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CHAPTER 5

CONCLUSIONS AND FUTURE WORK

5.1 Conclusions

Based on the experimentation that was done, the conclusions that can be made includes:

1. An ensemble learning model can be formulated with homogeneous models and heterogeneous models. The methods that were implemented in this exploration was Bagging for the homogeneous model technique, and Stacking for the heterogeneous technique.
2. It is found that the best results gathered came from a homogeneous ensemble model that implemented the bagging ensemble technique that aggregated 61 decision trees. The individual learners within the model each uses a max depth of 56 and used the random state of 44. This best model was also proven to be successful based on the evaluation metrics of 0.9067 accuracy, 0.8084 precision, 0.8444 AUC score, 0.6898 recall score and 0.7451 as the F-1 score. This exploration was also considered a success as shown through the implementation of the model in a mobile application that was developed

5.2 Future Work

As established through the exploration, there were a few suggestions that can be made for future references, this includes:

1. Based on the experimentation done and results gathered, pre-processing the data to make it more balanced could be beneficial. This process enables the model to possibly increase its evaluation metrics and make it more applicable to daily life.
2. A focus on recall and precision scores in terms of decision making could also be proven to be beneficial in further studies. This is due to the fact that having specified needs of the model in terms of what errors to avoid could be more significant than simply detecting whether an application is malicious or benign. Even though this study calculates the precision, recall and f1-score, in

further studies, these values can be held more accountable and deeper analysis on their importance could be done.

3. In the future, the model that was developed can be implemented in a system that can screen an application without the manual process implemented in this report. This new method may help those who are less tech savvy.
4. Additionally, being able to determine what type of malware is detected from the permissions an application requests can be done. Through implementation of external datasets and analysis, the system can not only determine if it is a malware or not, but it can also classify the types of malware such as adware, virus, worms, ransomware, or other types of detrimental applications.

