

PREDECTING BUS FITNESS USING CNN [PBFUC]

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled “PREDECTING BUS FITNESS USING CNN [PBFUC]”, submitted by **Hirak Bose, Md Mosharof Hossen** and **Rakibul Hasan** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 3-June-2021.

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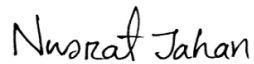
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Nusrat Jahan, Sr. Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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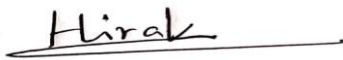
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ABSTRACT

PBFUC (Predicting Bus Fitness Using CNN) may play a great role to reduce traffic accidents, classification of bus condition. Giving safe roads to people and overcoming from the rate of accidents due to fitness of bus, for all the reasons Bus Fitness Prediction system is essential. We traced that issue of road accidents and settled us to work for reducing road accidents. The most eminent model like Convolutional Neural Network (CNN) is good for classification. In this paper, we proposed a model of Convolutional Neural Network (CNN) for classifying fitness of buses. To classify the condition or fitness of buses we followed two parts – one is feature extraction and another one is classification. These two parts performed good via CNN in our system. In this system, we worked on 2 classes to classify bus fitness- one class is fit buses and another one is unfit buses. So, CNN model played a great role to find a good accuracy and build our system perfectly. We split our total data as 80% for training dataset and 20% for testing dataset there after we achieved evaluate accuracy 80.93% for our CNN model and 84.56% for training accuracy.

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CHAPTER 1

Introduction

1.1 Introduction

A developing country like Bangladesh faces serious problems of road accidents, it has an immensely high road accidents mortality rate. Many people over whole the country lose life and become life time injured by road accidents and the number of them is numerous. In 2019, dimension of accidents across the country is 5,516 and leastwise 7,855 people lost their lives and 13,330 people got injured by road accidents. In 2018, 5,514 road accidents occurred across the country and at least 7,221 people lost their lives and 15,466 injured by road accidents that year [1]. There are many reasons for happening accidents these are – Overtaking, unfit Vehicles, unawareness of passengers and pedestrians, unskilled drivers etc. By analyzing all the reasons, we found that one of the components for happening road accidents across the country is unfit vehicles movement. In addition, responsible for accidents maximum unfit vehicles are unfit buses. Many of the unfit buses are modified without any rules, they enriched the amount of seats improper way and being another reason for increase the number of deaths by road accidents. On July 2015, at Mulibari two unfit vehicles crashes each other and 18 people were killed and 40 people were injured by this accident [2]. It's proved that, how fatal can be unfit vehicles are. On October, 2014 another crash happened at Boraigram upazila of Natore, 37 lives were lost and 40 people injured by unfit two unfit buses [3]. So, it wouldn't be wrong if we say unfit vehicle a mobile bomb that might explode any time. This type of vehicles emits disgusting smoke and add environment pollution that's are responsible people's health danger. Therefore, it is harmful for environment and road safety simultaneously. A large number of unfit buses have been playing on different type of roads without any validation. The Government and transport administrative body have settled many provisions to erase a huge number of unfit vehicles along with unfit buses from roads. But owner of the unfit vehicles has no care about this.

By speedy growth of new technology, many innovative ideas have been coming forward to reduce road accidents and strict traffic rules. In the field of image processing technology, some works already have done on the topics such as- Drowsiness detection system [4], Traffic sign recognition System [5] and so on. Drowsiness or fatigue is a major cause for happening road accidents. Same as traffic rules is a requisite portion for giving safe road to people where traffic signs are components of traffic rules. Besides, following traffic signs unnecessary traffic jam and accidents occurred generally. For the sake of that, many researchers have been working on reducing road accidents by image processing technology.

The principal achievement of this paper is classification of bus fitness for reducing the danger of road accidents across the country. We worked on a system with an algorithm like CNN which helped performing a prominent proposal for classifying fitness of buses. Which will be helpful for detecting unfit buses by image processing technology. In order that, a crucial issue of our country like road accidents which take lots of lives every year will decrease.

In our proposal, we tried assemble security camera and bus to classify fit or unfit bus. Security camera should be embedded in the key points of traffic signals that would take pictures of bus and system would work on the obtained pictures of bus. If bus is fit then a message will give traffic authority either they will take a decision against the bus owner. The system is done using image processing algorithm. The repercussion appears like fit or unfit bus drew on outcome.

Here is a simple block diagram to depict all awaited proposal of ours –

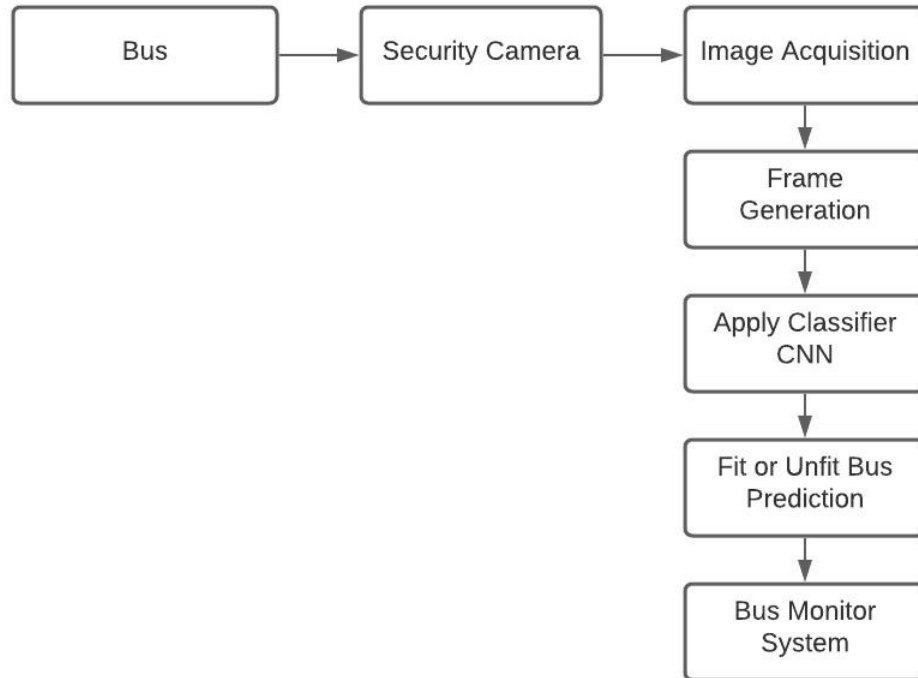


Figure 1.1.1: Simple block diagram of PBFUC

Via favor of this diagram, we tried to exhibit the proposal. In our system, image is captured from bus using security camera. Afterwards, data classification algorithm was created to predict fitness of buses. At last, authority can get a chance to take some steps against unfit buses.

1.2 Motivation

Road accidents has become a national trouble. As citizens, we also have some duties to ensure safe road. So, we decided to work on fitness of buses which is another reason for road accidents. The main aim of our project is providing a system on classifying fitness of buses. It will be an easy way for authorities to classify unfit buses. For accomplishing our prospect, we had to research on Artificial Intelligence

(AI) and Machine Learning (ML) fields. By degrees, we got some ideas of classification methods to classify fitness of buses from it using large amount of image dataset. Finally,

we reached on a superb idea – it is “Predicting Bus Fitness Using CNN”. And our proposal is fully connected with techniques of machine learning.

1.3 Rational of the Study

Our idea is new and no works have done on this yet. Basically, we go for a classification method which is CNN (Convolutional Neural Network). We have also a good concern to keep good accuracy of our project. There are three levels of image classified: first one is select training areas; second one is generating signature file and last one is Classify. Huge number of training and testing data works for enriching good accuracy. In the system, images for data should be collected from valid sources. And this system will be a good way to decrease road accidents from our country.

1.4 Research Questions

When we were conducting this research, we met numerous obstacles. For the purpose of determining a realistic, effective, and appropriate solution to the problem. The researchers would like to pose the following questions in order to uncover the perspectives and consequences of this problem:

- Usually comes some general questions like – what type of classification technique we used to classify?
- How can we predict whether a bus is in poor working condition?
- Is there a way to make safe roads by using this way?
- Will it be a helpful way to reduce accidents?

1.5 Expected Outcome

Our project’s outcome is purely prim and specific which we expect. This project will play a significant rule to decrease road accidents by unfit buses. Principal benefits available in this project for Traffic authorities, government and normal people also. Traffic authorities will easily detect fitness of buses which they can check and take proper actions. And also, they can category between fit buses and unfit buses. Government will beneficial because of the smaller number of road accidents. And normal people will be benefited by getting safe roads. So, our project will work on keeping safe roads actually.

1.6 Project Management and Finance

For doing our project we collected all the raw data from different bus stations. So, we spent some money for using transports to collect data. If traffic authority installs our system on roads there will be some cost for using Security Camera, PC, maintenance etc.

1.7 Report Layout

Chapter one exposed many things such as introduction, motivation, several questions which came from our research, anticipated result of this research and last thing is whole the formats of this report.

Chapter two goes with many things- related works which are similar with our proposal and same are. Chapter two illustrated comparative analysis, many opportunities of our research and exceptions of our paper.

- Chapter three provided theoretical part of our classification algorithms and whole works. Shows requirements of this kind of work, way of data collection, illustrated how to work this system and statistical part of our system.
- Chapter four showed result, evaluation accuracy, converse of all over result.
- Chapter five discussed influence of our system on environment, society. Main purpose of this system is illustrating how much good or bad our system for environment and society.

It also discussed about plan of sustainability.

And last one is the chapter six, which provided gist of the total work and ending speech and future works scope of our study.

CHAPTER 2

Background

2.1 Terminologies

We'll discuss relevant works, study summaries, and research issues in this section. In the related works part, which is clearly pertinent to our study, we will review other study papers, their works, and correctness. In the research summary section, we will highlight the highlights of our related work. We will explain how we increased the accuracy level in the challenges section.

2.2 Related Works

There are no exact research papers on this topic beside our paper. Although, we found some similar research paper as us.

In 2015, Qiling Jiang et al. proposed deep neural networks-based vehicle detection. They used window-based detection method and converted images data to superpixels. For classification they used Deep Neuro Network (DNN) based classifier. They got 85% accuracy [6]. In 2018, LI Suhao, LI Guoquan et al. proposed a system which is based on deep learning for detecting Vehicle type in traffic scene. They used Fast-RCNN network for detection. They made total dataset of 3 classes which are car,minibus,suv and their training sets constantly 3358,658,804.Highest accuracy of them – for car 84.4%, minibus 83.8%,Suv 78.3% [7]. In 2018, WEI CHEN, QIANG SUN et al. worked on a novel model for Vehicle Classification which built on AdaBoost algorithm and Deep CNN. And they got the highest accuracy 99.50% with the smallest storage resources 25mb of test data [8]. In 2020, Nusrat Jahan, Saiful Islam et al. proposed CNN based Real-Time Vehicle Classification. They used CNN algorithm and got 97% accuracy [9]. In 2017 Kuan-Chung Wang, Yoga Dwi Pranata et al. proposed Automatic Vehicle Classification. They used center strengthened convolutional neural network and got more than 97% accuracy [10]. In 2020, Rateb Jabbar, Mohammad Shinoy et al. worked for an android application which based on Driver Drowsiness Detection Model. They used CNN for classification and achieved 83.33% accuracy for all categories [11]. In 2019, Bilel Benjdira, Taha Khursheed

et al. worked on Car Detection. Because of this Detection system they used their Unmanned Aerial Vehicles. In their paper, they managed two state-of-the-art CNN algorithms and one of these is R-CNN, another one is YOLOv3. And they got 99.07% accuracy with YOLOv3 algorithm [12]. In 2020, Seda Kul, Ahmet Sayar et al. proposed a classification of Vehicle Type in Real-Time. In this paper, they used SVM and CNN algorithm [13]. In 2018, Ovidiu Csillik, John Cherbini et al. used CNN for identification of Citrus Trees. They got overall accuracy 96.24% from total 12,000 train data [14]. In 2014, Prem Kumar Bhaskar, Suet-Peng Yong et al. discussed Vehicle Detection and Tracking Method which is fully based on Image Processing. They developed a unique algorithm by using Gaussian mixture model and blob detection methods. They got 91% of average accuracy [15]. In 2018, Yohei Koga, Hiroyuki Miyazaki et al. proposed a method of Vehicle Detection. Their classifier is CNN based and they applied Hard Example Mining to select training data. And they got 99.986% last validation accuracy [16]. In 2018, Foo Chong Soon, Hui Ying Khaw, Joon Huang Chuah et al. worked for Vehicle logo recognition. They selected hyper parameters optimization of CNN to work with training and testing data. They used total 14,950 data for training and testing sets and got 99.1% accuracy [17]. In 2018, Jorge E. Espinosa, Sergio A. Velastin et al. worked on a model which is Motorcycle detection and classification. They used R-CNN for detection and classification. Total 7500 data used for training and testing and achieve 92% accuracy result [18]. In 2017, T. Vesselenyi, S. Moca, A. Rus et al. proposed Driver Drowsiness detection system. They used ANN for detection. Their total data are 200 images and achieved 100% classification result [19].

2.3 Comparative Analysis & Summary

The final step in the Machine Learning process might be deep learning. The structure is made up of Artificial Neural Frameworks. In the same way that human minds fill in the gaps, neural frameworks do the same. Convolutional Neural Network (CNN) is a well-known system in the field of significant learning. To convolve learned features with input data, a CNN employs 2D convolutional layers. CNN is also good for processing two-dimensional pictures. A CNN,

- Takes an image as input and processes it.
- For creating a feature map applies many different types of filters.
- Because of increasing non-linearity applies a ReLU function also.

- A pooling layer is integrated in each feature map.
- The pooled photographs are combined and flattened into a single long vector.
- A fully interconnected ANN gets the vector.
- The network is used to process the features. The final completely connected layer allows us to vote on the classes we're interested in.
- Uses forward and reverse propagation to train for a large number of epochs.

This approach is done until we have a well-defined neural network that has been trained with weights and feature detectors.

2.4 Scope of the problem

There has not been any work on this topic so we can say that there have many scopes to update this system. This system will detect fitness of buses and traffic authorities will be beneficial by this system for checking everything of buses internal and external parts. Basically, we focused on external part of buses for detecting fitness which is external looks. So, researcher can make this system more effective by combining internal and external parts of buses in future. And also, any researcher can extend dataset for getting better results.

2.5 Challenges

Collecting and processing the dataset are the main challenges of this work. Specially, we faced lots of new challenges for collecting the data. We visited lots of bus stations to get data. It was hard dealing with the dataset. For cleaning and normalizing dataset, we used different type of steps and methods. After training all the data with numerous layers with different size's epoch took such a long time in our machine. So, keeping a good patience for getting the final output was mandatory for us. There was no other dataset or research related to our study, thus it was difficult to manage and go forward in order to get the highest level of accuracy in our results.

CHAPTER 3

Research Methodology

3.1 Research Subject & Instrumentation

The term "research area" refers to a certain area or issue that has been explored and explored for the purpose of clarifying concepts. Other causes include creating the model, collecting data, analyzing data, and training the model, in addition to implementation. The instrumentation part, on the other hand, refers to the technology and procedures we used. We employed a Windows platform, Python language, and a variety of tools such as NumPy, matplotlib, and TensorFlow to complete our research. Training and testing are also crucial aspects of completing research. As a result, we used Jupyter Notebook for training and testing.

3.2 Data Collection and Procedure

Information augmentation and information planning are the two processes in data handling. When we bargain with push information, success is dependent on pre-processed information. Information should be preprocessed to improve the precision of the outcome. As a result, we might say that it is the most basic barrier for such inquiry-based activity. Data collection is good for increasing the depth of the system. Because Raw data creates an original vibe of real-life work. After collecting raw data, data processing and augmentation play a great role to make a proper dataset. Few reasons can work behind this as like – increasing the number of data and decreasing the pixel size of data. It is difficult to work with large pixel size of data. Because for implementation pc refers decent pixel size of data so that it can't make extra burden to pc. Large pixel's data take long time in. We fixed 128x128 pixel size for our data. In 3.1 table our data sample are showed.

Fit Bus	Unfit Bus
	
	
	
	

Figure 3.2.1: Fit and Unfit Buses

After splitting data into two class as - fit bus and unfit bus, we went for the data augmentation. Which is very important thing to increase the size of dataset. By using augmentation, we can get varieties of data in our dataset. And better prediction accuracy comes with huge data and variety of training data. That's why augmentation plays an important rule role to build any prediction model. This method can alleviate overfitting problem also. Many techniques available for data augmentation. We used also some of them and these are –

- rotation_range – we fixed the value here 40 so that by this range it could rotate our data and gave us new type of data.
- width_shift – we used this one for getting horizontal shifts data.
- height_shift – we used this one for getting vertical shifts of data.
- shear_range – This one used for the shearing transformations on our data randomly.
- zoom_range – This technique for zooming our data in order that we get a new variety of our data.
- horizontal_flip – we used this technique so that it can flip our data horizontally. We used horizontal_flip - True that means we fixed it for flipping. In normal, it is always false.
- fill_mode – this augmentation technique is used usually for working with pixels which are recently created just.

We used total 7 techniques of augmentations. There are some color techniques also which we didn't use our system. Here is our coding part of augmentation –

```
In [13]: datagen = ImageDataGenerator(
        rotation_range=40,
        width_shift_range=0.2,
        height_shift_range=0.2,
        shear_range=0.2,
        zoom_range=0.2,
        horizontal_flip=True,
        fill_mode='nearest')
```

Figure 3.2.2: Code of Data Augmentation

A Raw data of our dataset –

Here is an example of data augmentation which we applied on our work -



Figure 3.2.3: A sample of our raw data

Here is an example of data augmentation which we applied on our work -

After Augmentation technique we got –



Figure 3.2.4: After Augmentation

3.3 Statistical Analysis

We gathered data from the real world to complete this study. The data set was then divided into training and testing portions after being classified into classes. To propose a CNN model, we used 11665 images. We considered various classifications, and the unfit class received 5831 images, while the fit class received 5834. The entire dataset was partitioned for training and validation purposes. We used 80% of the data for training and 20% of the data for testing to create CNN. There was a total of two classes that worked there. The images of buses were sorted into two categories: fit bus and unfit bus.

3.4 Proposed Methodology

Figure 3.4.1- shows a sample flowchart for our suggested CNN model.

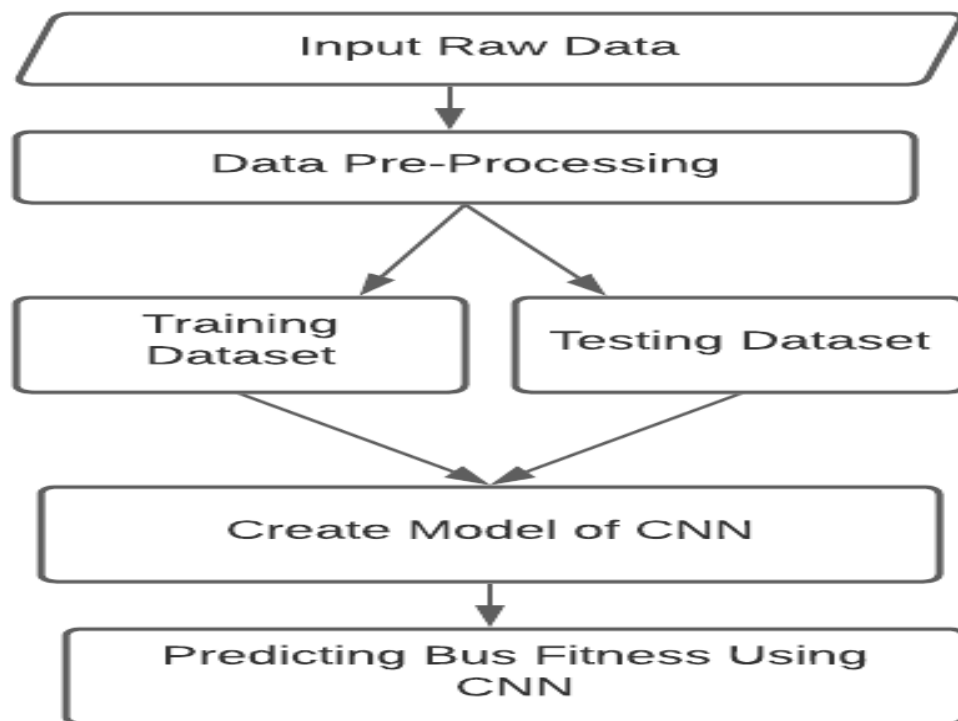


Figure 3.4.1: Flowchart of our model

3.4.1 Convolutional Neural Network

One of the famous artificial field is Computer Vision, evolving day by day for the shake of deep learning. When we talk about Computer Vision then The Convolutional Neural Network comes first. Image Classification, Face Recognition etc are the examples of CNN in computer vision. When we see 3D or 2D pictures first we catch the visual contents of those pictures and send it to the brain lastly, brain give the shape by depending on signal.

CNN came from the same concept. It's an Artificial Neural Network. CNN is the most used algorithm for Image Classification. According to CNN, reading direct image is an easy work. Getting high accuracy is quite possible through this algorithm. It's a milestone network for image classification. A CNN model builds with 4 layers these are –

- Convolutional layer
- ReLu layer

- Polling layer
- Fully connected layer

The Convolutional Neural Network was used to manipulate two photos in 2D format. The first is the input image, while the second is the output image. The equation for a convolution of two functions x and y is as follows: (1)-

$$(x * y)(i) = \sum_{j=i}^m y(j) * x(i - j + m/2) \quad (1)$$

Convolutional layers make with kernel and filter. This layer has ability to extract features from input pictures as first layer. For this assignment of Convolutional layer, it is called feature extractor layer. Convolutional layers contain ReLU to enrich non-Linearity. ReLU stands for the rectified non- linear function. In working with real life data, there are a demand after extracted feature maps move to ReLU layer. Polling layer works on reducing the parameters of input images if images are large. Max polling, one of the types of polling layer, holds largest element of rectified feature map, used in this paper. Edges, corners, feathers are commonly used by this layer to identify parts of the images. Fully Connected Layer or FC layer, feeding the output, used for classify images via using a function like softmax or sigmoid. Class level prediction can be possible by this layer. In figure 3.4.2

Methodology of CNN classification has shown-

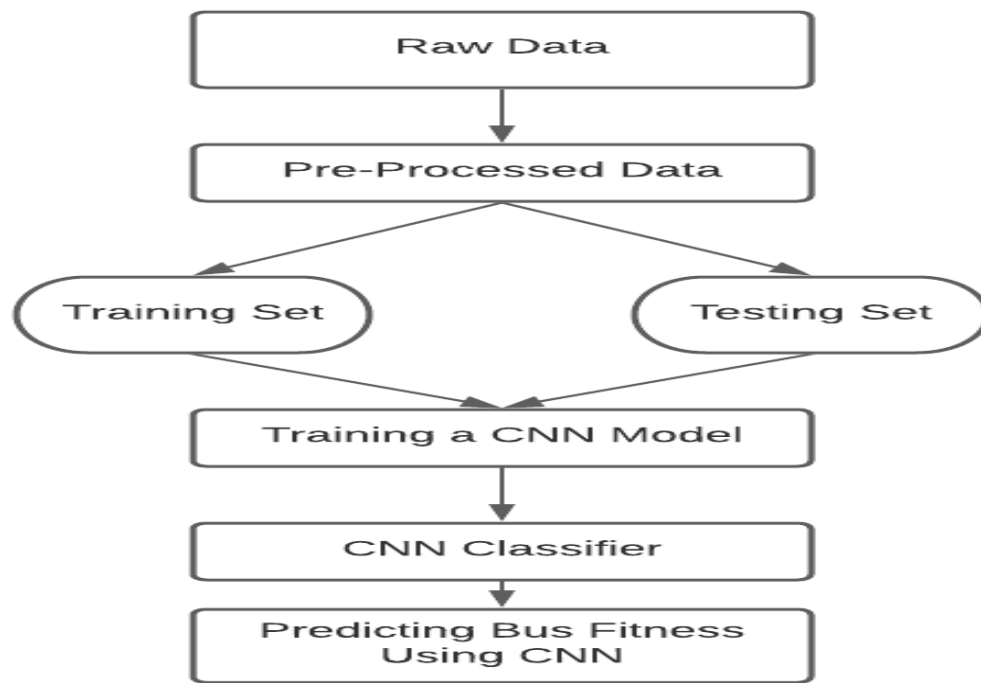


Figure 3.4.2: CNN Classification Flowchart

In order to achieve optimum accuracy, we also used the VGG16 model for our system. This is a model that has already been trained. VGG16 models do not require the same level of complexity as other CNN models. Where VGG16 is used and 16 layers are given, a normal CNN model must consider the number of layers, padding, and other factors. The pool size is 2x2. As a result, it is simple to construct. However, the length of time it takes to run is inconvenient.

3.5 Implementation Requirements

There are some requirements needed for implementation and these are -

3.5.1 Hardware/Software Requirements

First need an operating system. It could be any version of windows or another operating system. I used windows 10 for my research work.

Second need a hard disk because all of program or data is stored there. From 500gb up to more are ok.

Ram is another important component. 4GB is good for work whereas, I used 8GB.

3.5.2 Developing Tools

- Python Environment
- Jupyter Notebook

CHAPTER 4

Experimental Results & Discussion

4.1 Experimental Setup

Our proposal framework finished by a pc with Core-i4,8250U processor has speed 3.4 GHz, number of sockets is one and number of processors are 4. Also, it has 8GB of RAM.

For implementation via programming, used python setup in Jupyter Notebook.

4.2 Experimental Result & Analysis

In this section, we discussed about our result which got from our used algorithms – CNN. Through a CNN classification model, we got highest 80.93% testing accuracy and training accuracy 84.56%. Other two classification model like pre-trained VGG16 and another CNN classification did not give good accuracy. Accuracy was less than from the first CNN classification. And result

were - by VGG16 78.30% testing accuracy, 85.43% training accuracy. From another CNN model we got 58.54% training accuracy and 54.12% testing accuracy.

So, we got highest accuracy from the first CNN classification model which we built. VGG16 takes much time to run than our own built CNN model which we built at first. So, there are many positivity for the first built CNN classification as long as its highest testing accuracy. Our second CNN classification model has no good accuracy testing and training both, so it missed the important part of a classification system. It also slows to run as like VGG16. That's why it has no good efficiency. That's why, between three models the first CNN model is best. It has good accuracy along with good efficiency and easy deploying quality. Figure 4.2.1 will illustrate the result comparison between three model which we built for our proposal-

	Training accuracy	Testing Accuracy
CNN Model 1	84.56%	80.93%
VGG16	85.43%	78.30%
CNN Model 2	58.54%	54.12%

Figure. 4.2.1: Result comparison between three model

Where we split our total data as 80% for training and 20% testing data for our all model. Through figure 4.2.2 and 4.2.3 we illustrated the highest accuracy of validation and training and loss of training and validation which we found from the first CNN classification model.

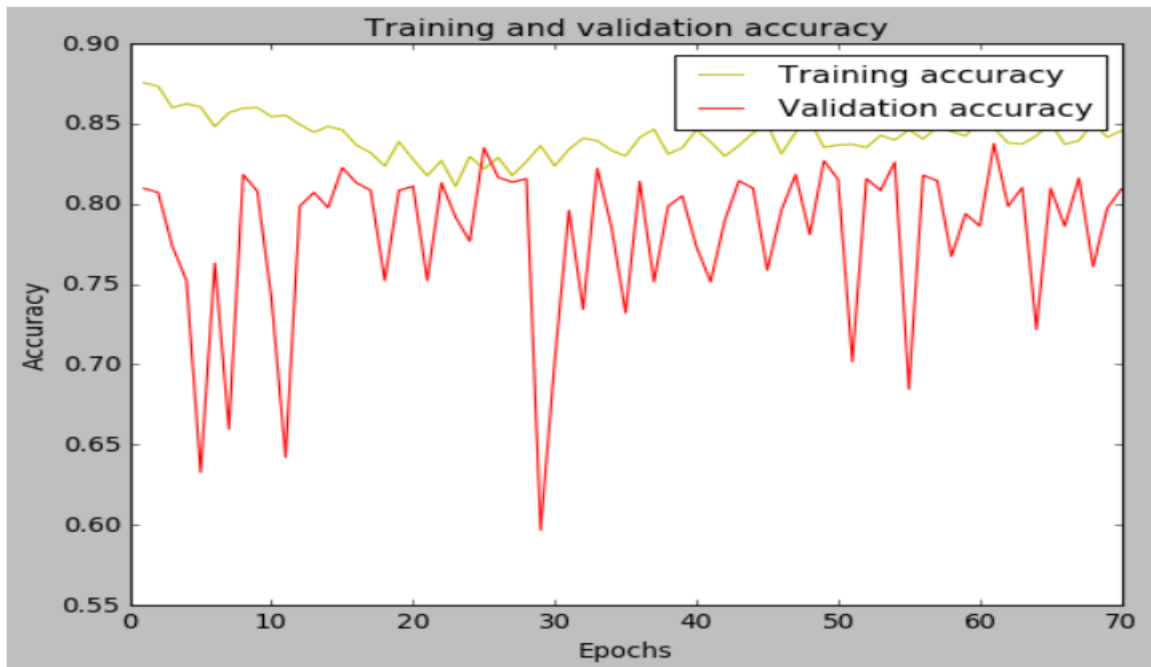


Figure. 4.2.2: Training and Validation Accuracy

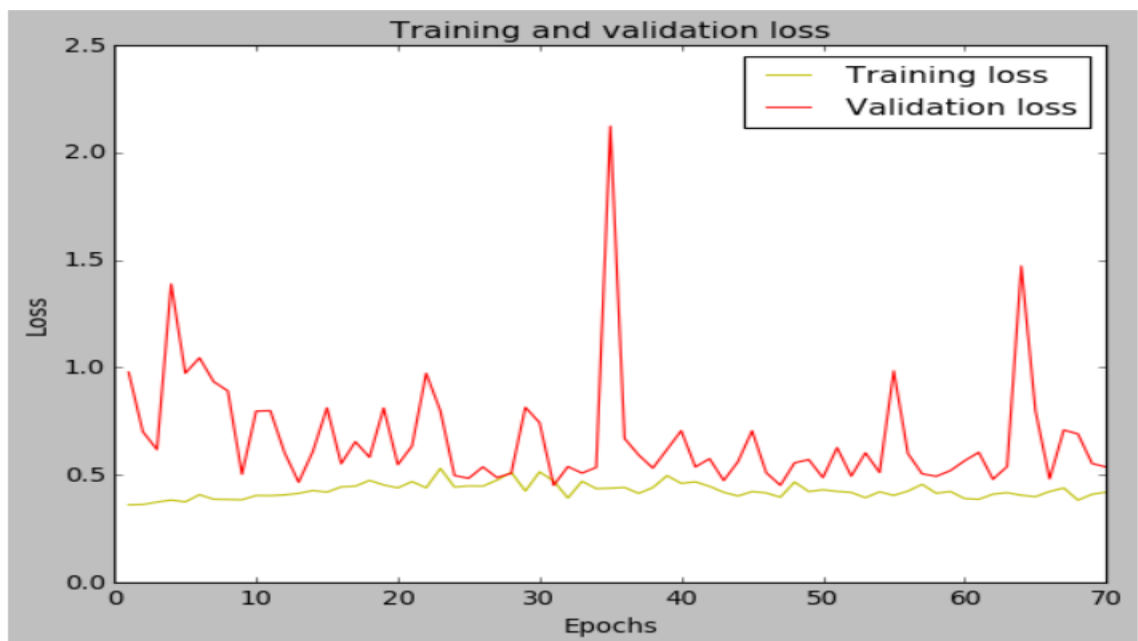


Figure. 4.2.3: Training and Validation loss

For CNN we achieved 80.93% accuracy and split our total data as 20% test data. So, rotation was 80:20. 20% split from total data illustrated our coding method is-

```
X_train, X_test, y_train, y_test = train_test_split(dataset, label, test_size = 0.20, random_state = 0)
```

Figure 4.2.4: Splitting method

At least, we developed our classification system which can predict. Sample prediction is-

```
The prediction for this image is: [[0.8123759]]  
The actual label for this image is: 1
```

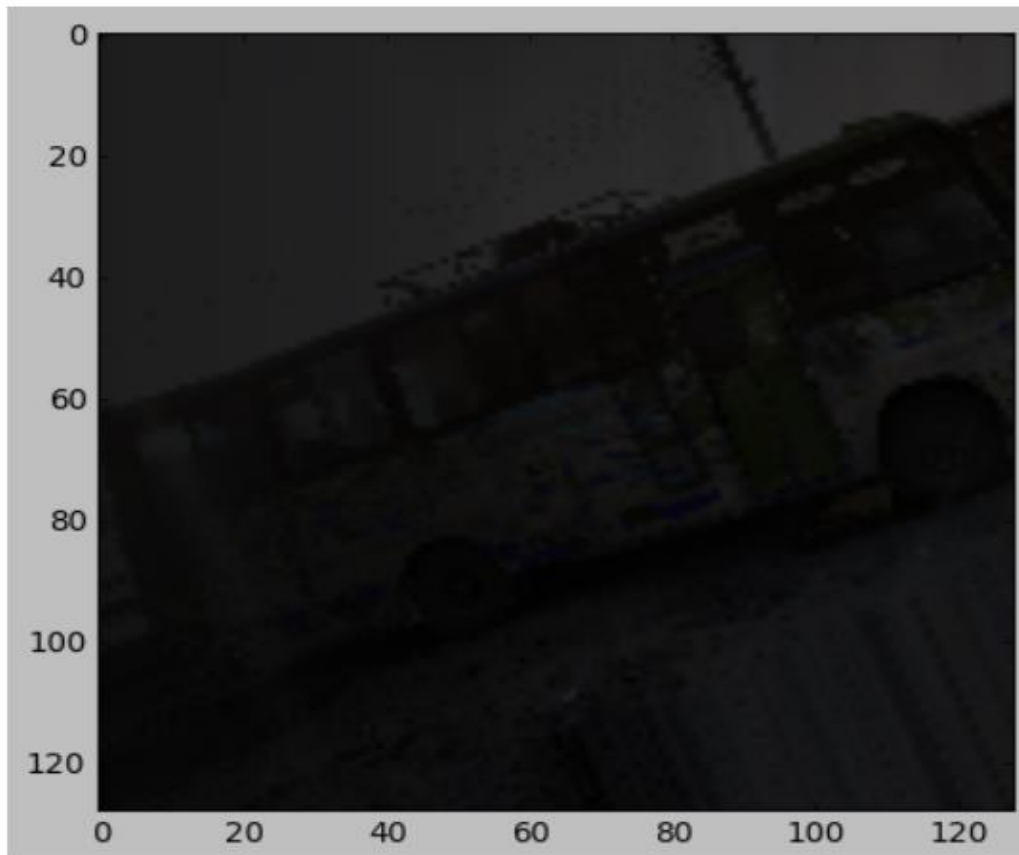


Figure 4.2.5: Predict unfit bus

The prediction for this image is: `[[0.5212107]]`
The actual label for this image is: 0

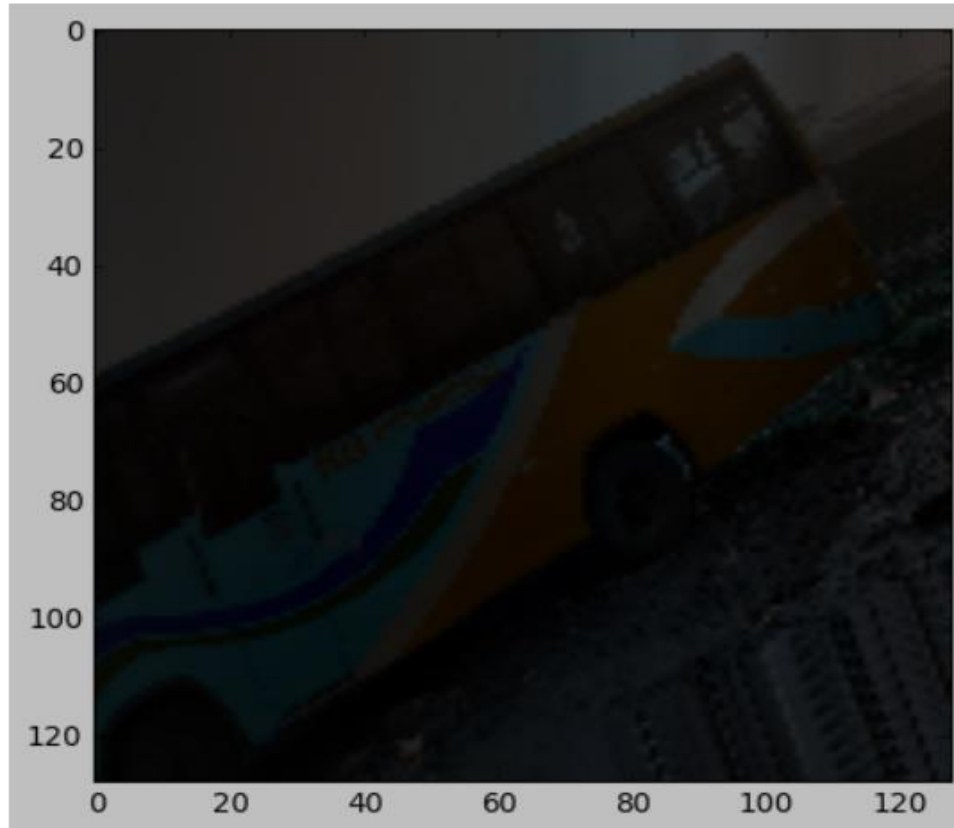


Figure 4.2.6: Predict fit bus

4.3 Discussion

Figure 4.2.4 and 4.2.5 illustrated all the performance of CNN which we applied. And we mention the accuracy level of us. After finishing our proposal study, we got an excellent system. Many researchers have been working with traffic issues to reduce road accidents. And our proposal is unique so we had to build a proper system which gives better solution.

CHAPTER 5

Impact on Society, Environment and Sustainability

5.1 Impact on Society

Science and technology have become an inextricable part of our existence. This period is entirely dependent on science and technology. This study works by determining how to reduce road accidents by predicting bus fitness. Road accident is common stuff in our country, one of the major reasons of accident is unfit buses. This system will be helpful as a detector of fit or unfit buses. And traffic department and government will be benefited via this to reduce road accidents. So, we can assure that this system has a vast impact on society.

5.2 Impact on Environment

The method that we have proposed is beneficial to the environment. Such like maximum unfit buses have no proper mechanical system to stop producing extra nitrogen oxides, carbon monoxide and other pollution which are responsible for air pollution. These unfit buses are pollution contributor. Some of them have no good engine and horns which are main contributor to noise pollution. As our proposed system able to unfit buses so it will be conducive also for reducing noise pollution also. If it comes about impact on environment, we can say that our system has.

5.3 Ethical Aspects

For clarifying this first we need to explain, there are a lot of unfit buses in our country, fulfilled passengers demand. Because, if they don't passengers would face a big problem of transportation. However, it may create a problem for certain time but it will provide them a safe transport to ride and safe road to walk.

5.4 Sustainability Plan

To implement this system in all kind of roads in our country can be costly but it can give a chance of making safe roads by reducing accidents. If one life can save by this system from accidents that will be its sustainability. Because first life matters and worth many things. May it be costly for our country but it can be one of the good ways to stop our vital problem as accident and can save life.

CHAPTER 6

Conclusion, Recommendation and Future Works

6.1 Summary of the Study

We proposed three model for accomplished our project. We had collected many data for this project physically from many places with many obstacles. Some bus drivers or owners of buses were not agreed to allow us for capturing their bus pictures. So, we had to manage them for capturing. After collecting data, we went for data pre-processing. Then, we used one algorithm which is CNN and its three model. Finally, we got a decent accuracy from the one model. Predicting Bus Fitness Using CNN (PBFUC) is an important part of traffics to reduce road accidents. Nowadays there are many kinds of technologies used for reducing accidents. And many research works have been going on this topic. So, by this approach, our proposed system will invent and make a way to classify unfit buses which is our actual goal for reducing road accidents.

6.2 Conclusions

Our study motivated to represent a prediction system of bus fitness that's why we built a system that is Predicting Bus Fitness using CNN (PBFUC). It's a new idea for reducing road accidents. We tried our best to get highest accuracy by CNN classification algorithm. And, we got 80.93% prediction accuracy for 80% training dataset and 20% testing dataset.

6.3 Implication for Further Study

This system proposed only for working with bus. In future, our aim is to include other vehicles for predicting the fitness of them. So, there will be more classes for our predicting system. And we will try to build a classification system from video also. So that it will make more efficient system. A large dataset is an important thing for Image Processing. Because, standard works or systems rely on good evaluation accuracy. And one of the reasons for getting good accuracy is huge amount of data. So, collecting huge number of data is also our aim to produce a system with good accuracy. And we will work to apply several classification algorithms besides CNN algorithm as like- SVM, ANN etc. For identifying which model go better with our proposal and we can illustrate a difference among those algorithms. And we exposed more accuracy from more algorithm's model. In

order to, make our system deeper and more accurate. To provide a better option for reducing road accidents, we will for making it as a cheaper system and easy system to use. So that, maintaining wouldn't be an issue there.

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APPENDICES

Appendix is all about a reflex of the research. We faced lots of obstacles to fulfilled the research work. First one is deciding the methodological way to complete our work and second one is collecting data. We worked with raw data so it was a tough job. And the main feature of our system is classifying the fitness of bus. And build itself as a way to reduce road accidents. So, we are determined that our system **“Predicting Bus Fitness Using CNN (PBFUC)”** will make a positive and effective vibe on users for making safe road.

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