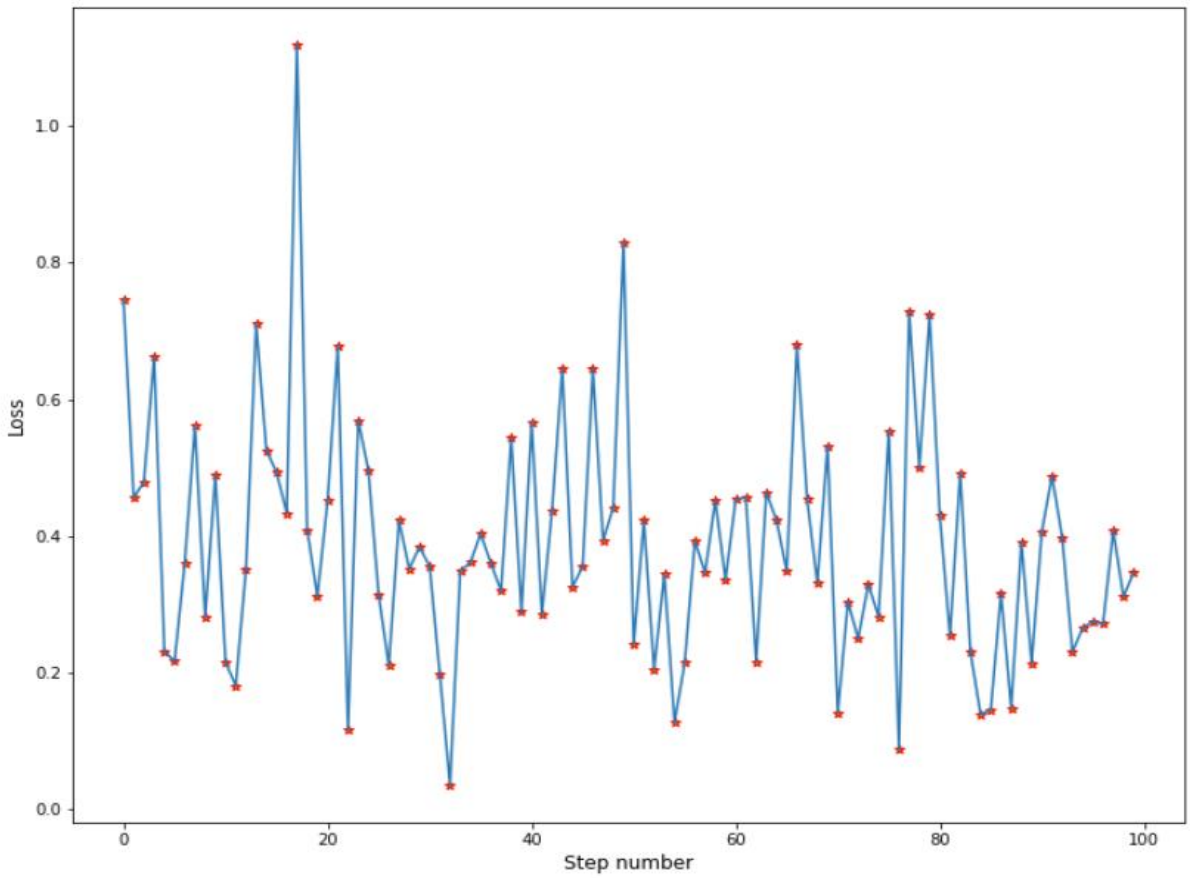
Assignment 1

Linear Regression:

Model Training Plots: The following 12 plots showcase the Loss against the Step number for the 12 Linear Regression models trained over the 4 features of the Iris dataset.

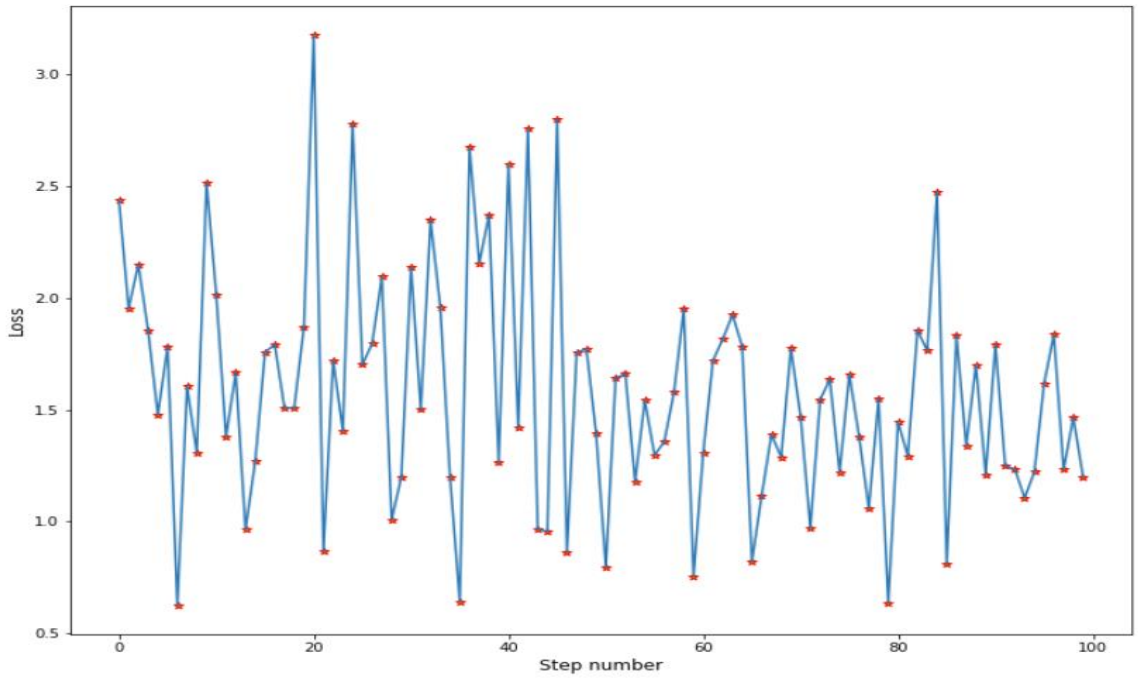
Model 0:

```
Weight =  [0.41999289]
Bias =  0.5166995092801899
MSE =  0.3460958014261579
```



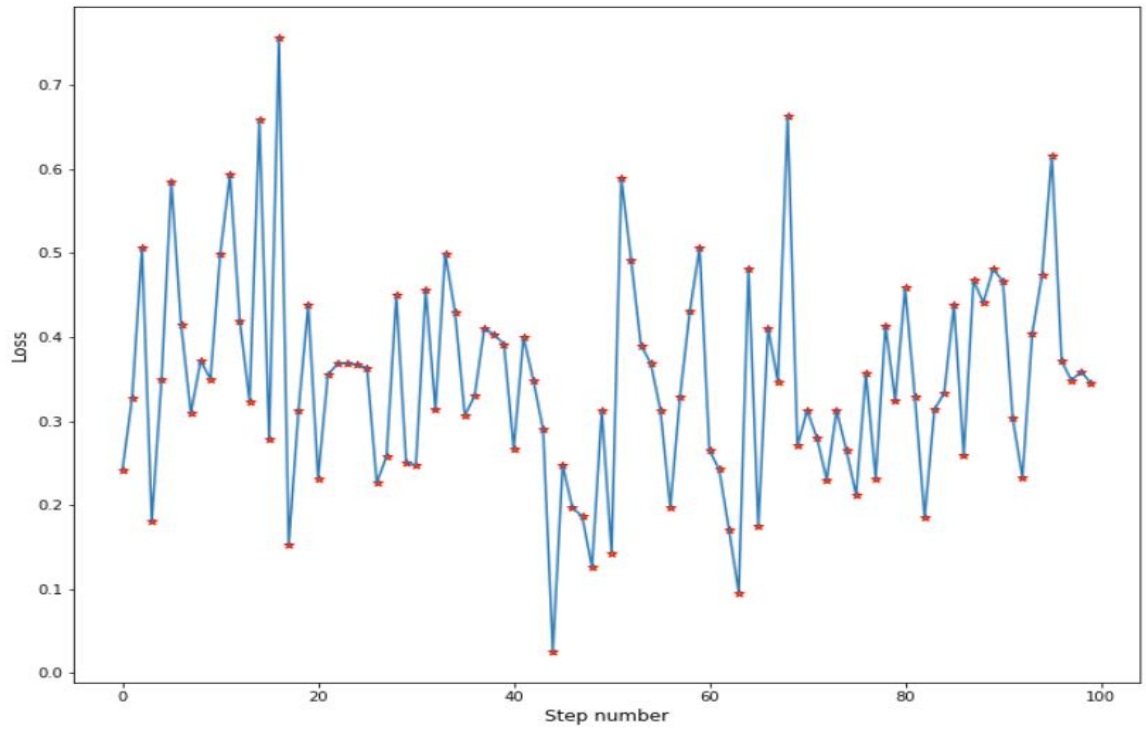
Model 1:

```
Weight =  [0.89244114]
Bias =  -1.282625462904057
MSE =  1.199466385420962
```



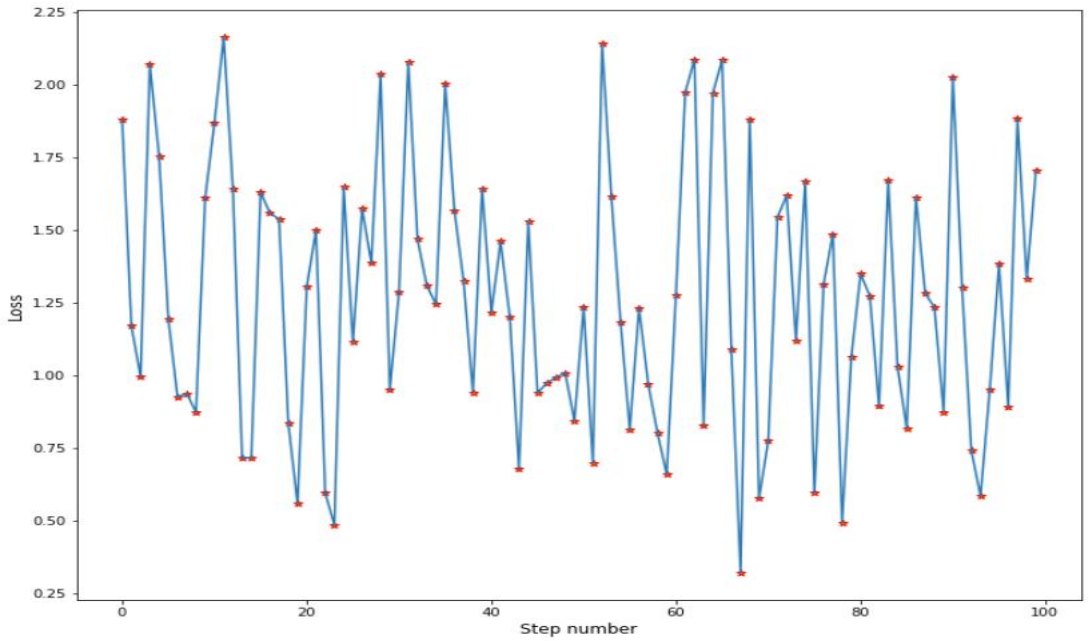
Model 2:

```
Weight =  [0.3234033]
Bias =  -0.6525507960764697
MSE =  0.3449294918696835
```



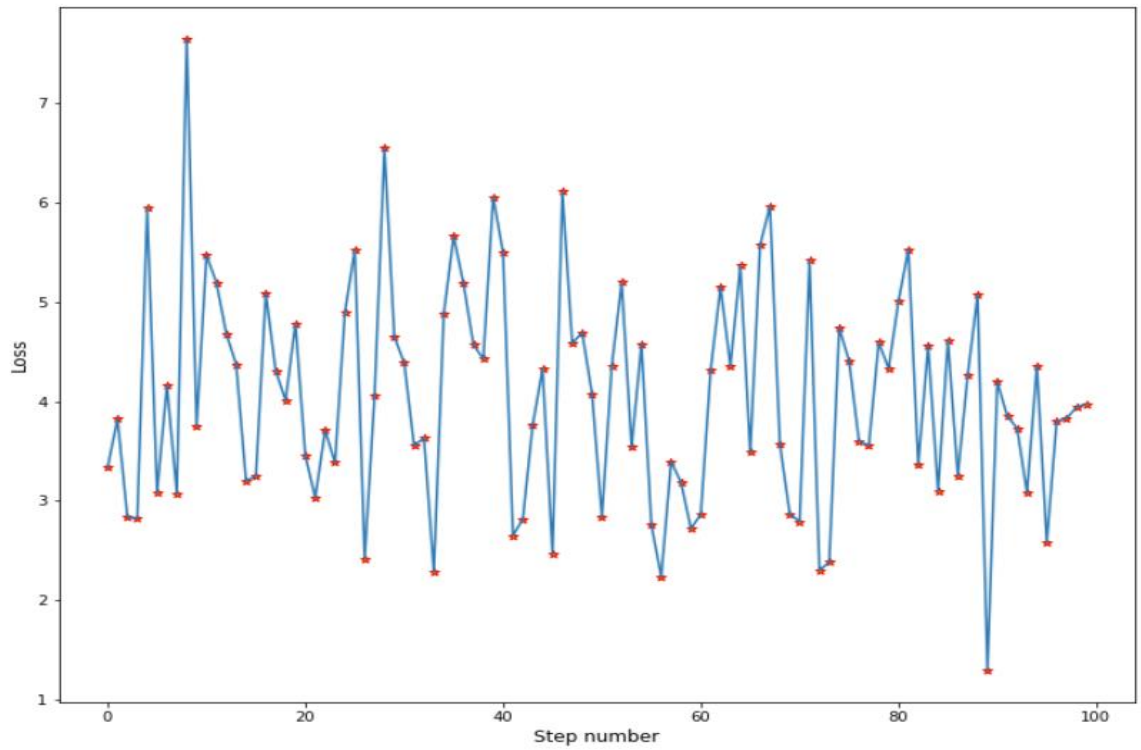
Model 3:

```
Weight =  [1.4815729]
Bias =  1.2452095358919102
MSE =  1.703052508497407
```



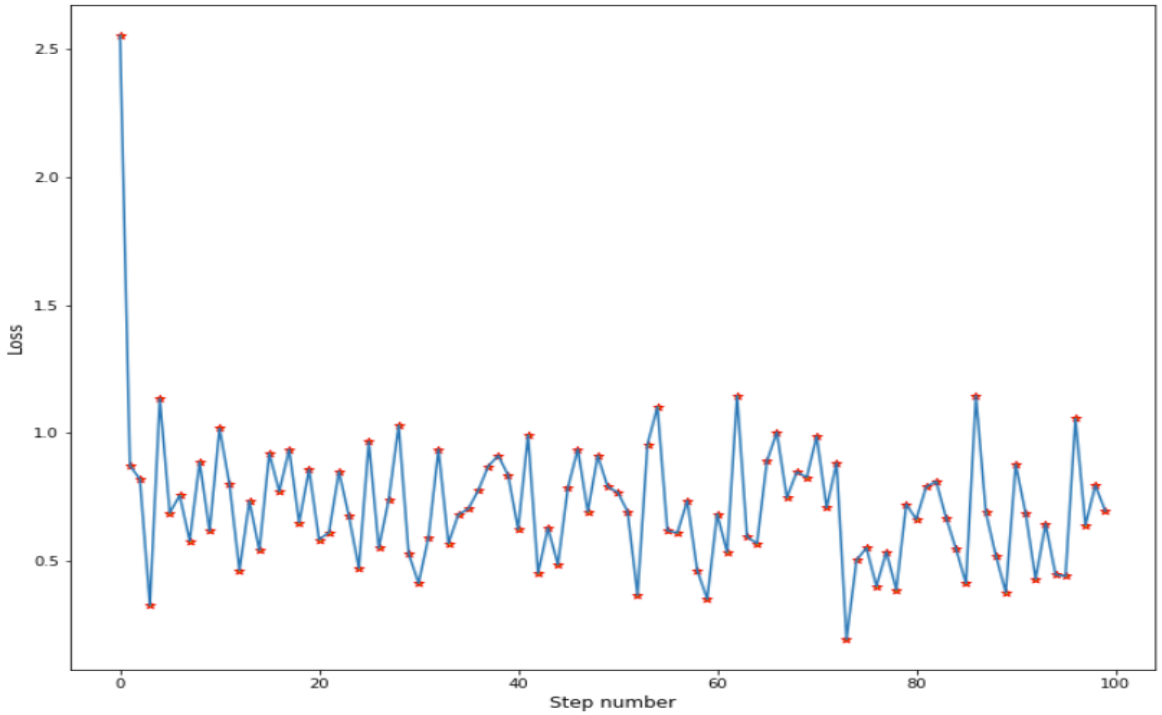
Model 4:

```
Weight =  [0.69983258]
Bias =  1.510035604384653
MSE =  3.9752079594106715
```



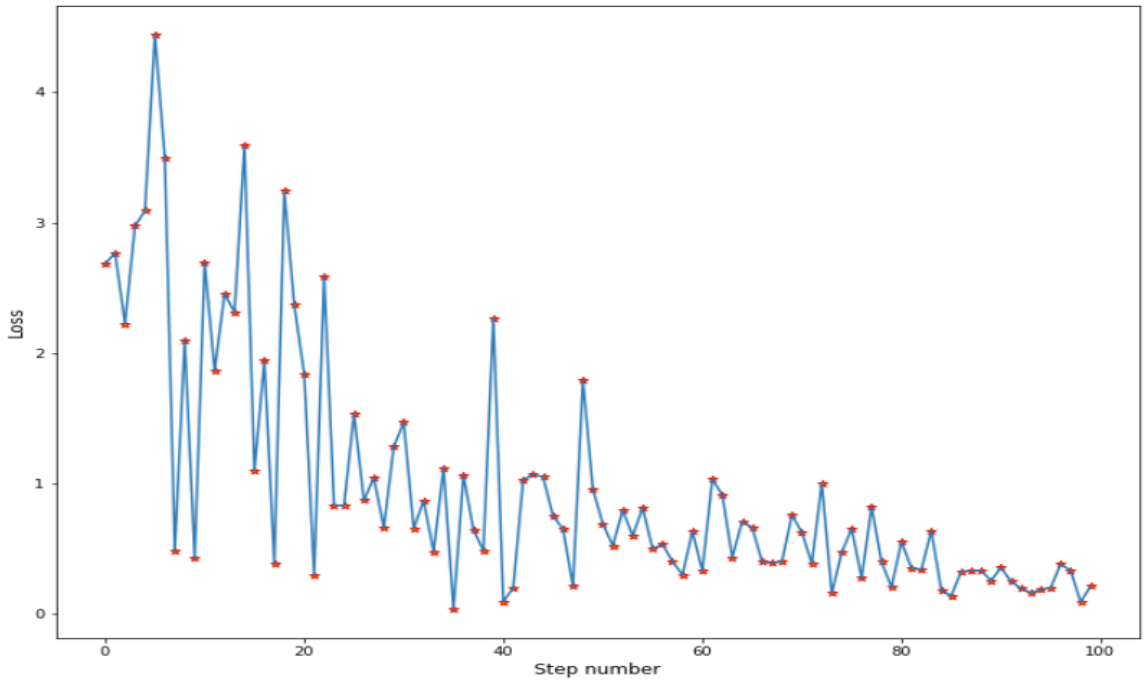
Model 5:

```
Weight =  [0.23279044]
Bias =  0.34721586631121343
MSE =  0.6962862159951371
```



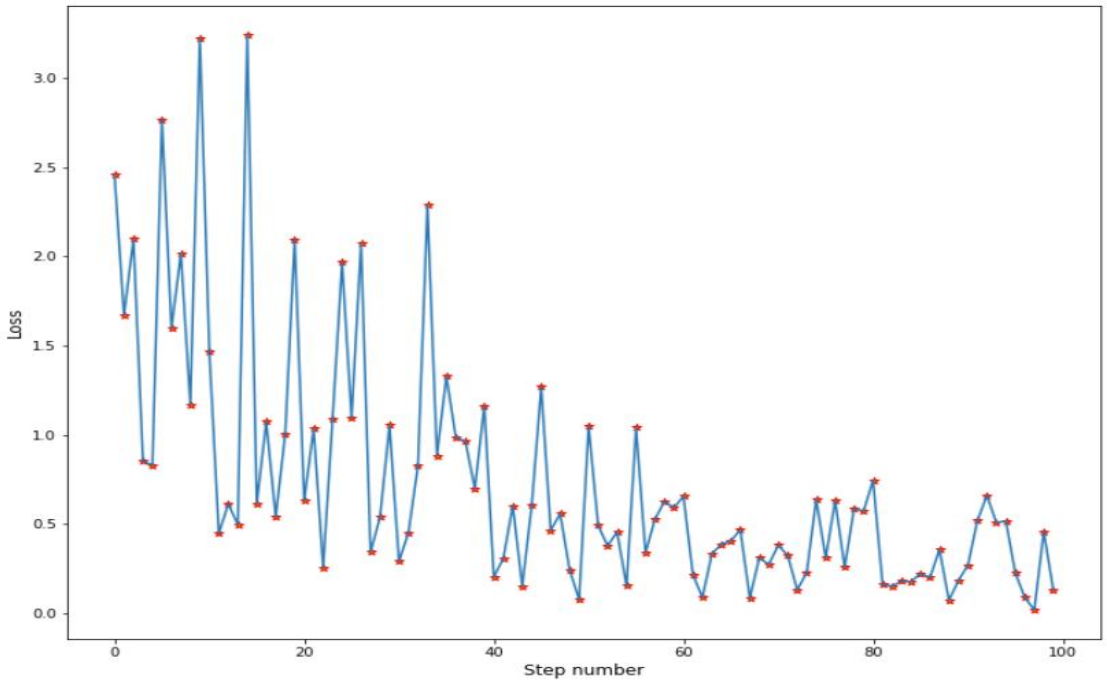
Model 6:

```
Weight =  [0.59056221]
Bias =  3.4835416171584557
MSE =  0.21401074993046684
```



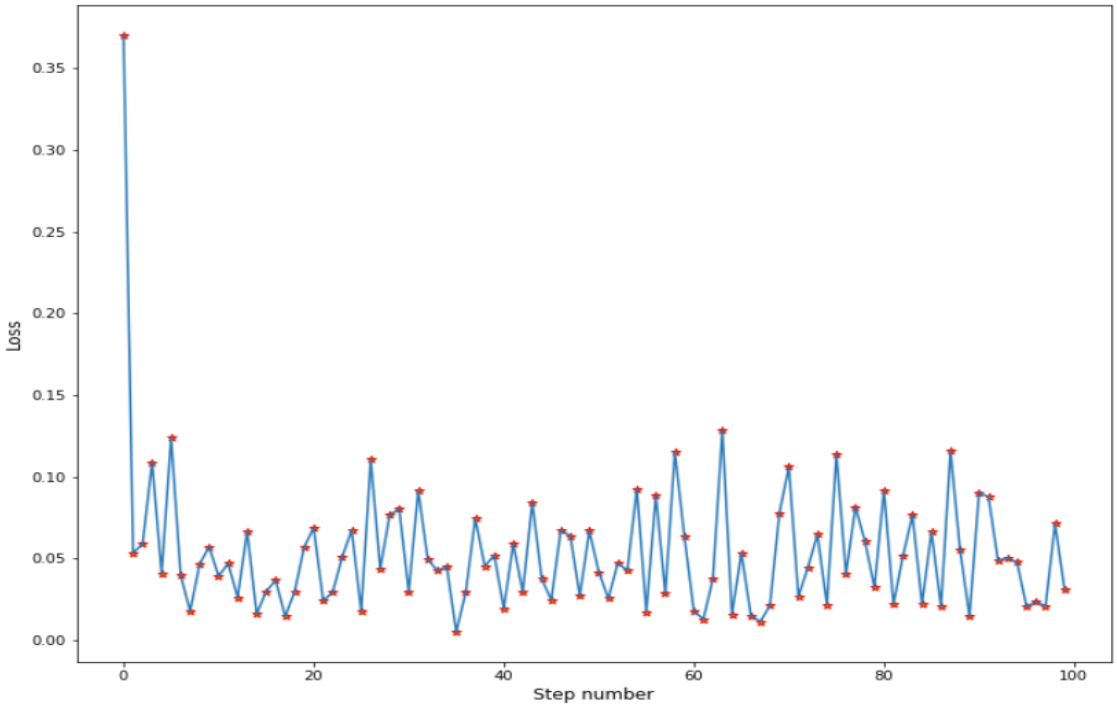
Model 7:

```
Weight =  [0.04282845]
Bias =  2.7811211263263787
MSE =  0.13219054975198946
```



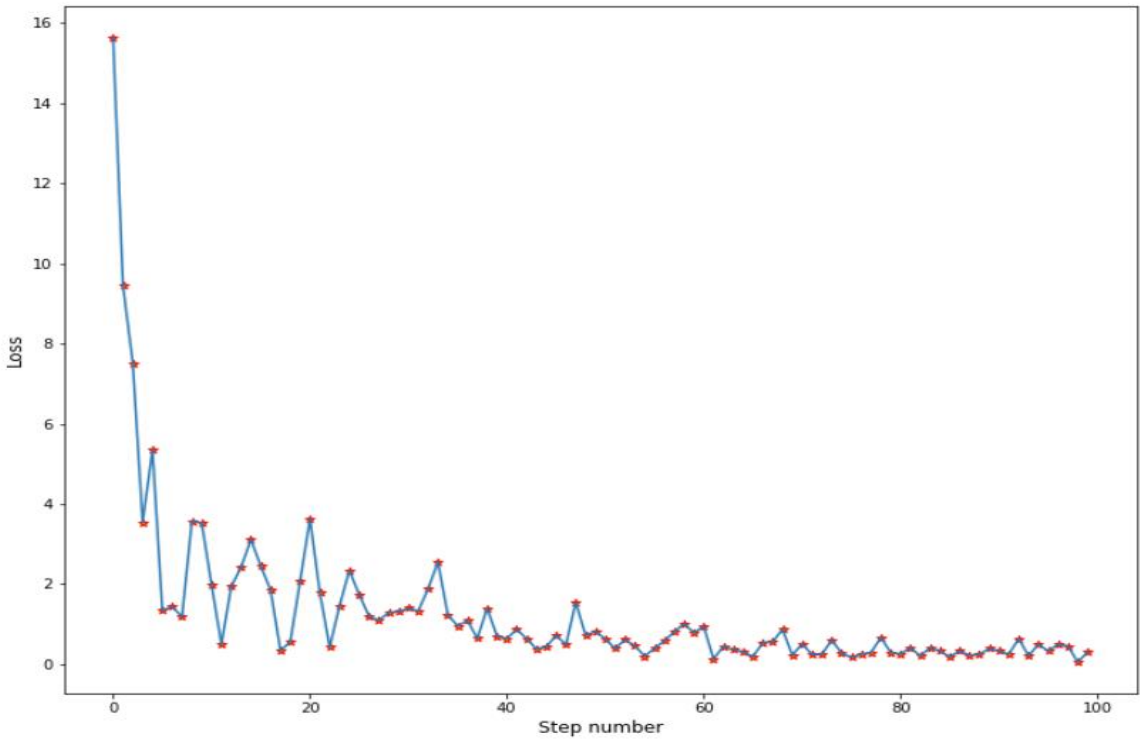
Model 8:

```
Weight =  [0.40449608]
Bias =  -0.31715930160587785
MSE =  0.031070495448887677
```



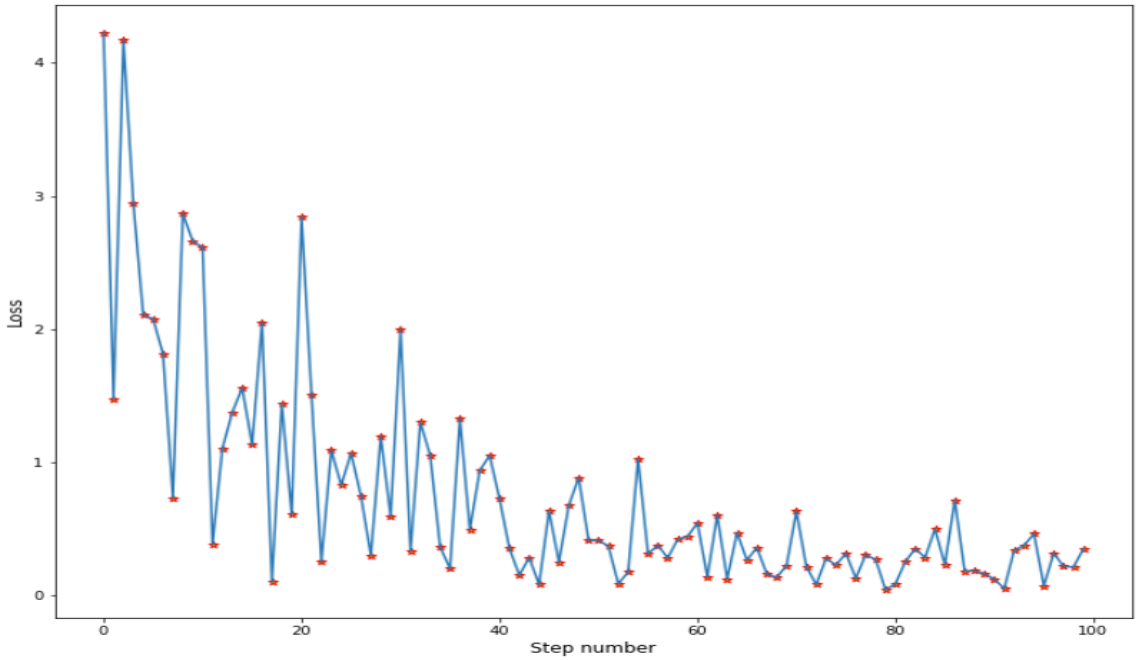
Model 9:

```
Weight =  [1.18480318]
Bias =  4.304319722923411
MSE =  0.29942671025857653
```



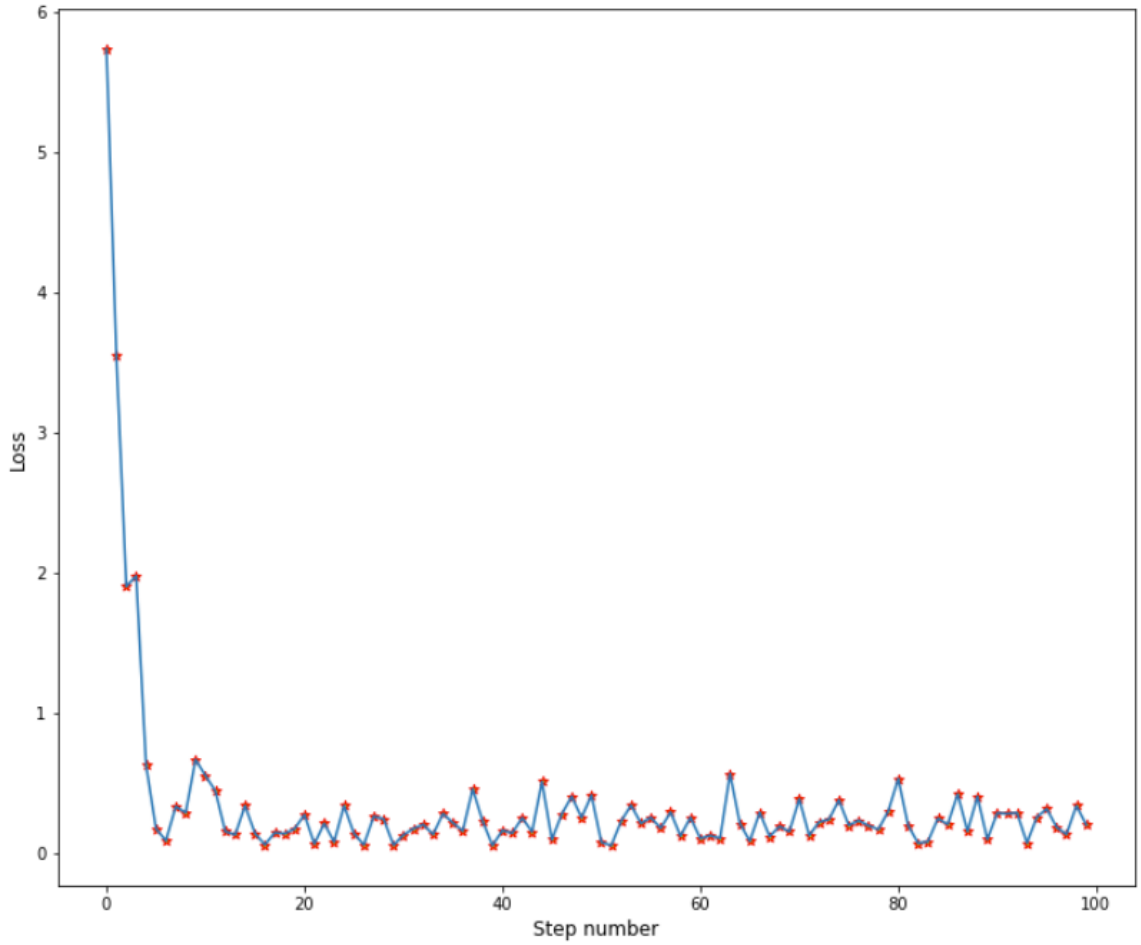
Model 10:

```
Weight =  [0.04512841]
Bias =  2.924173372160159
MSE =  0.3512714443694307
```



Model 11:

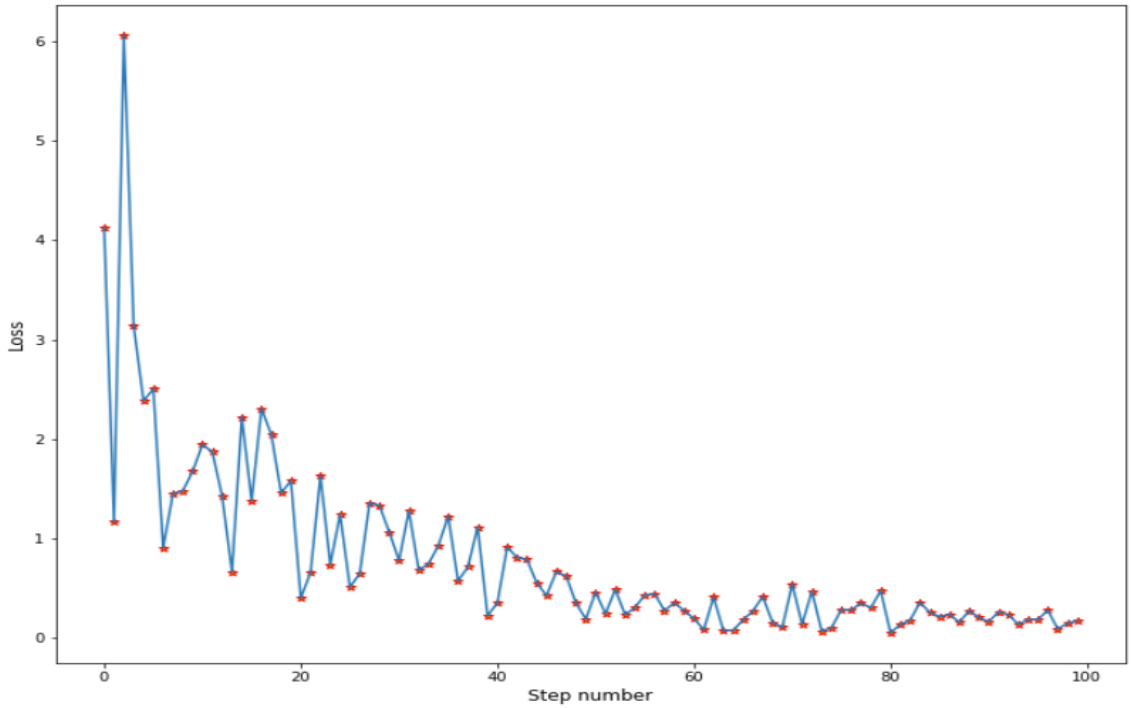
```
Weight =  [2.24385417]
Bias =  1.0648178826924835
MSE =  0.19881827465557192
```



Comparison of Model with and without Regularization: The following 2 plots showcase the comparison of bias and weight information without and with L2 Regularization applied to Linear Regression model for Petal length as feature and Sepal length as target.

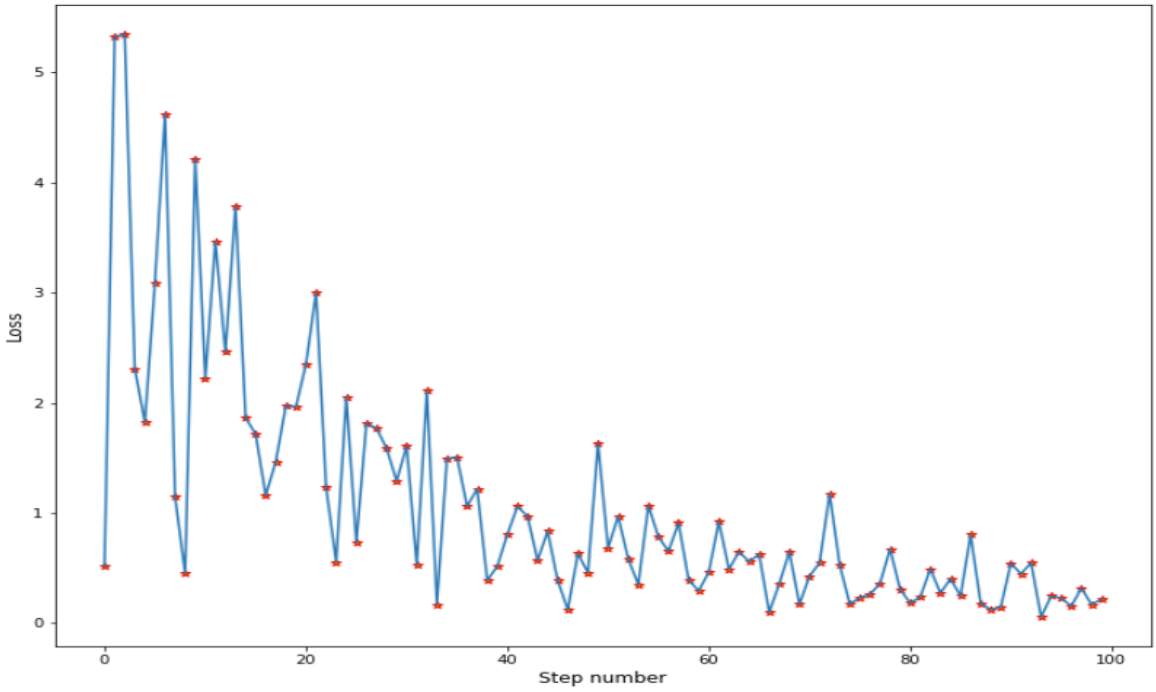
Model 6 without Regularization:

```
Weight =  [0.46443327]
Bias =  3.938806506179581
MSE =  0.1710727224478043
```



Model 6 with Regularization:

```
Weight =  [0.55942417]
Bias =  3.4832781892451674
MSE =  0.21768135960918159
```



Testing Summary:

Feature => Target ||	Sepal Length	Sepal Width	Petal Length	Petal Width
Sepal Length	**NA**	**1.0128**	**1.8072**	**1.5275**
Sepal Width	**0.3458**	**NA**	**0.1984**	**0.1887**
Petal Length	**4.4982**	**3.1839**	**NA**	**6.0349**
Petal Width	**0.7996**	**0.6034**	**1.0846**	**NA**

According to the testing results, PETAL WIDTH is most predictive for predicting SEPAL WIDTH with the least error of 0.1887.

Classification:

Testing Summary:

Model	Best Testing Accuracy
Latent – Discriminant Analysis	**0.9333**
Logistic Regression	**0.8000**
Naïve Bayes Classifier	**1.0000**

According to the testing results, Naive Bayes has the greatest prediction accuracy on the test set which is 100%.