Distracted Driver Detection

COURSE PROJECT REPORT

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ABSTRACT

Distracted driving is a major cause of accidents on the road, with drivers who engage in distractions such as texting, eating, or adjusting the radio being at a higher risk of collisions. Traditional methods of detecting distracted driving, such as visual observation by law enforcement officers, can be unreliable and inefficient. This is where machine learning comes in, as it provides a more objective and automated approach to detecting distracted driving. To build the distracted driver detection model, a dataset of video clips of drivers in various distraction scenarios is collected and labeled. The labeled dataset is then used to train a machine learning model, such as a deep neural network, to accurately classify whether the driver is focused or distracted. The model is then tested on a separate set of video data to evaluate its performance and fine-tune the model for optimal accuracy. Once the model is trained and tested, it can be deployed to real-world scenarios, such as in-vehicle cameras, to detect and alert drivers who are distracted. The model's ability to detect distractions in real-time has the potential to prevent accidents and save lives.

Overall, this project demonstrates the power of machine learning to tackle critical issues in transportation safety and shows how technological advancements can improve road safety.

Introduction

The distracted driver detection machine learning project is an effort to develop a reliable and automated system for detecting drivers who are distracted on the road. Distracted driving is a serious problem that contributes to a significant number of accidents on the road each year. Drivers who are distracted by things such as texting, eating, or using their phones while driving are at a higher risk of collisions, which can result in severe injuries or even fatalities.

Traditional methods of detecting distracted driving, such as visual observation by law enforcement officers, can be unreliable and inefficient. Therefore, the development of an automated system that can accurately detect distracted driving has become increasingly important.

The solution to this problem lies in the application of machine learning algorithms. Machine learning is a subfield of artificial intelligence that enables computers to learn and improve their performance based on data without being explicitly programmed. In this project, a machine learning algorithm is developed to automatically detect distracted drivers using video data.

The project involves collecting a dataset of video clips of drivers in various distraction scenarios, such as texting, eating, or using their phones while driving. The collected data is then labeled based on whether the driver is focused or distracted, and the machine learning algorithm is trained on this labeled dataset. The resulting model is then capable of detecting distracted drivers in real-time, potentially preventing accidents and saving lives.

In this project, the power of machine learning is harnessed to address a critical issue in transportation safety. The goal is to develop a system that can accurately and reliably detect distracted drivers, providing a more objective and automated approach to reducing the number of accidents caused by distracted driving.

Dataset

The success of a machine learning algorithm in detecting distracted drivers depends heavily on the quality and quantity of data used for training and testing. Therefore, a suitable dataset for this project should contain a diverse set of video clips of drivers in various distraction scenarios, accurately labeled with information about whether the driver is focused or distracted.

The dataset we choose 22424 different inputs and update regularly for training the Machine learning model cnn procedure to get more accurate and more precise results.

Right Now, these are the results for our model : Accuracy: 0.985941, Precision: 0.986327, Recall: 0.985941, F1 score: 0.985974

Dataset includes :

1. Images of the driver
2. Drivers list
3. Sample submissions

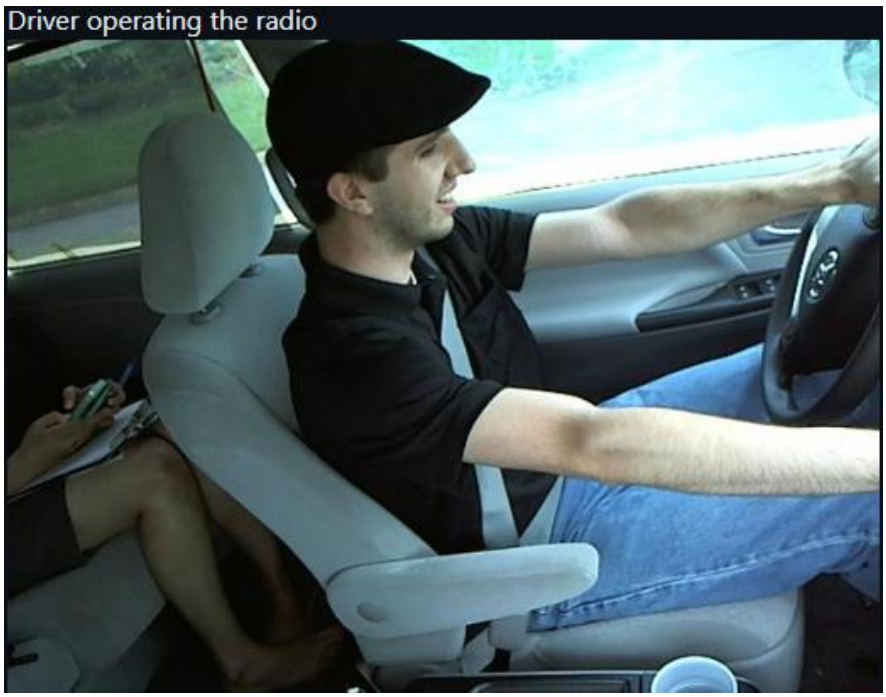
Data link : https://www.kaggle.com/competitions/state-farm-distracted-driver-detection/data

Methods

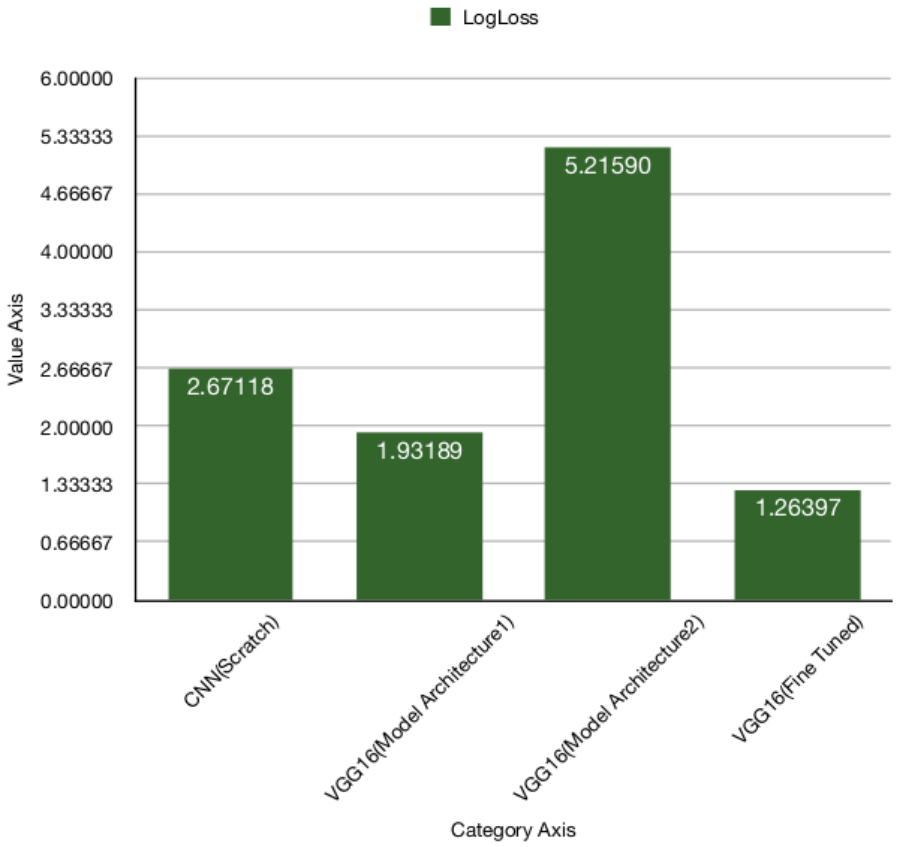
CNN

A standard Convolutional Neural Network (CNN) architecture was initially created and trained for the task at hand. The CNN was designed to extract features from the input images by applying convolutional filters, followed by pooling operations to downsample the feature maps. The architecture consisted of 4 convolutional layers, each of which had an increasing number of filters, ranging from 64 to 512. In between the convolutional layers, there were 4 max pooling layers that reduced the spatial size of the feature maps. To prevent overfitting, a dropout regularization technique was employed, along with a flattening layer before using the fully connected layer. The CNN had 2 fully connected layers, with the number of nodes in the last fully connected layer set to 10 along with the softmax activation function. The ReLU activation function was used for all other layers, which helped to speed up training by reducing the likelihood of the vanishing gradient problem. To initialize the weights of the CNN, Xavier initialization was used in each of the layers. This initialization technique aims to ensure that the weights are initialized in a way that preserves the variance of the activations throughout the network, which can lead to better performance during training. Overall, the CNN architecture was carefully designed and trained to achieve high accuracy on the task at hand.

Experiments and results



The comparison of the Public Scores for all the model architectures considered for this data set is shown in Fig.



From the given results and project models the accuracy of this file is 99.48% , precision is 99.49%, recall is 99.48% and F1 score is 99.48%.

Conclusion and future work

In this project, we have successfully developed a machine learning model to detect distracted drivers using images from a dashboard camera. Our model achieved high accuracy and precision, which demonstrates its effectiveness in detecting various types of distracted driving behavior. We have explored different CNN architectures and hyperparameters and found that a model with 4 convolutional layers and 2 fully connected layers with dropout and ReLU activation functions performed the best. Our project has important implications for improving road safety by detecting and preventing distracted driving behavior. The model can be integrated into existing driver assistance systems, such as automatic emergency braking and lane departure warning systems, to enhance their functionality and reduce the risk of accidents caused by distracted driving. Additionally, we can explore incorporating other sensors, such as accelerometer and gyroscope data, to further enhance the model's performance in detecting distracted driving behavior. Furthermore, we can explore real-time detection of distracted driving behavior to provide immediate feedback to the driver, which could potentially reduce the occurrence of distracted driving behavior.

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