

CHAPTER IV

DATA AND DISCUSSION

4.1 Results And Scores

The following figures below are the test results on the Decision Tree ensemble learning method:

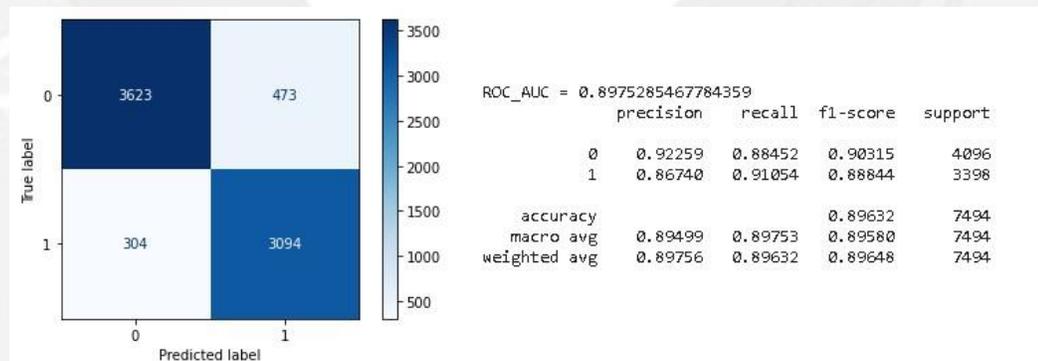


Figure 4.0.1: confusion matrix and precision, recall, f1-score, and support scores of Decision Tree ensemble learning method..

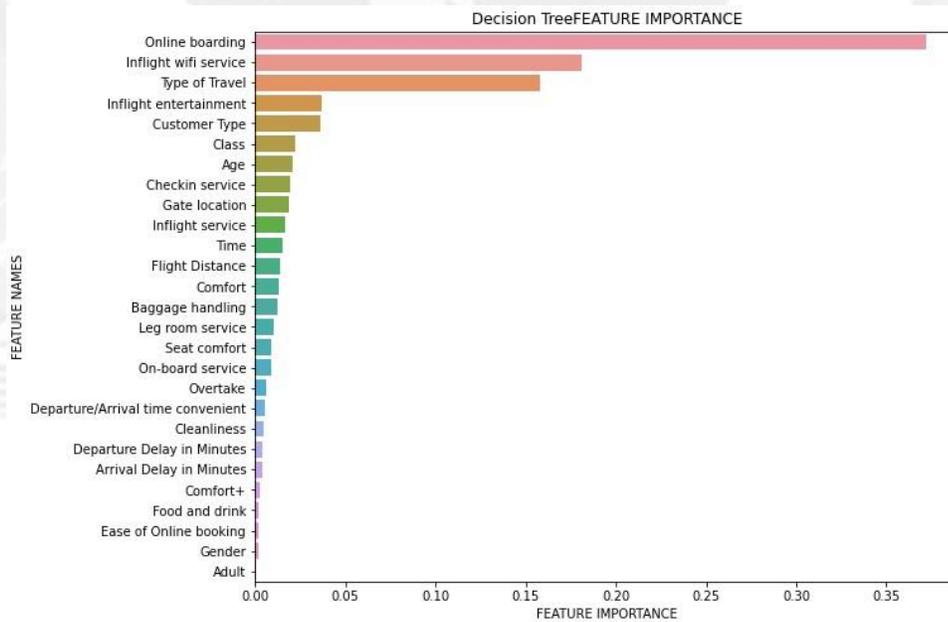


Figure 4.0.2: Feature importance for Decision Tree ensemble learning method.

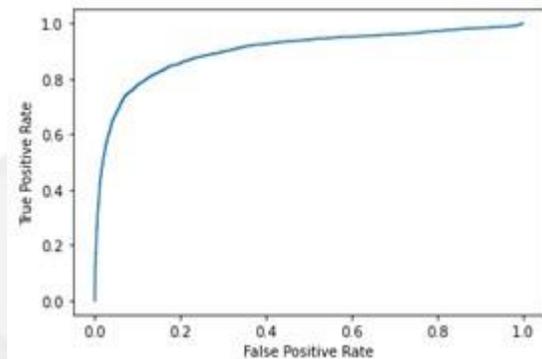


Figure 4.0.3: ROC curve for Decision Tree ensemble learning method.

The next figures below are the test results on the Random Forest ensemble learning method:

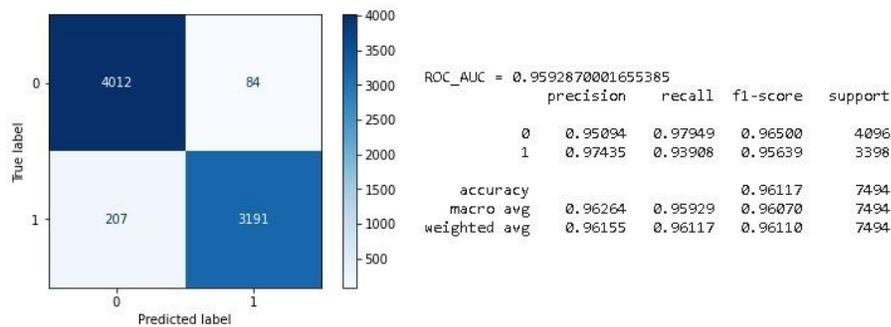


Figure 4.0.4: confusion matrix and precision, recall, f1-score, and support scores for the Random Forest ensemble learning method.

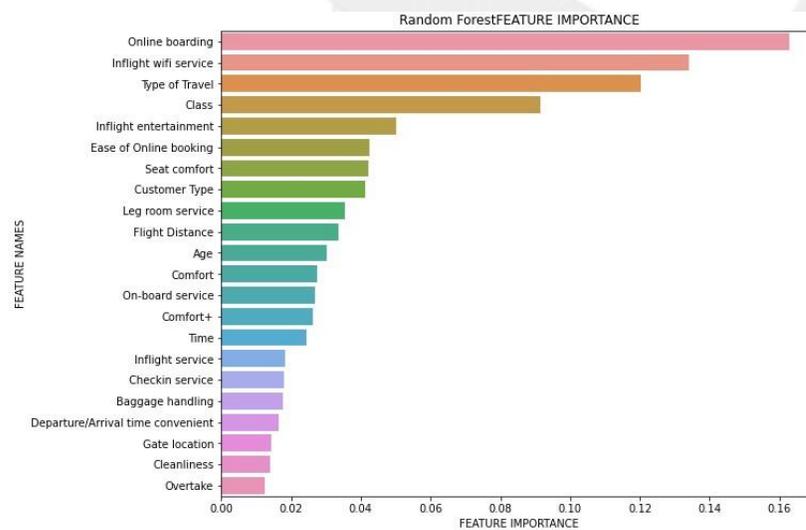


Figure 4.0.5: features importance of Random Forest ensemble learning method.

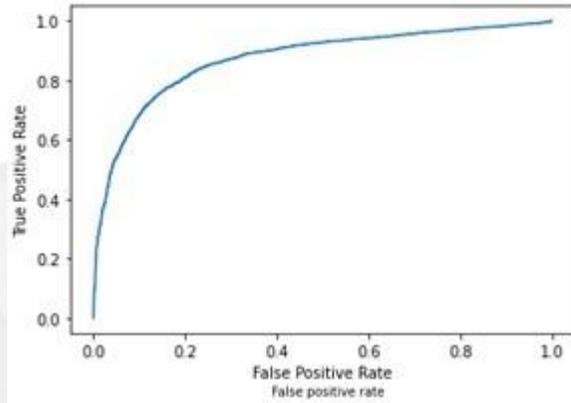


Figure 4.0.6: ROC curve of Random Forest ensemble learning method.

The next figures below are the test results on the Boosting ensemble learning method:

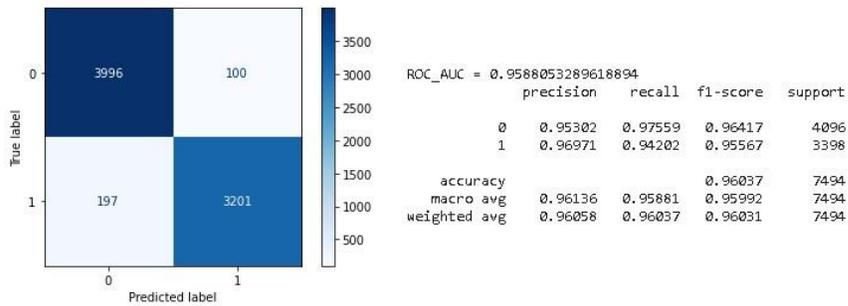


Figure 4.0.7: the confusion matrix and precision, recall, f1-score, and support scores for the Boosting ensemble learning method.

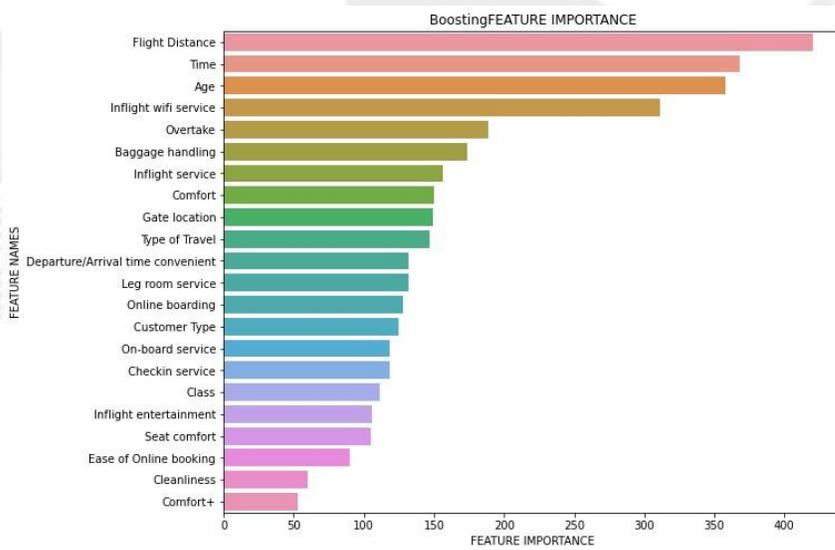


Figure 4.0.8: the features importance chart of the Boosting ensemble learning method.

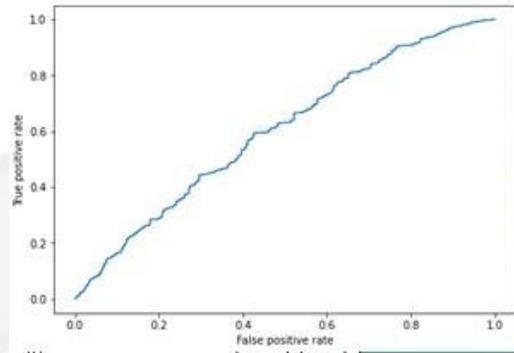


Figure 4.0.9: ROC Curve of the Boosting ensemble learning method.

The next figures below are the test results on the Stacking ensemble learning method:

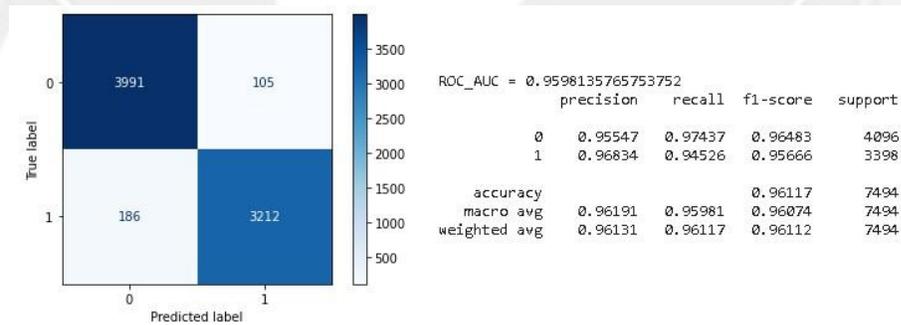


Figure 4.0.10: confusion matrix and precision, recall, f1-score, and support scores for Stacking ensemble learning method.

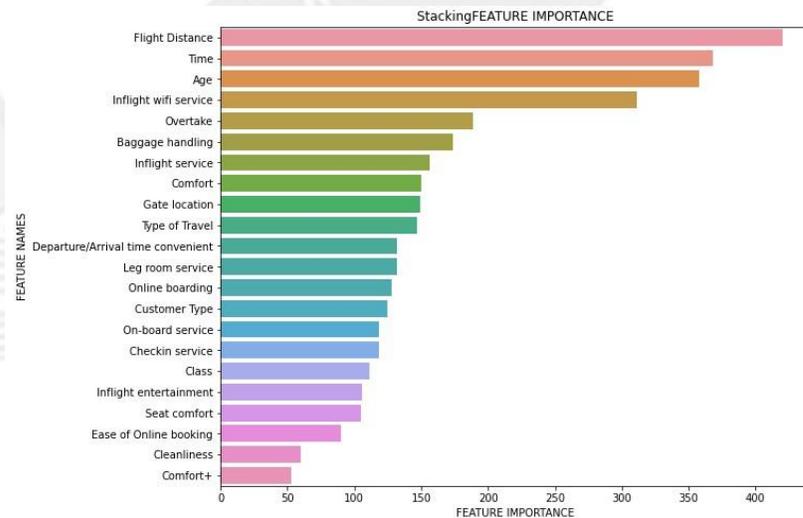


Figure 4.0.11: the features importance chart of the Stacking ensemble learning method.

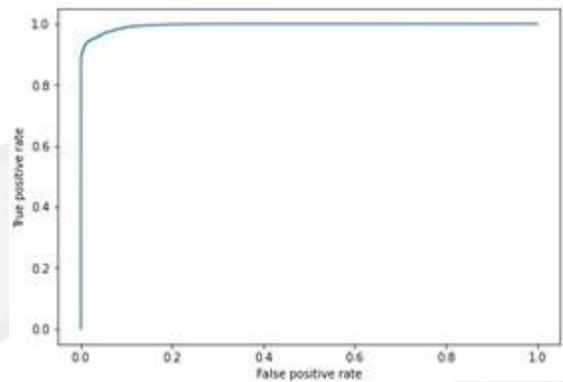


Figure 4.0.12: ROC curve of Stacking ensemble learning method.

4.2 Discussion

As shown on the charts and scores on all figures, the four methods, Random Forest, Decision Tree, Boosting, and Stacking, interestingly have almost reached parity with each other: Random Forest Bagging ensemble method has a success rate of 96.117%, Boosting has a success rate of 96.037%, and stacking has a success rate of 96.264%. However, when it comes to Decision Tree, it performs the worst among all, with a success rate of 89.63%, showing the inherent advantages of the Random Forest method in accuracy improvement over Decision Tree as discussed in chapter 2, with better recall score as shown in the confusion matrix, and less prone to false predictions. Interestingly, in terms of feature importance, the Decision Tree and Random Forest ensemble learning method, both belonging to Bagging method family on ensemble learning, has Online Boarding as the highest level of importance in affecting the overall study, while Flight Distance seems to affect the overall score the most on Stacking and Boosting method. The ROC curves has shown that overall, XGBoost has the worst graph shape of all, while Stacking has the best graph shape.