# Single layer Perceptron (SLP)

## (Class A – Class B), (gender - body\_mass)

A graph with red and blue dots

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 0.9667
* **Test Accuracy:** 0.925
* **Analysis:** These features (gender, body\_mass) could discriminate bet. class A and B

## (Class A – Class C), (gender - body\_mass)

A graph of a train decision boundary

Description automatically generated A blue and white graph

Description automatically generated

* **Train Accuracy:** 0.5
* **Test Accuracy:** 0.5
* **Analysis:** These features (gender, body\_mass) could’t discriminate between class A and C

## (Class A – Class B), (body\_mass – beak\_length)

A graph of a train decision boundary

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 0.933
* **Test Accuracy:** 0.875
* **Analysis:** These features (body\_mass, beak\_length) could discriminate between class A and B

## (Class B – Class C), (body\_mass – beak\_length)

A graph of a train decision boundary

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 0.9833
* **Test Accuracy:** 0.8
* **Analysis:** These features (body\_mass, beak\_length) could discriminate between class B and C

## (Class B – Class C), (beak\_length – beak\_depth)

A graph with red and blue dots

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 1.0
* **Test Accuracy:** 0.975
* **Analysis:** These features (beak\_length, beak\_depth) could discriminate between class B and C

## (Class A – Class B), (beak\_length – fin\_length)

A graph with red and blue dots

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 1.0
* **Test Accuracy:** 0.9
* **Analysis:** These features (beak\_length, fin\_length) could discriminate bet. class A and B

## (Class A – Class B), (beak\_depth – fin\_length)

A graph of a line with red and blue dots

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 1.0
* **Test Accuracy:** 0.975
* **Analysis:** These features (beak\_depth, fin\_length) could discriminate bet. class A and B

# Adaline

## (Class A – Class B), (beak\_length – fin\_length)

A graph of a train decision boundary

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 1.0
* **Test Accuracy:** 0.975
* **Analysis:** These features (beak\_length, fin\_length) could discriminate bet. class A and B

## (Class A – Class B), (beak\_depth – fin\_length)

A graph of red and blue dots

Description automatically generated A diagram of a test confusion matrix

Description automatically generated

* **Train Accuracy:** 1.0
* **Test Accuracy:** 1.0
* **Analysis:** These features (beak\_depth, fin\_length) could discriminate bet. class A and B

## (Class A – Class C), (gender – beak\_depth)

A graph with red and blue dots

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 0.51667
* **Test Accuracy:** 0.6
* **Analysis:** These features (gender, beak\_depth) could’t discriminate between class A and C

## (Class B – Class C), (body\_mass – fin\_length)

A diagram of a train decision boundary

Description automatically generated A blue squares with white text

Description automatically generated

* **Train Accuracy:** 0.95
* **Test Accuracy:** 0.95
* **Analysis:** These features (body\_mass, fin\_length) could discriminate bet. class B and C

## (Class B – Class C), (body\_mass – beak\_depth)

A diagram of a train decision boundary

Description automatically generated A diagram of a test confusion matrix

Description automatically generated

* **Train Accuracy:** 1.0
* **Test Accuracy:** 1.0
* **Analysis:** These features (body\_mass, beak\_depth) could’t discriminate between class A and C

# Data visualization:

# A group of graphs with different colored dots Description automatically generated

1. **Body Mass**:
   * body\_mass shows a clear separation between the classes, especially between A, B, and C. The A category is centered on a lower range of body\_mass, while B is higher, and C falls between them with some overlap with both classes.
   * This feature seems to be a strong discriminator between A and B, but less so for C due to its overlap with both categories.
2. **Beak Length**:
   * beak\_length also shows good separation between classes. Class A is mostly on the lower end of the beak\_length range, while B has higher values, and C lies in between with some overlap.
   * The separation here is effective, suggesting that beak\_length is another strong feature for distinguishing the classes.
3. **Beak Depth**:
   * beak\_depth provides clear separation between A and B, with A having lower values and B having higher values. Class C overlaps with both A and B, making this feature moderately effective for classification.
   * Overall, beak\_depth shows some usefulness in differentiating A from B but has limited distinction for C.
4. **Fin Length**:
   * fin\_length shows distinct peaks for each class, with A on the lower end, B on the higher end, and C in between.
   * This feature has a relatively clear separation and can help classify the classes, though there’s some overlap, especially with C.
5. **Gender**:
   * gender does not appear to offer much discriminatory power between classes, as it is evenly distributed across all categories.
   * This feature is likely not useful for classification on its own.

**General Conclusion:**

* **Best Discriminatory Features**: body\_mass, beak\_length, beak\_depth, and fin\_length are the most effective features for distinguishing between the bird categories, with body\_mass and beak\_length showing the best separation.
* **Moderate Discrimination**: beak\_depth and fin\_length provide moderate separation but show some overlap, particularly with class C.
* **Least Useful Feature**: gender does not show any significant pattern for distinguishing the bird categories.

**Recommendations:**

* For binary classification between two classes, you might choose features like body\_mass and beak\_length due to their high discriminatory power.