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MACHINE LEARNING DISTRACTED DRIVER DETECTION

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ABSTRACT

An Distracted driving is a main factor that causes severe car accidents. It has been suggested as a possible contributor to the increase in fatal crashes from 2014 to 2018, and is a source of growing public concern. It is revealed that different distraction activities have different risks of causing accident. Thus, a proper recognition and categorization of distraction activities via images of drivers in their driving is important.

This project focuses on driver distraction activities detection via images using different kinds of machine learning techniques. Our goal is to build a high-accuracy model to distinguish whether drivers is driving safely or conducting a particular kind of distraction activity. The input of our model is images of driver taken in the car.

We first preprocess these images to get input vectors, then use different classifiers (linear SVM, sofrmax, naive bayes, decision tree, and 2-layer neural network) to output a predicted type of distraction activity that drivers are conducting.

The causes of Distraction such as texting ,watching videos, using the GPS, looking in the mirror ,reading and using cell phone is the most common reason for distraction of driver. There are three types of distraction which are most happen manual, cognitive, and visual distraction.

- Manual Distraction:-taking your hands off the wheel (for ex using cell phones like texting, talking. or doing any activity which diverts driver mind from safe driving)
- Visual Distraction:-taking your eyes off the road(for ex adjust radio, texting on phone)
- Cognitive Distraction:-taking your mind off of driving(for ex talking to a person).

Keywords: Analysis, Investigation, Research.

I. INTRODUCTION

Drivers can get distracted on the road easily by various phenomena like using mobile phones, operating the infotainment system and getting into conversation with co-passengers and several times getting distracted can result in fatal accidents. With several advancements in technology, it has become easier to use technology based solutions in real time. The integration of ADAS (Advanced Distraction Assistance System) in vehicles is getting popular and enhances the safety of drivers and passengers on the road. This solution that detects whenever the driver is getting distracted can be integrated into ADAS to help prevent any fatalities due to distracted driving.

II. METHODOLOGY

Data Pre-processing

We took the StateFarm dataset which contains snapshots from a video captured by a camera mounted in the car. The training set has image samples with equal distribution among the classes.

There are 5 classes of images.

1. "C0": "safe driving",
2. "C1": "texting - left",
3. "C2": "talking on the phone - left",
4. "C3": "operating the radio"
5. "C4": "reaching behind"

The images were resized to form a uniform training data set. And the images were cropped to reduce the scope

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of unwanted feature learning for the models. And the images were flipped to suit the Indian driving style.

III. MODELING AND ANALYSIS

Images are resized to 64*64 coloured images for training and testing purposes. Following feature extraction techniques are applied LBP, HOG, color Histograms, KAZE, SURF. The result of feature extraction can be visualized in figure 2. Normalization is performed over the extracted features. Dimensionality reduction techniques like PCA and LDA are used to reduce the dimensions and avoid 'Curse of Dimensionality'. For deciding the n components of PCA, variance-components graphs are used(Figure 3). All the features are stacked together to get complete image representation and ML algorithms are applied to obtain the accuracy.

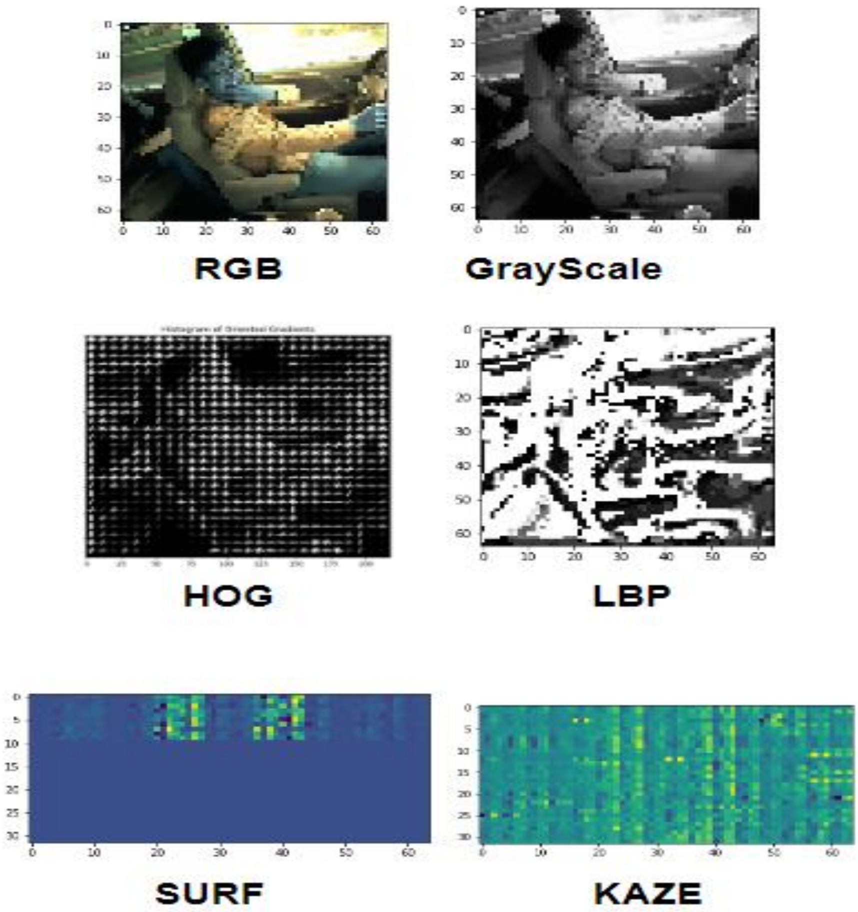


Figure 1: 3D view of building.

IV. RESULTS AND DISCUSSION

The results for each of the models trained using the transfer learning are presented below using the graphs for training accuracy and training loss.

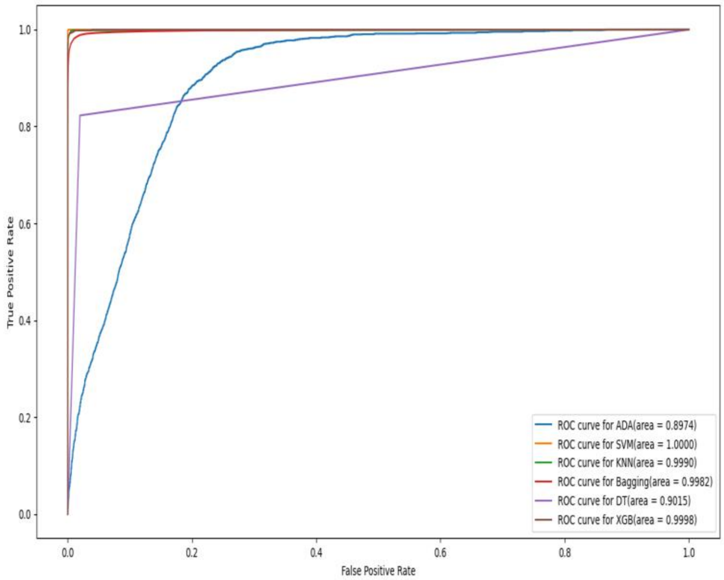


Figure 2: VGG16(Font size-10)

Table 1: Hyperparmeter Tuning

Model	**Optimal Hyperparameters**
DT	criterion = 'entropy', max-depth = 20
SVM	C=10 and kernel='rbf'
KNN	n-neighbours = 5
XGB	max-depth = 6, eta = 0.5
Bagging	n-estimators=40
Adaboost	n-estimators=200

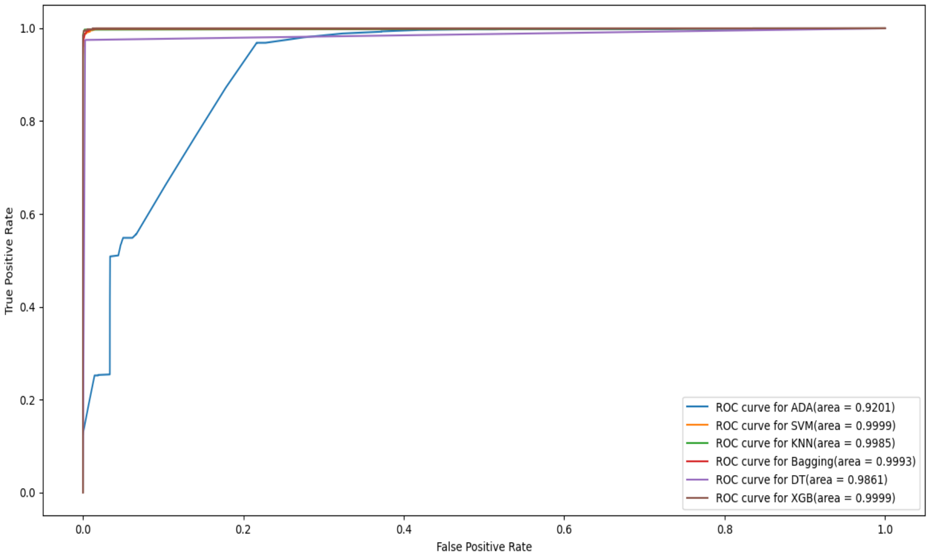
Table 2: PCA

Model	**Precision**	**Recall**	**F1 Score**	**Acc**
DT	0.8221	0.8213	0.8214	0.822
SVM	0.9973	0.9973	0.9973	0.997
KNN	0.9872	0.9870	0.9870	0.987
XGB	0.9856	0.9849	0.9852	0.985
Bagging	0.7927	0.7848	0.7861	0.789
Adaboost	0.7197	0.6957	0.7010	0.693

Table 3: LDA Model

Model	Precision	Recall	F1 Score	Acc
DT	0.9753	0.9752	0.9751	0.974
SVM	0.9881	0.9876	0.9876	0.987
KNN	0.9922	0.9924	0.9923	0.992

XGB	0.9912	0.9912	0.9912	0.991
Bagging	0.9825	0.9826	0.9825	0.982
Adaboost	0.5160	0.5785	0.5191	0.574



V. CONCLUSION

The study showed that image processing is a better technique to control the state change of the traffic light. • It shows that it can reduce the traffic congestion and avoids the time being wasted by a green light on an empty road. • As an extension of this work, we are working towards lowering the number of parameters and computation time. Incorporating temporal context may help in reducing misclassification errors and thereby increasing the accuracy. Also, in future, we wish to develop a system that will detect visual and cognitive distractions as well along with manual distractions. conclusion.

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