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From: SharpShooter

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Summary

The research was continued with 4 teams. IoT and sound detection teams implemented an environment in which the camera is captured by recognizing gunshots in real time through LoRa communication. The front-end team implemented of the draft web design for the shooter. Paper team constructed the Method section.

What Sharpshooter completed this week:

- Improved the performance of deep learning model that detects gun sound
The accuracy is 99.05%, and F1-score is 98.91%. The loss value at the training and validation process is as shown in Fig. 1. Also, the recall is 99.22%, the precision is 98.60%. As seen in Fig. 2., it is possible to check the results for the binary output.

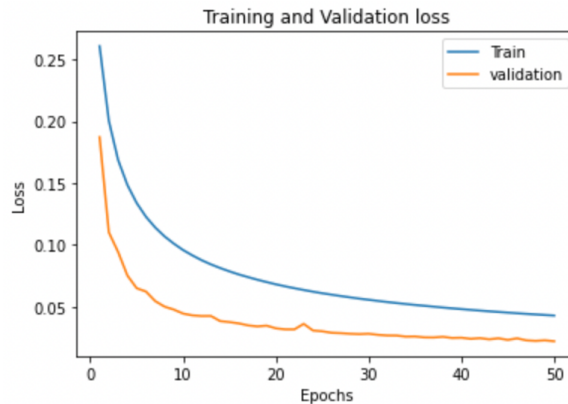


Fig. 1. Loss values at the training and validation phase of the gun sound classification model

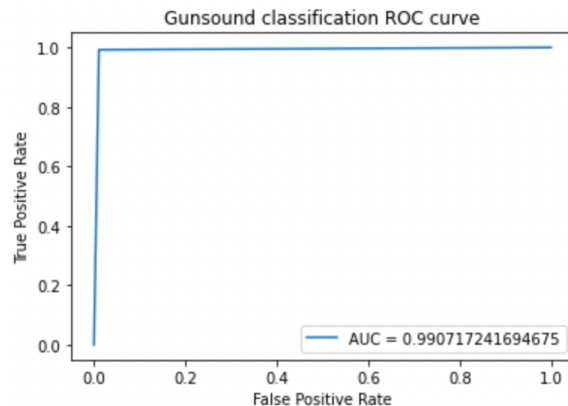


Fig. 2. The performance of the gun sound binary classification

- Set the system to detect real-time gun sound
After recording when a high frequency sound is detected, a spectrogram is generated. Then, the camera was operated only when classified as an actual gun sound through the CNN model [1].
- Completed development of draft web design for shooter
When the shooter presses the start button, the camera is running.
- Enabled remote Raspberry Pi using VPN

Things to do by next week

- Implement water-filling algorithm code to remove shadows [2]
- Adjust the system based on the results of the outdoor test

Problems or challenges:

- Sound detection takes a long time, and one of the reasons is that the sound data length can be as long as 2 seconds. The team should find the optimal sound data length that shows the best performance.
- In target image processing, shadow affects more than that the team first predicted. Because of this, it makes hard to detect the contour of shooting point by comparing previous and current image.

References

- [1] F. Demir, D. A. Abdullah and A. Sengur, "A New Deep CNN Model for Environmental Sound Classification," in IEEE Access, vol. 8, pp. 66529-66537, 2020, doi: 10.1109/ACCESS.2020.2984903.
- [2] S. Jung, M. Hasan and C. Kim, "Water-filling an efficient algorithm for digitized document shadow removal", Asia Conference on Computer Vision (ACCV), pp. 398-414, 2018.