

**AUTOMATIC DETECTION AND RECOGNITION OF OBJECT TO  
HELP VISUALLY IMPAIRED PEOPLE WHILE VISITING  
LIBERATION WAR MUSEUM IN BANGLADESH**

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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 Internship titled “**Automatic Detection and Recognition of Object to Help Visually Impaired People while Visiting Liberation War Museum in Bangladesh.**”, submitted by **Md. Nahiduzzaman Sajeeb** and **Mst. Afsana Akther Ankhi** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as suitable for the partial completion of the requirements for the degree of B.Sc. in Computer Science and Engineering (BSc) and approved as to its style and contents. The presentation has been held on December 2020.

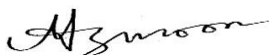
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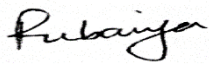
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## DECLARATION

We hereby declare that this thesis has been done by us under the supervision of **Rubaiya Hafiz, Lecturer (Senior Scale), Department of CSE**, and co-supervision of **Subhenur Latif, Assistant Professor, and Department of CSE** Daffodil International University. We also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for the award of any degree or diploma.

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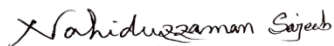
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## **ABSTRACT**

This paper offers an overview of target recognition through grouping of numerous images and machine learning methods for the blind. Our system has been developed based on speech recognition to allow blind people to learn about the various components of the Bangladesh Liberation War Museum. The first poll reveals that most blind people are eager to see what is inside the museum, but the museum has no electronic mechanism for identifying the item as an excuse.

Different Machine Learning software (ML) such as Scikit-learn, Pandas, Matplotlib, Numpy, TensorFlow have been used for the entire process. We also used Scikit-learn for applying algorithms for pre-processing images and classification. We used five different K-Nearest Neighbor(KNN), Support Vector Machine(SVM), Decision Tree Classifier, Random Forest, Naive Baies and the most common Convolutional Neural Network(CNN) image processing algorithm to test the validity of our work. The algorithm was the most accurate. Both algorithms have been analyzed. Finally, this algorithm that provided the highest precision detects museum displays.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

All this is mystery in the museum. Both people are still delighted to know and see the museum's stuff. No exemption is blind or visually impaired. In 2010[1], the global number of visually disabled people of all ages is estimated to be 285 million, where 39 million are blind, which is massive. The museum of the liberation war is very significant in our history in Bangladesh. Form the key survey, we have related to the fact that most of the blind people are pleased to know what is in the Bangladesh Museum of Liberation War, but the museum has no computer device for recognizing the item to be understood by voice recognition. We were sorry to see them know these items and wanted to encourage them to discover the museum systematically. As the computing ability of a camera system is being established, object identification on these systems switches from customer-server oriented techniques, in which the cameras operate only as input/output front-ends, to on-device classification methods. For this reason, we created a visual imperial people model that automatically recognizes the object and defines the object through the technique of speech recognition. ML helps the system to automatically understand and use artificial intelligence (AI) to optimize the execution of the information without being specially programmed. We define the picture by using the ML method in the picture dataset to construct our model. ML libraries, such as Pandas, Matplotlib, Numpy, Pandas, Numpy, Matplotlib, Tensorflow, Pytorch, etc. have been used. ML library is still used. We used TensorFlow for the pre-processing of the image and Scikit-learn for classification. In order to test the validity of our work, we employed five common classifiers and profounds learning Neural Network algorithms. The six algorithms were evaluated in order to decide which algorithm offered the highest precision. We cover ten groups for the identification and classification of the picture initially for our model. For perfect identification of the museum spectacle we used the best precision generated algorithm for image classification. Our concept can also be helpful to average citizens. You may receive information from a single exhibit for any kind of visitor.

## **1.2 Motivation**

The ecosystem for all types of people is our wonderful world. Some of these are born with the gift they should have all their characteristics or qualities, but it is destiny that not everyone is equal. Some of them can not understand or some of them cannot see. They have various types of deformations. There are not enough programs to support blind people. When anyone who is blind tries to go to a museum, he or she cannot do so herself. For this purpose, we decided to create an application that handles pictures, converts photographs into texts, and transfers texts into voice-form using Machine Learning, Image Processing. This software is a huge support for the blind. We first selected the Bangladesh Museum of Liberation War to collaborate with.

## **1.3 Problem Definition**

Blind people can't see anything, because they don't know our society much. This can be tackled by photo analyzes by recognizing the blind image in the museum in order to explain the history of the region. By using picture recognition, we can detect and reorganize pictures or artifacts in front of the camera, blind people can hear details or things, and blind people can understand world history by visiting the museum.

## **1.4 Research Questions**

- Can the program detect the image inside the museum precisely?
- How detecting image can be helpful to blind people for visiting the museum?
- Can the detection accurately define the image?

## **1.5 Research Methodology**

We will address in this section the selection of experimental data, data pre-processing, classification, algorithm section, implementation of the algorithm and algorithm evaluation. At the end of this chapter, the model's success is addressed.

## **1.6 Research Objectives**

Our main objective is to build a machine learning based system that will help visually impaired people to visit a museum.

## 1.7 Research Layout

The report will have appeared as regards:

**Chapter 1** presents a review of this research. The introductory study is the essential phase of this first section.

**Chapter 2** comprises the discussion on what has already been done in this domain before.

**Chapter 3** is the research methodology; this chapter embellishes the statistical methods of this work. Besides, this chapter shows the procedural approaches of the Machine Learning & deep learning.

**Chapter 4** is related to the evaluation of the result. That means it refers to the result or outcome of the research

**Chapter 5** is Conclusion of future work of the research.

## 1.8 Expected Outcome

The struggle of the blind people's will be less and their lives can be more beautiful. They can visit the museum all by themselves and enjoy because with the help of this application they will know what is the object lying in front of them and can also know the history behind.

## **CHAPTER 2**

### **BACKGROUND**

#### **2.1 Introduction**

Computer learning and profound learning are commonly used for the resolution of image processing problems. The processing of photographs is important to help people make their lives simpler. There is a lot of study to make this in our everyday life easy to use.

#### **2.2 Related Works**

T. Mensink et. al. [2] have proposed a detection scheme for the creator, form, material and year of creation of a work of art. They took 112,030 images, representing the Rijksmuseum's displayed artwork in Amsterdam, The Netherlands, which were publicly available. The system's accuracy was calculated depending on the precision of the frequency weighted. The Mean Average Precision (MAP) algorithm has been used to calculate the forms of artwork categorisation. Accuracy was also assessed with MAP for the marking of the materials. You encoded the pictures using modern vectors from Fisher (FV). For classification and regression models, they used 70% data from the data set. 10% of the data set was used as a validation set to change the hyperparameters of model. Test collection of 20% data generated. The studies were carried out with SVM.

O. Bimber et. al. [3] identified its PhoneGuide system of mobile museum directions. The technique was explored with the help of adaptive image classification in order to achieve technically feasible object recognition rates under reasonable conditions. For object recognition, the captured images extracted global color characteristics, and a 3-layer neural network was used. Once separate keyframes are identified using the nearest neighbor process, the database images are known to contain near-far interim relationships close to the keyframes. The role of the consumer was meant as an upgrade of the 93.47 percent accuracy mobile image classification system.

J. S. Hare et. al. [4] A new approach was created to perform content-based image collection and input image object recognition which was noisily degraded and transformed through the imaging system. They also used a space-vector model to index any picture efficiently. After that, the right matching picture is calculated using a two-step rating process. The algorithm is particularly immune to differences between query and database pictures. In the implementation of this method, Lowe Invariant Scale Function Transform (SIFT) Descriptor<sup>13</sup> is used. The query images are reconstructed into a vector based on "visual" words frequencies in the image. The datasets included 850 pictures taken from image collections at the National Museum. The device was checked with 200 randomly selected images.

T.-Y. Lin et. al. [5] The authors built function pyramids with a minimal extra cost by taking advantage of the intrinsic multiscale pyramid hierarchy of deep convolutionary networks. Using a top-down architecture with side links, a high-level semantical function map was built at all stages. The Pyramid Network (FPN) architecture has seen substantial progress with the extractor of functions. The COCO identification benchmark without bells and whistles obtained state-of-the-art single-model results. The device is built on an architecture that incorporates low-resolution, semantically powerful elements, semantrops, top down track features and side connections.

In order to use quick function pyramids, P. Dollár et. al. [6] updated three varied visual recognition systems. The findings were checked for the identification of the footpath and artifacts. Their methodology is widely applicable to vision algorithms that involve detailed multiscale analysis. Their techniques are the Caltech, INRIA, TUD-Brussels and ETH datasets and the PASCAL VOC. They can be calculated on wide spectrum pictures, but on images of narrow spectrum band passes it fails. They also demonstrated the skills in pedestrian identification of Aggregated Channel Functionality (ACF). ACF uses uniform gradient scale, the histogram and the color channel of LUV.

C. Szegedy et. al. [7] tried by using the power of the DNNs to identify and locate objects precisely. They designed a framework to create a binary mask of the object bounding box. Regression dependent on DNN. You show that the DNN regression can learn classification characteristics and collect geometrical data. After extracting masks from several objects in a range using DNN regression, the device applies a DNN tracker on a small group of large

subwindows. It uses one network to the object box mask and four other networks to predict four half of the event. The system was tested on Pascal Visual Object Challenge (VOC) 2007 dataset which contained 5000 images over 20 classes. The VOC2012 testing and evaluation device comprising 11k images was trained.

X. F. Hermida et. al. [8] Proposed Braille text recognition method using Optical Character Recognizing Philosophy (OCR) Many techniques have been utilized in image processing including adaptive threshold detection and skew angle detection. A technique was used to transform the areas into black and white areas with two adaptive thresholds. The luminance histogram was used to measure the thresholds. False points and lost points were also observed by the system.

G. Sainarayanan et. al. [9] aimed to develop a device that can support blind people by sensing barriers along their way. The vision sensor catches the world in front of the person, and the device is comprised of an SBPS, a vision sensor mounted with a headgear, and a pair of stereo earphones. It is then analyzed using fuzzy clustering algorithms using a real-time image processing scheme. The processed image is then transformed and passed to the earphones of the stereo into a precisely structured stereo Acoustic pattern. A fuzzy LVQ (FLVQ) is tested for object recognition from the context.

## **2.3 Research Summary**

The study above, carried out in different research teams, indicates that research work on image processing every day has been established lately. This argument has also been verified by some positive consequences. While not enough funds are available, it is optimistic that every day after an individual day this region will become more resourceful.

## **2.4 Challenges**

The key obstacles of this work are the data sets. For the purposes of refinement, we need productive inputs, but not adequate well-known approaches. Another task is not to provide adequate resources on this issue.

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Introduction

The chapter on methodology should explain the design decisions by demonstrating that the methods and techniques selected are ideally suited for research goals and targets and that they can deliver true and consistent results. For the construction of our model, we followed a 6-step module. Our module step is illustrated

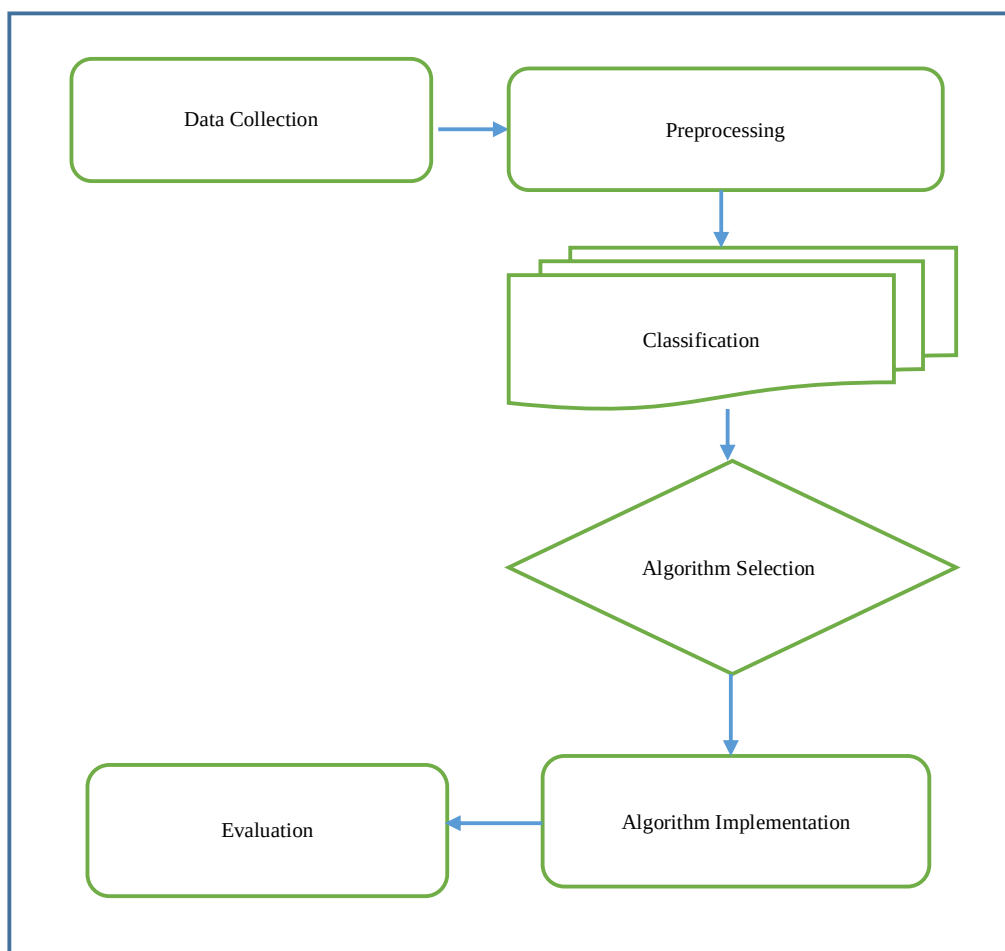


Figure 3.1: Methodology diagram

### 3.2 Data Collection

We are compiled from Bangladesh's Liberation War Museum. For this study, more than thousand photos have been collected.

### 3.3 Pre-Processing

The method of translating raw information into pixel array formats can be exploited for the development of various algorithms for machine learning. We used Tensor Flow Keras for the training of our model. It is a library for data flow and differentiable programming, free and open source. Our data set has been split into two sections. Our model was educated in the first section. There were approximately 978 photos. For research purposes the second component contained 103 images was used. Until translating all raw images to pixels 450 height and width, we processed them in gray images.

### 3.4 Data Analysis

Data of ten styles have been compiled. This divided our entire dataset into ten groups. These 10 groups are 10 different exhibits that we have defined in 0,1,2,3,4,5,6,7,8,9. An total of around one hundred pictures of schools.

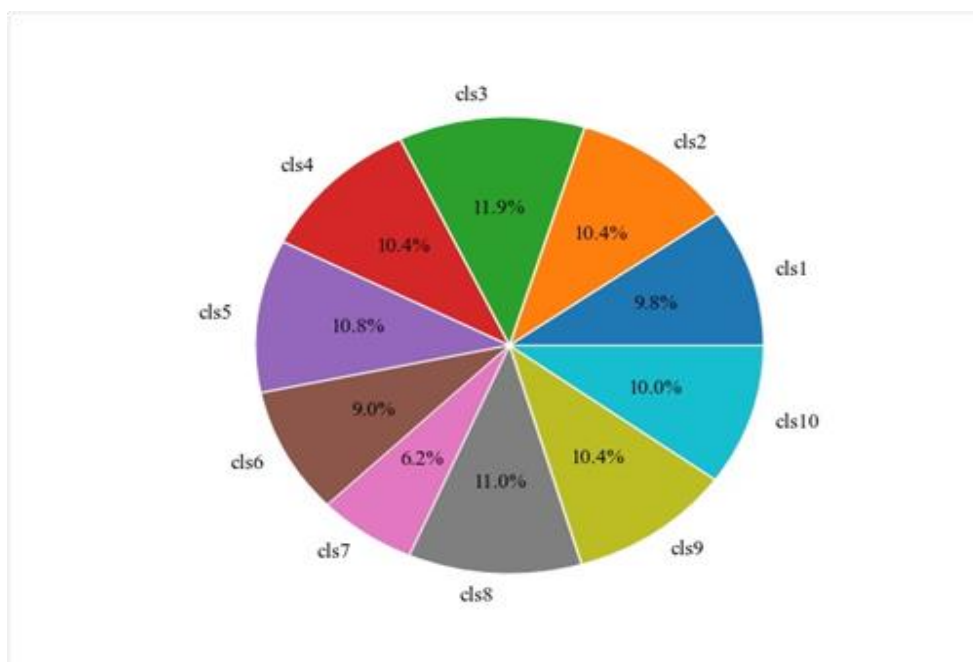


Figure 3.2. Classification of dataset

### 3.5 Algorithm Selection

The proper classification of images relies on our model. In this case, we selected five mainstream algorithms for classification. The algorithms we have chosen included KNN, SVM, Random Forest, Naive Bayes and the Decision Tree. And we have used CNN algorithms to equate precision with the profound learning model. We measured all the output algorithms to decide what is best for our model training.

### 3.6 Dataset

We must transform the original image to gray image when building our dataset. The picture was then transformed into the pixel array of the gray scale. A gray scale transformation illustration is given in the figure3.3 represents data have been translated in the following way.



Figure 3.3 Sample of dataset

### 3.7 Algorithm Implementation

Following an overview of the results of all algorithms we concluded that CNN was the best alternative to build our model. Since of 95.65% accuracy CNN has obtained the best result. All the other algorithms were also successful. Machine Learning SVM algorithm, on the other hand, produces highest precision of 92.38%. SVM is very effective and storage-efficient in high-dimensional spaces. We used the following parameters to enforce all machine learning algorithms that is represented in table 3.1.

Table: 3.1 Parameter Usage

| Algorithms    | Details                 |
|---------------|-------------------------|
| KNN           | K=3, p=2,random_state=0 |
| Decision Tree | random_sate=0           |
| SVM           | Kernel=linear           |
| NN            | max_iter=1000,alpha=1   |
| Random Forest | n_estimators=100        |

### 3.8 Evaluation

Evaluation helps you to show the quality or progress of your curriculum. You will better articulate the effect of the policy to those who are important for public affairs, the morals of workers and the recruitment and preservation of patronage from existing and future supporters.

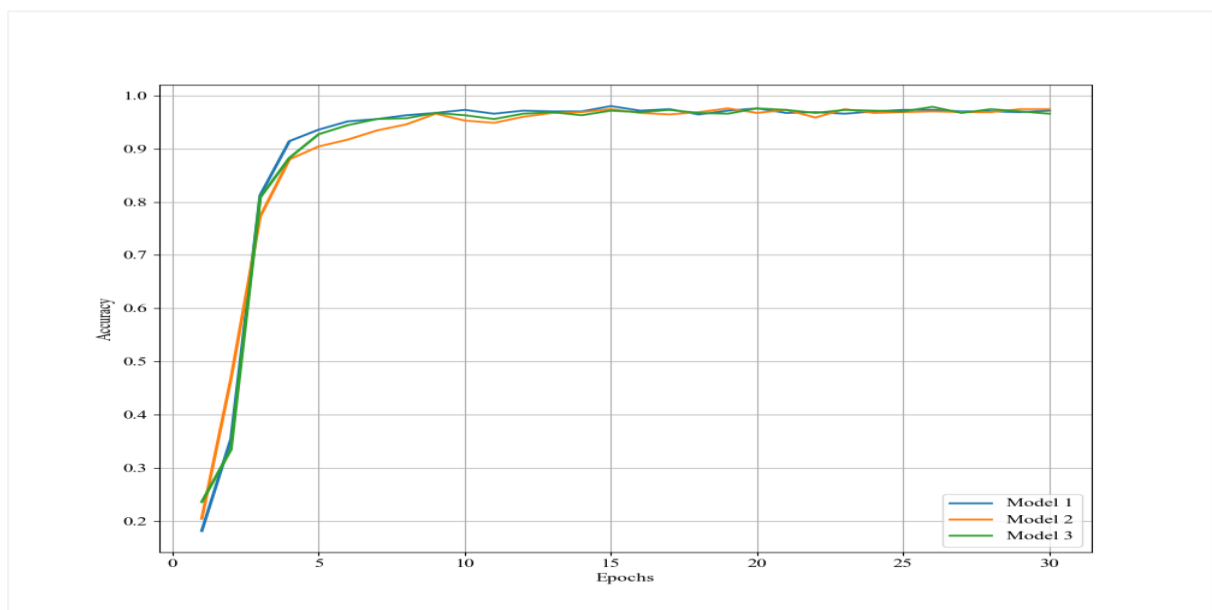


Figure. 3.4. Accuracy comparison of three models

From Figure. 3.4. We acknowledge the high anticipated and less distinguishable performance of our three models. They overlapped each other's success.

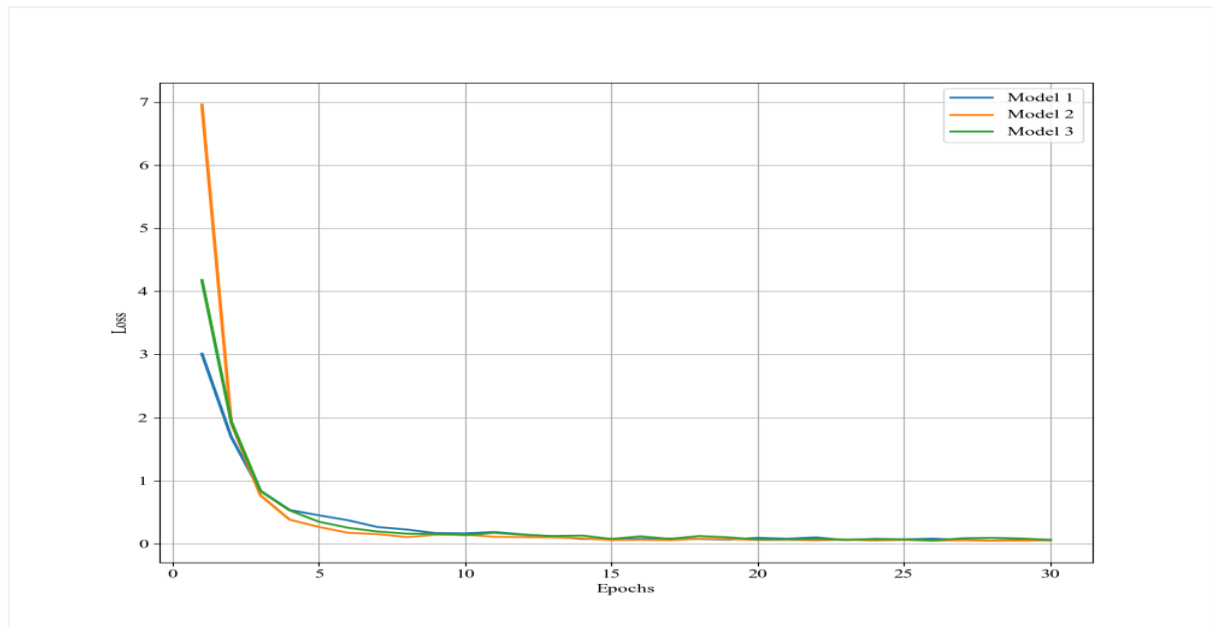


Figure 3.5 Loss comparison of three models

Figure. 3.5 Represents the amount of loss of our three model. From this graph we can see that losses of our three models is near to zero and different is so less that, three line is overlapped with each other.

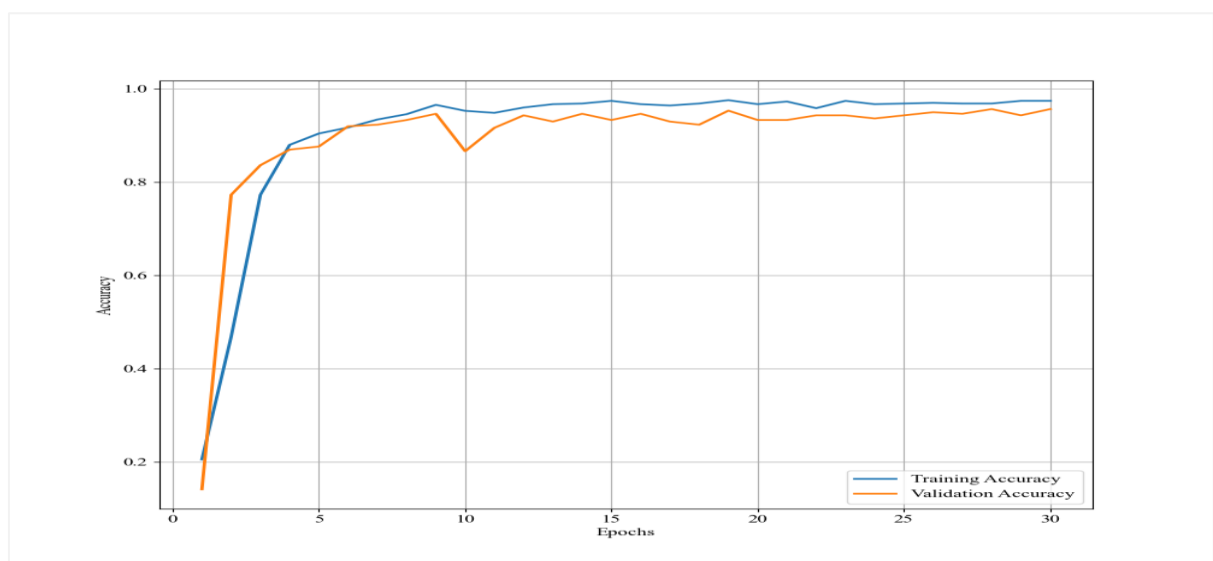


Figure. 3.6. Training vs validation accuracy

Figure. 3.6 This indicates the accuracy of the CNN model M2 preparation and validation. For validation at 10 Epochs, the difference between training accuracy and validation accuracy is otherwise largely negligible.

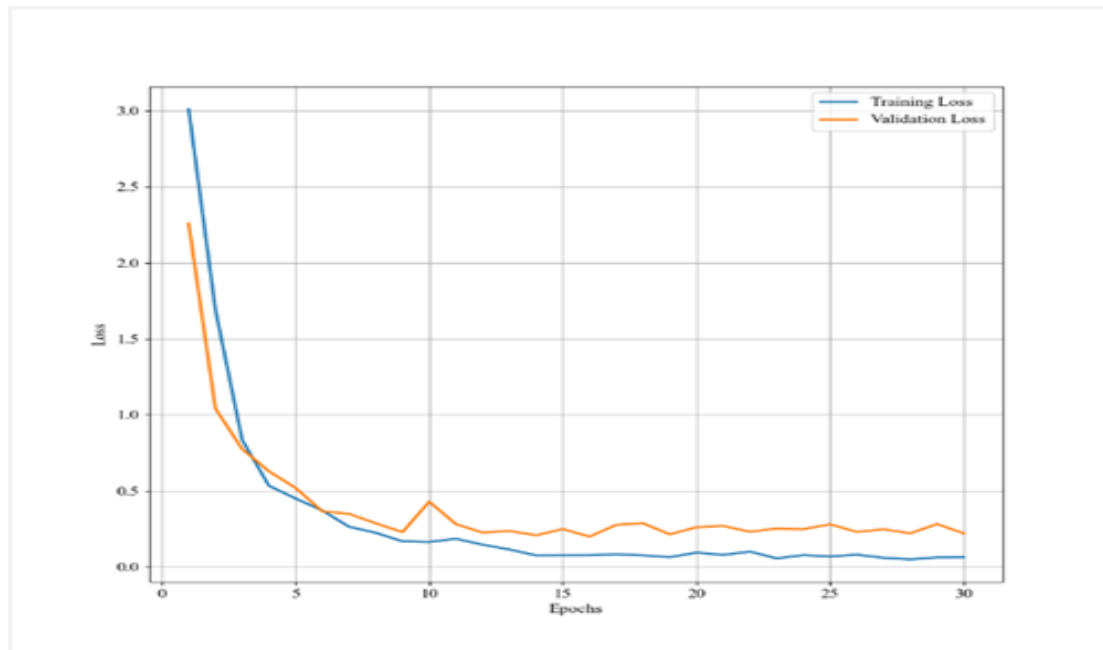


Figure. 3.7 Loss comparison of M2 model.

Figure. 3.7 This reflects the Model M2 lack of preparation and validation. For this diagram we can see that the loss of validation is greater than the loss of preparation but very small.

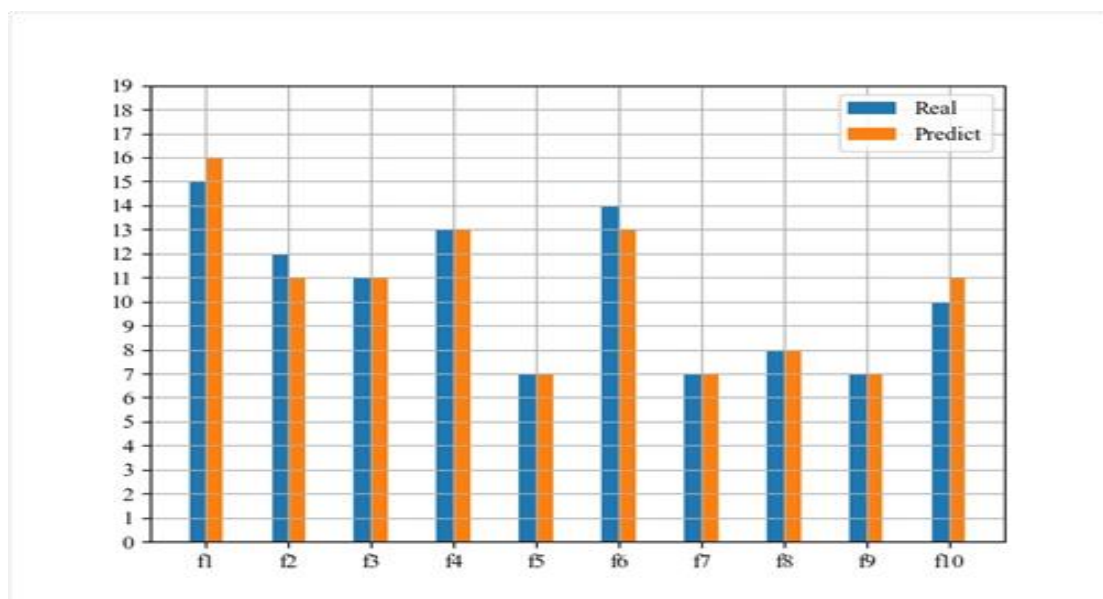


Figure 3.8 Real Vs Predicted Comparison

In this phase our model has been checked using randomly picked pictures of exhibits. We have randomly selected 103 images, to measure them against the CNN algorithm prediction.

Figure 3.8 displays our appraisal result. The evaluation data included all class photographs. The grades in all pictures we expected. The classes and actual classes expected were essentially the same. The blue bar is a class image and the orange bar is an image class expected. From the table, less than 2 percent inaccuracy can easily be seen.

## **CHAPTER 4**

### **RESULT ANALYSIS**

#### **4.1 Introduction**

This chapter 4 mainly focuses on the descriptive analysis of the data used in the research as well as the experimental results of our research. Results Review allows you to understand how your students learn in what field of the program. You will use the knowledge to recognize areas of strength and vulnerability so that your teaching is concentrated where it is required.

#### **4.2 Experimental Result**

In order to assess their performance in the managed data set, we have implemented five ML algorithms for Machine Learning. To obtain a crystal accuracy representation, we entered the data into the accuracy table to determine the future observation of this research. The efficiency of algorithms is calculated by five kinds of test data usage: 30 percent, 40 percent, 50%, 60% and 70%. An remarkable result was discovered with the corresponding five algorithms. All algorithms except for the Decision tree were relatively equivalent. SVM has been modelled by Vapnik et. al. [10] mathematical structure . Minimize recognised information waste. SVM created the most important accuracy in our work by 92.38%. The red rectangular box is shown in Table II. There is a yellow mark in every column defining the most accurate use of these algorithms by different test data rates. Precision was achieved with a data consumption rate of 70 percent. The other 4 algorithms are done in close proximity to SVM. Simon et. al.[11] stated that the Random Woods provide a subset of decision tree that applies a variety of different sets of classifiers through the development of patterns on the basis of training data. The Random forest, which is 91.18% with 30 percent test results, provides the second highest accuracy. Z. Deng et. al. [12] conjectured that while KNN is a lazy learning algorithm, it is useful with greater performance and efficiency when it is working with distributed data.

Table 4.1 Accuracy table

| Test Data usage rate | Algorithms |                      |                    |                      |            |
|----------------------|------------|----------------------|--------------------|----------------------|------------|
|                      | <i>KNN</i> | <i>Decision Tree</i> | <i>Naïve Bayes</i> | <i>Random Forest</i> | <i>SVM</i> |
| 30%                  | 90.81%     | 77.78%               | 90.41%             | 91.18%               | 92.38%     |
| 40%                  | 90.19%     | 83.59%               | 88.23%             | 90.71%               | 91.17%     |
| 50%                  | 88.92%     | 78.75%               | 88.08%             | 89.37%               | 90.09%     |
| 60%                  | 87.26%     | 76.04%               | 87.79%             | 89.11%               | 90.02%     |
| 70%                  | 86.73%     | 73.96%               | 87.28%             | 88.51%               | 89.87%     |

KNN and Naïve Bayes reached a high degree of data classification. His view on Naïve Bayes was expressed by Zhang [13] as the most powerful and effective ML. KNN gave 90.81 per cent to Naive Bayes accuracy, with an equal value for the data utilization rate of 90.41 per cent. These two algorithms have behaved similarly in various test cases. Safavian et. al. [14] The decision tree offers beneficial performance when the dataset is complex. Surprisingly, by using 60 per cent training data and 40 per cent test data, the Decision Tree algorithm achieved 83.59 per cent. The overall accuracy of other data use rates was motivating, recognizing fair accuracy. All of result is shown in table 4.1

Table 4.2: CNN model

| Model Layout |                 |         |             | Training Accuracy(%) | Validation Accuracy(%) |
|--------------|-----------------|---------|-------------|----------------------|------------------------|
| No           | Layers          | Filters | Kernel size |                      |                        |
| M1           | Convolutional   | 32      | [3,3]       | 97.99                | 94.98                  |
|              | MaxPool         | -       | [2,2]       |                      |                        |
|              | Convolutional   | 64      | [3,3]       |                      |                        |
|              | MaxPool         |         | [2,2]       |                      |                        |
|              | Fully Connected | -       |             |                      |                        |
| M2           | Convolutional   | 32      | [3,3]       | 97.56                | 95.65                  |
|              | MaxPool         | -       | [2,2]       |                      |                        |
|              | Convolutional   | 64      | [3,3]       |                      |                        |
|              | MaxPool         | -       | [2,2]       |                      |                        |
|              | Convolutional   | 64      | [3,3]       |                      |                        |
|              | MaxPool         | -       | [2,2]       |                      |                        |
|              | Fully Connected | -       |             |                      |                        |
| M3           | Convolutional   | 32      | [3,3]       | 97.85                | 94.98                  |
|              | MaxPool         | -       | [2,2]       |                      |                        |
|              | Convolutional   | 64      | [3,3]       |                      |                        |
|              | MaxPool         | -       | [2,2]       |                      |                        |
|              | Convolutional   | 128     | [3,3]       |                      |                        |
|              | MaxPool         | -       | [2,2]       |                      |                        |
|              | Fully Connected | -       |             |                      |                        |

The history of the CNN model is represented in Table 4.2.2. First, we produced three M1 models with 2 cooling layer with 32, and sixty-four filters, with a training accuracy of 97.99% 94.98%. We used three layers of 32 64 64, 64 filters in the same way for M2 model.

We have 97.56 percent instruction and corresponding 95.65 percent accuracy of validation. We also have used three layers for the M3 model but correspondingly 32, 64, 128 layers and this model has a validation accuracy of 97.85 and 94.98 percent.

For the above topic we can see that CNN Model M2 gives 95,65% of all algorithms the highest precision. For the next processes, we have chosen CNN. CNN model shown in table 4.2

## **CHAPTER 5**

### **SUMMARY, CONCLUSION AND FUTURE WORK**

#### **5.1 Summary of the Study**

It does not have any suspicion that there are loads of research activities on Image Processing, especially on Image detection. When the consequence of such a variety of works is taking a cataclysmic change in our computing life, recently, such kind of research is being expanded this time. We get some notable real-life applications on the benefit of such types of research works. But it is a matter of great concern that there is no such research work on detecting object in the museum for blind people in Bangladesh. But it is the expectation for us that many researchers from various countries have commenced researching this field. In our research work, we make some approaches to detect the object for blind people while visiting the liberation museum in Bangladesh.

#### **5.2 Conclusion**

Our device can detect the exposures with 95.65% accuracy by collecting data from the Liberation War Museum in Bangladesh. Our core algorithms include SVM, KNN, Random Forest, Decision Tree, and CNN and Naive Bayes. The performance of all the algorithms was quite close. CNN has done remarkably well. The sightless will learn about the Liberation War Museum with our proposed model. Our history is marked by the Liberation War Museum. Our model is also useful for ordinary citizens. It will provide the details of a specific exhibit to any kind of customer.

#### **5.3 Future Work**

Based on our proposed model we have already begun to build mobile applications. We are also working to develop our prediction classes and datasets so that all sorts of people who are visiting the museum will benefit from them. We will try to cover all the museum's shows to give you more valuable knowledge about our war of liberation, and everyone will gain benefits from learning our history.

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