Model Comparison

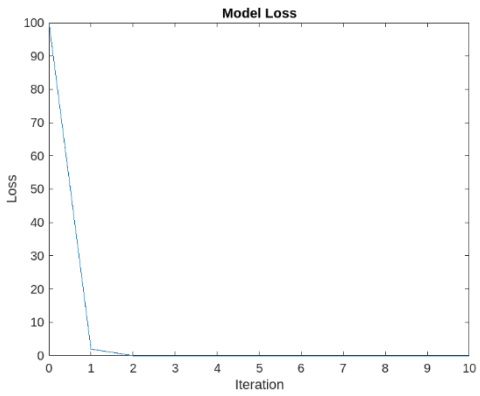
- Naïve Bayes
    1. Model Performance

```
>> NaiveBayesQ2
-----Start  Training-----
-----Finish Training-----
-----Start  Predict-----
-----Finish Predict-----
Accuracy: 1.000000
Confusion Table for Naive Bayes:
          Predicted 0   Predicted 1
Actual 0  54             0
Actual 1  0             46
```

    2. Advantage
        - Based on probabilistic and statistical methods
        - Effective for small datasets
        - Fast training and prediction speeds
    3. Disadvantage
        - Assumes independence between features (might not always hold true in real-life scenarios)

- Perceptron
    1. Model Performance

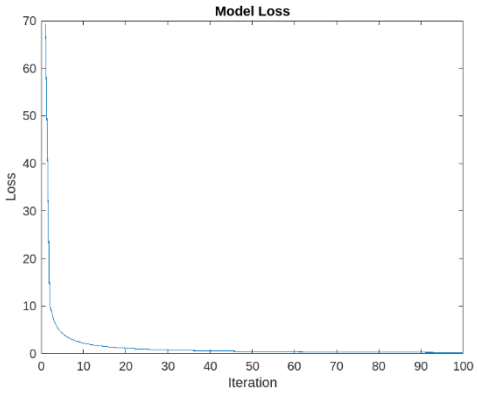
```
>> PerceptronQ2
-----Start  Training-----
Epoch0 Loss: 100.000000
Epoch1 Loss: 2.000000
Epoch2 Loss: 0.000000
Epoch3 Loss: 0.000000
Epoch4 Loss: 0.000000
Epoch5 Loss: 0.000000
Epoch6 Loss: 0.000000
Epoch7 Loss: 0.000000
Epoch8 Loss: 0.000000
Epoch9 Loss: 0.000000
Epoch10 Loss: 0.000000
-----Finish Training-----
-----Start  Predict-----
-----Finish Predict-----
Accuracy: 1.000000
Confusion Table for Perceptron:
          Predicted 0   Predicted 1
Actual 0  54             0
Actual 1  0             46
```



2. Advantage
   - ➢ Simple to understand
3. Disadvantage
   - ➢ Might not perform well on non-linear data

- Logistic Regression
  1. Model Performance

```
>> Logistic_RegressionQ2
-----Start  Training-----
Epoch1 Loss: 69.314718
Epoch10 Loss: 2.224903
Epoch20 Loss: 1.156197
Epoch30 Loss: 0.785486
Epoch40 Loss: 0.596149
Epoch50 Loss: 0.480955
Epoch60 Loss: 0.403381
Epoch70 Loss: 0.347539
Epoch80 Loss: 0.305394
Epoch90 Loss: 0.272443
Epoch100 Loss: 0.245966
-----Finish Training-----
-----Start  Predict-----
-----Finish Predict-----
Accuracy: 1.000000
Confusion Table for Logistic Regression:
          Predicted 0   Predicted 1
Actual 0  54             0
Actual 1  0             46
```



  2. Advantage
     - ➢ Can estimate feature importance
  3. Disadvantage
     - ➢ Might not capture non-linear patterns

- Adaboost
  1. Model Performance

```
>> AdaboostQ2
-----Start Training-----
-----Finish Training-----
-----Start  Predict-----
-----Finish Predict-----
Accuracy: 1.000000
Confusion Table for Adaboost:
          Predicted 0   Predicted 1
Actual 0  54             0
Actual 1  0             46
Weak Model Weights:
Model 1: 18.021827
Model 2: 18.021827
Model 3: 18.021827
```

  2. Advantage
     - ➢ Enhances model performance by combining multiple

weak classifiers
    - Can focus on harder-to-classify samples
3. Disadvantage
    - Might overfit(especially when the data has noise)

- Why every Model's accuracy is 100%
    1. IMU data is very distinguishable. For example, when the Minibot is inclined, there might be a noticeable change in acceleration on a particular axis. This suggests that the data might have a very clear and distinct boundary on a specific axis.
    2. IMU data has an equal number of inclined and non-inclined data, making the models less likely to be biased.
    3. There might not be much noise in IMU data, making it easier for the models to learn and predict.