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Summary

- The resource to study machine learning and deep learning was founded.
- The draft paper was rewritten with feedback from Mia.

What TN completed this week

- Write a script for a presentation and make the presentation for mid-presentation.
- Collect one third of the dataset.
- Write and revise Literature review.
- Find some resources to study machine learning and deep learning [1], [2].
 - There is information that is written about machine learning and how to use Pytorch to make AI models. Our goal is to finish this study by July.
 - This Post explained RandomForest, XGBoost, LGBM (Light Gradient Boosting Machine), and CatBoost. 'RandomForest' based on the decision tree, and 'LightGBM' that improve the slow pace of XGBoost learning are going to be used in our study. CatBoost is a model that solves the overfitting problem of LightGBM. However, if there are many continuous variables, the training time will increase. So CatBoost is unsuitable for our study using audio files [3].
- meeting with Mia
 - There was a discussion about what is better "detect" or "predict" in our research. Mia told me it will be discussed with Dr. Matson.
 - Need a .csv file that has information about the dataset.
 - Introduction consist of problem, how to solve this problem, limitation, how to solve this limitation, future plan. our introduction contain problem too long. The draft paper will be rewritten.
 - There is another method to collect UAV sound that hold UAV and record sound of RPM. However, It is hard to hold UAV and to measure velocity of UAV. Therefore, the method of collecting UAV sound maintains the old way.
- Abstract
 - In this paper, we focused on detecting when the UAV (Unmanned Aerial Vehicle) exceeds a certain speed limit, then using that dataset to predict the velocity of a UAV. The Federal Aviation Administration (FAA) set the UAVs' speed limit to 100 mph. It is hard to detect a malicious UAV, but we can assume that a UAV over 100 mph is most likely

malicious. The test was conducted by utilizing a microphone and recording these UAVs at different speeds. The reason is that there is little research about using a microphone to detect a UAV compared to other research using RADAR, LiDAR, and cameras. An indoor environment will be used as a controlled environment and the dataset is divided into two classes: slow (0-9mph) and fast (10~mph). Support Vector Machine (SVM), Randomforest, and Light Gradient Boosting algorithm (LGBM) were the machine learning model used for this research, and Convolutional Neural Network (CNN) was the deep learning model used for this research. The result shows that the CNN model has the highest accuracy for detecting when the UAV exceeds the slow range. This means the result shows the possibility of predicting the UAVs' velocity and also, can minimize the damage from UAVs.

- Still working on rewriting the Introduction part.

Things to do by next week

- Fill a Environment settings in a readme.md
- Collect each slow sound and fast sound for 30 min.
- Buy another type of drone for collecting dataset.
- Prepare for mid-presentation and Q&A.
- Finish the Introduction part and restart working on the literature review part.

Problems or challenges:

- Prepare PPT presentation and Q&A question list
- MFCC image of slow sound and MFCC image of fast sound are not much different.

References

- [1] A. Ng, "Stanford Machine Learning," holehouse.org. <http://www.holehouse.org/mlclass/> (accessed May. 19, 2022)
- [2] J. Oh, "deeplearningzerotoall," github.com. <https://github.com/deeplearningzerotoall/season2> (accessed May. 19, 2022)
- [3] jhkim0759, "RandomForest, XGBoost, LGBM, CatBoost", Tistoty.com, <https://jhkim0759.tistory.com/12> (accessed May. 20, 2022)