

Utilizing Machine Learning to Identify Gunshots

Project Proposal

Team Members

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Project Summary

The exploration of models and research into more complex algorithms such as convolutional networks and audio and image classifiers utilizing such methods are of interest to the team. The scope of applications is large with these models and thus implementation of them would be of great advantage to the group. Specifically, the team is concerned with audio detection models geared toward detecting and identifying gunshots in various environments. The implementation of such a system could aid in community safety, security integrations, and response systems. Through research and implementation of such a system the team aims to establish familiarity with the intricacies of said model while providing a net positive into the community. With the recent shootings occurring across the country, a working model may be used in schools, government buildings, and other public areas to negate the harmful impacts that these events bring. Designing such a model also presents the opportunity for integration with larger systems, such as triggering notifications or hardware that locks down classrooms/doors.

Project Details:

The dataset that will be used is the ‘UrbanSound’ dataset found at the following link: <https://urbansounddataset.weebly.com/urbansound.html>. The dataset includes 1302 labeled, 4 second, urban sound files split into ten classes: air_conditioner, car_horn, children_playing, dog_bark, drilling, engine_idling, gun_shot, jackhammer, siren, and street_music. In addition the audio files are randomized and split into ten folders, or “Folds”. It is made in such a manner so that a 10K fold cross validation can be performed. The dataset also provides a .csv file listing all the audio files and their information, such as the class they belong to.

In this project we hope to reprocess the data set to two classes, gunshots and not gunshots. Various preprocessing will be needed when doing so, especially when rearranging the data into two classes, the number of samples in each class will not be balanced (over/undersampling). A neural network algorithm will be built and trained using the new dataset in order to classify data input. Evaluation will be done by reporting the accuracies and losses of different training practices used. Different types of preprocessing, training, and validation will be used to and analyzed for a comparison of the results.

Projection on Achievable Outcomes:

The primary project outcome is aimed at the development of a working model capable of identifying if an audio is indeed a gunshot or not. Iterative training will ensure acceptable accuracy of the final model, where an audio input will be all that is necessary to classify new data.

Individual Responsibility (Few sentences per member, highlighting the member's responsibility):

Jacinto Rodriguez (Team Lead) - Will handle research on existing neural network designs and theory as well as necessary data preprocessing. Oversee administrative tasks paperwork, presentations, and other team lead tasks.

Carlos Urias - Explore/consolidate different pytorch/tensorflow models or deep learning audio/gunshot classifiers. Identify trainable/working implementations of the models and frameworks.

Ibrahim Eksheir - Explore/consolidate different pytorch/tensorflow models or deep learning audio/gunshot classifiers. Identify trainable/working implementations of the models and frameworks.