Distracted driver detection

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Introduction

- 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 drivers showing that most of these accidents were due to driver distractions.

- Through this project, our goal is to predict driver's distractions through classification notify them in order to control incidents.

About the project

- According to the CDC motor vehicle safety division, one in five car accidents is caused by a driver who is texting, seemingly enraptured by social media, or in a lively hand-held conversation on their phone. Sadly, this translates to *425,000* people injured and *3,000* people killed by distracted driving every year.

- We can improve these alarming statistics, by testing whether dashboard cameras can automatically detect drivers engaging in distracting behaviors. Given a dataset of 2D dashboard camera images, *we classify each driver's behavior*. Are they driving attentively, wearing their seatbelt, or taking a selfie with their friends in the backseat?

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

Literature Survey

- K. He, X. Zhang ***[1]***
  - residual framework to train deeper nets
  - evaluated 152 layers deep net on ImageNet
  - had 3.57% error on the ImageNet test set
- Karen Simonyan ***[2]***
  - used CNN for large scale image recognition
  - increase in classification with dropouts
- Bhakti Baheti ***[3]***
  - studies the VGG16 architectures
  - used regularization to improve performance (96.31% accuracy)

Our Approach

Dataset

StateFarm's dataset available on kaggle, providing images of 10 different classes of distraction

EDA

Plotted various visualisation to build the intuition about the dataset

Pre-Processing

converted the images to lower dimension for faster computation

Model Architecture

using transfer learning We have used ResNet50 pre-trained model

Predicting Results

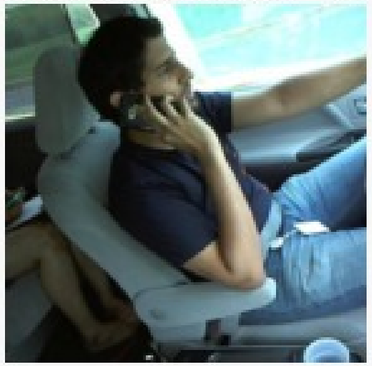
Achieved an accuracy of 98% (overfitting)

Fine tuning

By changing the parameters of the model

Types of Distraction

talking on the phone - right



texting - right

texting - right

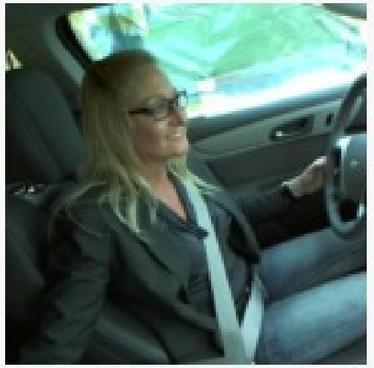
hair and makeup

talking to passenger

safe driving

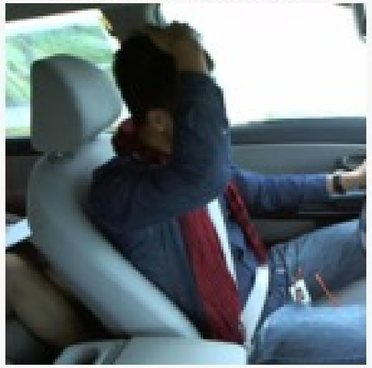
drinking

reaching behind

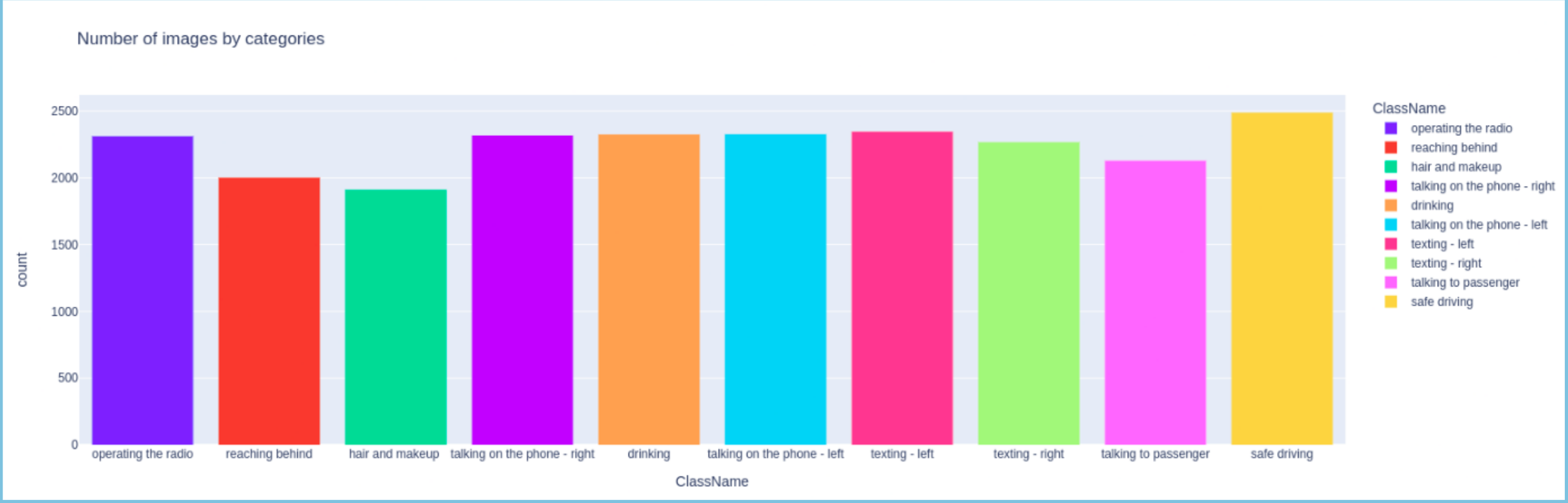


talking to passenger

hair and makeup

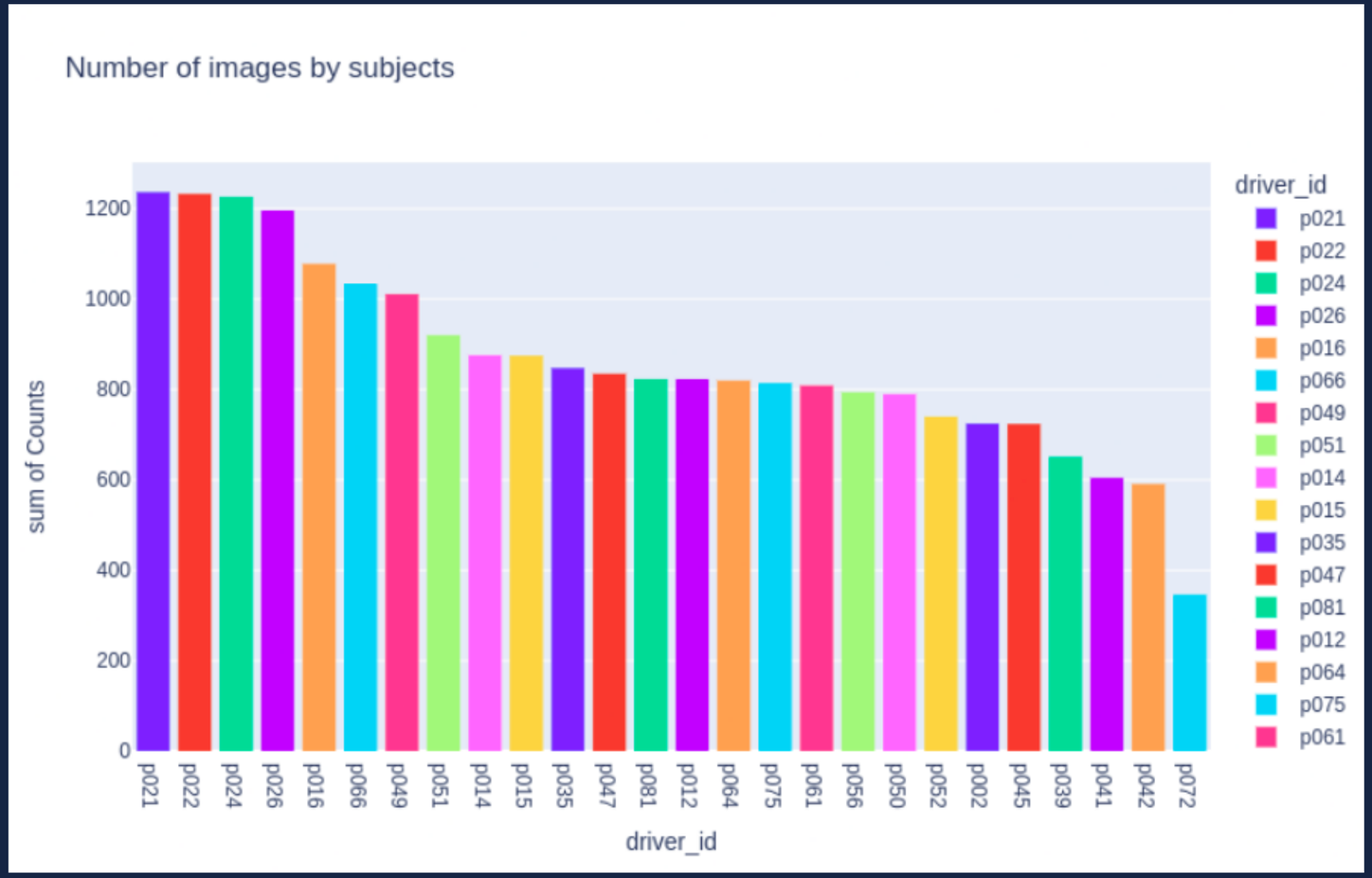


Exploratory Data Analysis



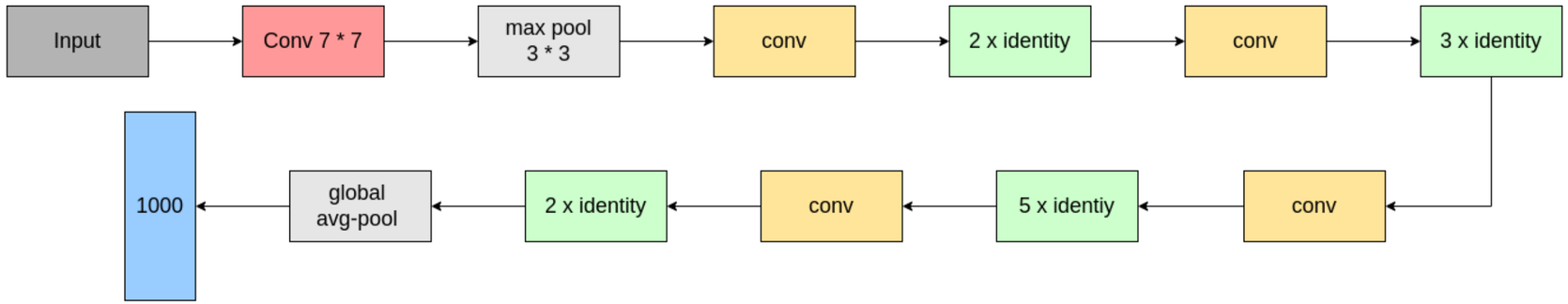
From this, we could infer that the dataset is balanced in terms of the type of distraction

Explorative Data Analysis

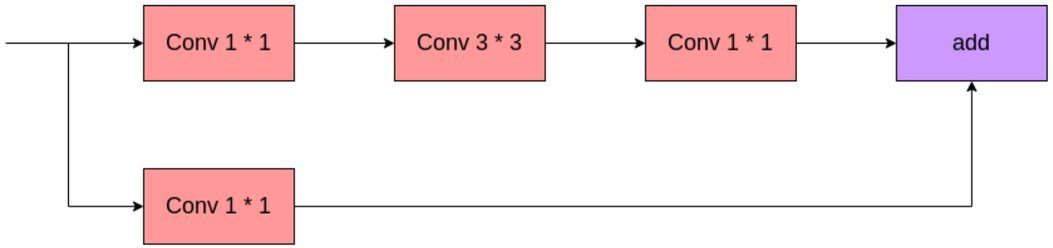


From this, we could infer that there is some imbalance in terms of the driver (id)

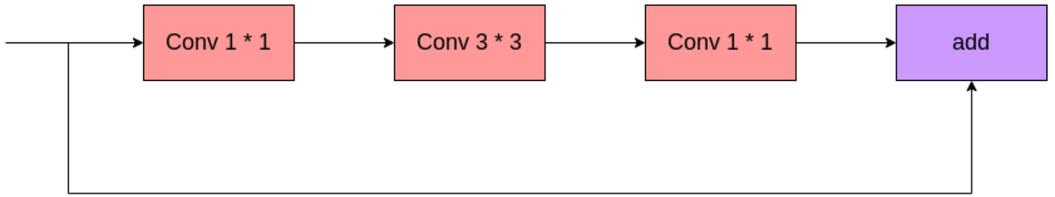
Architecture of the Model



Full Model



Convolution Block

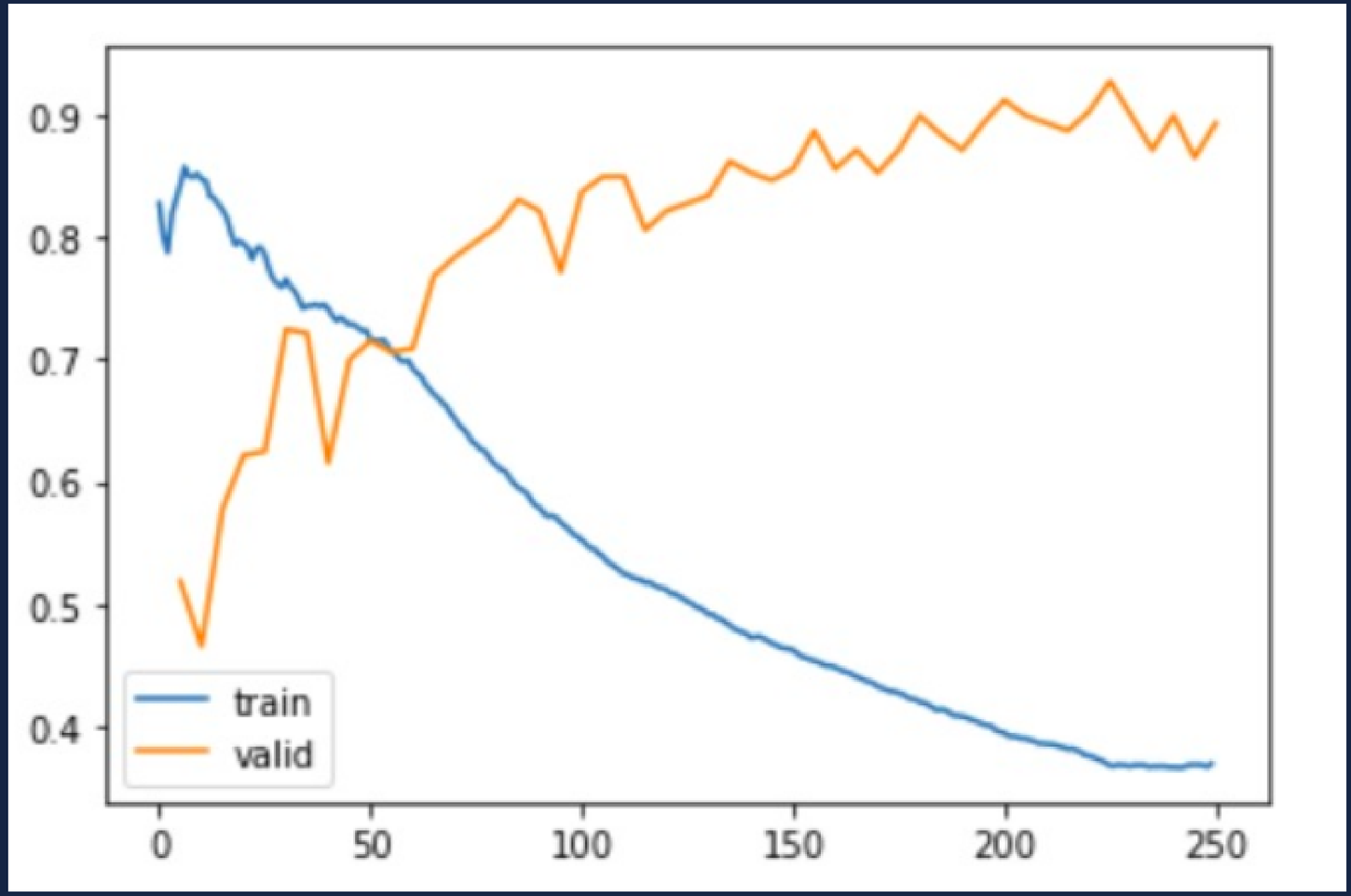


Identity Block

- using the resnet-50 convolution neural network
- series of convolution and identity blocks followed by fully connected layers

Results

- implemented transfer leaning by finetuning the last layer of resnet-50
- size of input images - 200 pixels
- number of epochs - 250



Plot of loss v/s epoch

Role of each group member

	EDA	Data preprocessing	Literature Survey	ResNet	VGG
Bhavya	✔	✔		✔	
Mananshi		✔	✔	✔	
Nandini	✔		✔		✔
Vinay		✔		✔	✔

Future work

- We will try to avoid overfitting by:
  - using cross-validation
  - performing data augmentation
  - using different implementations of transfer learning
- We will explore deeper networks like VGG-16 to further improve accuracy
- Based on the information we have about data, we will perform a transformation on input images that can better handle the complexity of the problem

References

[1] K. He, X. Zhang, S. Ren, and J. Sun, “Deep residual learning for image recognition,” in Proceedings of the IEEE conference on computer vision and pattern recognition, 2016, pp. 770–778.

[2] K. Simonyan and A. Zisserman, “Very deep convolutional networks for large-scale image recognition,” arXiv preprint arXiv:1409.1556, 2014.

[3] 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.

[4] “State farm distracted driver detection.” [Online]. Available: https: //www.kaggle.com/c/state-farm-distracted-driver-detection

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

Thank you!