COMP309 Assignment 1

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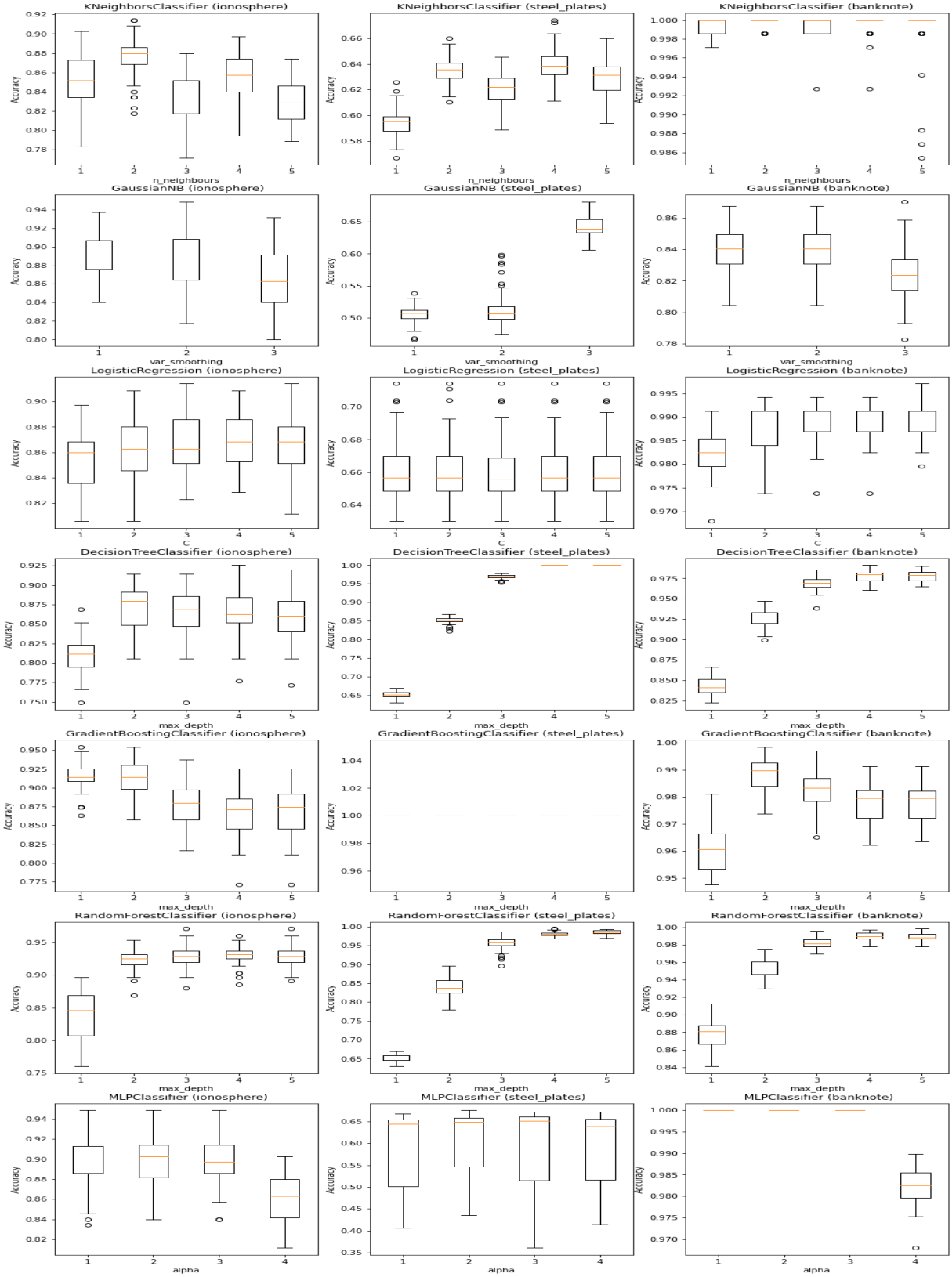
Task 1 (i)



(ii)

Table 1

	banknote	ionosphere	steel_plates
knn	0.000204082	0.124229	0.361031
gaus	0.159971	0.109029	0.356639
log	0.0109913	0.133257	0.337753
dtc	0.0226531	0.128914	0
grad	0.0111079	0.0853714	0
rand	0.0102332	0.0701714	0.0157938
mlp	0	0.100914	0.393835

Table 2

	banknote	ionosphere	steel_plates
knn	2	2	4
gaus	1e-09	1e-09	0.1
log	1	2	5
dtc	8	3	8
grad	3	1	1
rand	8	8	10
mlp	1e-05	0.001	0.001

(iii)

Overall, the model with the lowest mean error is the Random Forest Classifier. It has the lowest average of mean test error across all datasets at 0.0321 (4d.p). The next closest was Gradient Boosting which had 0.0322 (4d.p). This shows that it worked the most effectively across all 3 datasets. Although, it might not have had the lowest mean error for each data set it worked consistently across all three. For example, other classifiers such as KNeighbours had the lowest mean error for banknotes. However, it had the second highest mean error for steel_plates at 0.361031. This mean error is approx. 20 times that of the Random Forest Classifier. So although it performed extremely well on the banknotes data set it really struggled on steel_plates. Thus, considering all datasets it is not a great choice. This pattern repeats itself multiple times as visible in the table. Therefore, Random Forest Classifier is the best Overall model as it performed well on all datasets.

Different datasets responded in varying ways to change in hyperparameters. There is no clear trend where all dataset respond well to lower hyperparameters or higher hyperparameters. For example, for Decision Tree Classifier banknote and steel_caps had the lowest mean error at “max_depth” of 8. This is the second highest depth with the maximum being 10. Therefore, these datasets where not so sensitive to increases in max_depth. However, ionosphere had the best mean error at a max_depth of 3. This indicates that after 3 the mean test error increased. 3 is the second lowest max_depth HyperParameter. From this we can conclude that ionosphere was much more sensitive to increases in max_depth.

There is also no clear trend where a single dataset responds well to high hyper parameters or low hyperparameters. For example, steel_plates has the lowest mean test error with a hyperparameter of 1 which is the lowest when using the Gradient Boosting model. However, has the lowest test mean error with a hyperparameter of 10 for Random Forest which is the highest value. This is repeated among other datasets when comparing the hyper parameter values of different models. From this we can conclude there is not one way to figure out what the best value for a hyperparameter is. The best way is essentially guess and checking for each model and seeing what the best result is.