Distracted Driver Detection

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***Abstract*—With an alarming increase in the rate of traffic accidents recently, studies are conducted to analyze the situation in depth. Various computer vision techniques were used to study the images of driver showed that most of these accidents were due to driver distractions. Through this report, we present the result of classifying the type of distraction. The outcome of CNN approaches suggest that Resnet50 was a suitable model that outperformed the other pre-trained model with features extracted from the same deep convolutional network. .**

***Index Terms*—computer vision, models, classification, convolutional networks**

I. Introduction

A Camera is mounted on the car dashboard that captures real-time images of the driver. The dataset is taken from State farm distracted driver detection competition on kaggle. A classification output of the ten different postures are shown below. For the problem, we used Convolutional Neural Network architecture ResNet50 for classification by detecting face and hand features. However, we did face computational complexity and memory allocation issues which we overcame by reducing the size of the images in order to increase accuracy for autonomous driving.

Fig. 1. Different classes

II. Literature Survey

Neural Networks provide an architecture wherein the interconnected layers which have some initial weight, updates these weights as networks gets trained. It indicates that the model has learnt the features of the dataset. This applies to the case on CNN where the hidden layers are used for training the model. The works by Bhakti Baheti *et al.* [1] studies the VGG16 architectures and uses it for distracted driver detection. Karen Simonyan *et al.* [2] also presented how CNN could be used for large scale image recognitions using 16-19 weight layers. The report thus attempts to use an architecture subject to Deep convolutional network approaches.

III. Implementations

Some of the most common architecture of CNN are VGG16 and ResNet. We have applied ResNet50 pretrained model on our dataset for classification. ResNet50 is an ANN(Artificial Neural Network) that is 50 layers deep. A pre-trained version of this network is loaded from ImageNet database. Fastai library is used to implement model using cnn learner function. High resolution input images are scaled down to 200*200 pixels to reduce training time. The model runs 600 epochs over dataset and computes training and validation loss for each epoch. Based on comparisons between the predicted and output value, we measure model's accuracy.

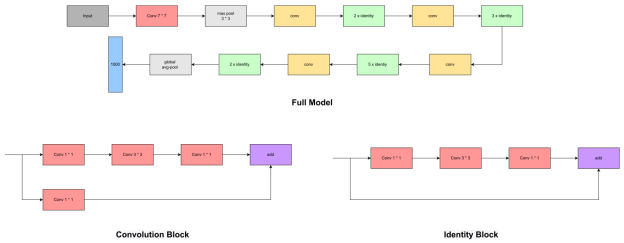

Fig. 2. Pictorial Representation of ResNet50 model

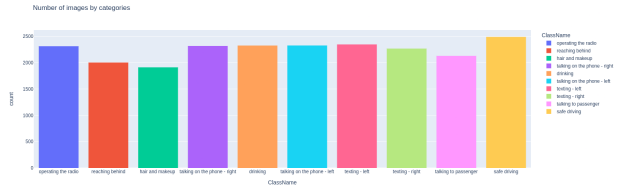

Fig. 3. EDA Results: Distribution of data among various classes

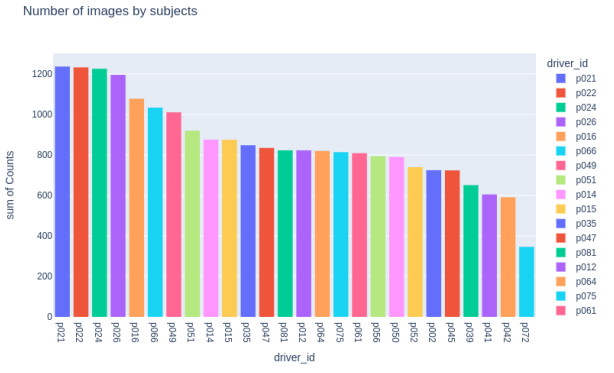

Fig. 4. EDA Results: Distribution of images among 17 drivers

IV. Results

These Results are presented using accuracy metrics. We have implemented transfer leaning by finetuning the last layer of resnet-50. Size of our input images is 200 pixels. It first presents a Confusion metric depicting how classes are correlated. A confused class metric is used to plot misclassification. A plot of loss v/s epoch is shown below that depicts losses after each of 250 epochs.

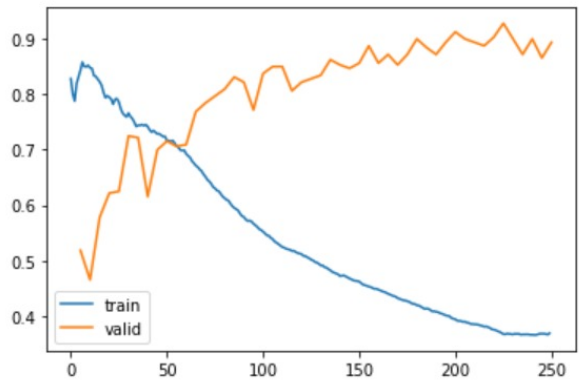

Fig. 5. Graph of loss v/s epoch

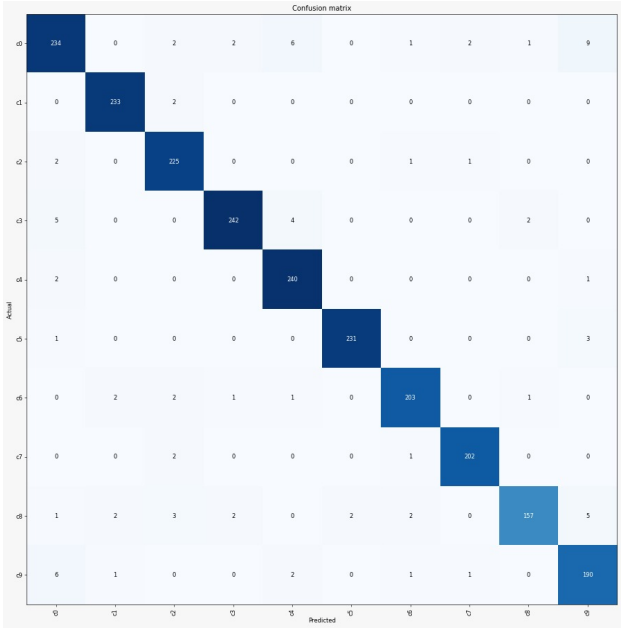

Fig. 6. Confusion Metric - Heatmap

V. Conclusion

The aim of this project is to explore different approaches to detect the distracted driver with high accuracy and low system resource usage. The main focus till now was to study the dataset with proper EDA and perform some implementation of convolutional neural network. Current results are generated using pretrained models to get a headstart in implementing the code.

VI. References

[1] B. Baheti, S. Gajre, and S. Talbar, "Detection of distracted driver using convolutional neural network," in 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), 2018, pp. 1145–11 456.

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[3] P. Canuma, "Image classification: Tips and tricks," Nov 2021. [Online]. Available: https://neptune.ai/blog/ image-classification-tips-and-tricks-from-13-kaggle-competitions