

Computer Vision Hackathon: Emergency Vehicle Classification

Background

Fatalities due to traffic delays of emergency vehicles such as ambulances and fire brigade is a huge problem. In daily life, we often see that emergency vehicles face difficulty in passing through traffic. So differentiating a vehicle into an emergency and non emergency category can be an important component in traffic monitoring as well as self drive car systems as reaching on time to their destination is critical for these services. The goal of this project is to classify vehicle images as either belonging to the emergency or non-emergency category. Here, emergency vehicles usually include police cars, ambulances, and fire brigades. If successful, these models will be used in traffic monitoring or self-driving car systems.

Data Sources

The data comes from a hackathon competition that is available in Analytics Vidhya.

Model Building and Selection

I worked with the Python library fast.ai for developing and training models. I used ResNet-101, which is a convolutional neural network (CNN) that is 101 layers deep. I used an automatic learning rate finder to secure a learning rate that minimizes the loss of a gradient descent. Gradient descent is an optimization algorithm that minimizes the loss function and updates weights of parameters in neural networks by iteratively moving in the direction of the steepest decrease. The size of these movements is the learning rate. And a loss function indicates how good the model makes predictions. Once I found a good learning rate, I unfroze other layers and performed a similar technique to update the model parameters. After the parameter tuning, the model was able to reach an accuracy of over 90%.

Future Improvements

First, although the model works well in the training set, it might not perform as well as in other datasets or images. I built the model with only ResNet-101, but there are various CNN models that are also suitable in this case. It would be recommended to explore different models.

However, no matter what models were applied, the overall accuracy score would not change dramatically.

Second, the CNN models are often easily overfitted, so some validation techniques may be helpful in reducing possible errors.

Third, more advanced image processing techniques would be encouraged to improve image quality and consistency.