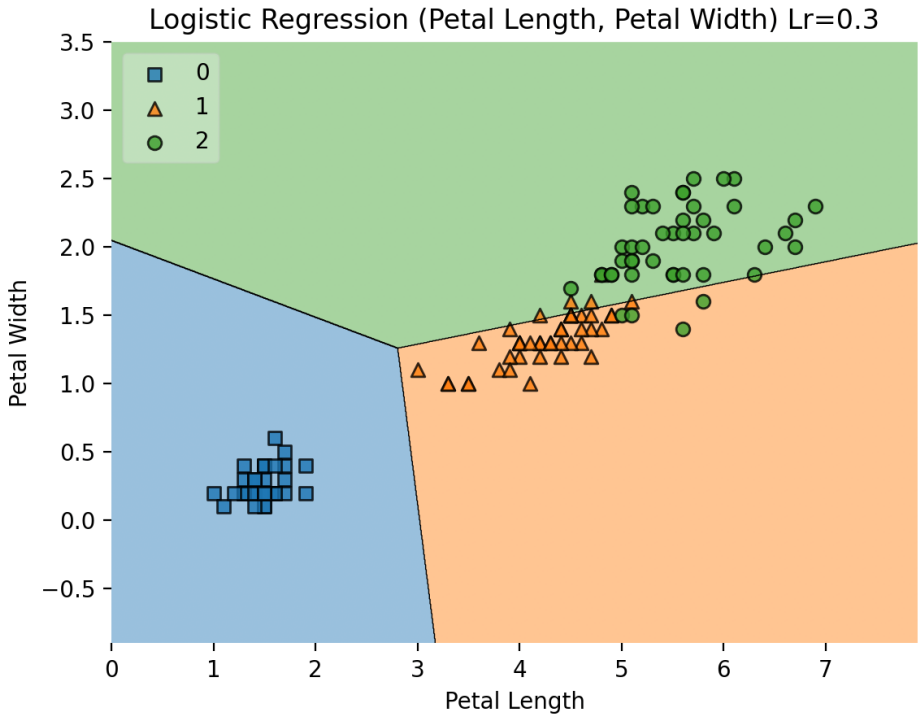
Model	Without Regularization	With Regularization 0.2
Sepal Length, Sepal Width	0.8356492906388883	0.8656393099995793
Petal Length, Petal Width	0.3107241703275187	0.31756194455440784
Sepal Length, Sepal Width and Petal Width	0.21296932327993845	0.22222719143124248
Petal Length, Petal Width and Sepal Length	5.3221129224726935	5.291541908915519

2. Logistic Regression and Linear Discriminant Analysis:

In this assignment, I have implemented Logistic Regression and Linear Discriminant Analysis from scratch in Python without using pre-existing packages.

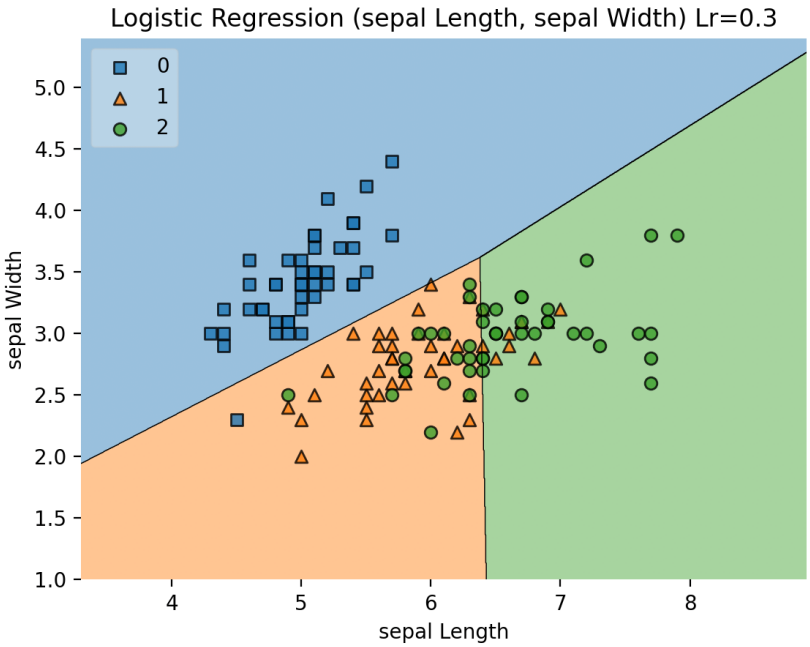
Visualization for above:

Model 2.1: Visualization Petal Length, Petal Width for Logistic Regression with Learning Rate 0.3



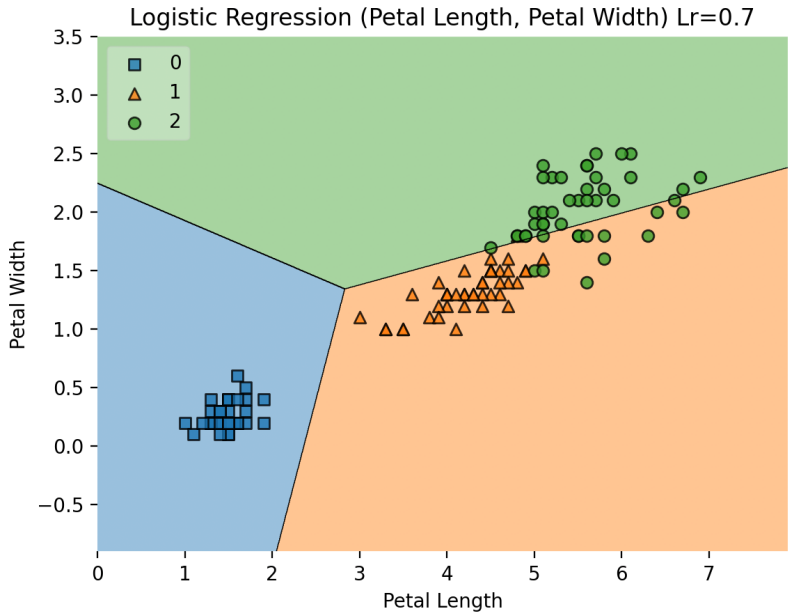

```
Accuracy for petal data:  0.9333333333333333
```

Model 2.2: Visualization Sepal Length, Sepal Width for Logistic Regression with Learning Rate 0.3



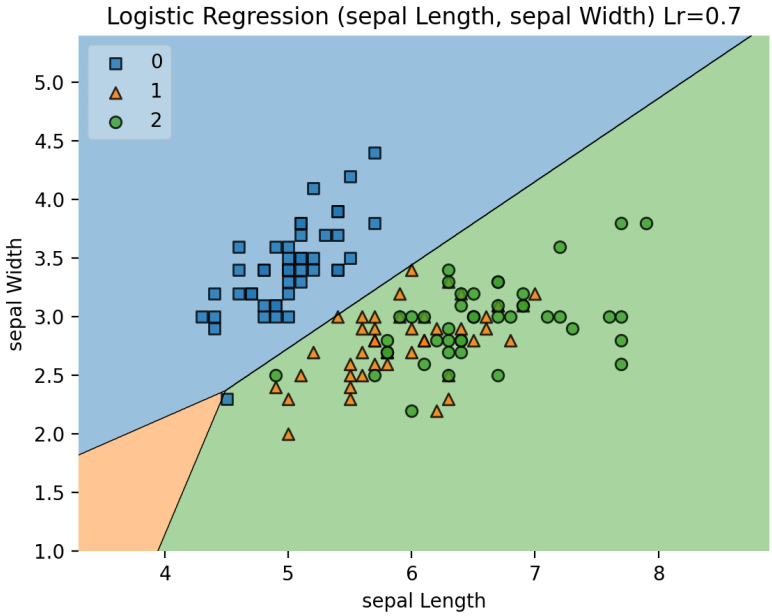

```
Accuracy for sepal data:  0.8
```

Model 2.3: Visualization Petal Length, Petal Width for Logistic Regression with Learning Rate 0.7



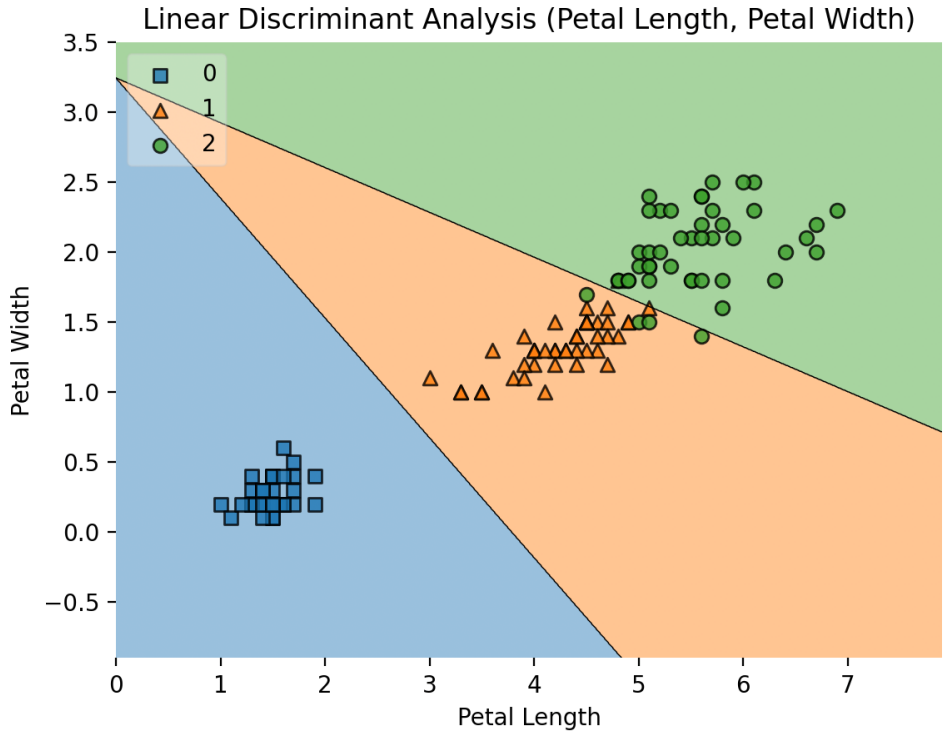

```
Accuracy for petal data:  0.8666666666666667
```

Model 2.4: Visualization Sepal Length, Sepal Width for Logistic Regression with Learning Rate 0.7



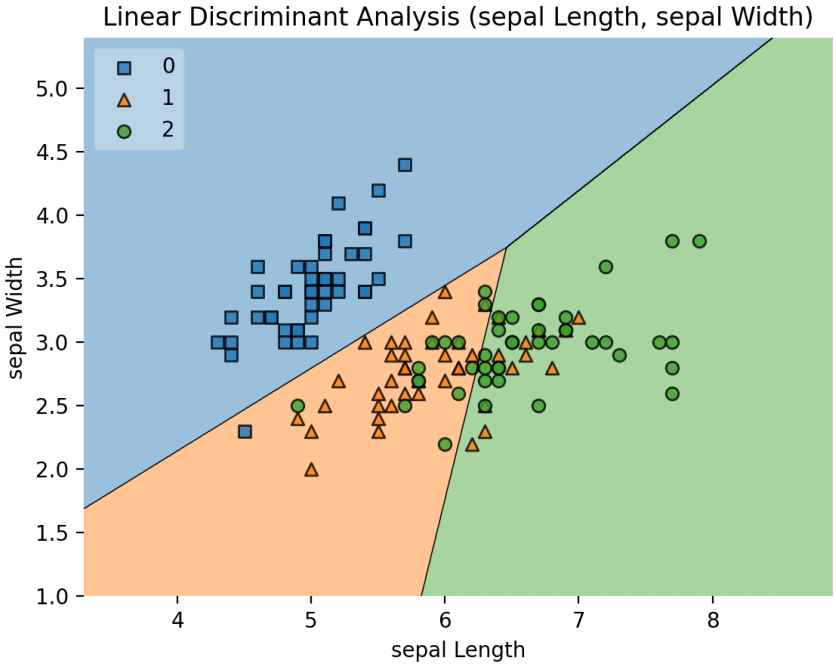

```
Accuracy for sepal data:  0.6666666666666666
```

Model 2.5: Visualization Petal Length, Petal Width for Linear Discriminant Regression




```
Accuracy for petal data:  0.9333333333333333
```

Model 2.6: Visualization Sepal Length, Sepal Width for Linear Discriminant Regression




```
Accuracy for sepal data:  0.8
```

Summarize results in table:

	Sepal Length/width	**Petal Length/width**	**All**
Logistic Regression, Lr= 0.3	0.8	0.93333	0.86667
Logistic Regression, Lr = 0.7	0.66666	0.86667	0.86667
LDA	0.8	0.93333	1.0