Task 1

Team ID : SC_26

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Perceptron Algorithm Combination

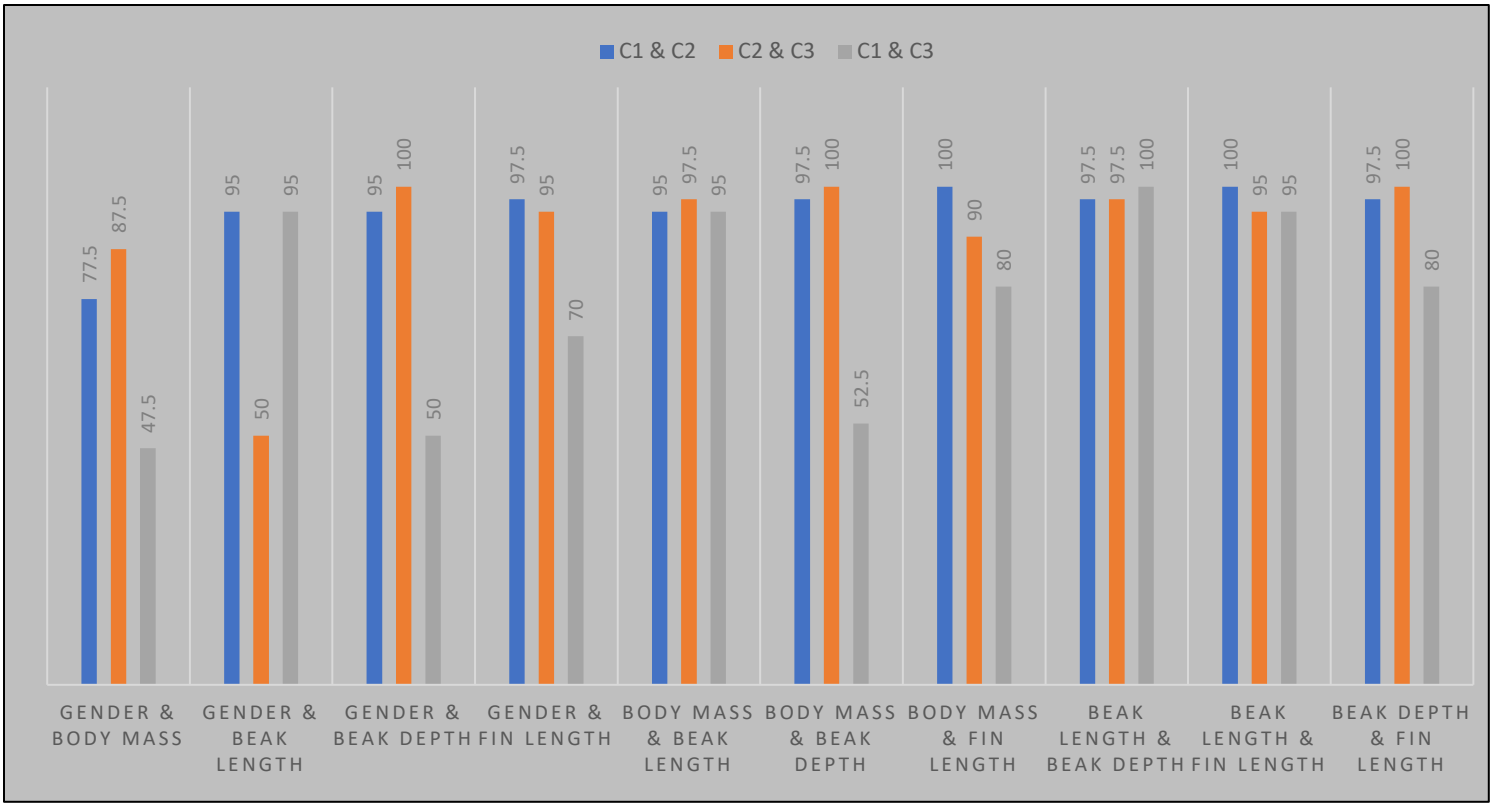
After make the variables constant to decide which the best Feature with each class, we found the next:

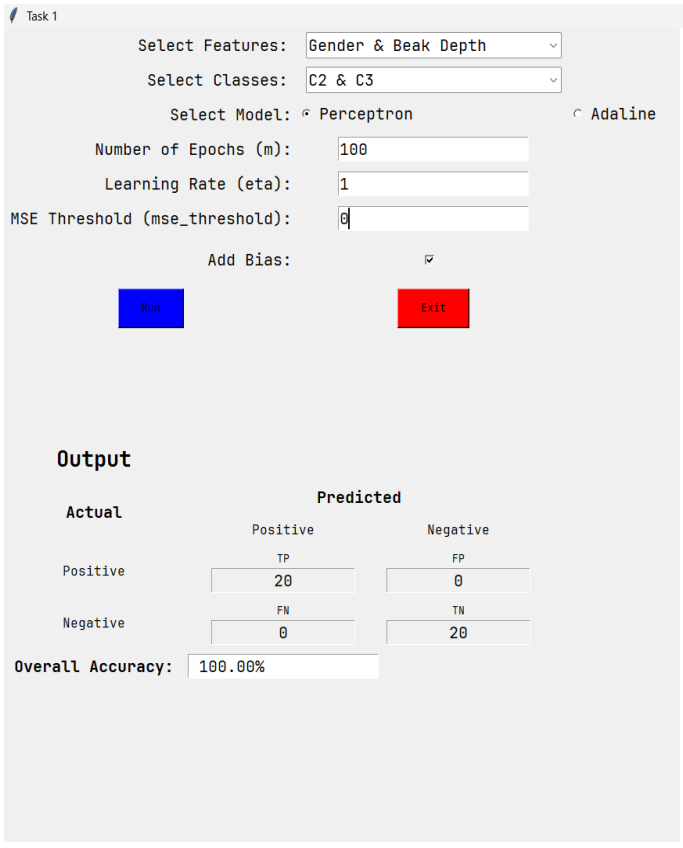
(all this cases the epoch=100, learning_rate=1,mse_threshold=0, add_bias=True)

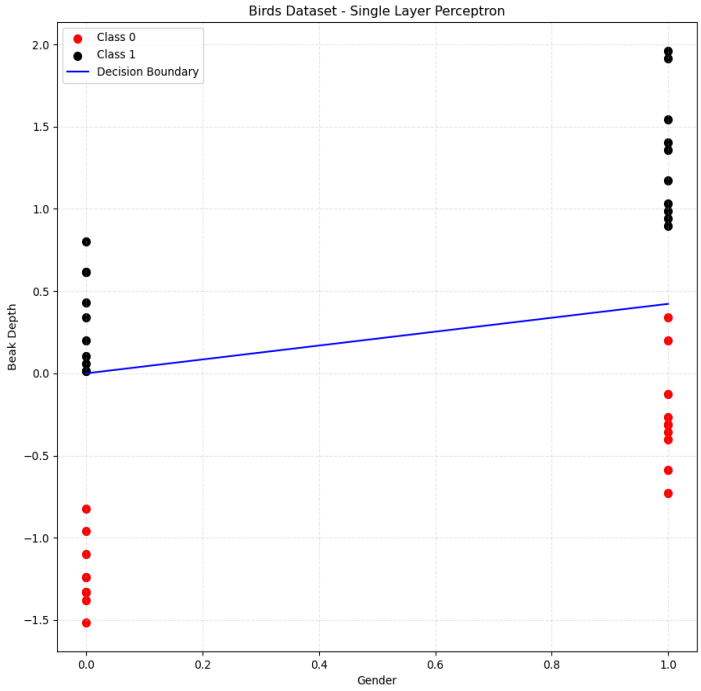
- The accuracy 100% has been founded 6 times with :
  - Gender and Body Mass with C2 & C3.
  - Body Mass and Beak Depth with C2 & C3.
  - Body Mass and Fin Length with C1 & C2.
  - Beak Length and Beak Depth with C1 & C3.
  - Beak Length and Fin Length with C1 &C2.
  - Beak Depth and Fin Length with C2 & C3.
- Most the feature has got above 90% Accuracy exactly (95%, 97.5%, 90%,..)
- It is rare with this input to get bad performance ,but unfortunately we found some combination with some classes has a bad performance, like :
  - Gender and Body Mass with C1 & C3 => 47.5%.
  - Gender and Beak Length with C2 & C3 => 50%.
  - Gender and Beak Depth with C1 & C3 => 50%.
  - Body Mass and Beak Depth with C1 & C3 => 52.5%.

  (and with some edit for the variables like learning rate and epoch we will get bad performance also)

  And you can see all the number in the next chart and plots:


C1 & C2
C2 & C3
C1 & C3
77.5
87.5
47.5
95
50
95
95
100
50
97.5
95
70
95
97.5
95
97.5
100
52.5
100
90
80
97.5
97.5
100
100
95
95
97.5
100
80
GENDER & BODY MASS
GENDER & BEAK LENGTH
GENDER & BEAK DEPTH
GENDER & FIN LENGTH
BODY MASS & BEAK LENGTH
BODY MASS & BEAK DEPTH
BODY MASS & FIN LENGTH
BEAK LENGTH & BEAK DEPTH
BEAK LENGTH & FIN LENGTH
BEAK DEPTH & FIN LENGTH


Task 1
Select Features:
Gender & Beak Depth
Select Classes:
C2 & C3
Select Model:
Perceptron
Adaline
Number of Epochs (m):
100
Learning Rate (eta):
1
MSE Threshold (mse_threshold):
0
Add Bias:
Run
Exit
Output
Actual
Predicted
Positive
Negative
Positive
TP
20
FP
0
Negative
FN
0
TN
20
Overall Accuracy:
100.00%


Birds Dataset - Single Layer Perceptron
Class 0
Class 1
Decision Boundary
Beak Depth
Gender
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
0.0
0.2
0.4
0.6
0.8
1.0

Task 1

Select Features: Gender & Body Mass

Select Classes: C1 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 1

MSE Threshold (mse_threshold): 0

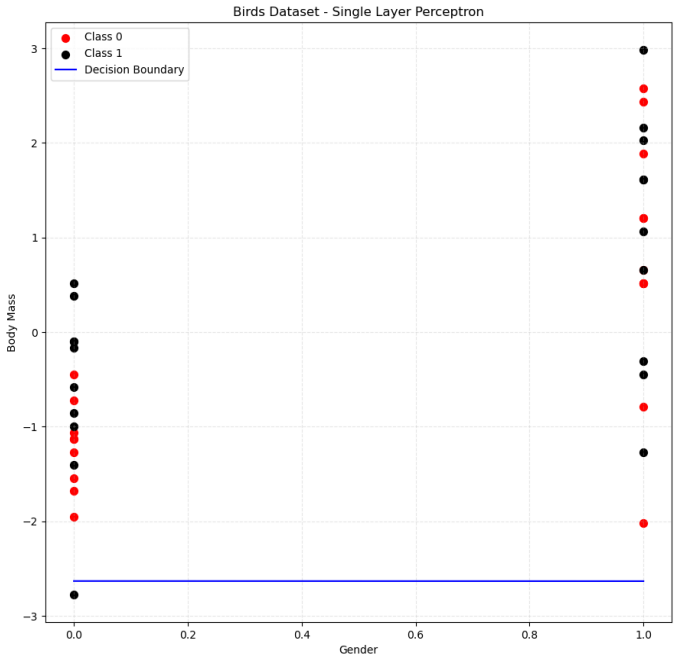
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 19	FP: 20
Negative	FN: 1	TN: 0

Overall Accuracy: 47.50%



Task 1

Select Features: Beak Length & Beak Depth

Select Classes: C2 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 1

MSE Threshold (mse_threshold): 0

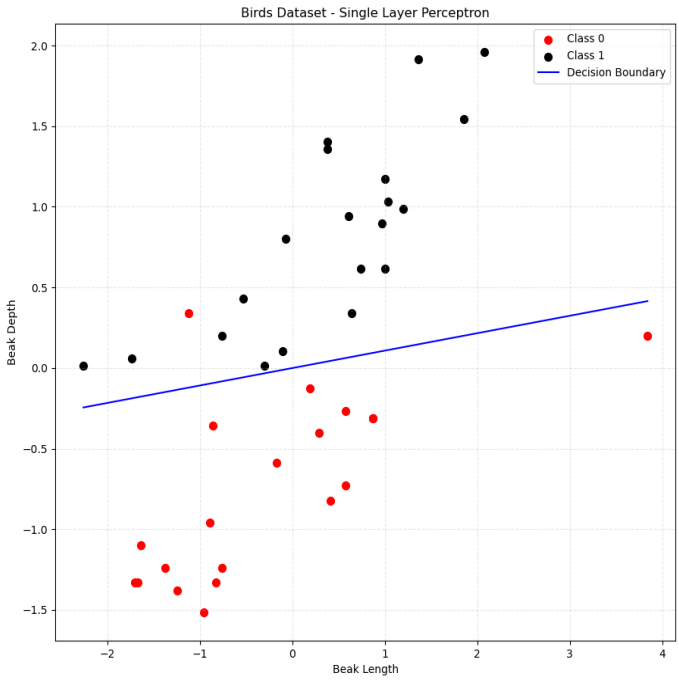
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 20	FP: 1
Negative	FN: 0	TN: 19

Overall Accuracy: 97.50%



Task 1

Select Features: Gender & Fin Length

Select Classes: C1 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 1

MSE Threshold (mse_threshold): 0

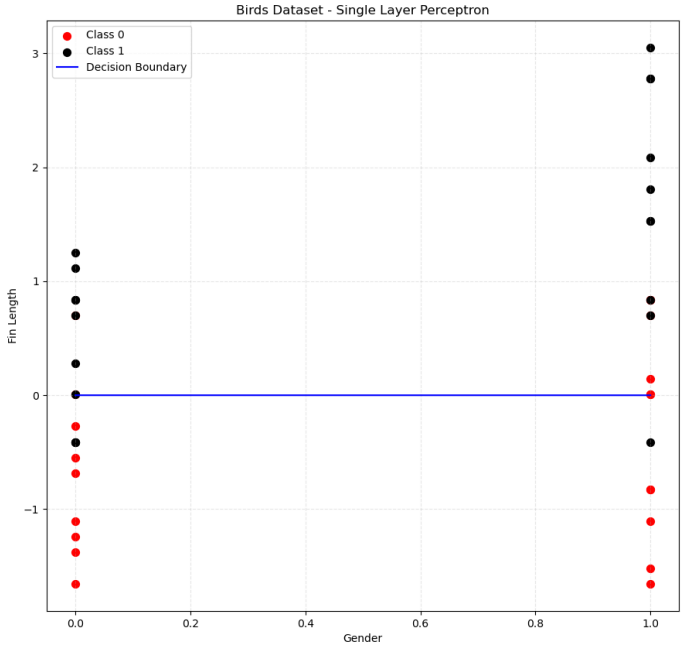
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 16	FP: 8
Negative	FN: 4	TN: 12

Overall Accuracy: 70.00%



Task 1

Select Features: Beak Depth & Fin Length

Select Classes: C1 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 1

MSE Threshold (mse_threshold): 0

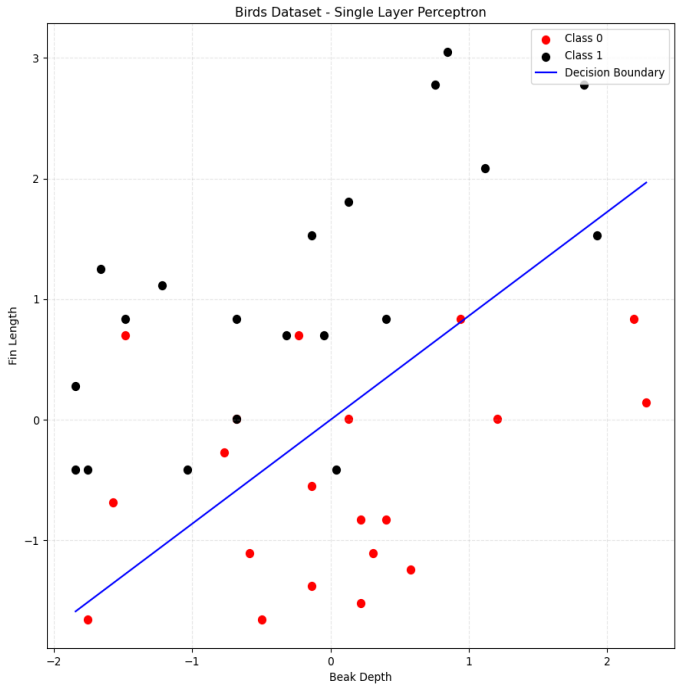
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 18	FP: 6
Negative	FN: 2	TN: 14

Overall Accuracy: 80.00%



Conclusion:

For this algorithm with these combinations I think this algorithm with this numbers has a decent performance , but when we must chose one combination of feature with this algorithm , I will go with :

Beak Length & Beak Depth

Because it is the only one with the 3 combination of classes has the best numbers (97.5, 97.5, 100) as an overall accuracy

And for the worst combination of feature , I will choose :

Gender & Body Mass

Because it is the only one with the 3 combination of classes has the worst numbers (77.5, 87.5, 47.5) as an overall accuracy

And as an overall the “Gender” is worst feature in performance in this test .

Adaline Algorithm Combination

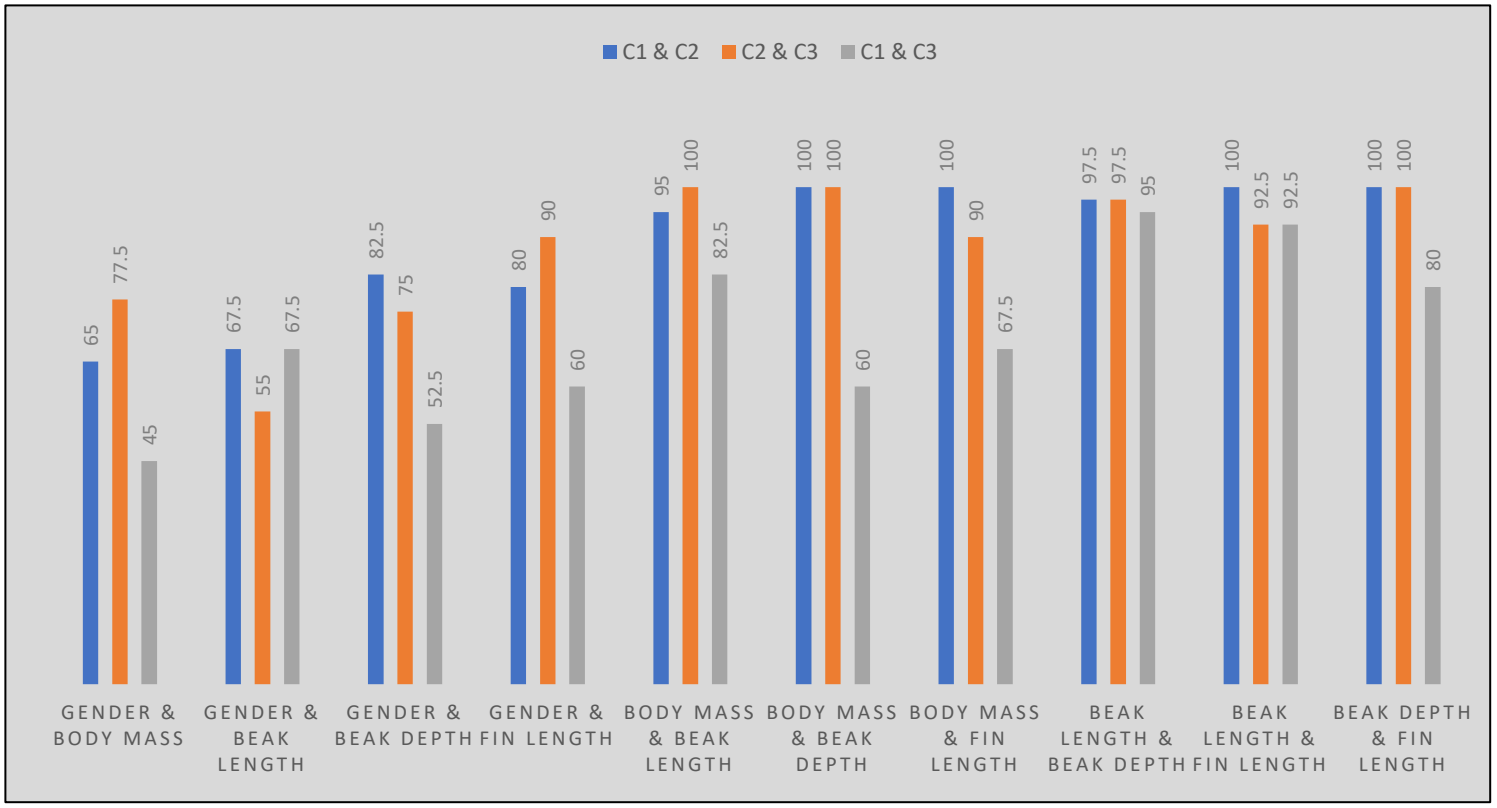
After make the variables constant to decide which the best Feature with each class, we found the next:

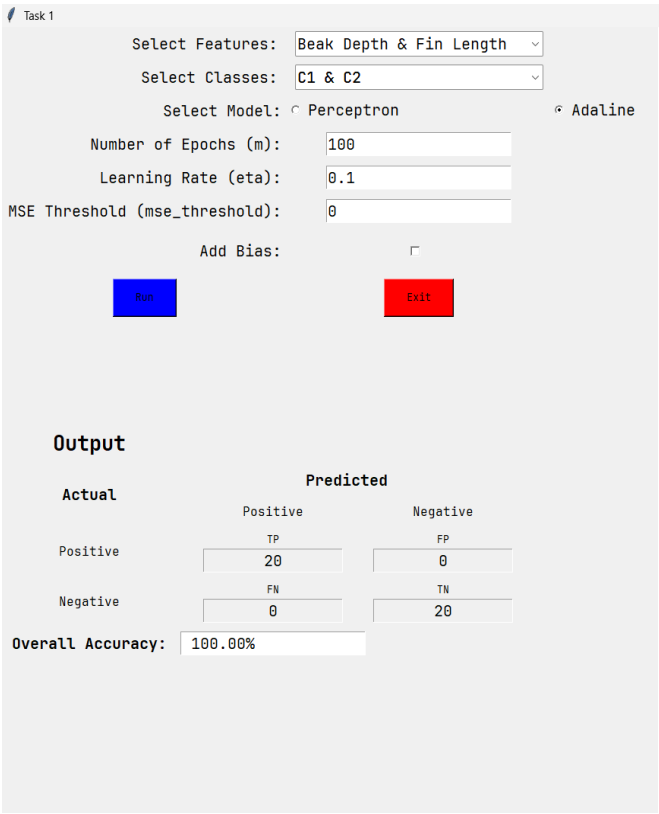
(all this cases the epoch=100, learning_rate=0.1,mse_threshold=0, add_bias=False)

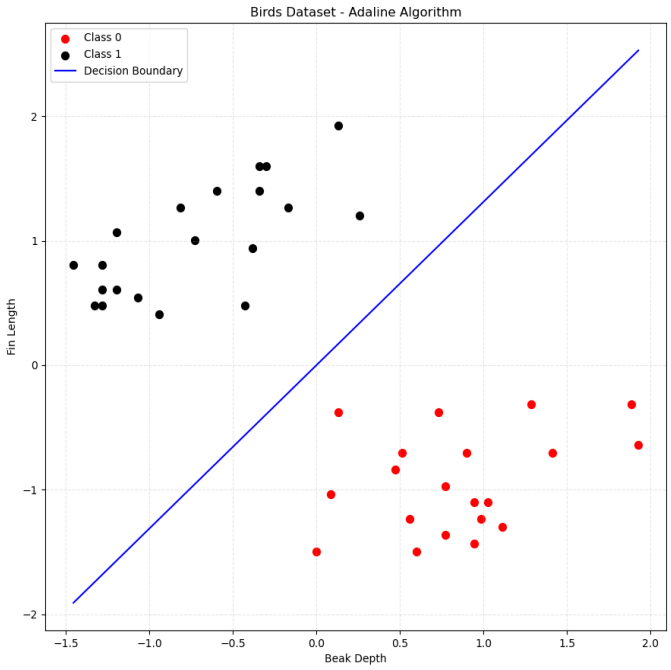
- The accuracy 100% has been founded 7 times with :
  - Body Mass and Beak Length with C2 & C3.
  - Body Mass and Beak Depth with C1 & C2.
  - Body Mass and Beak Depth with C2 & C3.
  - Body Mass and Fin Length with C1 & C2.
  - Beak Length and Fin Length with C1 &C2.
  - Beak Depth and Fin Length with C1 & C2.
  - Beak Depth and Fin Length with C2 & C3.
- Most the feature has got around 75% Accuracy
- It may found with this input get bad performance , we found some combination with some classes has a bad performance, like :
  - Gender and Body Mass with C1 & C3 => 45%.
  - Gender and Beak Length with C2 & C3 => 55%.
  - Gender and Beak Depth with C1 & C3 => 52.5%.

  (and with some edit for the variables like learning rate and epoch, we will get bad performance also)

  And you can see all the number in the next chart and plots:


C1 & C2
C2 & C3
C1 & C3
65
77.5
45
67.5
55
67.5
82.5
75
52.5
80
90
60
95
100
82.5
100
100
60
100
90
67.5
97.5
97.5
95
100
92.5
92.5
100
100
80
GENDER & BODY MASS
GENDER & BEAK LENGTH
GENDER & BEAK DEPTH
GENDER & FIN LENGTH
BODY MASS & BEAK LENGTH
BODY MASS & BEAK DEPTH
BODY MASS & FIN LENGTH
BEAK LENGTH & BEAK DEPTH
BEAK LENGTH & FIN LENGTH
BEAK DEPTH & FIN LENGTH


Task 1
Select Features:
Beak Depth & Fin Length
Select Classes:
C1 & C2
Select Model:
Perceptron
Adaline
Number of Epochs (m):
100
Learning Rate (eta):
0.1
MSE Threshold (mse_threshold):
0
Add Bias:
Run
Exit
Output
Actual
Predicted
Positive
Negative
TP
20
FP
0
FN
0
TN
20
Positive
Negative
Overall Accuracy:
100.00%


Birds Dataset - Adaline Algorithm
Class 0
Class 1
Decision Boundary
Fin Length
Beak Depth
2
1
0
−1
−2
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0

Task 1

Select Features: Beak Length & Beak Depth

Select Classes: C1 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 0.1

MSE Threshold (mse_threshold): 0

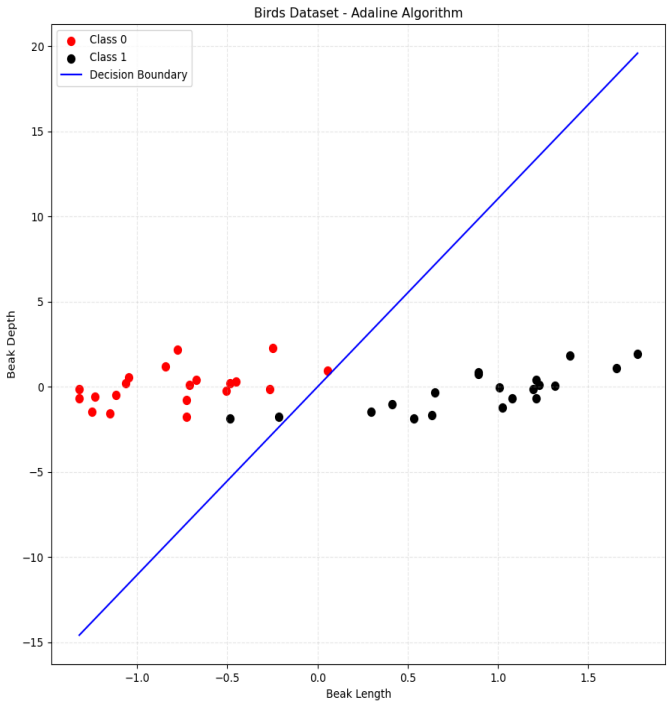
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 18	FP: 0
Negative	FN: 2	TN: 20

Overall Accuracy: 95.00%



Task 1

Select Features: Gender & Body Mass

Select Classes: C2 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 0.1

MSE Threshold (mse_threshold): 0

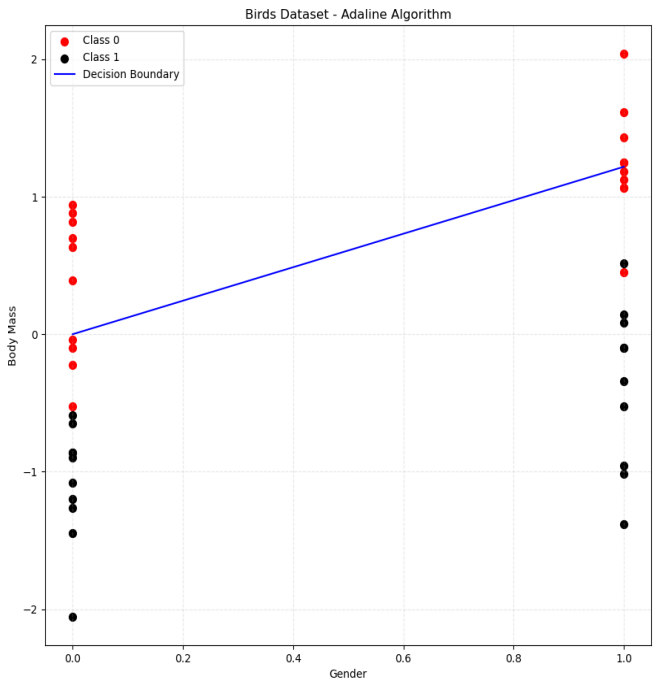
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 20	FP: 9
Negative	FN: 0	TN: 11

Overall Accuracy: 77.50%



Task 1

Select Features: Body Mass & Fin Length

Select Classes: C1 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 0.1

MSE Threshold (mse_threshold): 0

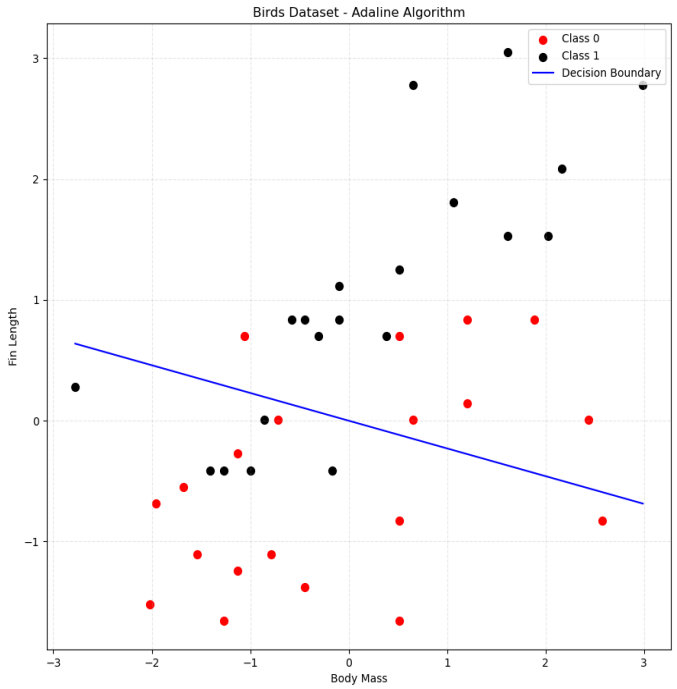
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 14	FP: 7
Negative	FN: 6	TN: 13

Overall Accuracy: 67.50%



Task 1

Select Features: Gender & Body Mass

Select Classes: C1 & C3

Select Model: Perceptron Adaline

Number of Epochs (m): 100

Learning Rate (eta): 0.1

MSE Threshold (mse_threshold): 0

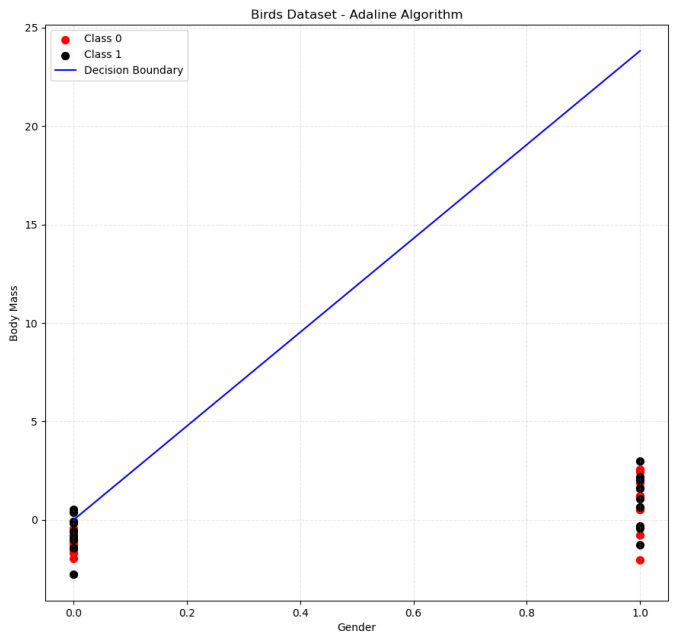
Add Bias:

Run Exit

Output

Actual	Predicted: Positive	Predicted: Negative
Positive	TP: 18	FP: 20
Negative	FN: 2	TN: 0

Overall Accuracy: 45.00%



Conclusion:

For this algorithm with these combinations I think this algorithm with this numbers has a decent performance , but when we must chose one combination of feature with this algorithm , I will go with :

Beak Length & Beak Depth

Because it is the only one with the 3 combination of classes has the powerful numbers (97.5, 97.5, 95) as an overall accuracy, with all of them is above 95 that good performance than (100, 100, 80)

And for the worst combination of feature , I will choose :

Gender & Body Mass

Because it is the only one with the 3 combination of classes has the worst numbers (65, 77.5, 45) as an overall accuracy

And as an overall the “Gender” is worst feature in performance in this test .