

## Neural Network & Deep Learning (Task 1)

**TEAM\_ID = CS\_H17**

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## **GENERAL NOTES BEFORE READING AND TEST OUR CODE OR DOCUMENTATION**

- We handled all of the user's input such as :1) if user choose the same feature twice in textboxes then error message is showing and return from program . 2) If the user leaves the box empty .
- we assumed and encoded in preprocessing phase that Adelie class is 1 and Gentoo class is 0 and Chinstrap class is -1 , but we handled it in training and test because MUST be 1 or -1 only (means comparison between two classes only )
- First thing is showed if you run the code is 10 figures (Visualization Before training data ) you must close all of 10 figures first then GUI page will show .
- In visualization Phase after training and test we tried more than once with a different Epochs and eta .
- The whole code in main.py
- preproc.py is file for preprocessing only and creation new csv file

- **Preprocessing :**

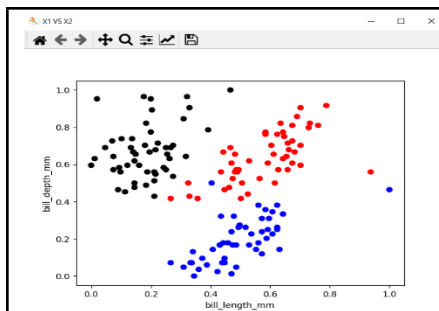
- Filling the NA in the gender column .
- Normalize the numerical data between 0 and 1.
- create a new CSV file with an updated version.

- **Visualization :**

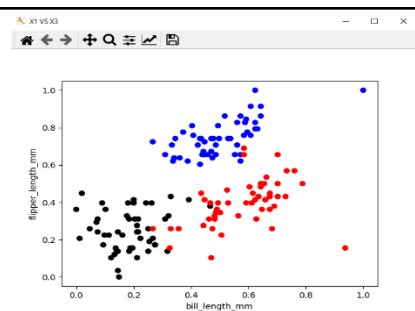
Red : Adelie Class .

Blue : Gentoo Class .

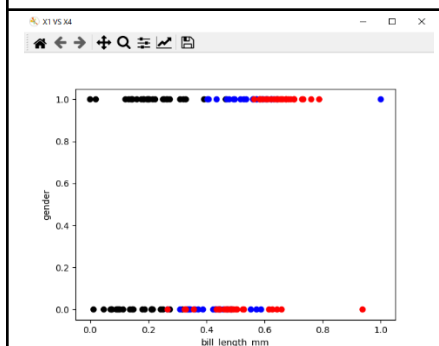
Black : Chinstrap Class .



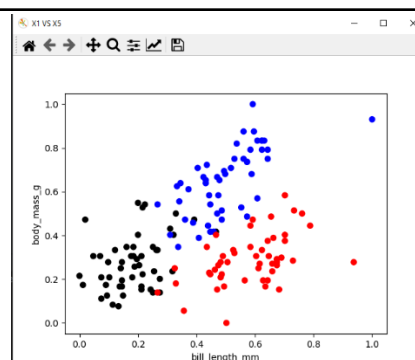
1-Bill depth and Bill length:



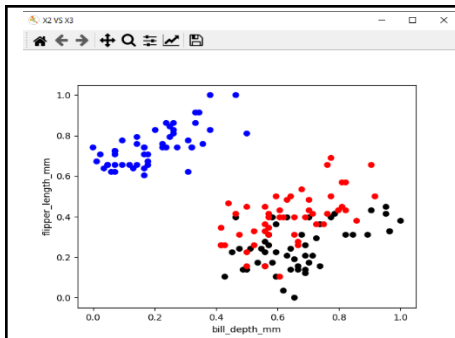
2- Bill length and flipper length:



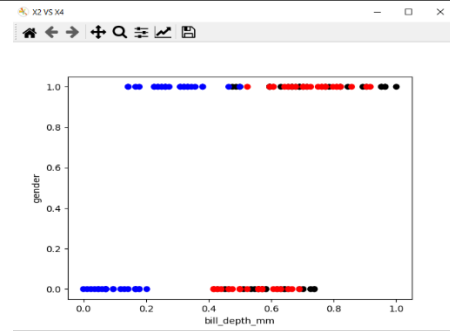
3- Bill length and gender :



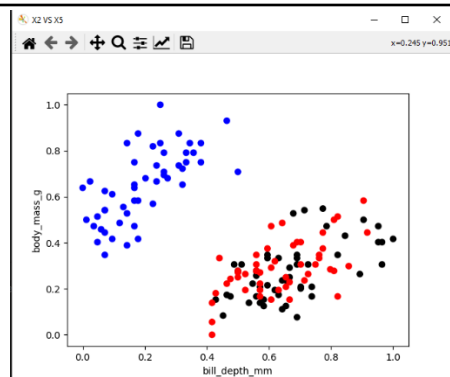
4- Bill length and body mass:



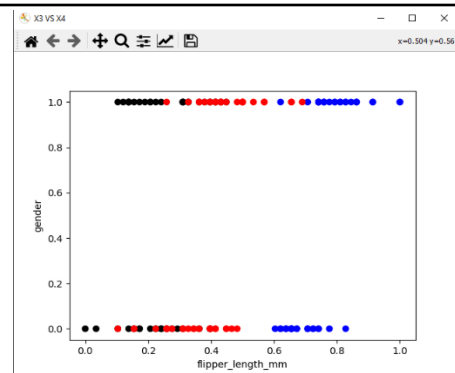
5- Bill depth and flipper length:



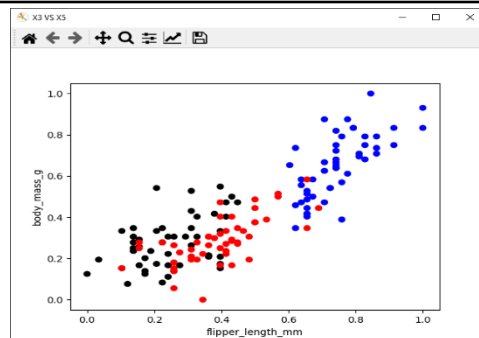
6- Bill depth and gender:



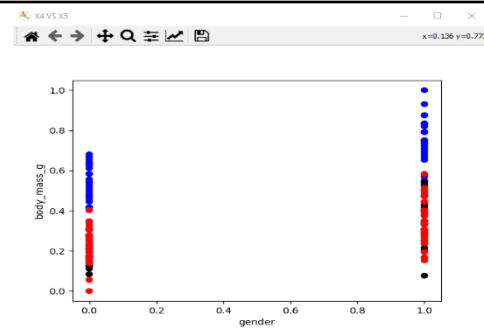
7- Bill depth and body mass:



8- Flipper length and gender:



9 Flipper length and body mass:

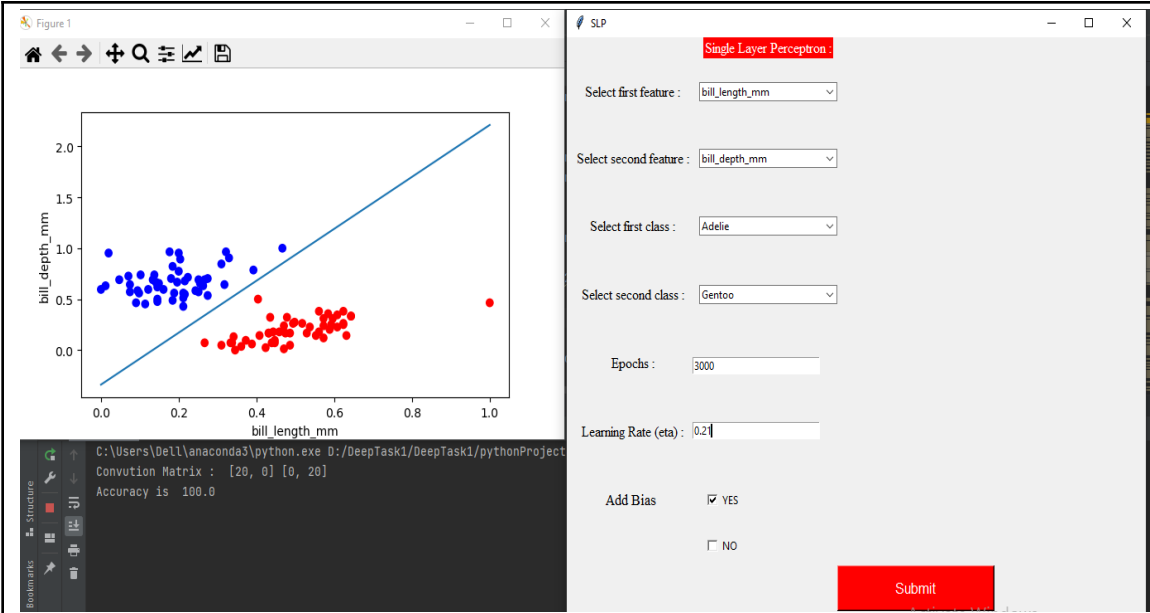


10- Gender and body mass:

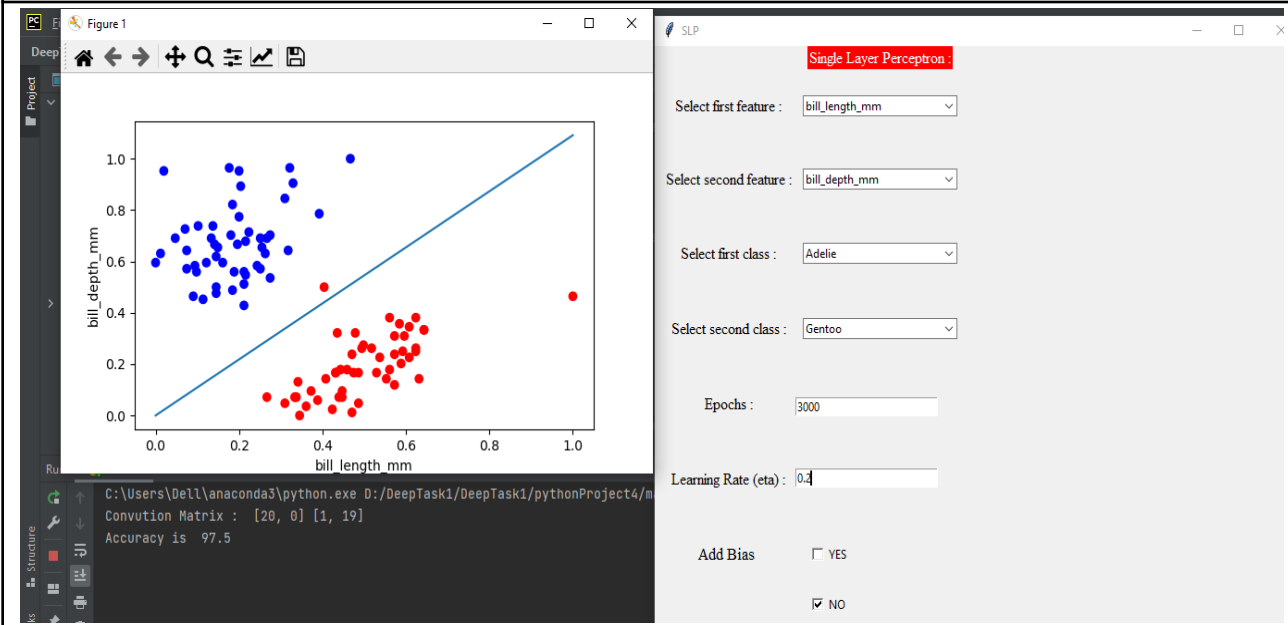
### Analysis:

1. Gender feature can't discriminate between classes.
2. Bill depth and Bill length discriminate between classes clearly.
3. Flipper and body mass discriminate between classes.

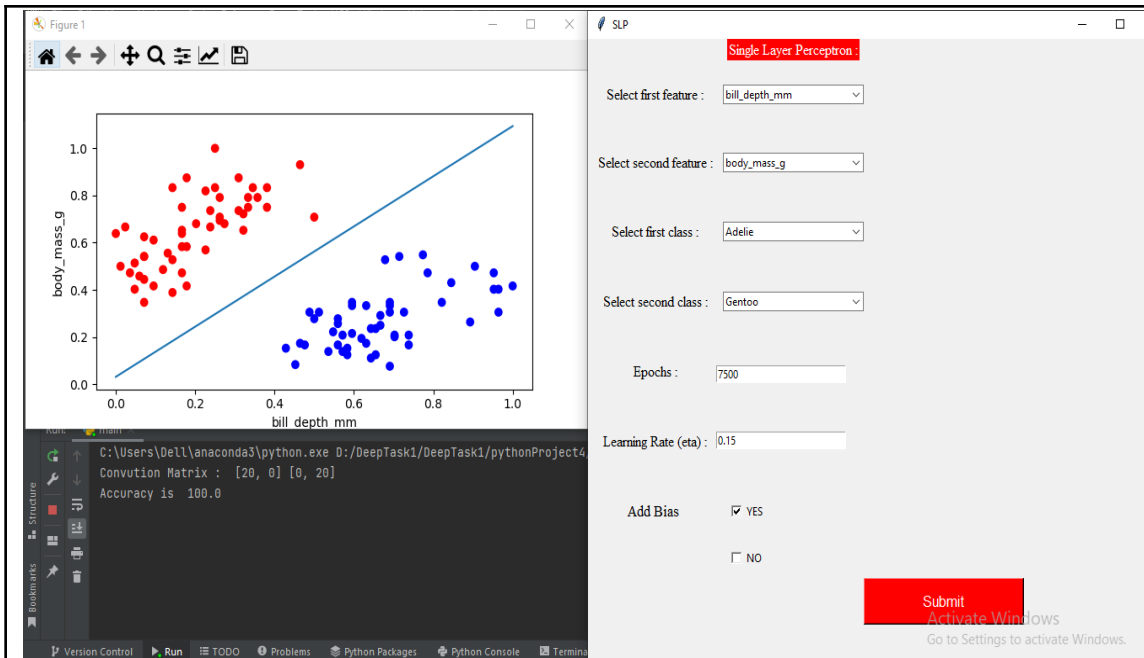
● Visualization (After Draw Line) :



Accuracy:  
  
with bias  
: 100%

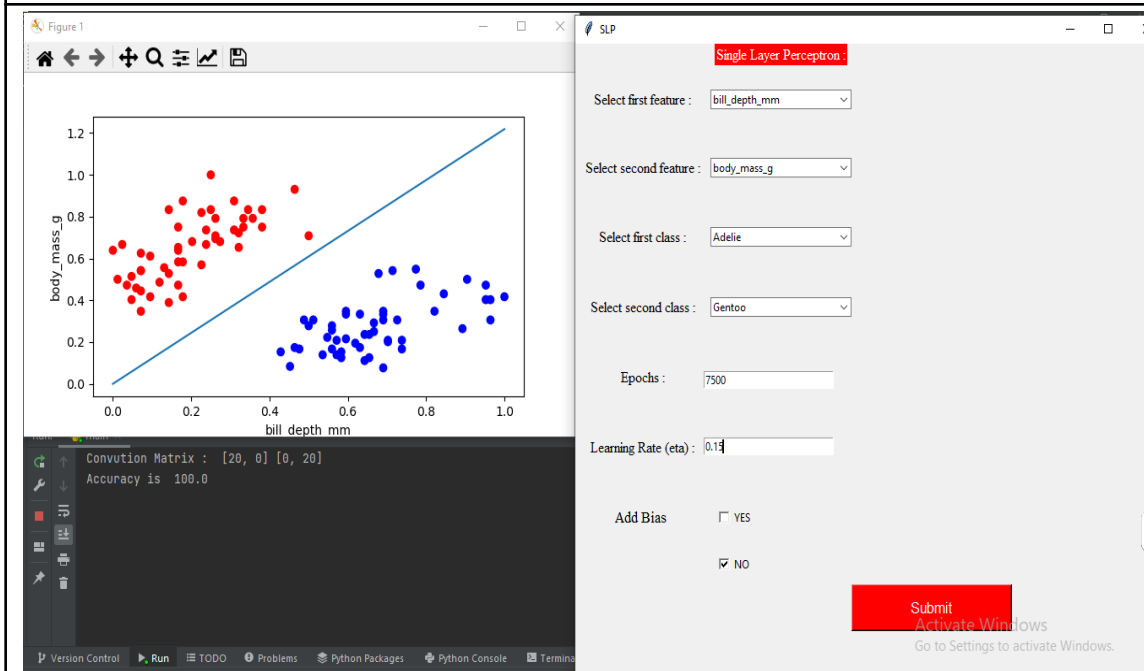


Accuracy:  
  
without  
bias  
: 97.5%



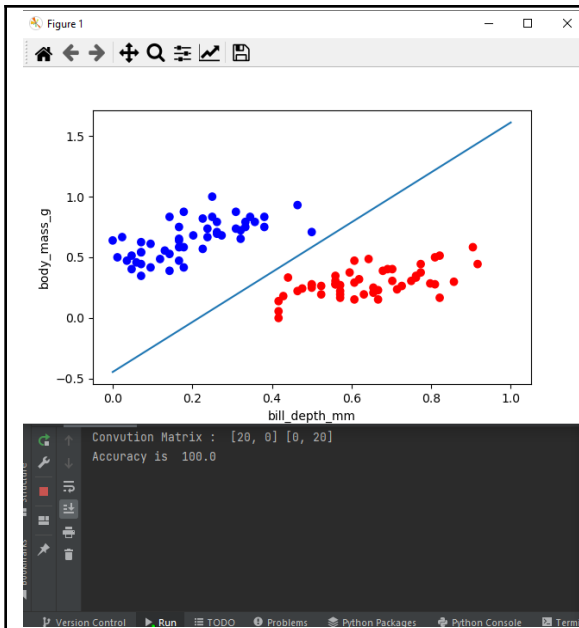
Accuracy:

with bias  
:100%



Accuracy:

without  
bias  
: 100%



Single Layer Perceptron :

Select first feature :

Select second feature :

Select first class :

Select second class :

Epochs :

Learning Rate (eta) :

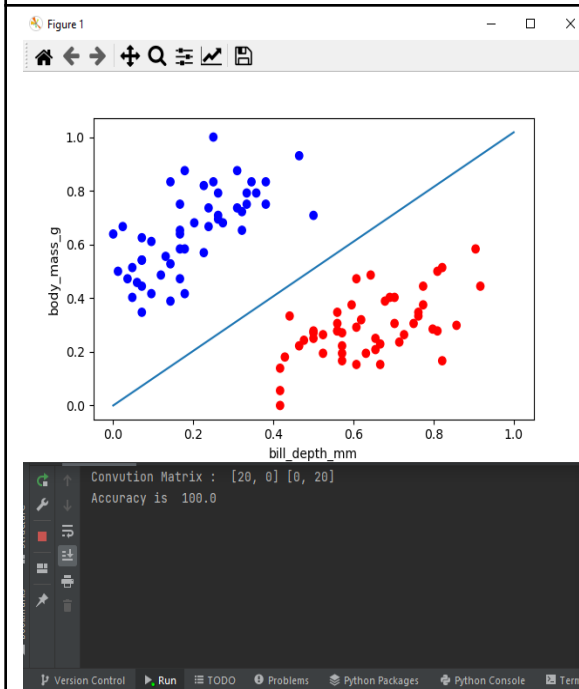
Add Bias ☒ YES ☐ NO

Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

with bias  
: 100%



Single Layer Perceptron :

Select first feature :

Select second feature :

Select first class :

Select second class :

Epochs :

Learning Rate (eta) :

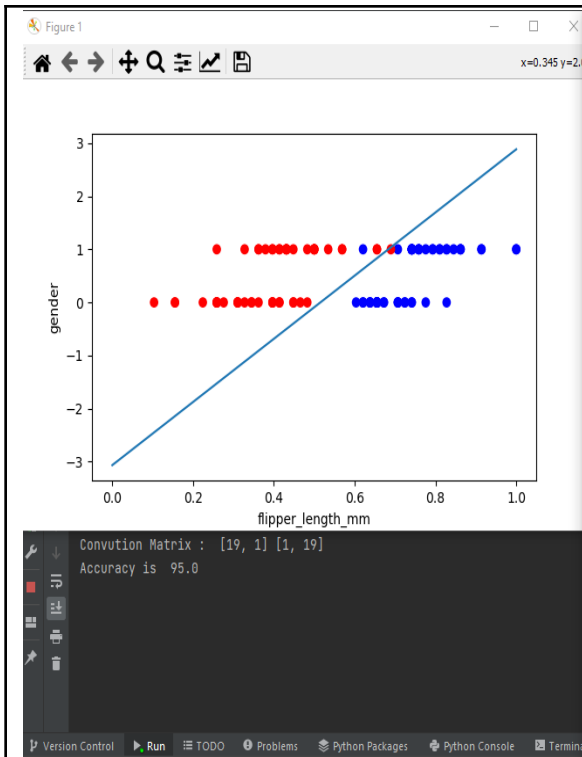
Add Bias ☐ YES ☒ NO

Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

without bias  
: 100%



SLP

Single Layer Perceptron

Select first feature : flipper\_length\_mm

Select second feature : gender

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 5000

Learning Rate (eta) : 0.21

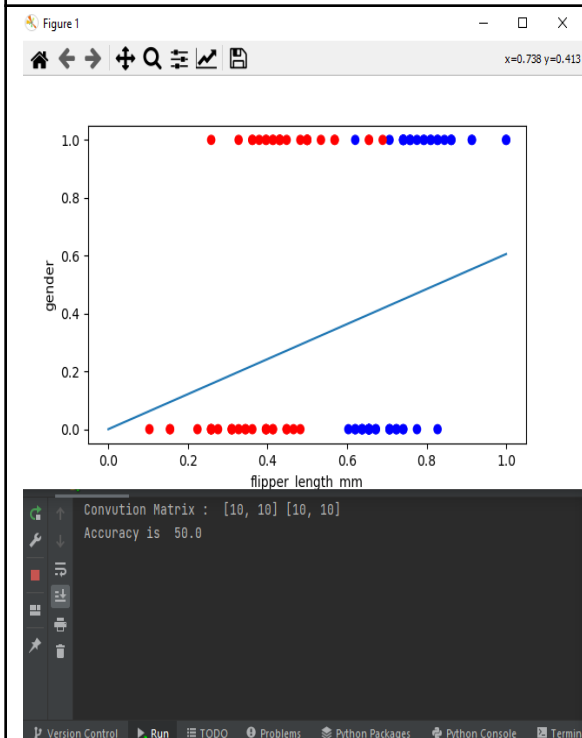
Add Bias ☒ YES ☐ NO

Submit  
Activate Windows  
Go to Settings to activate Windows.

Accuracy:

with bias

:95%



SLP

Single Layer Perceptron

Select first feature : flipper\_length\_mm

Select second feature : gender

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 9000

Learning Rate (eta) : 0.21

Add Bias ☐ YES ☒ NO

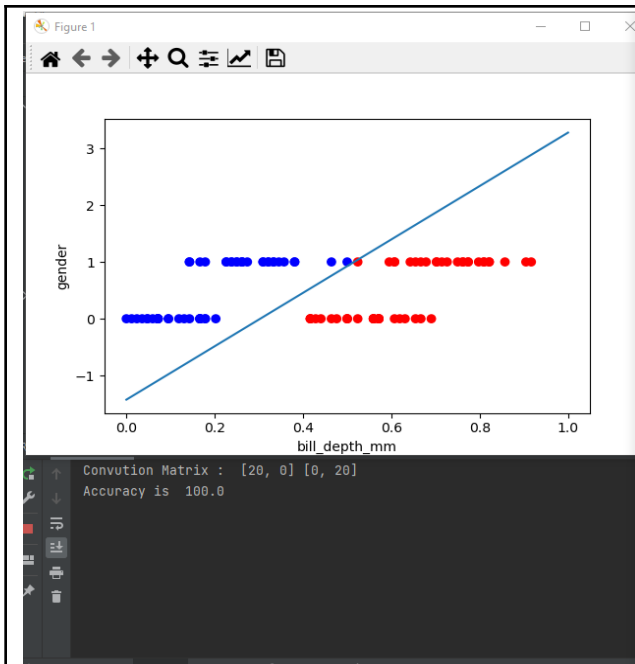
Submit  
Activate Windows  
Go to Settings to activate Windows.

Accuracy:

without  
bias

: 50%





SLP

**Single Layer Perceptron :**

Select first feature : bill\_depth\_mm

Select second feature : gender

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 9000

Learning Rate (eta) : 0.25

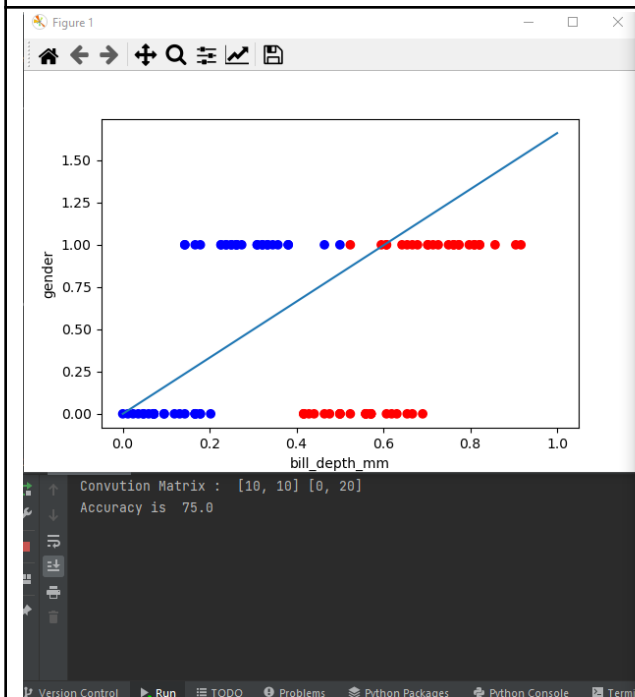
Add Bias ☒ YES ☐ NO

Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

with bias  
: 100%



SLP

**Single Layer Perceptron :**

Select first feature : bill\_depth\_mm

Select second feature : gender

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 28000

Learning Rate (eta) : 0.4

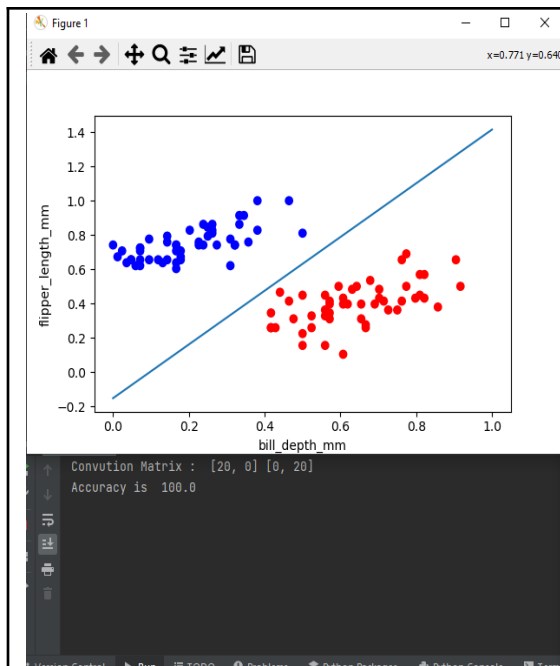
Add Bias ☐ YES ☒ NO

Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

without  
bias  
: 75%



Single Layer Perceptron

Select first feature : bill\_depth\_mm

Select second feature : flipper\_length\_mm

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 1200

Learning Rate (eta) : 0.25

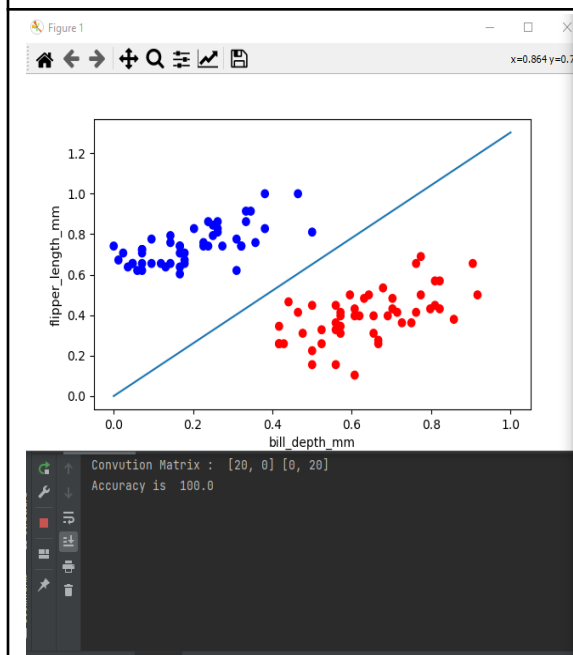
Add Bias ☒ YES ☐ NO

Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

with bias  
: 100%



Single Layer Perceptron

Select first feature : bill\_depth\_mm

Select second feature : flipper\_length\_mm

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 3000

Learning Rate (eta) : 0.2

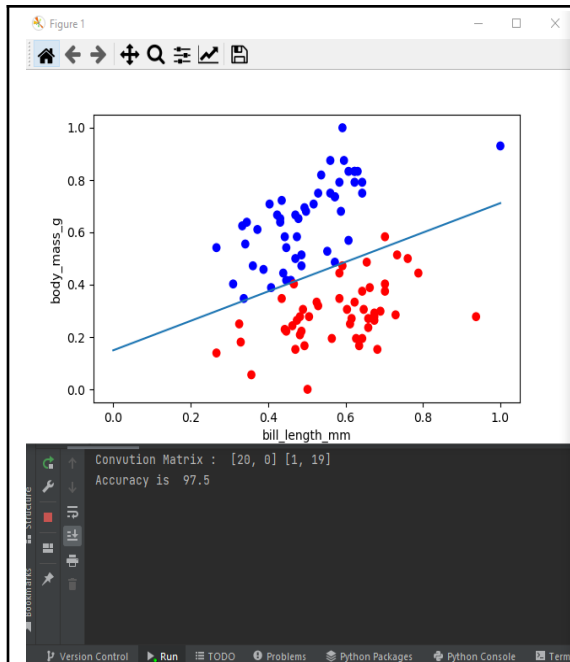
Add Bias ☐ YES ☒ NO

Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

without  
bias  
: 100%



SLP

Single Layer Perceptron

Select first feature : bill\_length\_mm

Select second feature : body\_mass\_g

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 5000

Learning Rate (eta) : 0.24

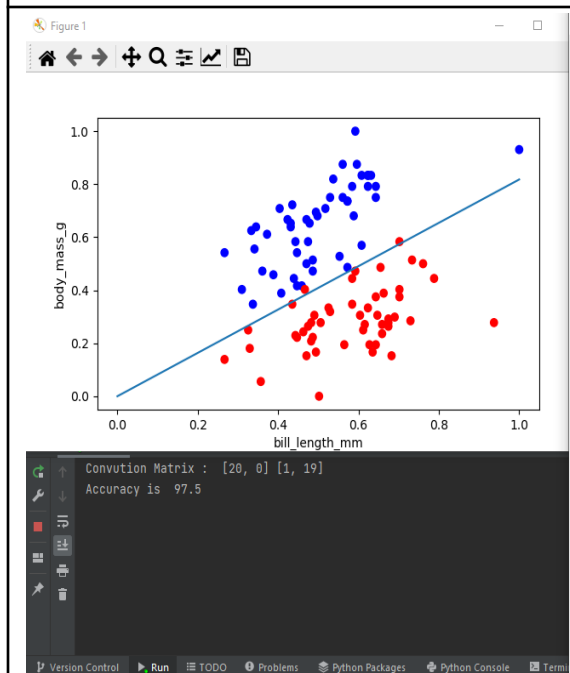
Add Bias ☒ YES ☐ NO

Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

with bias  
: 97.5%



SLP

Single Layer Perceptron

Select first feature : bill\_length\_mm

Select second feature : body\_mass\_g

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 5000

Learning Rate (eta) : 0.24

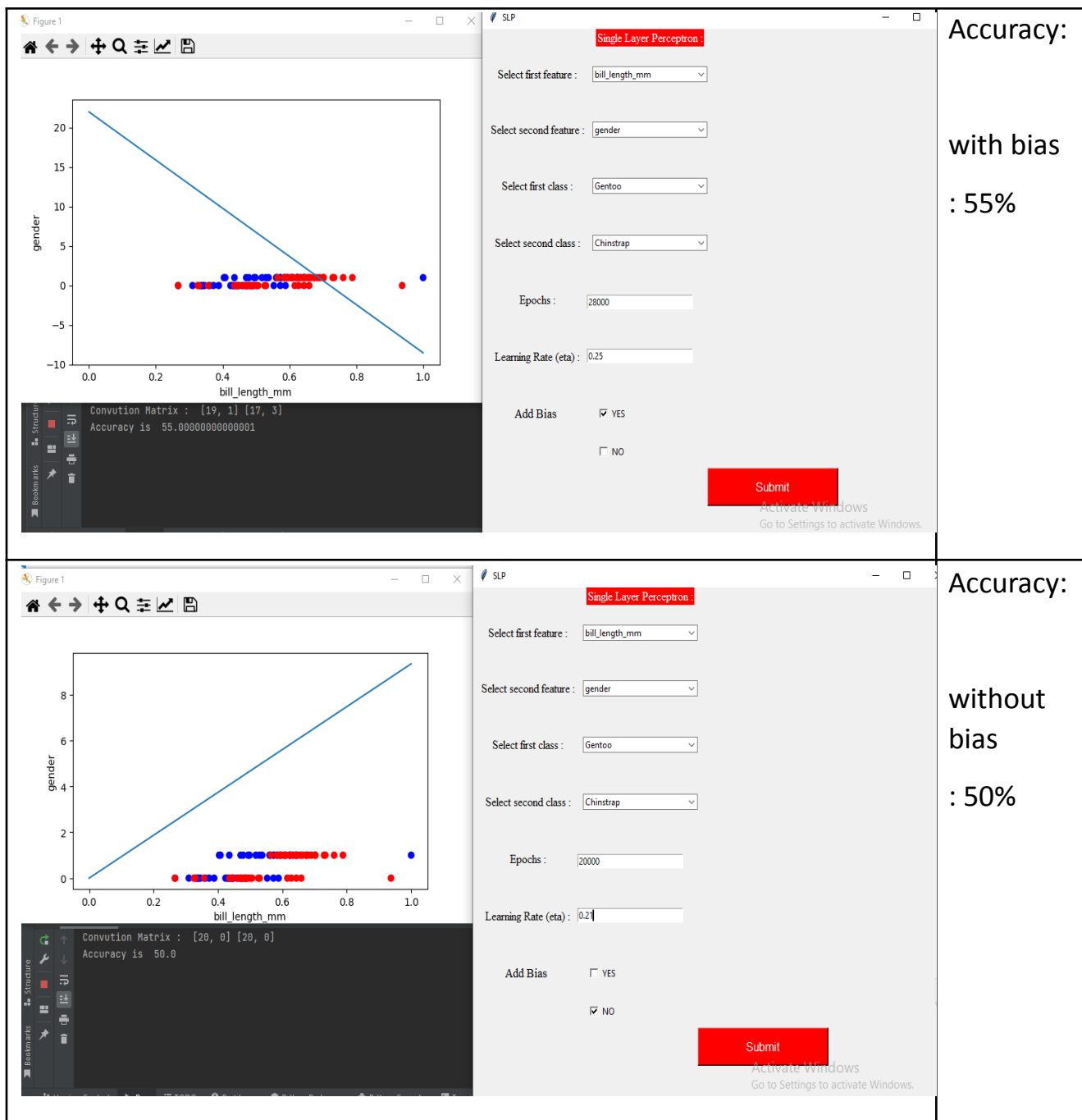
Add Bias ☐ YES ☒ NO

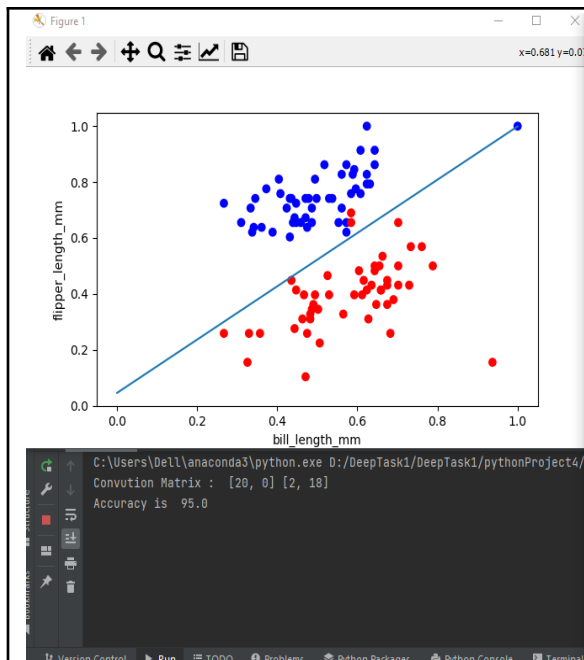
Submit

Activate Windows  
Go to Settings to activate Windows.

Accuracy:

without  
bias  
:97.5%





SLP

Single Layer Perceptron

Select first feature : bill\_length\_mm

Select second feature : flipper\_length\_mm

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 5000

Learning Rate (eta) : 0.24

Add Bias ☒ YES ☐ NO

Submit

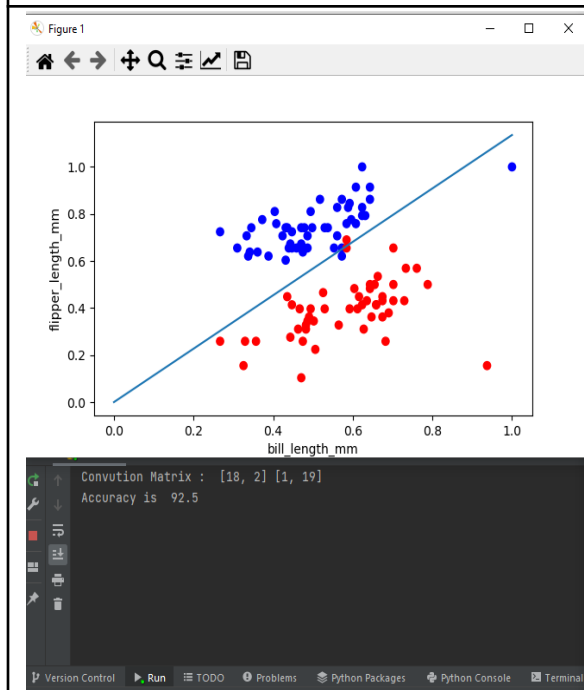
Activate Windows

Go to Settings to activate Windows.

Accuracy:

with bias

: 95%



SLP

Single Layer Perceptron

Select first feature : bill\_length\_mm

Select second feature : flipper\_length\_mm

Select first class : Gentoo

Select second class : Chinstrap

Epochs : 10000

Learning Rate (eta) : 0.25

Add Bias ☐ YES ☒ NO

Submit

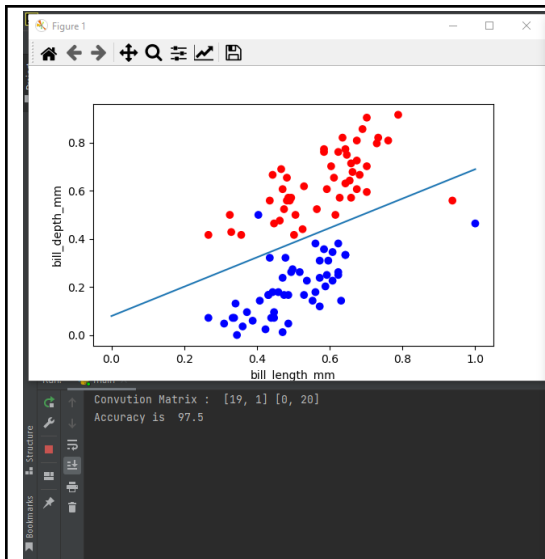
Activate Windows

Go to Settings to activate Windows.

Accuracy:

without bias

: 92.5%



SLP

Single Layer Perceptron

Select first feature : bill\_length\_mm

Select second feature : bill\_depth\_mm

Select first class : Gentoo

Select second class : Chinstrap

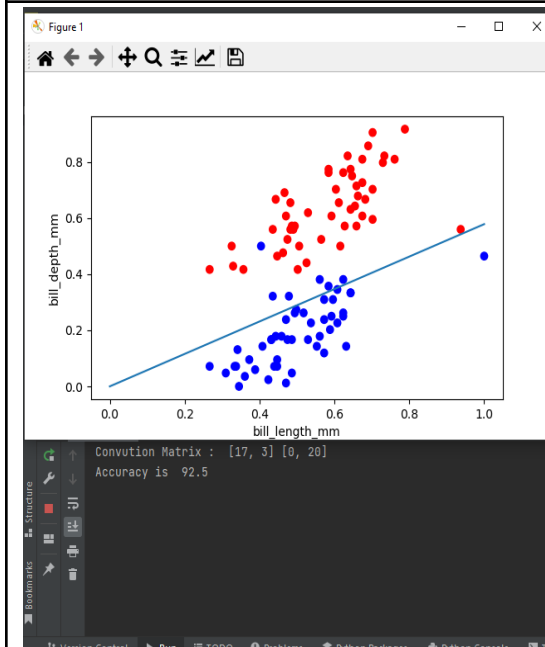
Epochs : 2054

Learning Rate (eta) : 0.22

Add Bias ☒ YES ☐ NO

Submit

Accuracy:  
with bias  
: 97.5%



SLP

Single Layer Perceptron

Select first feature : bill\_length\_mm

Select second feature : bill\_depth\_mm

Select first class : Gentoo

Select second class : Chinstrap

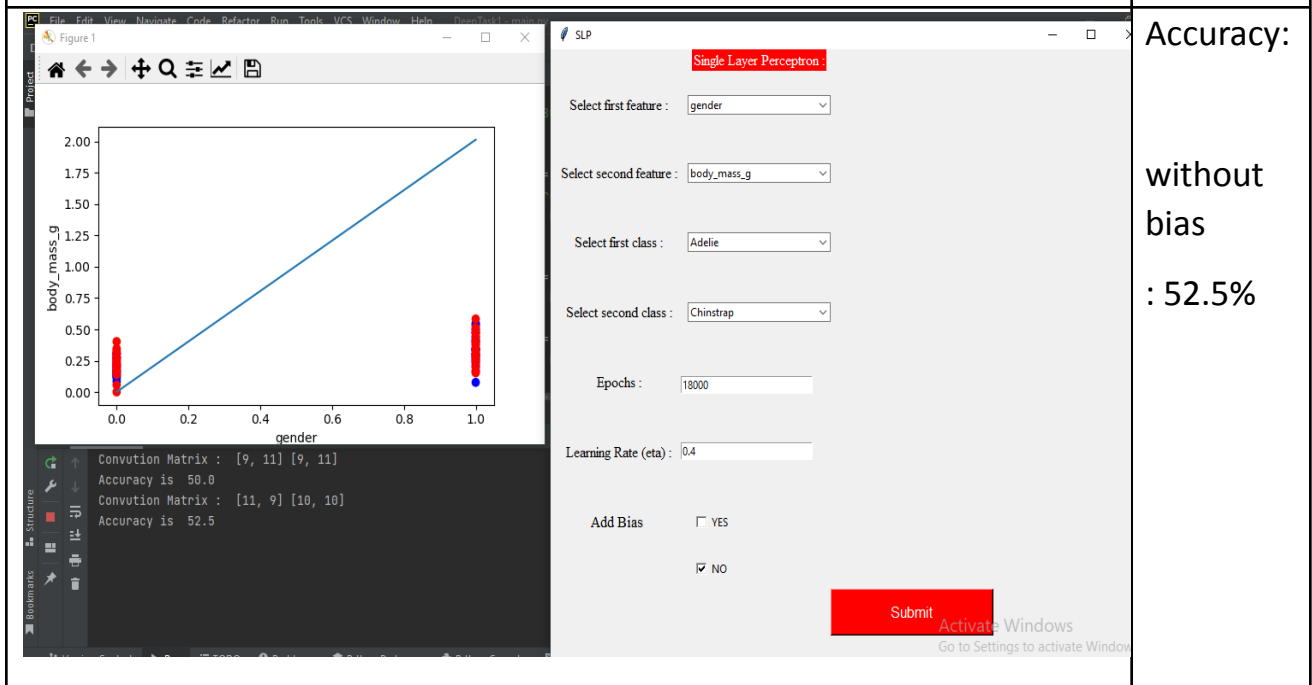
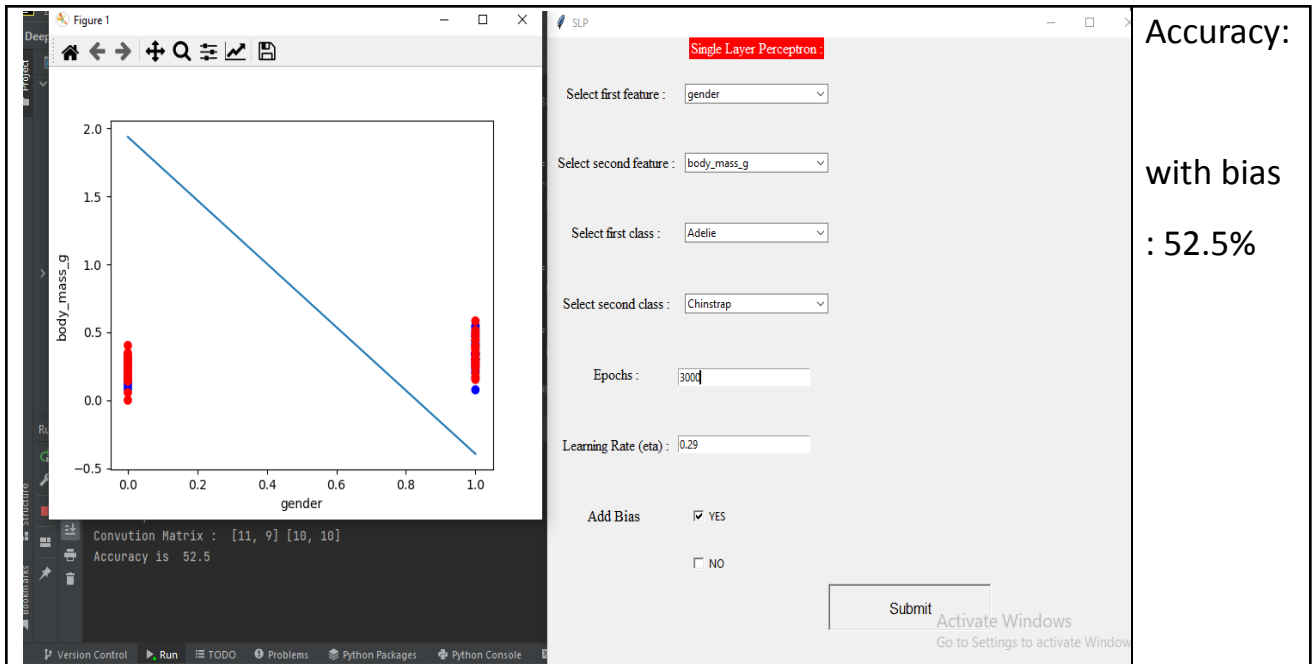
Epochs : 2054

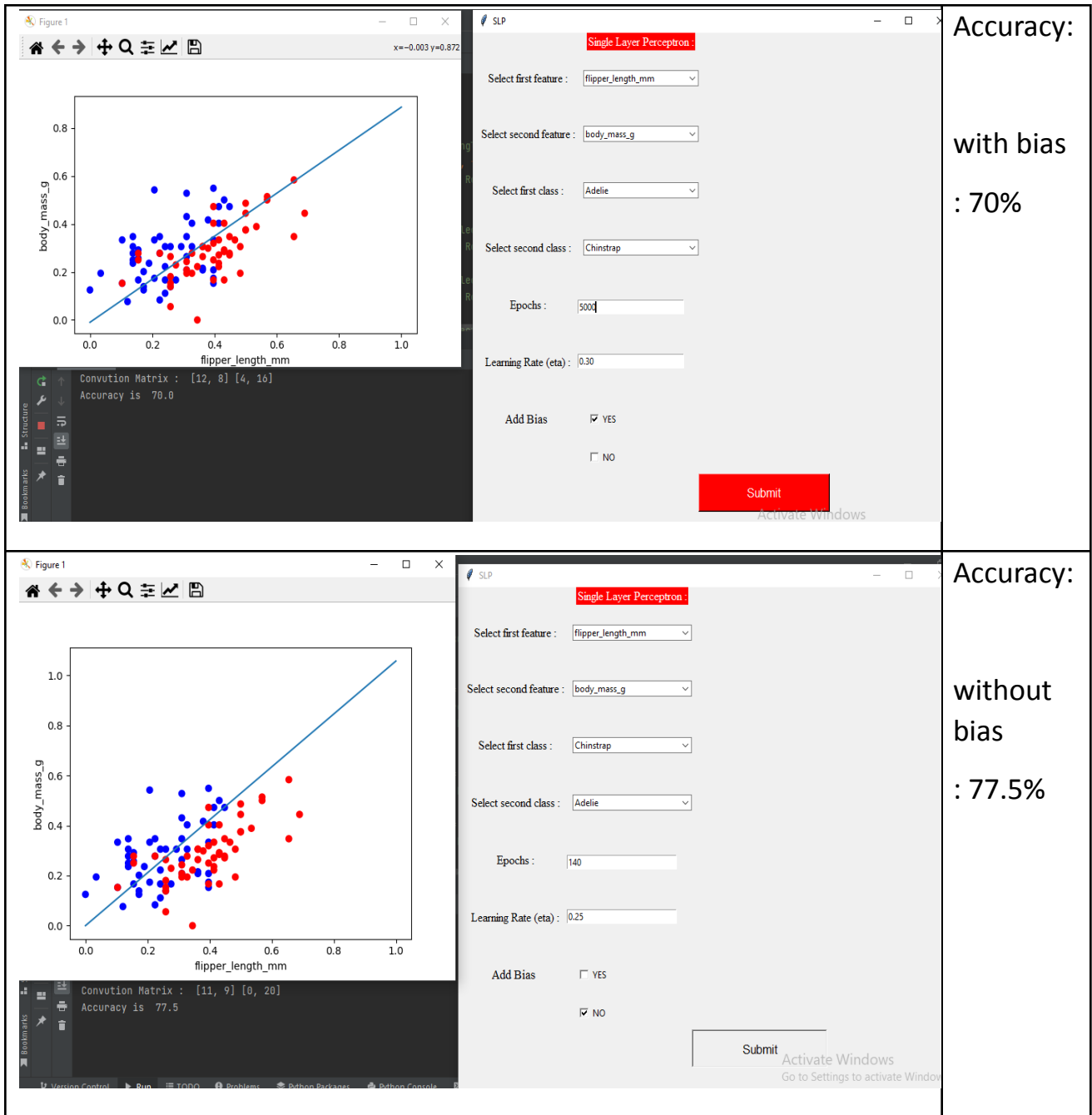
Learning Rate (eta) : 0.22

Add Bias ☐ YES ☒ NO

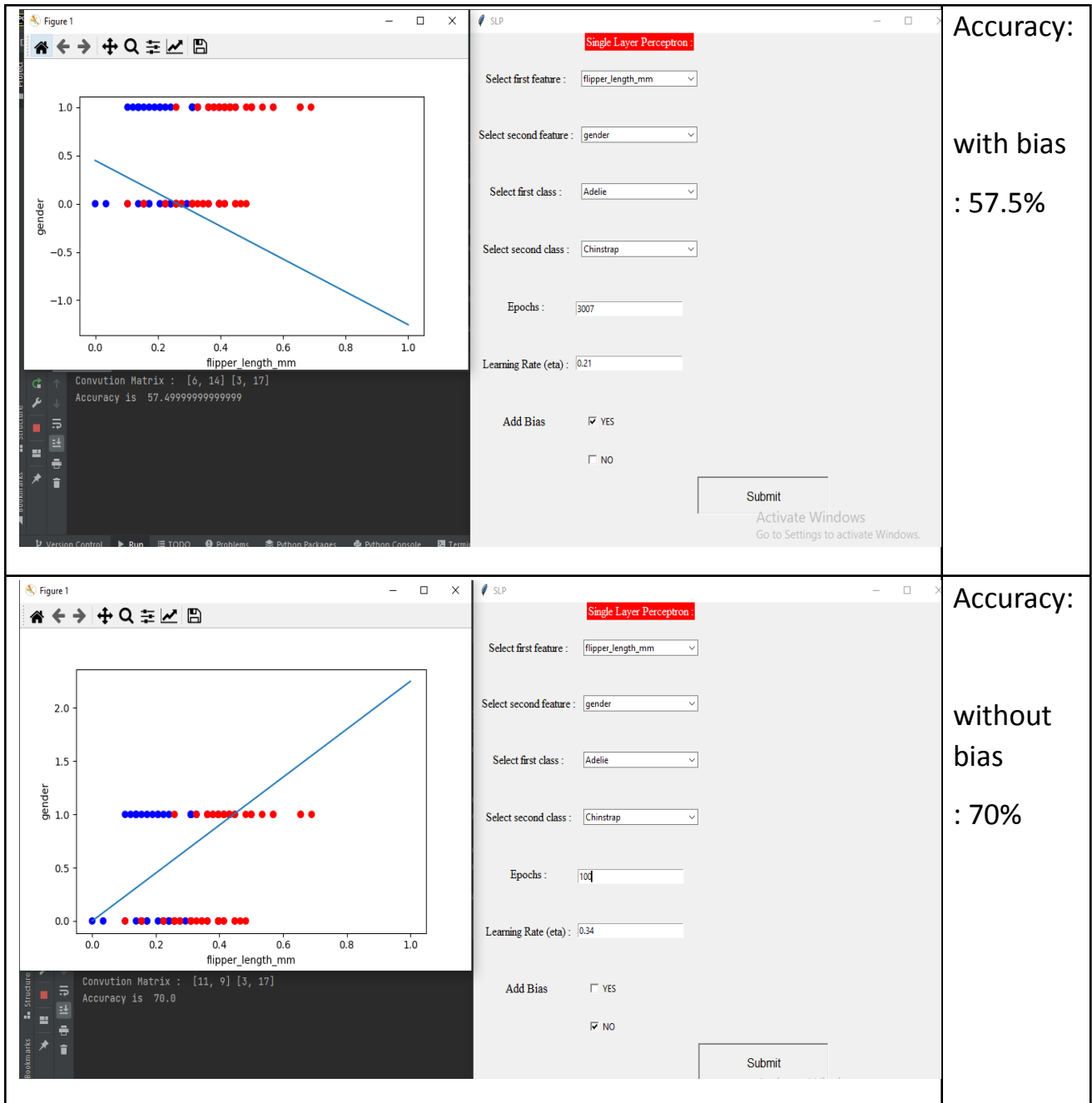
Submit

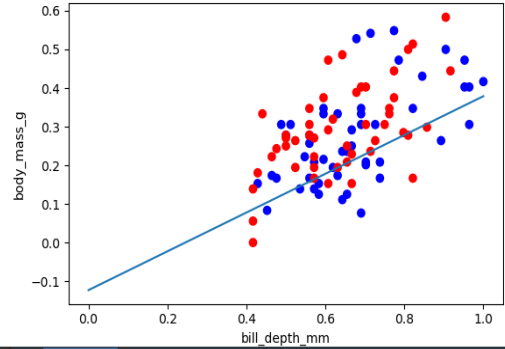
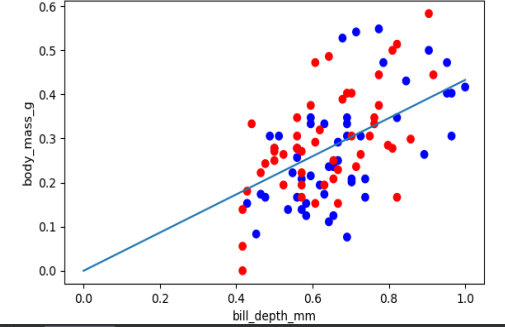
Accuracy:  
without  
bias  
: 92.5%

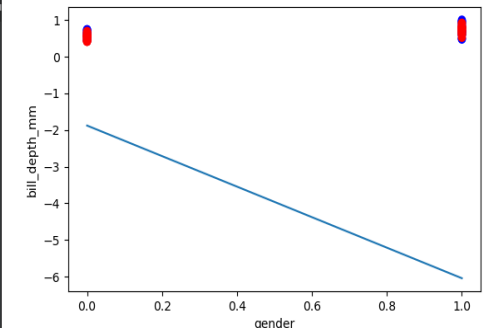
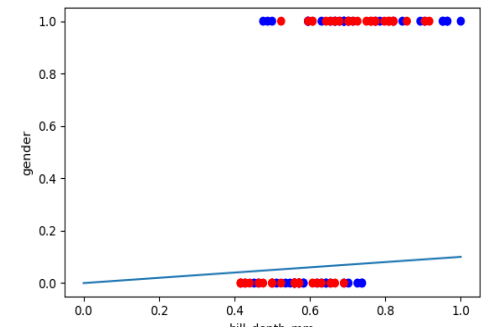


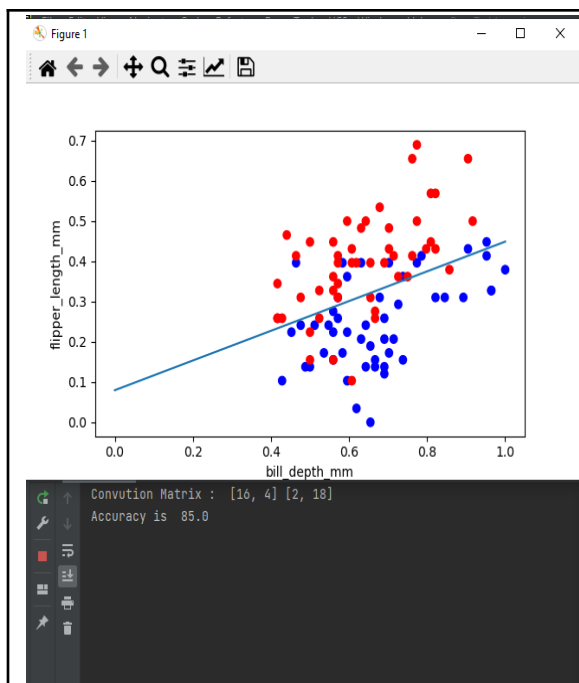






 <p>Convution Matrix : [0, 14] [2, 18] Accuracy is 60.0</p>	<p>SLP</p> <p>Single Layer Perceptron</p> <p>Select first feature : bill_depth_mm</p> <p>Select second feature : body_mass_g</p> <p>Select first class : Adelie</p> <p>Select second class : Chinstrap</p> <p>Epochs : 95000</p> <p>Learning Rate (eta) : 0.25</p> <p>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>Submit</p>	<p>Accuracy:</p> <p>with bias</p> <p>: 60%</p>
 <p>Convution Matrix : [14, 6] [7, 13] Accuracy is 67.5</p>	<p>SLP</p> <p>Single Layer Perceptron</p> <p>Select first feature : bill_depth_mm</p> <p>Select second feature : body_mass_g</p> <p>Select first class : Adelie</p> <p>Select second class : Chinstrap</p> <p>Epochs : 40000</p> <p>Learning Rate (eta) : 0.24</p> <p>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p> <p>Submit</p>	<p>Accuracy:</p> <p>without bias</p> <p>: 67.5%</p>

 <p>Convolution Matrix : [20, 0] [20, 0] Accuracy is 50.0</p>	<p>Single Layer Perceptron</p> <p>Select first feature : <input type="text" value="gender"/></p> <p>Select second feature : <input type="text" value="bill_depth_mm"/></p> <p>Select first class : <input type="text" value="Adelie"/></p> <p>Select second class : <input type="text" value="Chinstrap"/></p> <p>Epochs : <input type="text" value="4000"/></p> <p>Learning Rate (eta) : <input type="text" value="0.28"/></p> <p>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</p> <p><input type="button" value="Submit"/></p>	<p>Accuracy:</p> <p>with bias</p> <p>: 50%</p>
 <p>Convolution Matrix : [11, 9] [10, 10] Accuracy is 52.5</p>	<p>Single Layer Perceptron</p> <p>Select first feature : <input type="text" value="bill_depth_mm"/></p> <p>Select second feature : <input type="text" value="gender"/></p> <p>Select first class : <input type="text" value="Adelie"/></p> <p>Select second class : <input type="text" value="Chinstrap"/></p> <p>Epochs : <input type="text" value="28000"/></p> <p>Learning Rate (eta) : <input type="text" value="0.4"/></p> <p>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p> <p><input type="button" value="Submit"/></p>	<p>Accuracy:</p> <p>without bias</p> <p>: 52%</p>



SLP

Single Layer Perceptron

Select first feature : bill\_depth\_mm

Select second feature : flipper\_length\_mm

Select first class : Adelie

Select second class : Chinstrap

Epochs : 4000

Learning Rate (eta) : 0.30

Add Bias ☒ YES ☐ NO

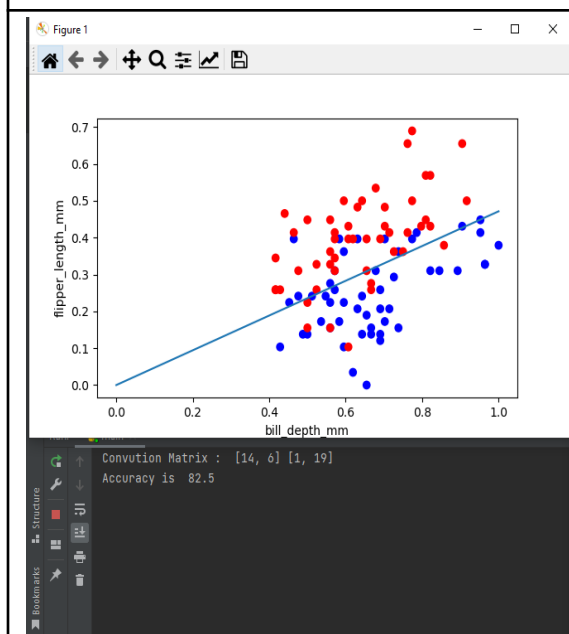
Submit

Activate Windows

Accuracy:

with bias

:85%



SLP

Single Layer Perceptron

Select first feature : bill\_depth\_mm

Select second feature : flipper\_length\_mm

Select first class : Adelie

Select second class : Chinstrap

Epochs : 3008

Learning Rate (eta) : 0.22

Add Bias ☐ YES ☒ NO

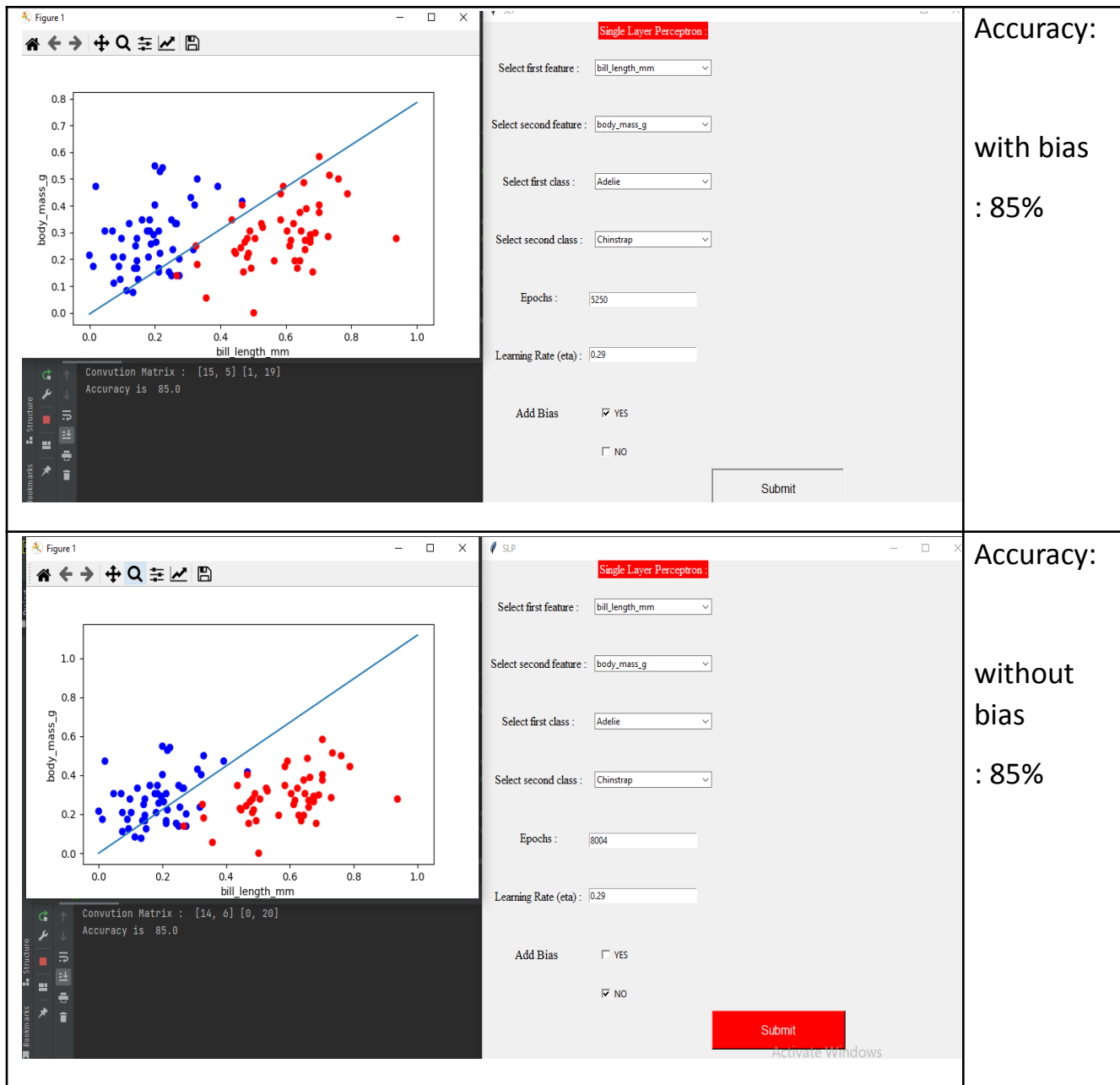
Submit

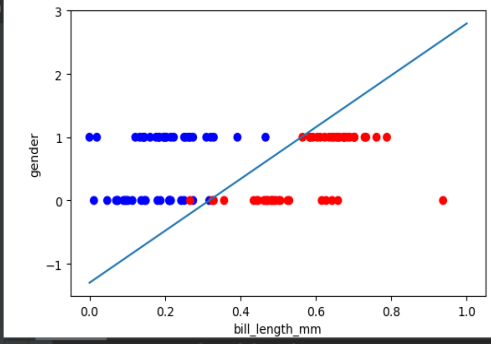
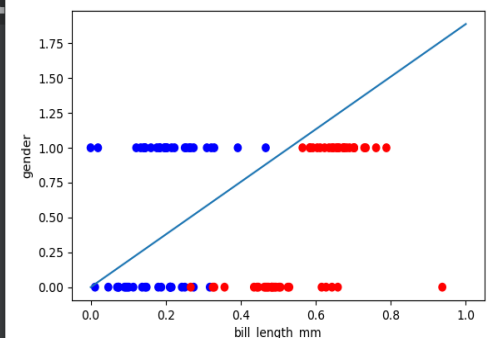
Activate Windows

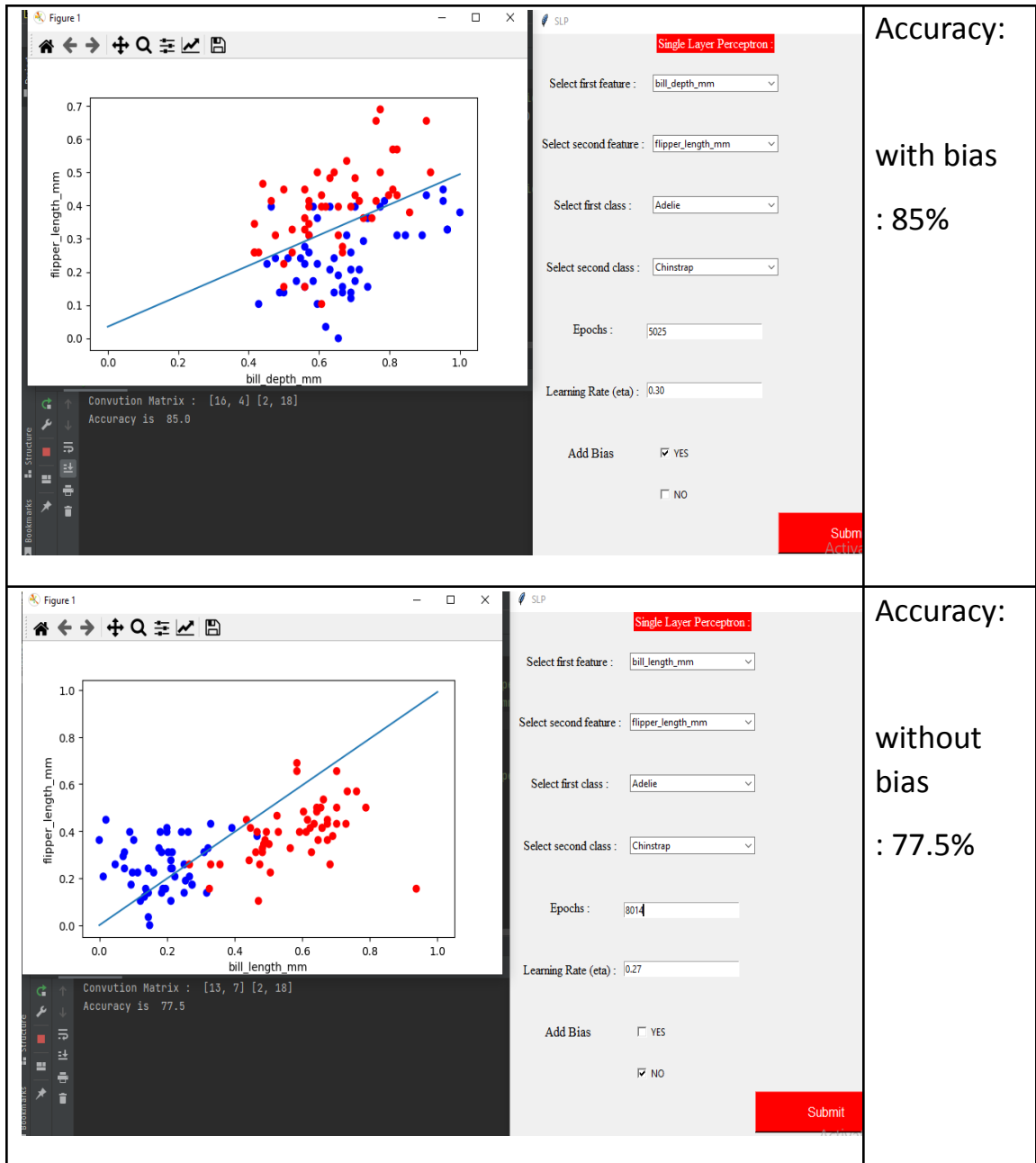
Accuracy:

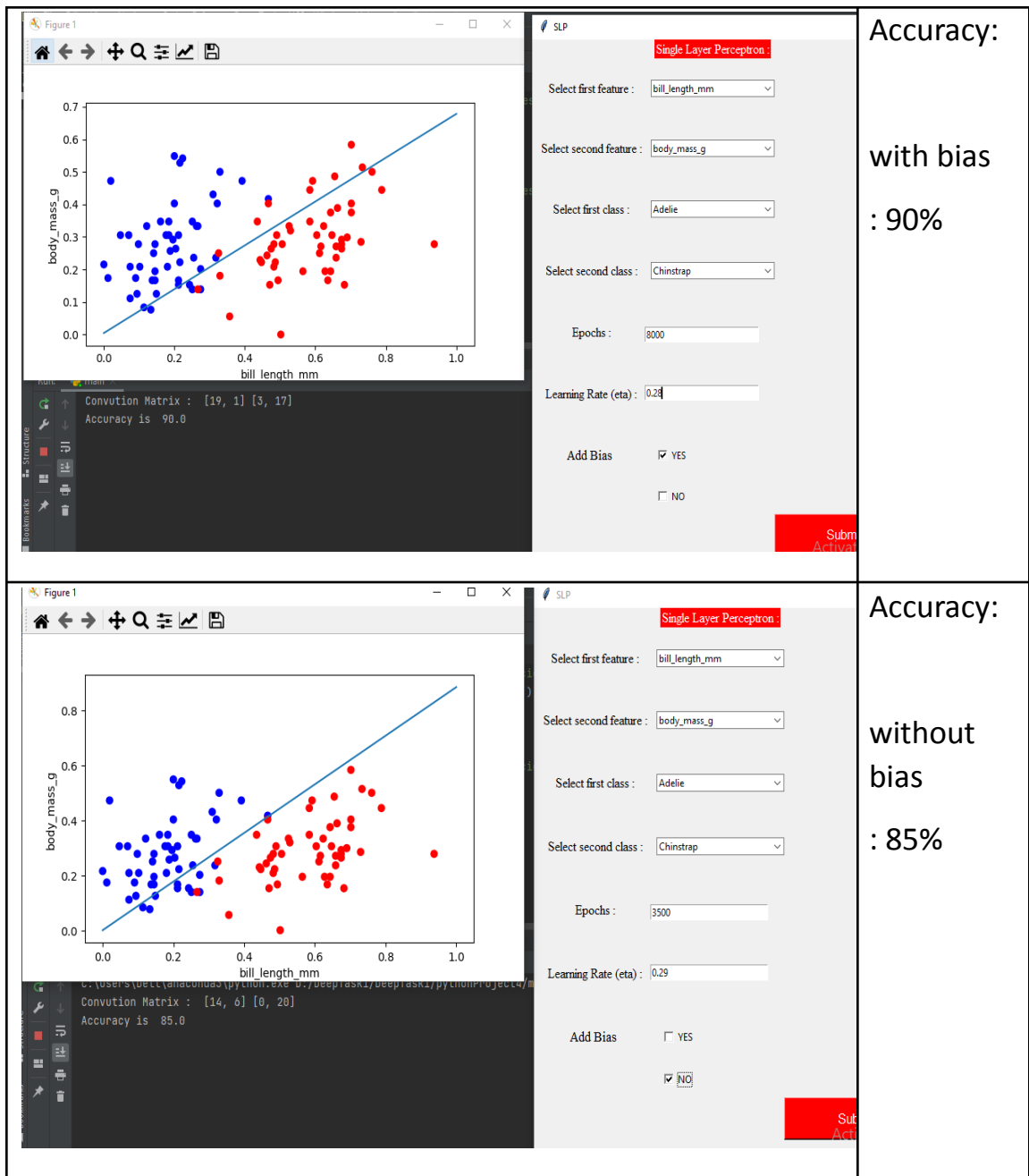
without  
bias

: 82.5%

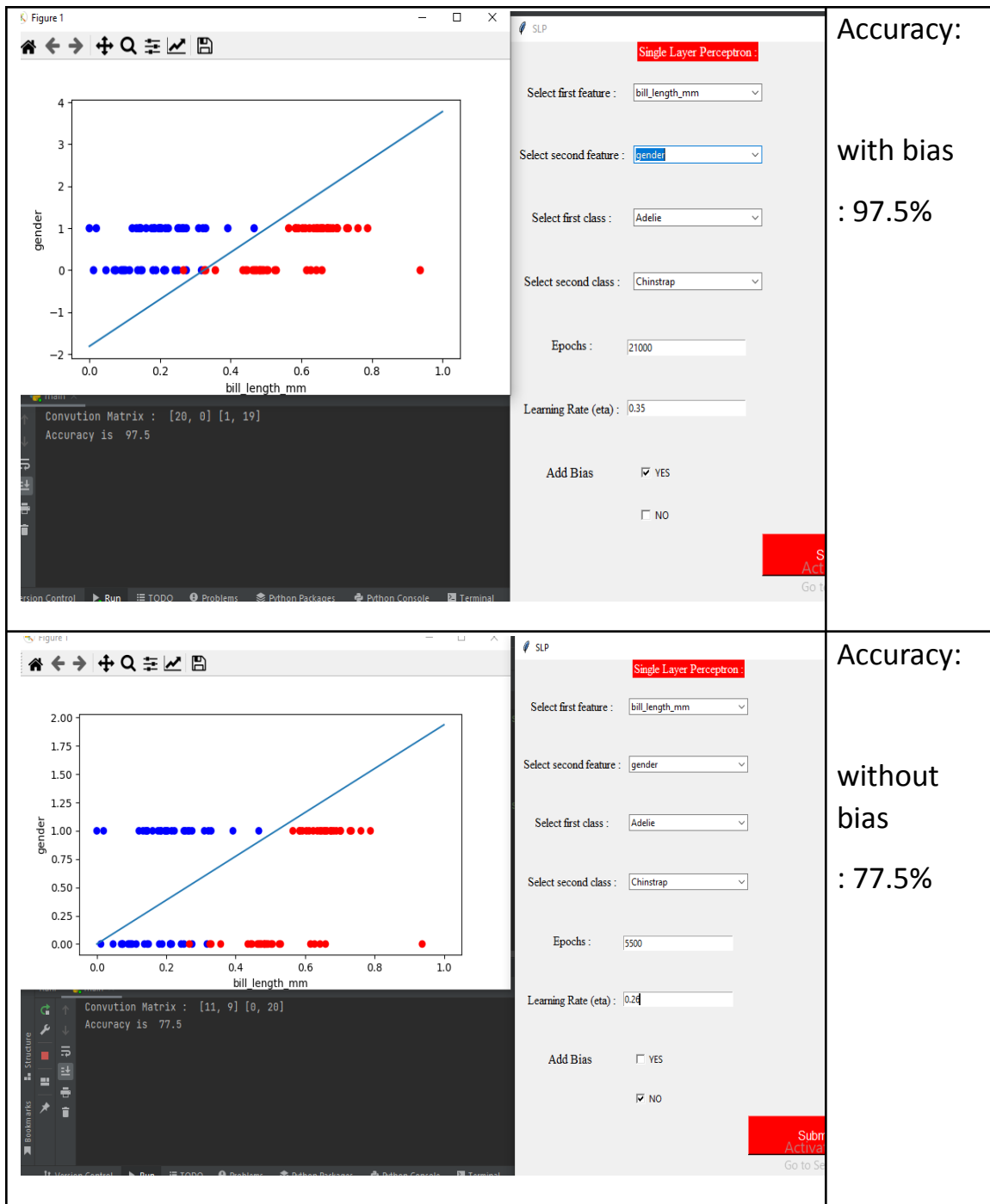


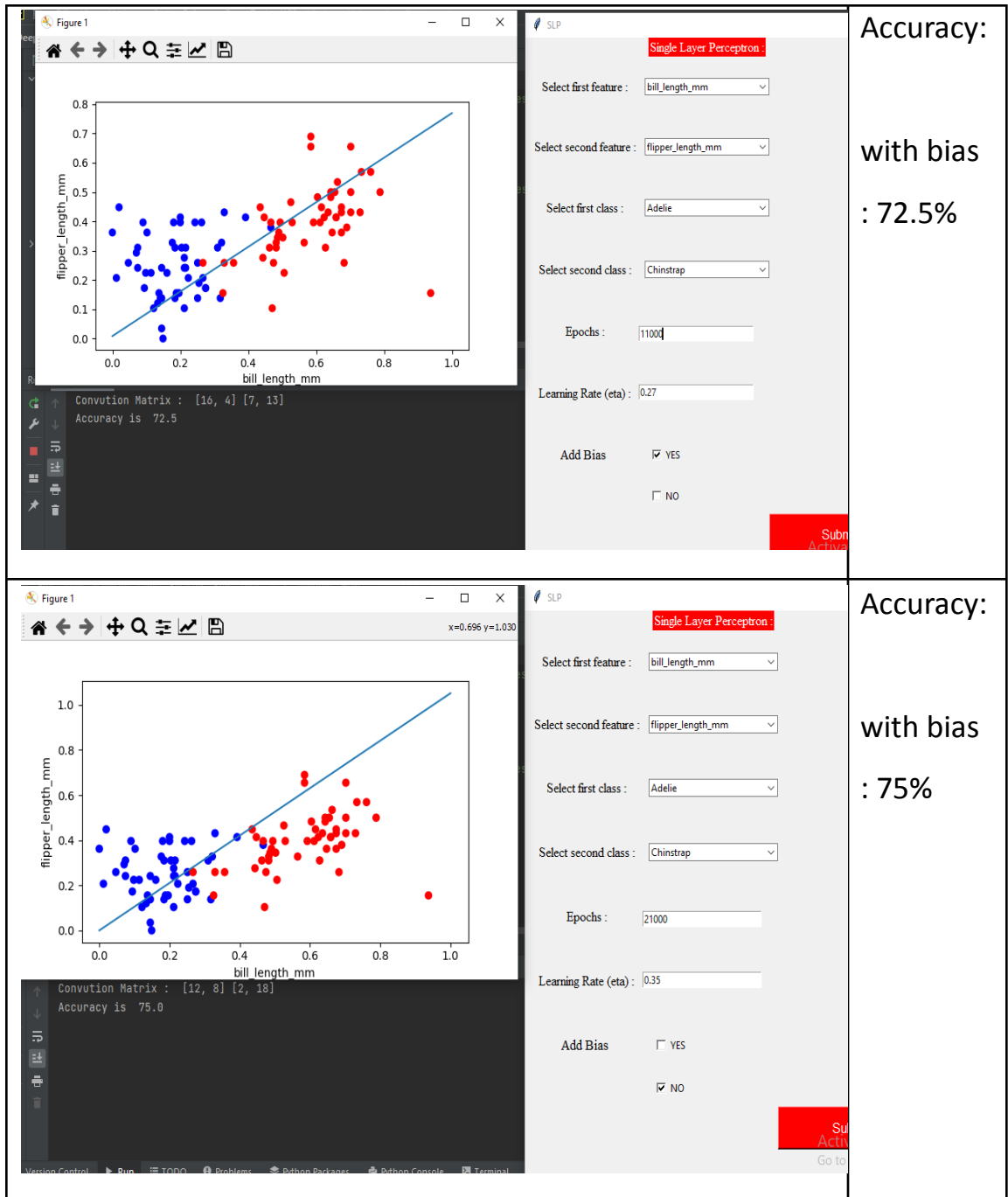
 <p>Convution Matrix : [19, 1] [1, 19] Accuracy is 95.0</p>	<p>SLP</p> <p>Single Layer Perceptron :</p> <p>Select first feature : bill_length_mm</p> <p>Select second feature : gender</p> <p>Select first class : Adelie</p> <p>Select second class : Chinstrap</p> <p>Epochs : 7000</p> <p>Learning Rate (eta) : 0.28</p> <p>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>Submit</p>	<p>Accuracy:</p> <p>with bias</p> <p>: 95%</p>
 <p>Convution Matrix : [11, 9] [0, 20] Accuracy is 77.5</p>	<p>SLP</p> <p>Single Layer Perceptron :</p> <p>Select first feature : bill_length_mm</p> <p>Select second feature : gender</p> <p>Select first class : Adelie</p> <p>Select second class : Chinstrap</p> <p>Epochs : 850</p> <p>Learning Rate (eta) : 0.28</p> <p>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p> <p>Submit</p>	<p>Accuracy:</p> <p>without bias</p> <p>: 77.5%</p>

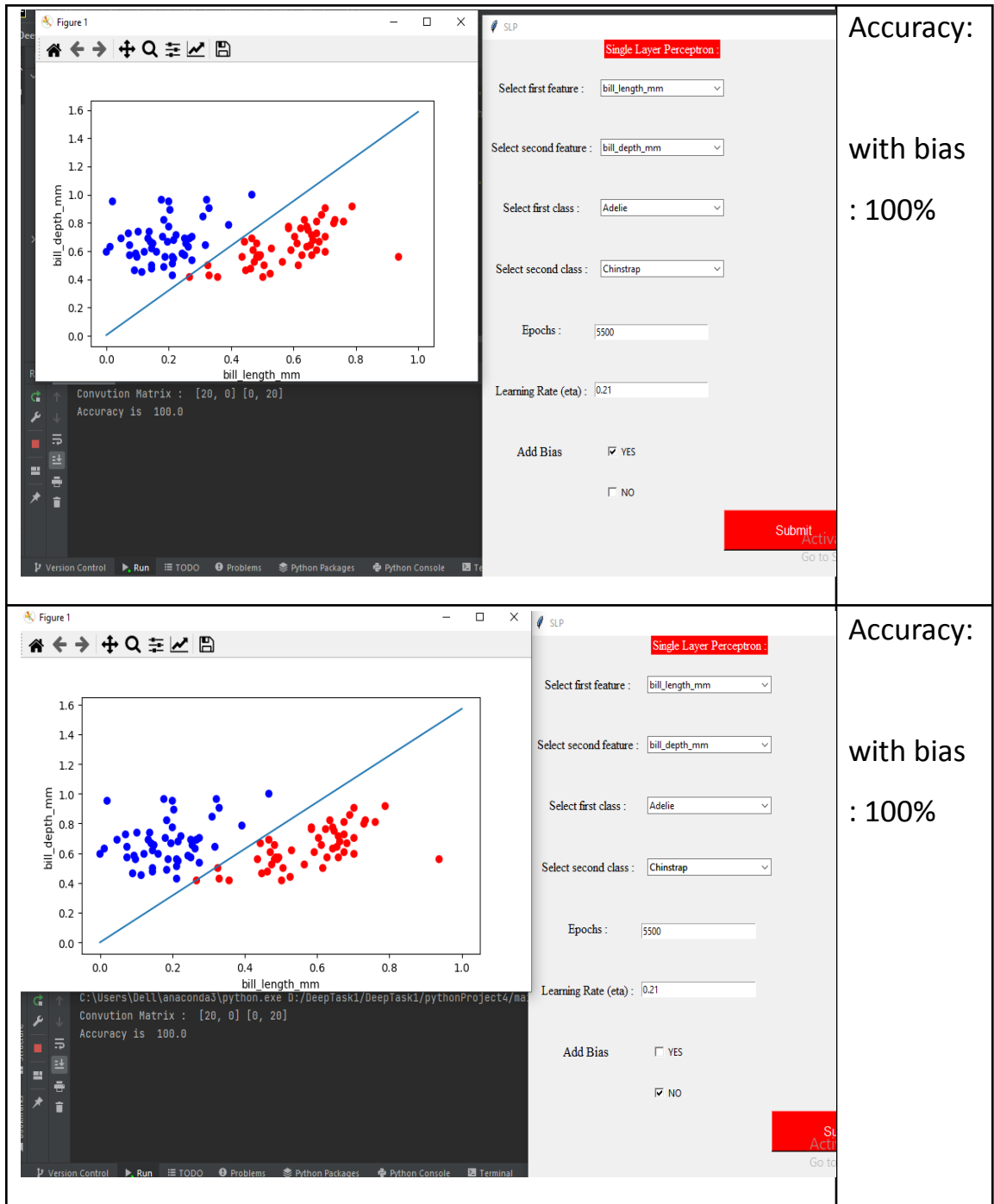


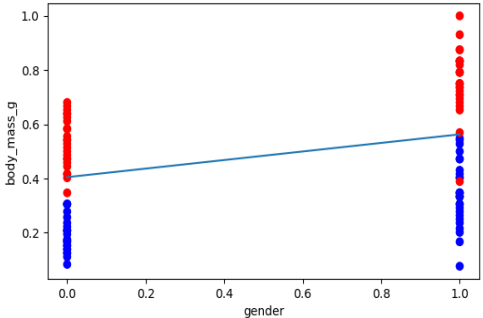
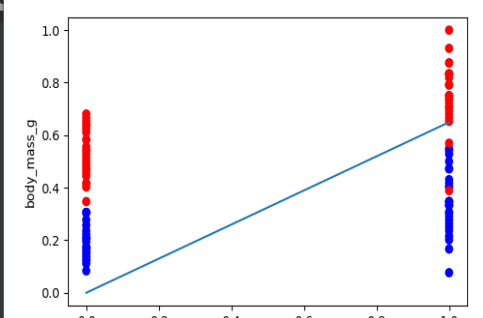


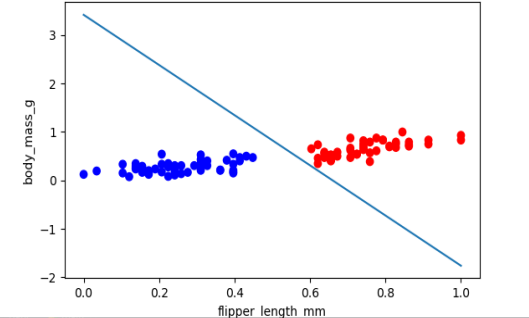
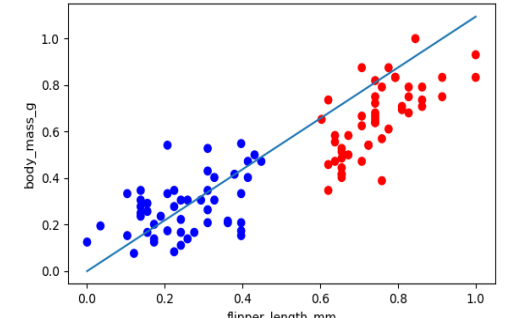








 <pre> C:\Users\ DELL\anaconda3\python.exe D:/DeepTask1/DeepTask1/pythonProject Convution Matrix : [20, 0] [1, 19] Accuracy is 97.5 </pre>	<div>SLP</div> <div>Single Layer Perceptron:</div> <div>Select first feature : gender</div> <div>Select second feature : body_mass_g</div> <div>Select first class : Adelie</div> <div>Select second class : Gentoo</div> <div>Epochs : 5000</div> <div>Learning Rate (eta) : 0.21</div> <div>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</div> <div>Submit</div>	<p>Accuracy:</p> <p>with bias</p> <p>: 97.5%</p>
 <pre> C:\Users\ DELL\anaconda3\python.exe D:/DeepTask1/DeepTask1/pythonProject Convution Matrix : [11, 9] [1, 19] Accuracy is 75.0 </pre>	<div>SLP</div> <div>Single Layer Perceptron:</div> <div>Select first feature : gender</div> <div>Select second feature : body_mass_g</div> <div>Select first class : Adelie</div> <div>Select second class : Gentoo</div> <div>Epochs : 7000</div> <div>Learning Rate (eta) : 0.21</div> <div>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</div> <div>Submit</div>	<p>Accuracy:</p> <p>without bias</p> <p>: 75%</p>

 <pre> Convution Matrix : [20, 0] [0, 20] Accuracy is 100.0 </pre>	<div>SLP</div> <div>Single Layer Perceptron</div> <div>Select first feature : flipper_length_mm</div> <div>Select second feature : body_mass_g</div> <div>Select first class : Adelie</div> <div>Select second class : Gentoo</div> <div>Epochs : 7000</div> <div>Learning Rate (eta) : 0.25</div> <div>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</div> <div>Submit</div>	Accuracy:  with bias : 100%
 <pre> Convution Matrix : [10, 10] [1, 19] Accuracy is 72.5 </pre>	<div>SLP</div> <div>Single Layer Perceptron</div> <div>Select first feature : flipper_length_mm</div> <div>Select second feature : body_mass_g</div> <div>Select first class : Adelie</div> <div>Select second class : Gentoo</div> <div>Epochs : 28000</div> <div>Learning Rate (eta) : 0.4</div> <div>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</div> <div>Submit</div>	Accuracy:  with bias : 72.5%

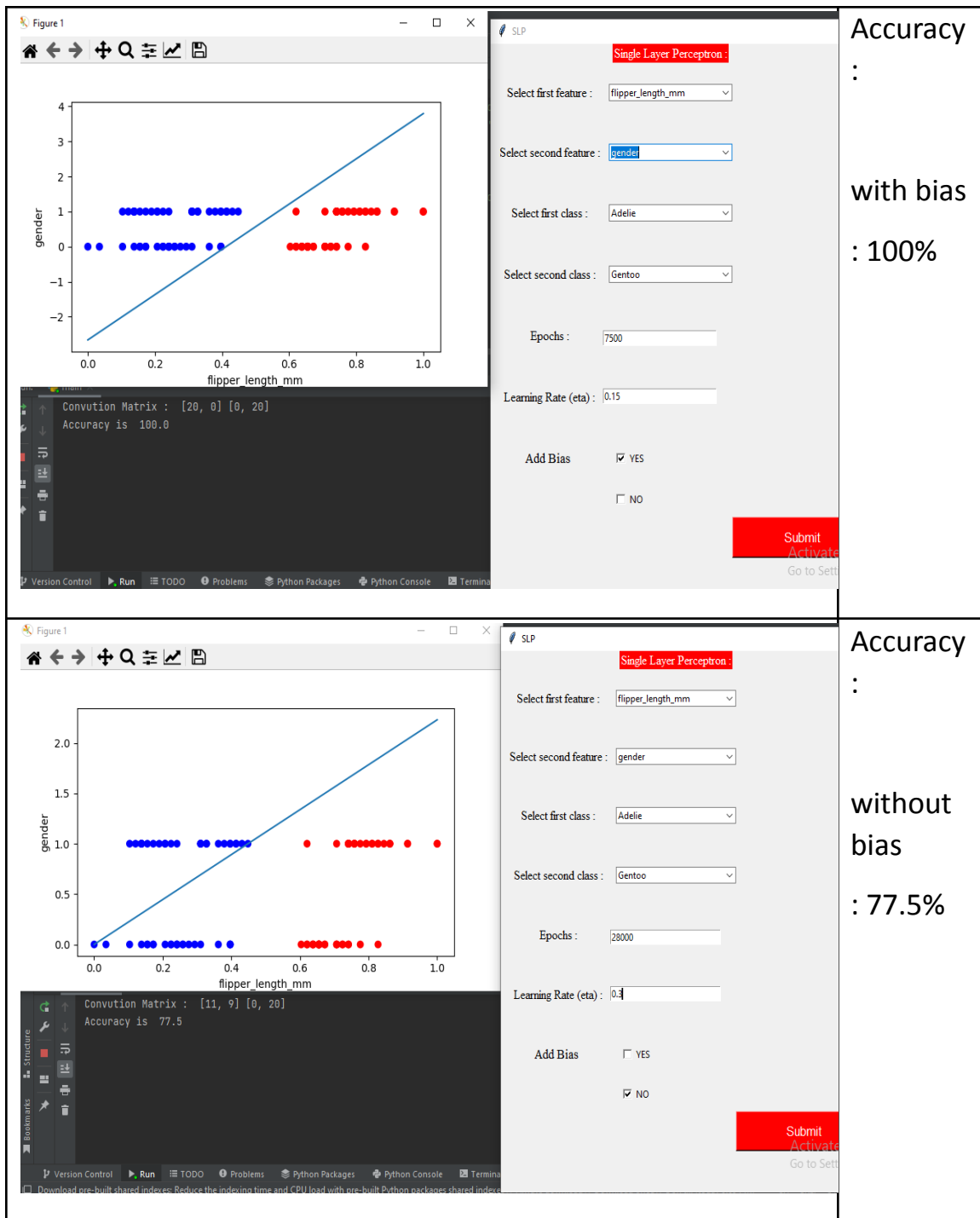


Figure 1



gender

flipper length mm

```
Convution Matrix : [11, 9] [0, 20]
Accuracy is 77.5
```

Structure Bookmarks Version Control Run TODO Problems Python Packages Python Console Termin

SLP

Single Layer Perceptron:

Select first feature : flipper\_length\_mm

Select second feature : gender

Select first class : Adelie

Select second class : Gentoo

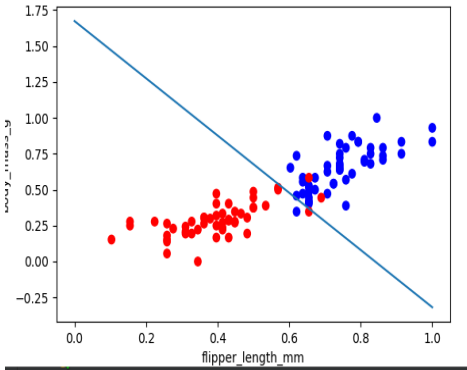
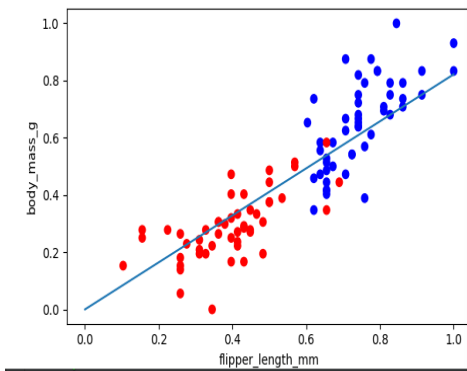
Epochs : 28000

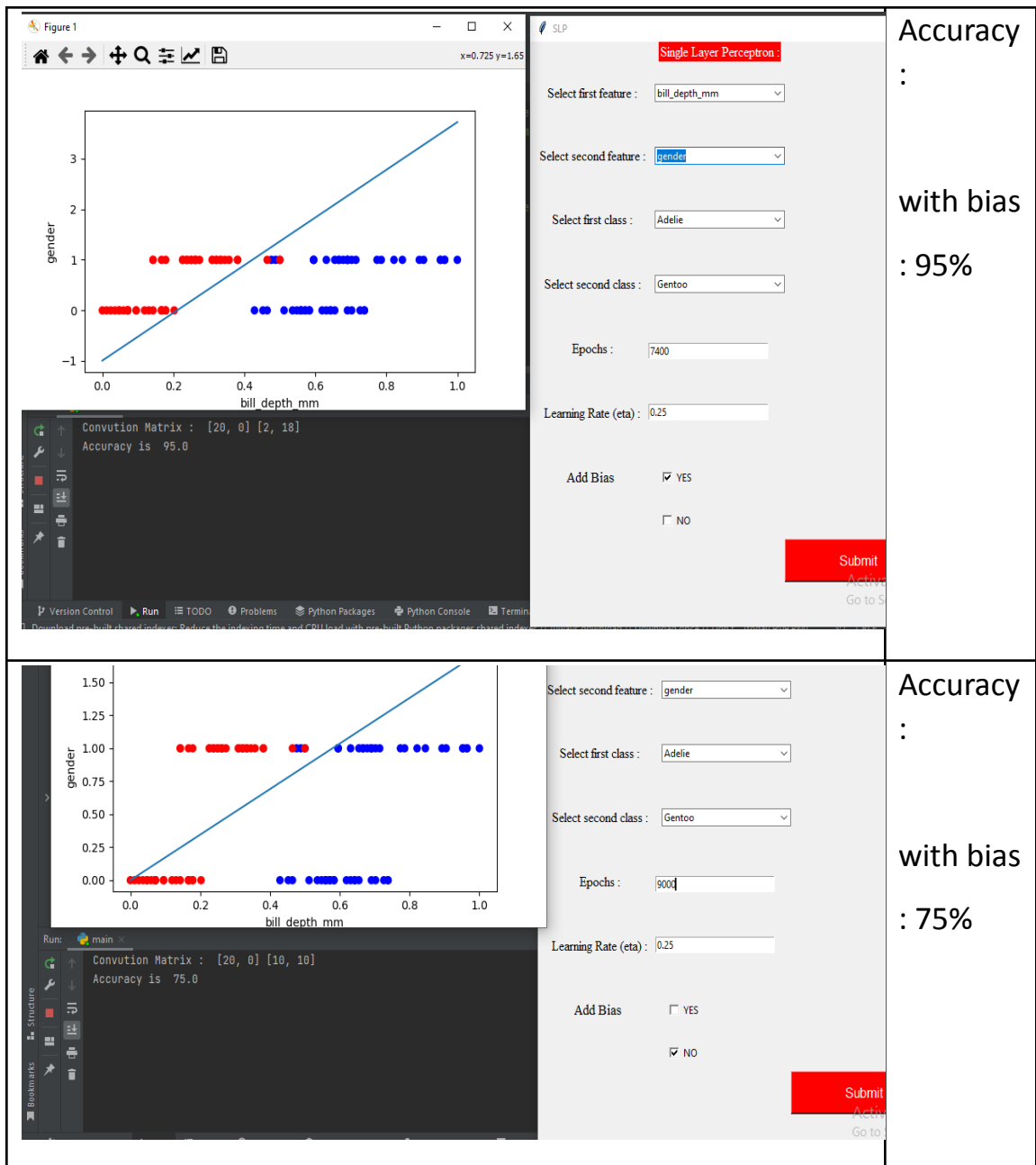
Learning Rate (eta) : 0.3

Add Bias ☐ YES ☒ NO

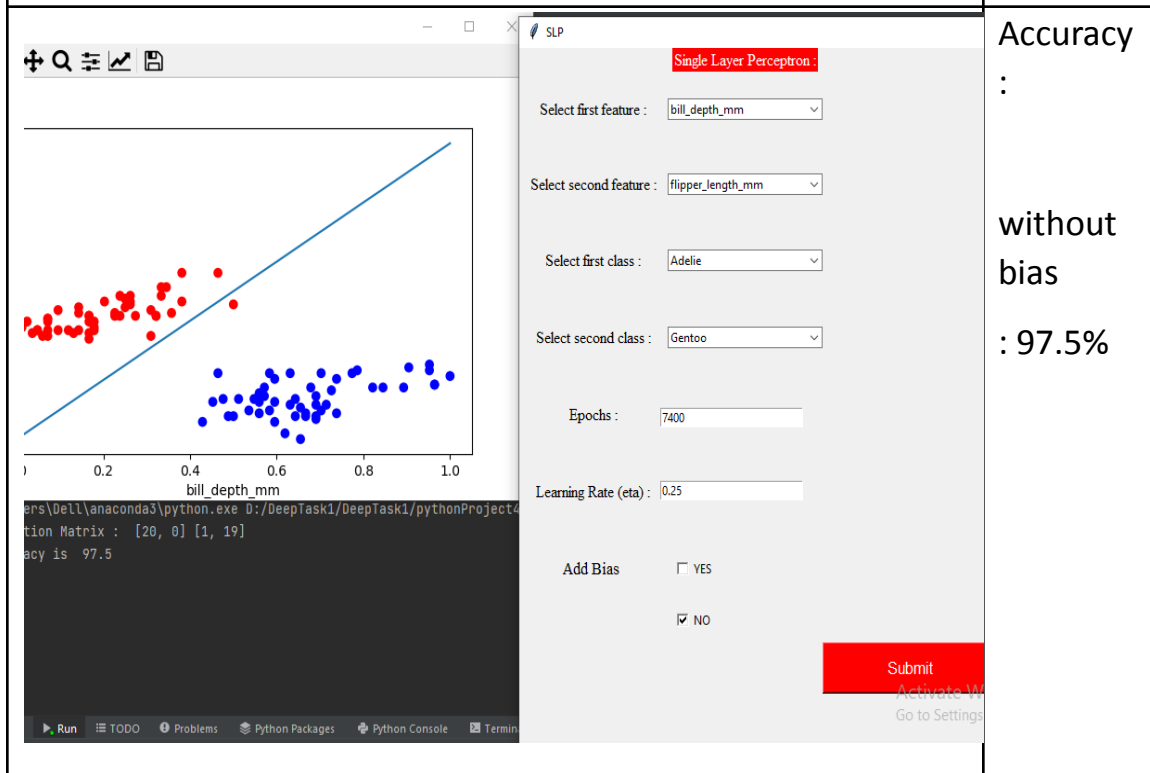
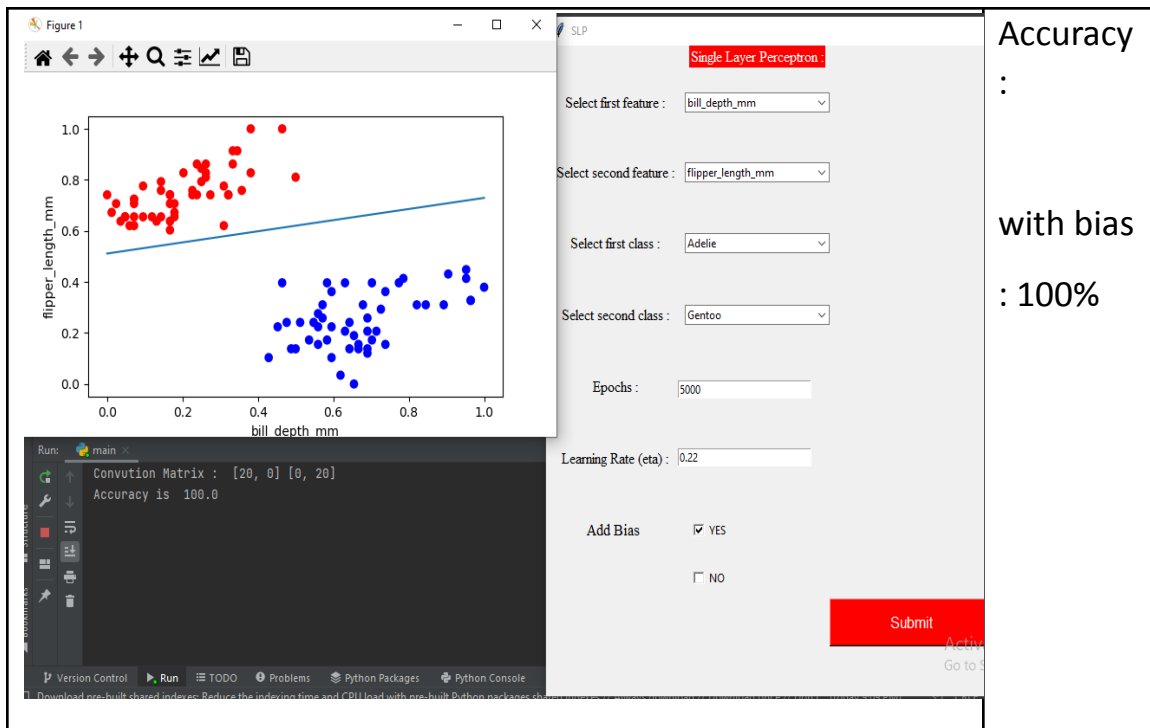
Submit Activate Go to Sett

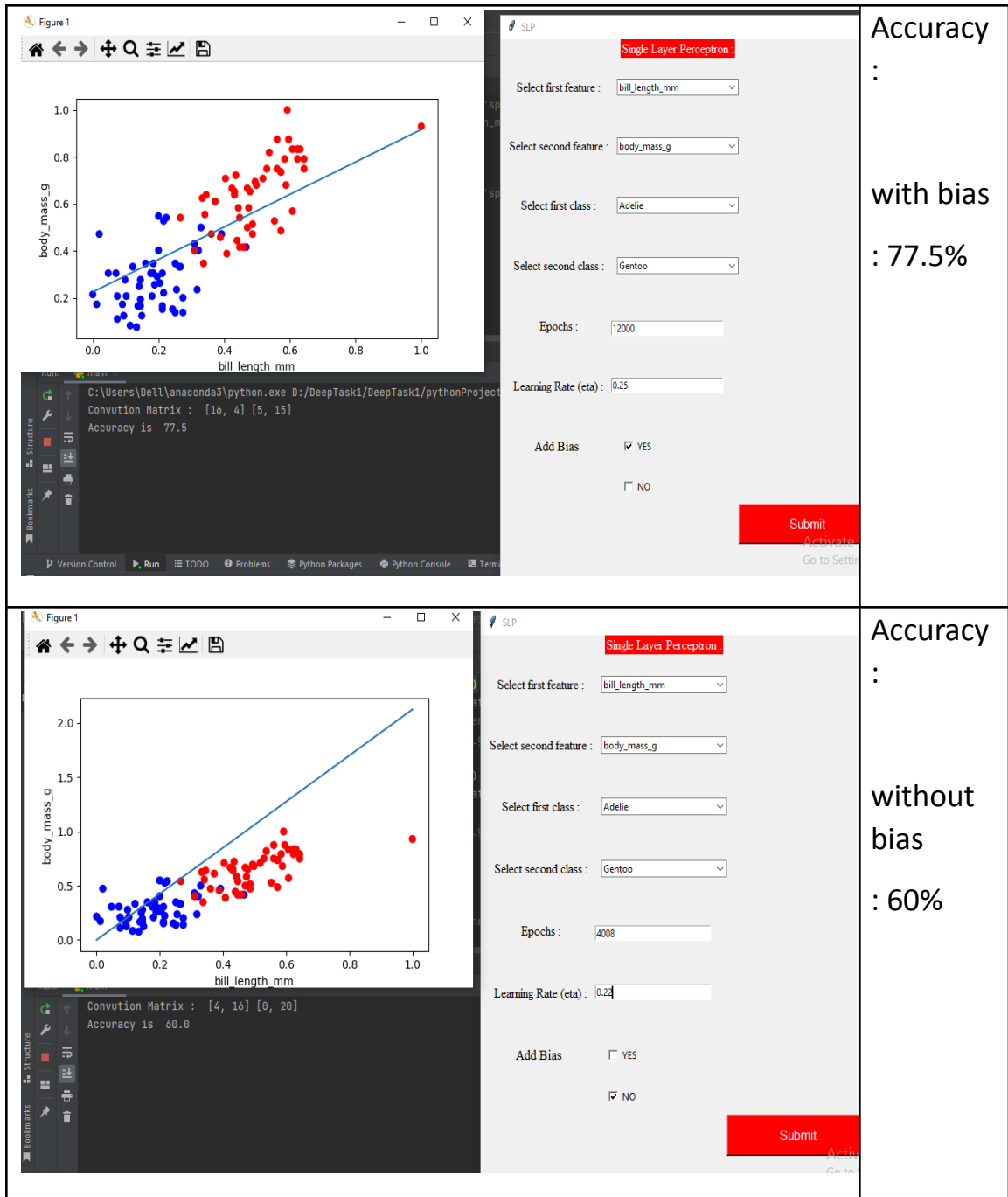
Accuracy :  
without bias : 77.5%

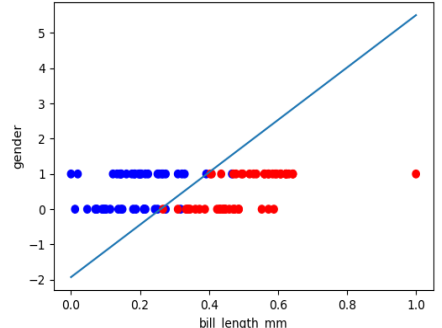
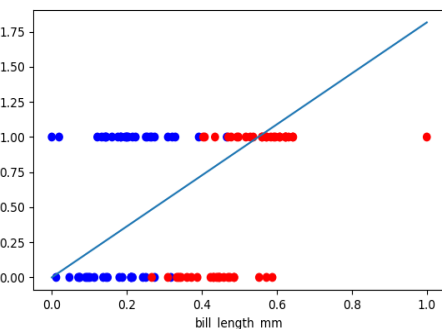
 <pre> Convution Matrix : [19, 1] [2, 18] Accuracy is 92.5 </pre>	<div>Single Layer Perceptron</div> <div>Select first feature : flipper_length_mm</div> <div>Select second feature : body_mass_g</div> <div>Select first class : Gentoo</div> <div>Select second class : Chinstrap</div> <div>Epochs : 10000</div> <div>Learning Rate (eta) : 0.24</div> <div>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</div> <div>Submit</div>	Accuracy :  with bias : 92.5%
 <pre> Convution Matrix : [12, 8] [5, 15] Accuracy is 67.5 </pre>	<div>Single Layer Perceptron</div> <div>Select first feature : flipper_length_mm</div> <div>Select second feature : body_mass_g</div> <div>Select first class : Gentoo</div> <div>Select second class : Chinstrap</div> <div>Epochs : 8000</div> <div>Learning Rate (eta) : 0.21</div> <div>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</div> <div>Submit</div>	Accuracy :  without bias : 67.5%

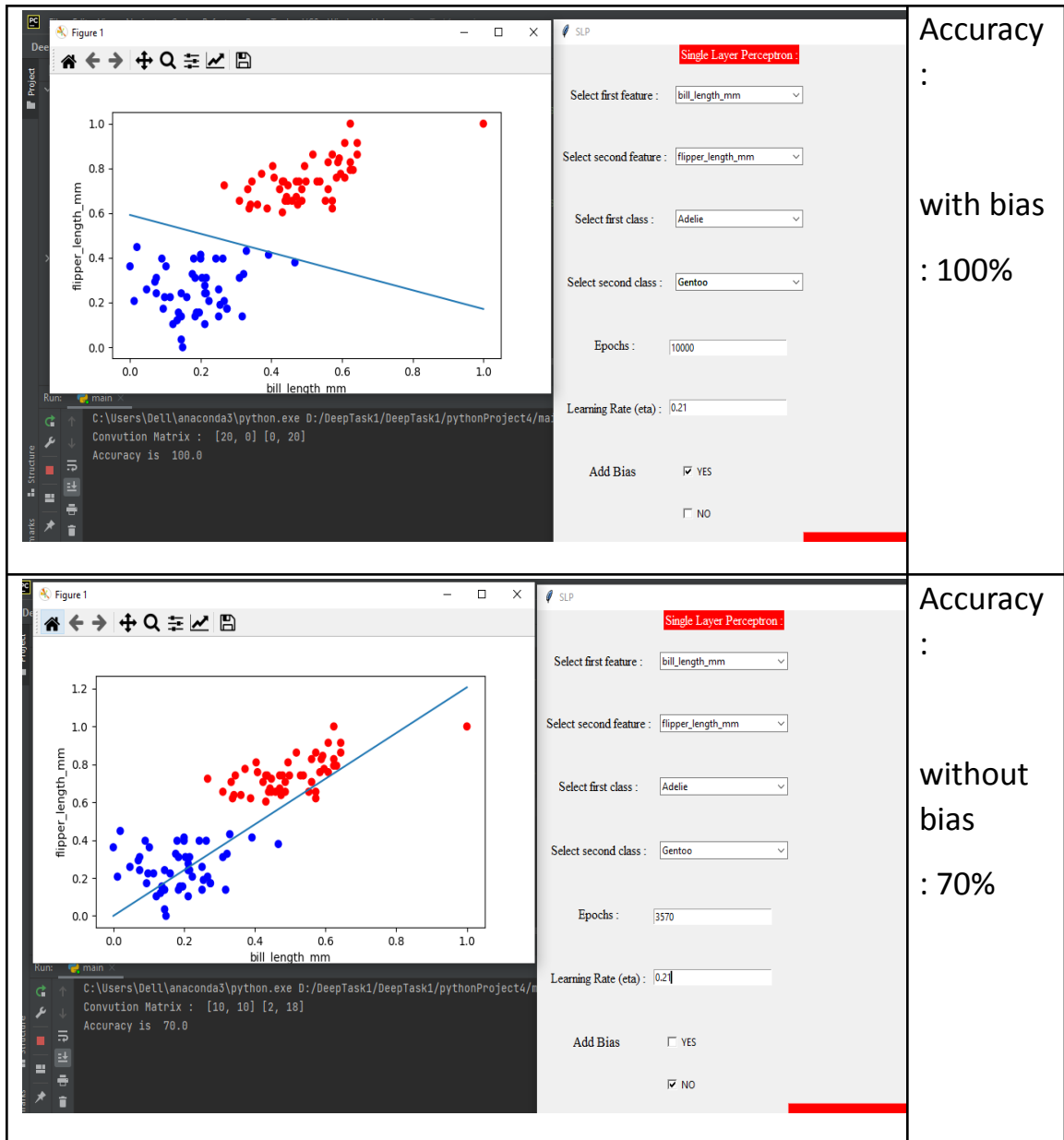


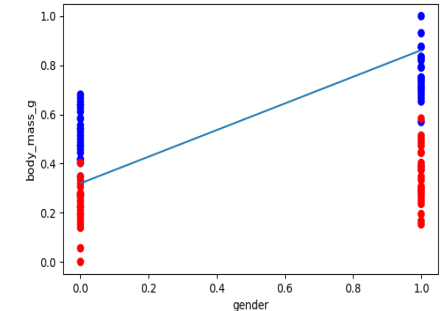
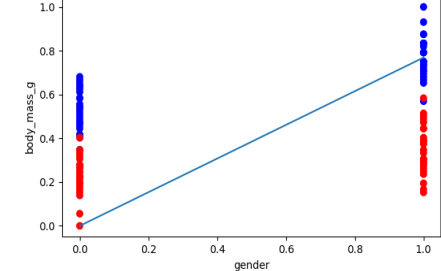






 <p>Convution Matrix : [19, 1] [0, 20] Accuracy is 97.5</p>	<p><b>Single Layer Perceptron:</b></p> <p>Select first feature : bill_length_mm</p> <p>Select second feature : gender</p> <p>Select first class : Adelie</p> <p>Select second class : Gentoo</p> <p>Epochs : 3150</p> <p>Learning Rate (eta) : 0.2</p> <p>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</p>	<p>Accuracy :</p> <p>with bias</p> <p>: 97.5%</p>
 <p>Convution Matrix : [11, 9] [3, 17] Accuracy is 70.0</p>	<p><b>Single Layer Perceptron:</b></p> <p>Select first feature : bill_length_mm</p> <p>Select second feature : gender</p> <p>Select first class : Adelie</p> <p>Select second class : Gentoo</p> <p>Epochs : 10000</p> <p>Learning Rate (eta) : 0.2</p> <p>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p>Accuracy :</p> <p>without bias</p> <p>: 70%</p>



 <pre>Convution Matrix : [[11, 9] [1, 19]] Accuracy is 75.0</pre>	<p>SLP</p> <p>Single Layer Perceptron</p> <p>Select first feature : <input type="text" value="gender"/></p> <p>Select second feature : <input type="text" value="body_mass_g"/></p> <p>Select first class : <input type="text" value="Gentoo"/></p> <p>Select second class : <input type="text" value="Chinstrap"/></p> <p>Epochs : <input type="text" value="5000"/></p> <p>Learning Rate (eta) : <input type="text" value="0.25"/></p> <p>Add Bias <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>Submit</p> <p>Activate Windows</p> <p>Go to Settings to activate Windows.</p>	<p>Accuracy :</p> <p>with bias</p> <p>: 75%</p>
 <pre>Convution Matrix : [[13, 7] [9, 11]] Accuracy is 60.0</pre>	<p>SLP</p> <p>Single Layer Perceptron</p> <p>Select first feature : <input type="text" value="gender"/></p> <p>Select second feature : <input type="text" value="body_mass_g"/></p> <p>Select first class : <input type="text" value="Gentoo"/></p> <p>Select second class : <input type="text" value="Chinstrap"/></p> <p>Epochs : <input type="text" value="9000"/></p> <p>Learning Rate (eta) : <input type="text" value="0.25"/></p> <p>Add Bias <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p> <p>Submit</p> <p>Activate Windows</p> <p>Go to Settings to activate Windows.</p>	<p>Accuracy :</p> <p>without bias</p> <p>:60%</p>

- **Conclusion :**

Bill Length and Bill Depth achieved the highest accuracy :

- With Bias :100%
- Without Bias :97.5%

Bill Length and Flipper Length achieved high accuracy :

- With Bias :100%
- Without Bias :70.5%

Bill depth and body mass achieved high accuracy :

- With Bias :100%
- Without Bias :100%