

Neural Networks Task 1 – Dataset (Penguins)

Name	Department	ID
محمد احمد عبدالرحمن	cs	20191700494
خالد جلال يحيي كامل	cs	20191700233
ناهد محمد مصطفى	cs	20191700916
محمد عماد الدين المغاوي	cs	20191700564
فارس احمد عبد التواب	cs	20191700433

Data Visualization:

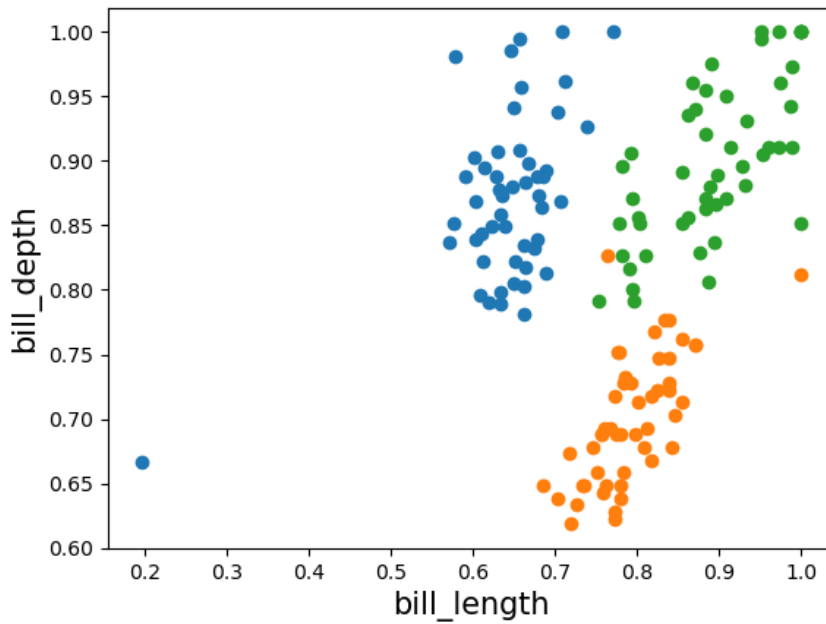
First visualize between all Penguins species by:

Blue: Adelie

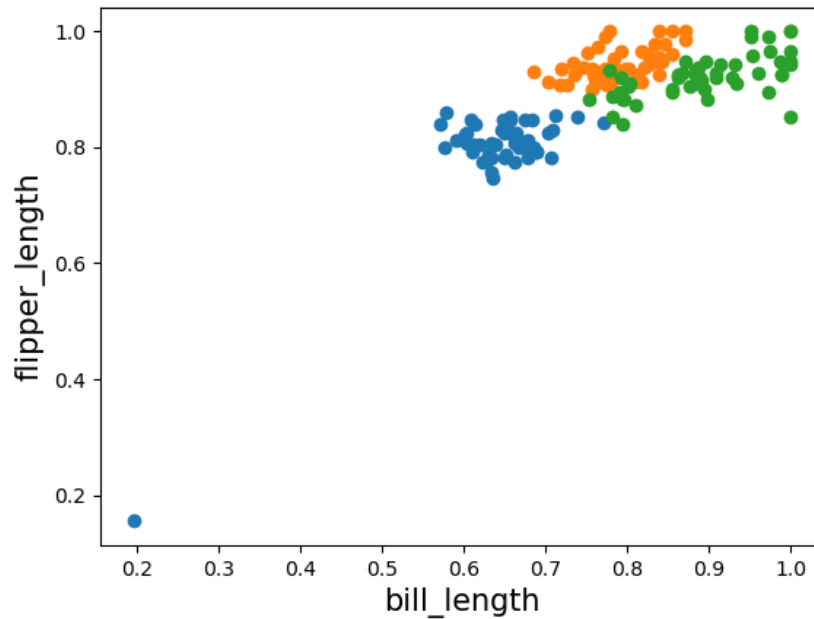
Orange: Gentoo

Green: Chinstrap

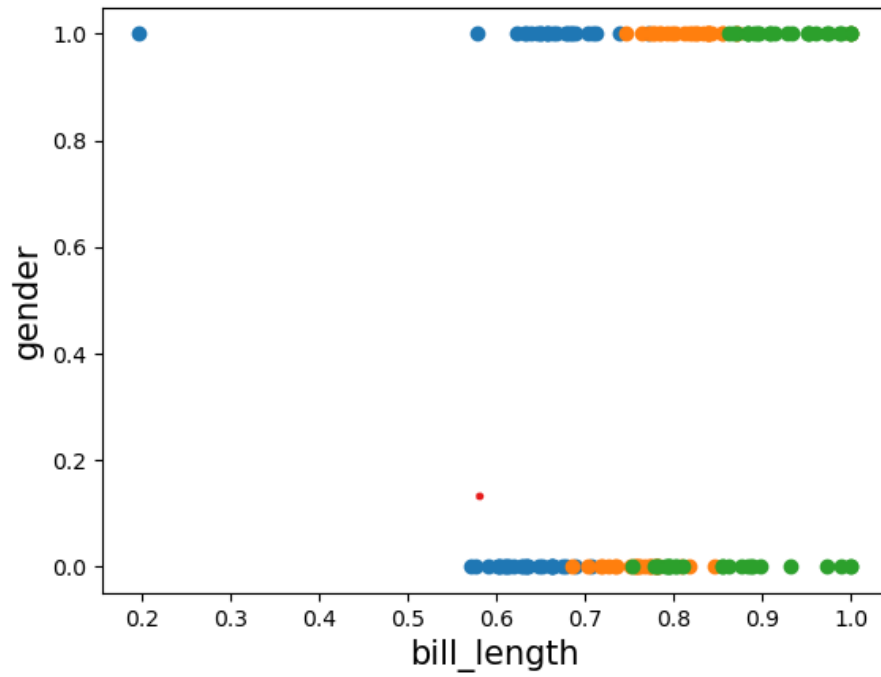
- Bill_length and bill_depth



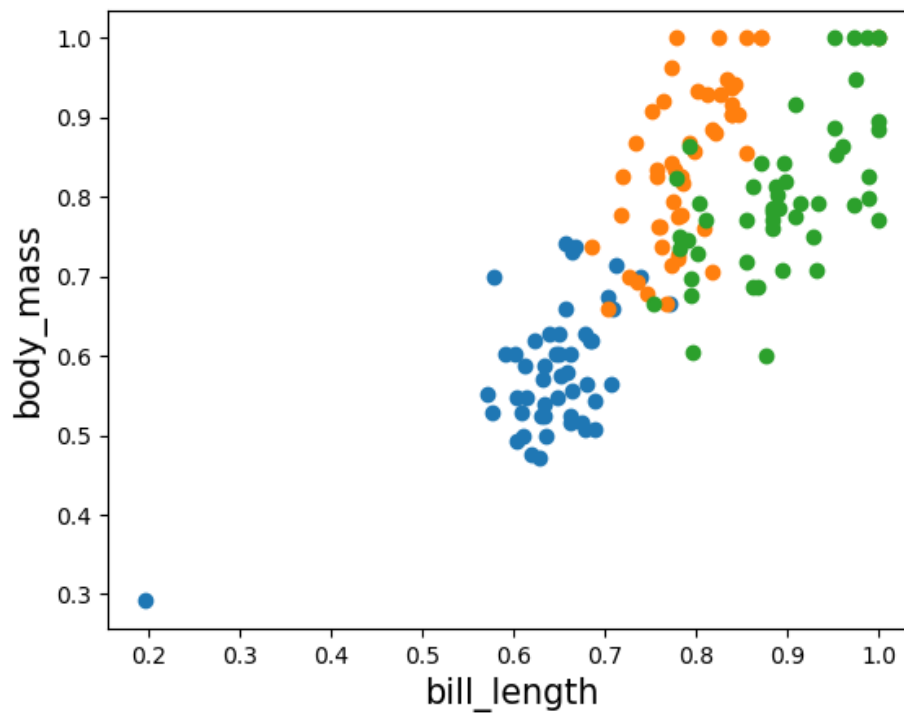
- Bill_length and flipper_length



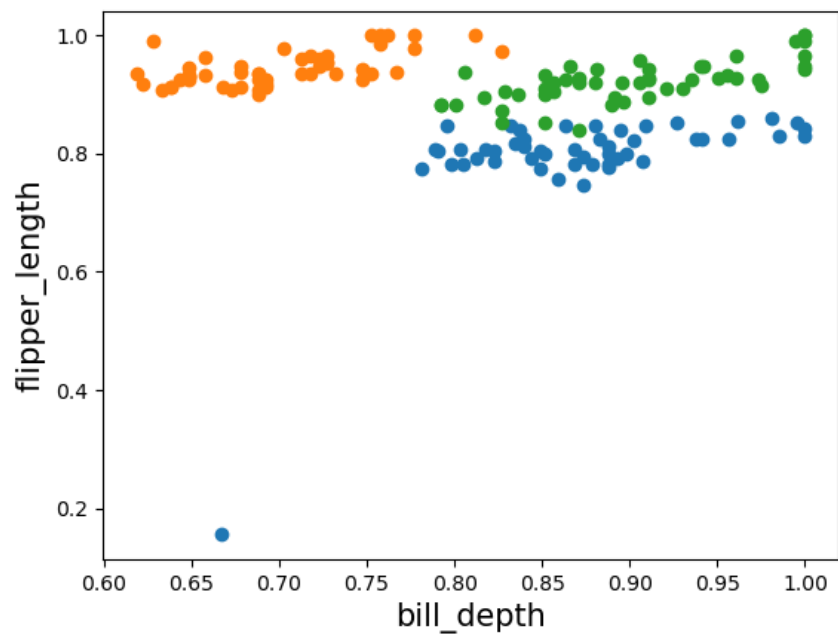
- Bill_length and gender



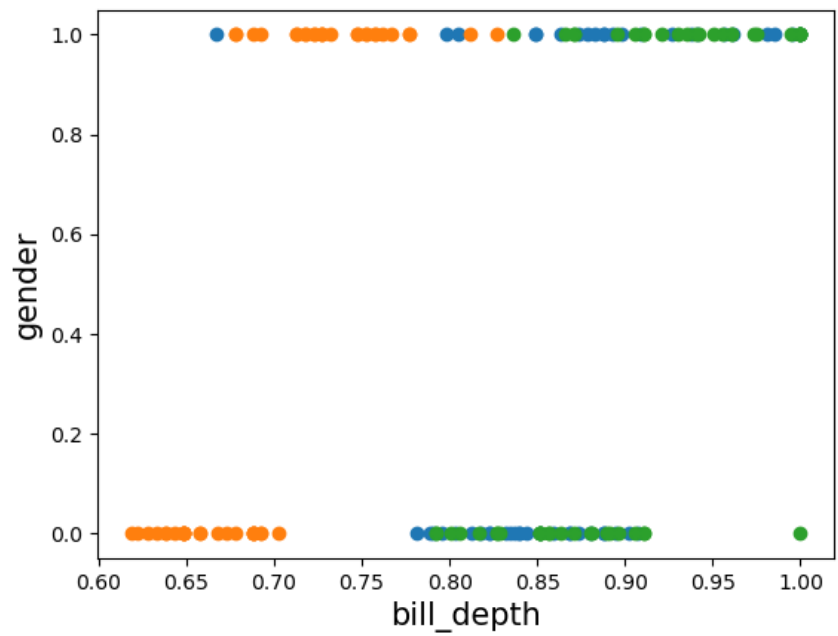
- Bill_length and body_mass



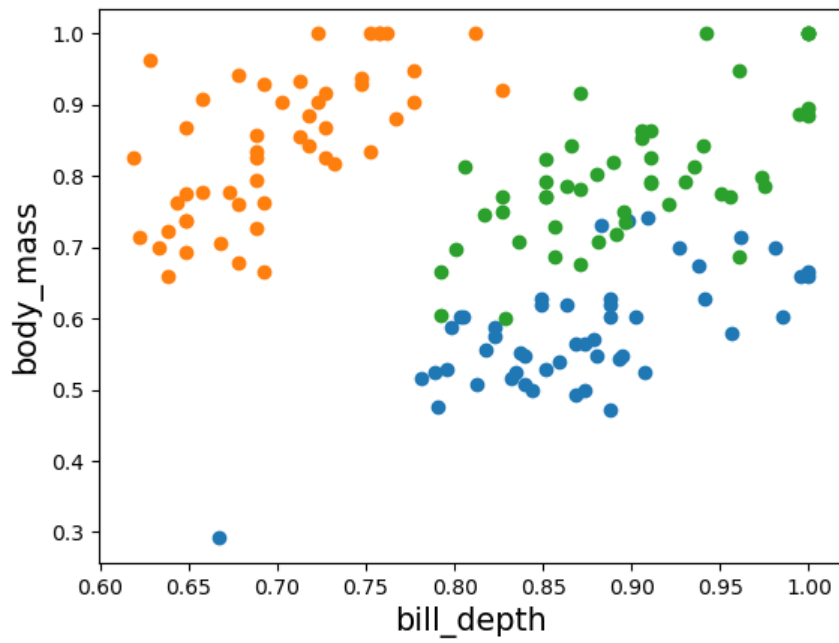
- Bill_depth and flipper_length



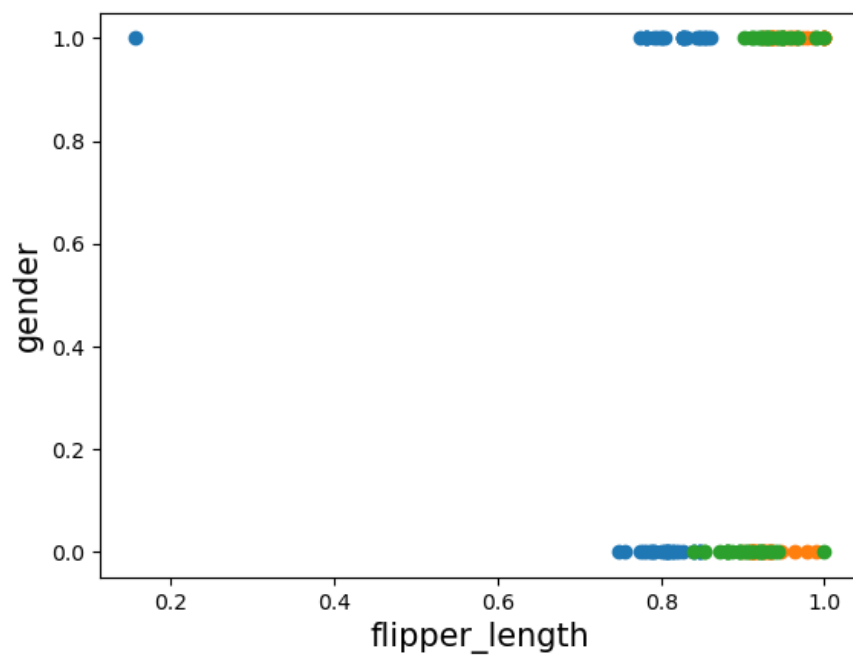
- Bill_depth and gender



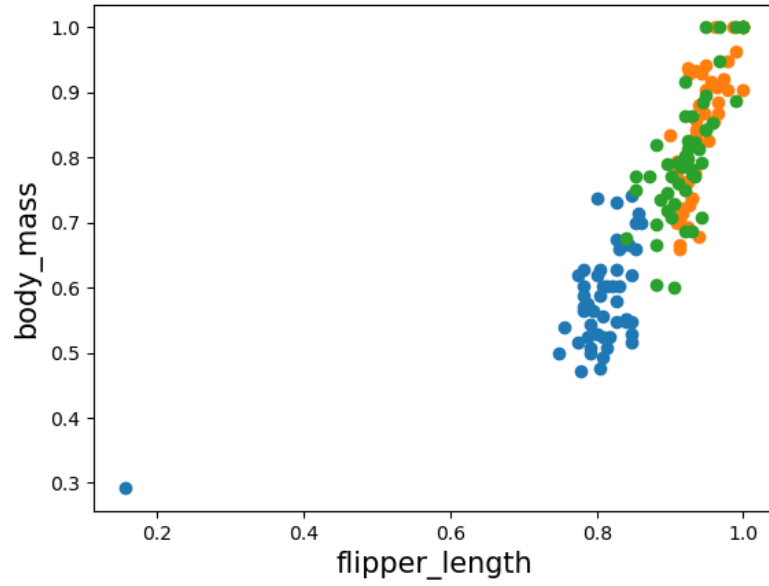
- Bill_depth and body_mass



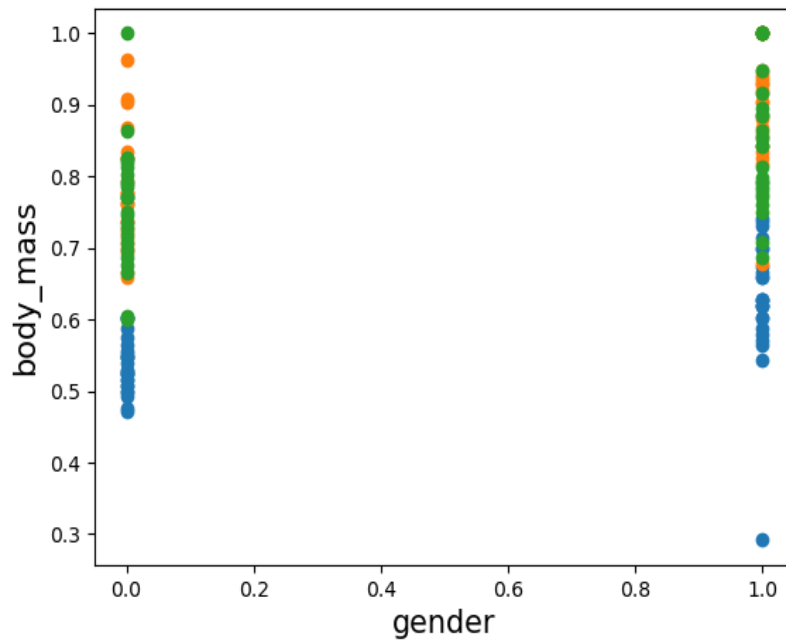
- flipper_length and gender



- flipper_length and body_mass



- gender and body_mass



- when using Bill_length and bill_depth
we find that the 3 classes are linearly separable
- when using Bill_length and flipper_length
we find that we can separate between class Adelie and class Chinstrap with line and we can separate between class Adelie and class Gentoo with line
- when using Bill_length and gender
we can not separate 3 classes with each other
- when using Bill_length and body_mass
we can separate class Adelie and class Chinstrap
- when use Bill_depth and flipper_length
we can separate 3 classes
- when using Bill_depth and gender
we can not separate 3 classes because they are not linearly separable
- when using Bill_depth and body_mass
we can separate 3 classes because they are linearly separable
- when using flipper_length and gender
we can hard separate between 3 classes because they are not linearly separable
- when using flipper_length and body_mass
we can separate class Adelie and class Chinstrap only
- when using gender and body_mass
we can not separate 3 classes because they are not linearly separable

Preprocessing techniques:

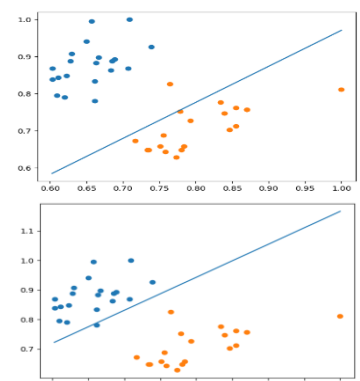
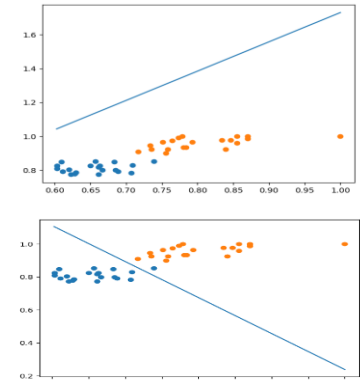
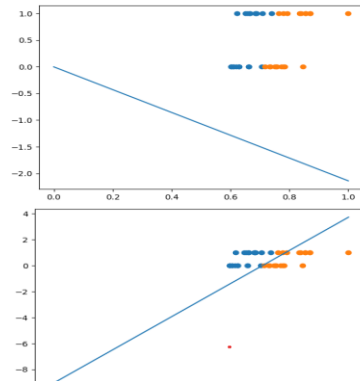
- Reading the features from the dataset and filling the NA.
- features in gender we used the normalize equation to
normalize the data from 0 to 1.
- converted the three classes into 3 numbers from (1 to 3)
to make it easier in the code.

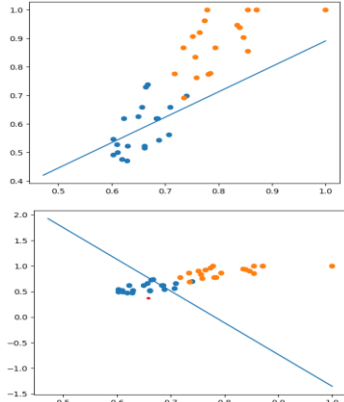
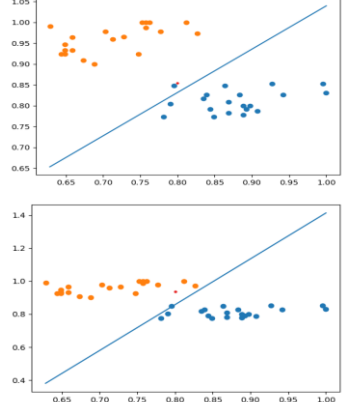
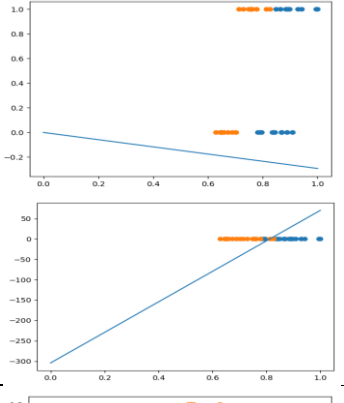
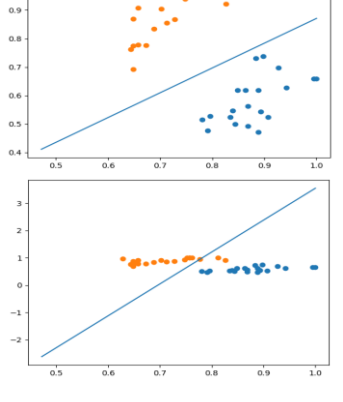
NOTE:

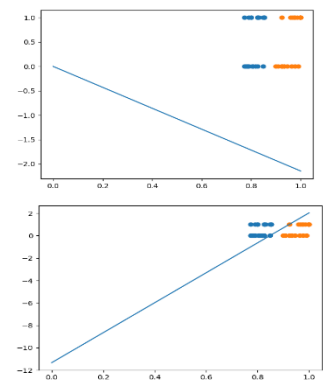
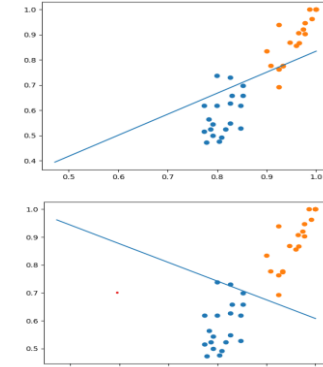
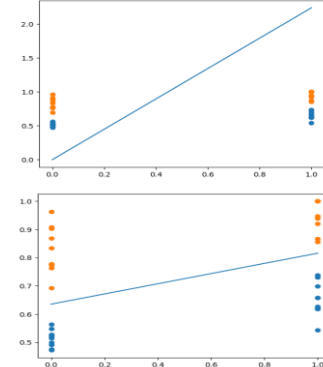
For all next result make epoch = 2000 and Learning Rate = 0.01

Visualization between each two Penguins:

“Adelie” and “Gentoo”:

Features	Accuracy	plot
bill_length and bill_depth:	Without bias:97.5% With bias: 97.5%	
bill_length and flipper length	Without bias:50.0% With bias: 97.5%	
bill_length and gender	Without bias:50.0% With bias:95.0%	

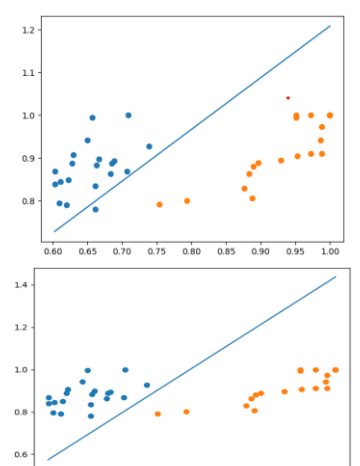
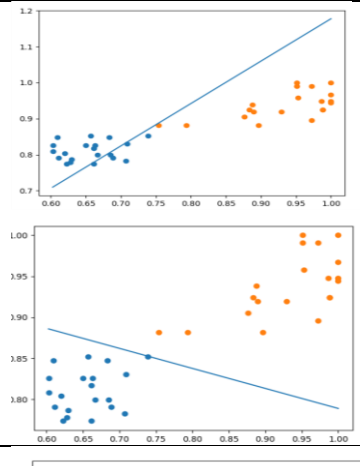
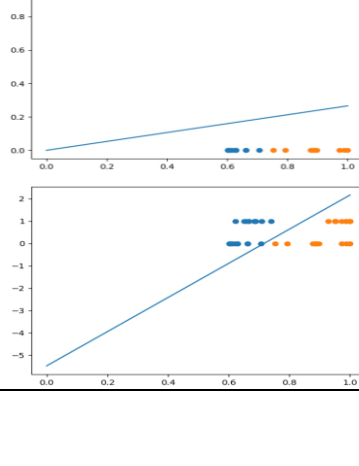
bill_length and body_mass	Without bias: 75.0% With bias:92.5%	
Bill_dipth and flipper_length	Without bias: 97.5% With bias:97.5%	
Bill_dipth and gender	Without bias:50.0% With bias: 90.0%	
Bill_dipth and body_mass	Without bias:100.0% With bias: 95.0%	

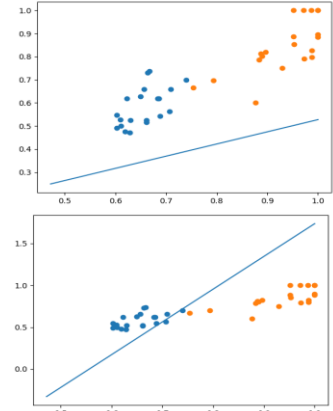
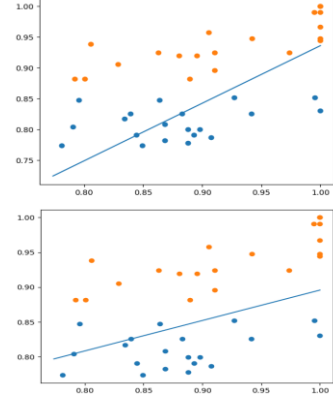
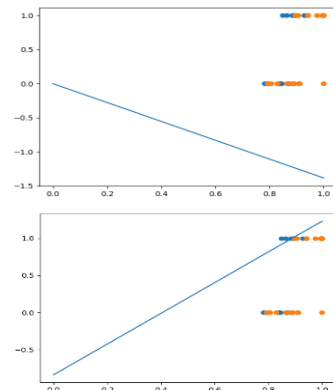
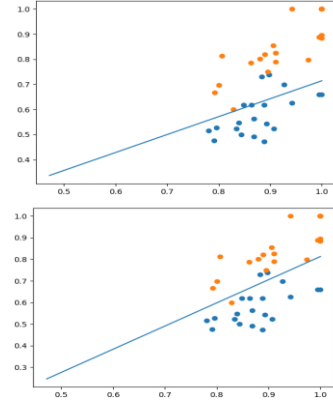
flipper_length and gender	<p>Without bias:50.0%</p> <p>With bias: 100.0%</p>	
flipper_length and body_mass	<p>Without bias:85.0%</p> <p>With bias: 97.5%</p>	
Gender and body_mass	<p>Without bios:50.0%</p> <p>With bias: 100.0%</p>	

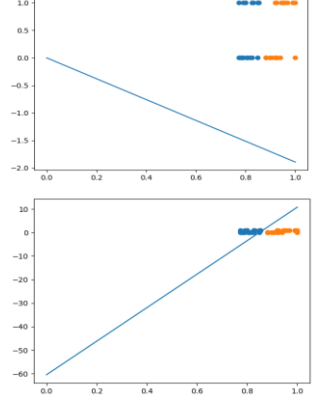
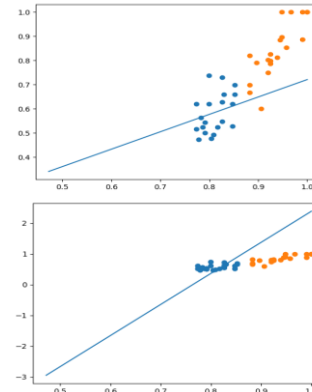
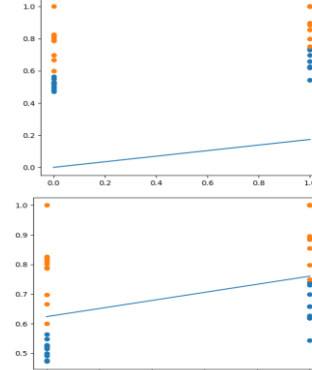
The best features to distinguish **between ‘Adelie’ and ‘Gentoo’** :

- flipper_length and gender
- bill_length and bill_depth
- Bill_dipth and body_mass

between “Adelie” and “Chinstrap”:

Features	Accuracy	plot
bill_length and bill_depth	Without bias:97.5% With bias: 100%	
bill_length and flipper length	Without bias:85.0% With bias: 100%	
bill_length and gender	Without bias:50.0% With bias:100%	

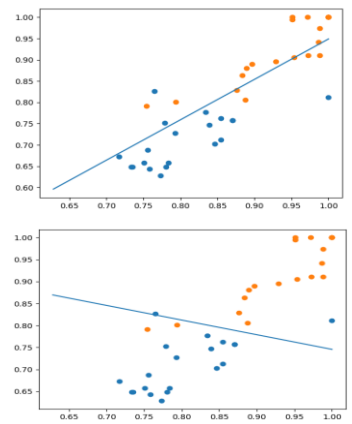
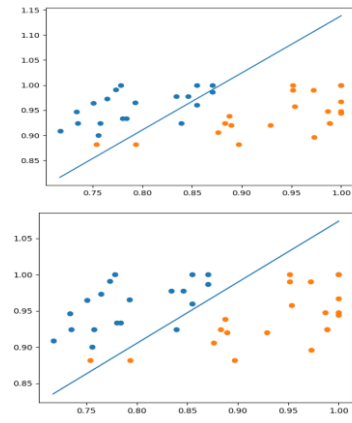
<p>bill_length and body_mass</p>	<p>Without bias: 50.0%</p> <p>With bias:95.0%</p>	
<p>Bill_dipth and flipper_length</p>	<p>Without bias: 82.5%</p> <p>With bias:87.5%~92%</p>	
<p>Bill_dipth and gender</p>	<p>Without bias:50.0%</p> <p>With bias: 60.0%</p>	
<p>Bill_dipth and body_mass</p>	<p>Without bias:87.5%</p> <p>With bias: 92.5%</p>	

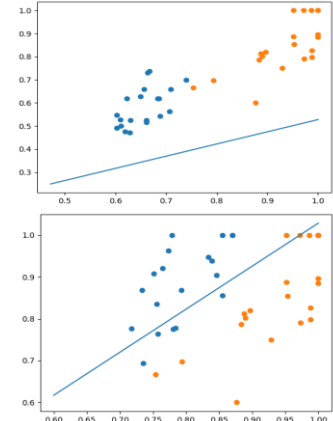
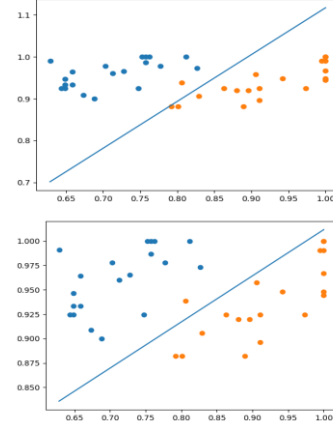
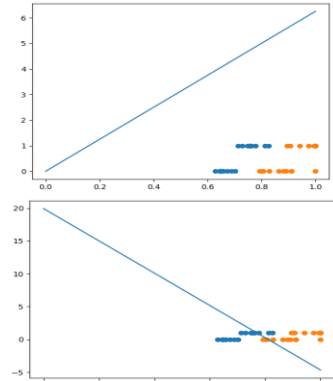
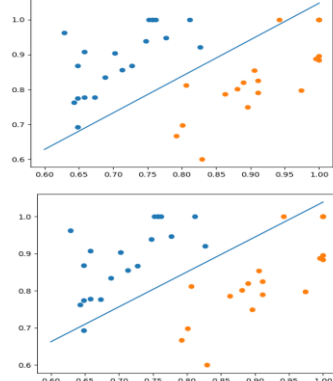
flipper_length and gender	<p>Without bias:50.0%</p> <p>With bias: 100.0%</p>	
flipper_length and body_mass	<p>Without bias:75.0%</p> <p>With bias: 80.0%</p>	
Gender and body_mass	<p>Without bias:50.0%</p> <p>With bias: 97.5%</p>	

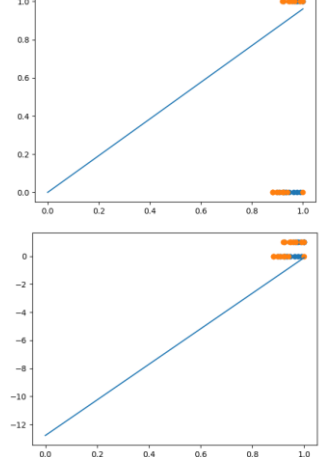
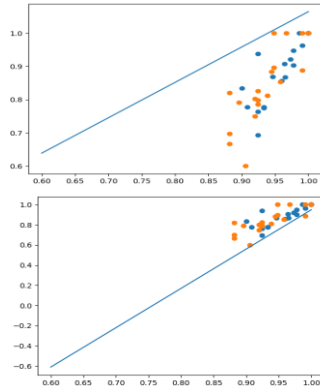
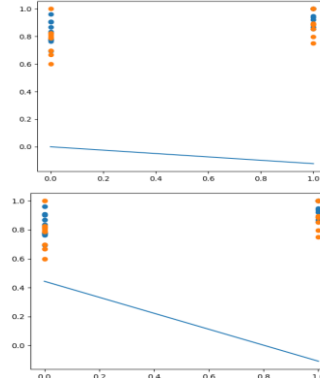
The best features to distinguish between **“Adelie”** and **“Chinstrap”**:

- flipper_length and gender
- bill_length and bill_depth
- Gender and body_mass

between “Gentoo” and “Chinstrap”:

Features	Accuracy	plot
bill_length and bill_depth:	Without bias:85.0% With bias: 90%	
bill_length and flipper length	Without bias:87.5% With bias: 92.5%	
bill_length and gender	Without bias:50.0% With bias:77.5%	

<p>bill_length and body_mass</p>	<p>Without bias: 50.0%</p> <p>With bias:80.0%</p>	
<p>Bill_dipth and flipper_length</p>	<p>Without bias: 97.5%</p> <p>With bias:92.5%</p>	
<p>Bill_dipth and gender</p>	<p>Without bias:50.0%</p> <p>With bias: 85.0%</p>	
<p>Bill_dipth and body_mass</p>	<p>Without bias:87.5%</p> <p>With bias: 95%</p>	

flipper_length and gender	<p>Without bias:50.0%</p> <p>With bias: 50.0%</p>	
flipper_length and body_mass	<p>Without bias:50.0%</p> <p>With bias: 47.5%</p>	
Gender and body_mass	<p>Without bias:50.0%</p> <p>With bias: 97.5%</p>	

The best features to distinguish **“Adelie”** and **“Chinstrap”**:

- Bill_dipth and flipper_length
- Bill_dipth and body_mass
- Gender and body_mass