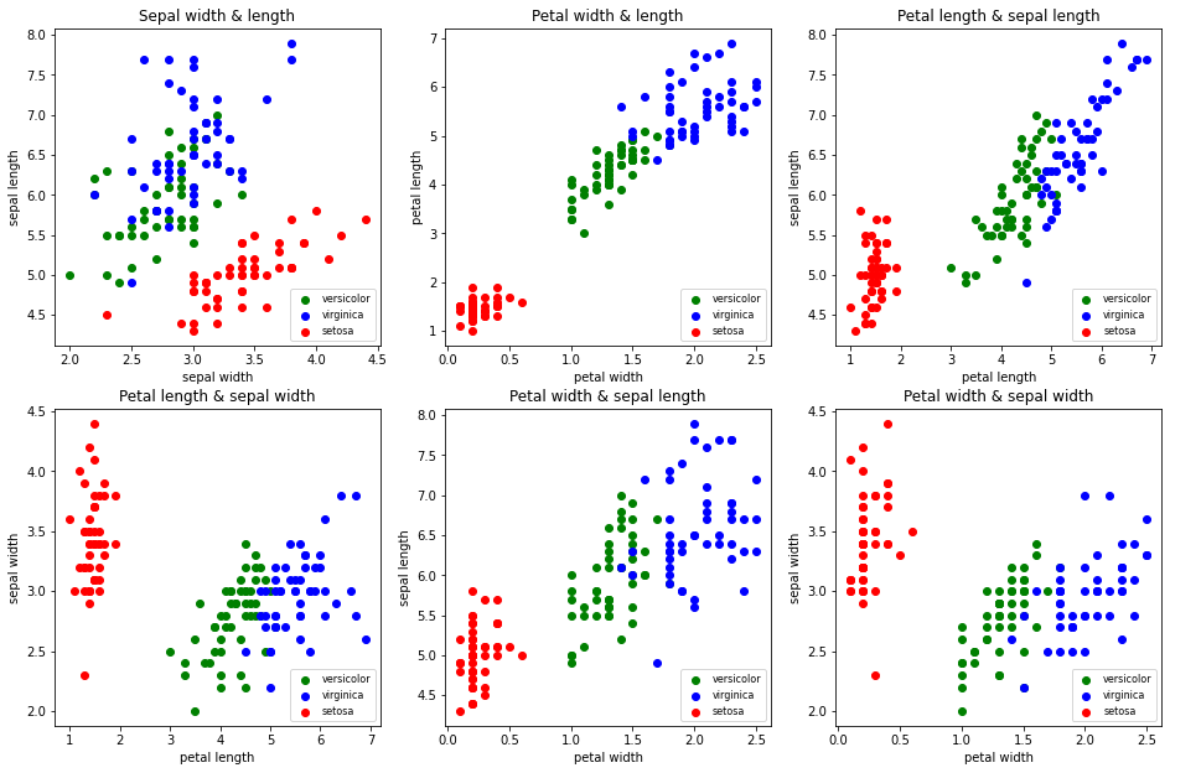
COMP5400M: BIC Coursework 2

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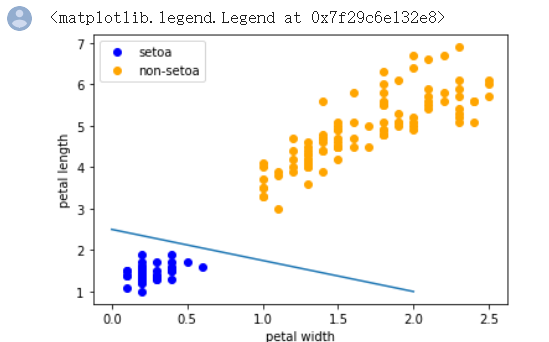
1. Plots shows as below.



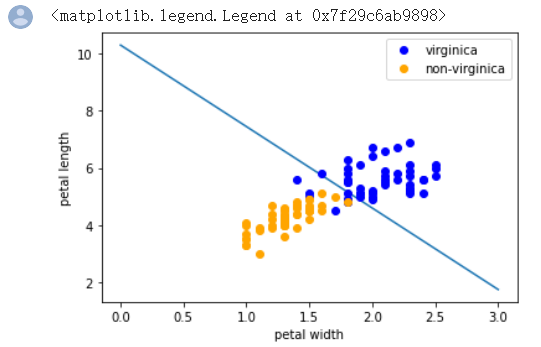
1. I do believe that setosa vs. non-setosa can be learnt by a perceptron. Based on the plots above, there are 6 plots of different 2 inputs’ combations. And we can see that all of these plots are linear separable between setosa and non-setosa flowers. Especially for the plot that use petal width and length as its inputs. There is a huge gap between setosa and the others, which means we can use one single decision line to separate it easily. In conclusion, the formular of the perceptron is *y + 2.8 \* x – 3.5 = 0.* The weight of petal length is 1, petal width is 2.8, both of sepal width and length are 0, and the bias is -3.5. The decision line on the plot shows as below.



1. As for setosa vs. non-setosa classification, the algorithm for training the perceptron without learning rate can converge. From the plot, we can observe that the setosa data is completed separable from non-setosa data. As long as we set a rough but appropriate initial weights and bias, it’s still converge even without learning rate. And the output is correct. As the plot below, the decision line seprates the setosa and non-setosa data completely.



As for virginica vs. non-virginica classification, the algorithm cannot converge without learning rate. A little part of virginica data is overlap with the non-virginica. So it’s need learning rate to improve the preceptron classify ability and seprate the data as correct as possible. And I set the learning rate as 0.1. If the preceptron classify more than 95 data point (out of 100) correctly within one epoch, then I believe the preceptron is good enough and the program will stop training.



And there are differences between versicolor and the other two. According to the plots in Q1, we can see that the versicolor data (green points in Q1 plots) is in the middle of setosa and virginica. This phenomenon also tells us that it’s unlikely to separate versicolor from other flowers with one single descision line or one perceptron. To classify versicolor need to build multi layer perceptron network. Or use the previous two perceptrons to classify the data. If the data doesn’t belong to either virginica nor setosa, then it’s versicolor. As the two decision lines in the plot below.

