ANIMAL IDENTIFICATION USING CNN

BY

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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 Research titled **"Animal Identification Using CNN"**, submitted by Md. Rashed Khan Menon, ID No: 171-15-8909 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 *13/09/2022*.

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We hereby declare that, this project has been done by us under the supervision of **Ms. Nazmun Nessa Moon, Associate Professor, 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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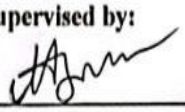

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ABSTRACT

Around us there are many kinds of animal with different colors, different sizes, different characteristics, different behavior and different usefulness. In our city's people mainly city's children don't have any or enough idea about our rural animals. Also, our child spent their leisure time by using video games, you-tubing, browsing much unnecessary thing so we realize for them that they should use their time for educating about animal. In my research I have used convolutional neural network or CNN to identify animals. Because CNN is a very popular platform that use for image detection. I have chosen 3 types of animals such as cow, cat and rabbit. Almost 1200 images I have collected to make our dataset. After collected data, I process those and keep 3 different paths. In training path, I keep 60% data and for testing and validation I keep 20%. I have use 4 types of CNN models such as VGG19, RseNet50, Mobile-Net, Inception v3. Then I set and train my dataset into these models and got different types of result. I got best accuracy from Inception v3 model that is 100%. In future I have a plan to add more data and upgrade my system.

Keywords: animal identification, image detection, CNN, VGG19, Mobile-Net, Inception v3, RseNet50.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

Animals play a significant role in our lives. They provide meals and a variety of other things for people. Animals are vital to both human survival and the health of the land. Humans have been taking advantage of animals since ancient times. Animals are used in research laboratories to evaluate drugs. Astronomers also use animals to do their research. Different animal has different shape, color, size. So most of ordinary people or city's children don't know most of these animals. Occasionally walking on the roadside or zoo or park we notice some animals those we had never seen before. And that's why, we develop a curiosity with that particular animal. So in this case we are going to make a system that will help those people to gather knowledge about those animals. Also our city's children waste their time by using unnecessary things on internet and cartoons so our system will be beneficial for them to know about rural animals. Also some animals enter agricultural lands and destroy crops so by using our system there might be a good solution to protect those crops from those animals.

1.2 Motivation

Around us there are many kinds of animal with different colors, different sizes, different characteristics, different behavior and different usefulness. The majority of people in our country, especially those living in cities and children have no idea about rural animal of our country so we have made an effort to create a system that can identify and categorize some local animals. Even many students are eager to collaborate with rural animals but, they are unaware of that type of rural animals. It can be advantageous for our kids who spent their time by watching cartoon, now can spent time to gather knowledge about our rural animals. Also, many wild animals enter running road beside of forest and made accident. Many of those wild animals also enter to human habitats and destroy people houses. Some of those animals enter agricultural land and destroy crops. For these reason

we have worked with animals and attempt to create a system that can helpful for those persons to identify and recognize an animal.

1.3 Research Question

- Which procedure have used for processing to my dataset?
- Are those models accurately recognizing those data?
- Can CNN is best for image detection?
- How much it helpful for our people?

1.4 Objective

- To create a system that would aid in identifying and recognizing some rural animals.
- To make a scope for children to gather knowledge with entertainment.
- To make our system fulfill We are also finding the most accuracy making algorithm

1.5 Report Layout

Chapter 1 will discuss with introduction, motivation, question and objective. I also talk about our research that why we have chosen this topic.

Chapter 2 will discuss with background study that contains introduction, Related work, Research summary, Related of our research and Challenges. Here I talk about same work that done by previous researcher.

Chapter 3 will discuss with Research methodology that contains with data collection, procedure, pre-processing, training and implementation requirement. Here I also talk about my field works that I perform.

Chapter 4 will discuss about experimental results & discussion. Here I have talk with 4 CNN models result and their result accuracy.

Chapter 5will discuss with conclusion, limitations and future work. In here my final discussion I have done.

CHAPTER 2
BACKGROUND STUDY

2.1 Introduction

This section will cover the following couple of research those are comparable to my research. I have used CNN that is a very popular platform for image detection. I have selected 3 types of animals those are cow, cat and rabbit. And every animal contains with 400 data that means almost 1200 images makes my dataset. I have learned python that is a necessary language for our system. Also I have studied with deep learning and use TensorFlow.

2.2 Related works

As animals comes with different colors, shapes and height so it's very difficult task to perform identifying. So, we had to study couple of research based on animal identification. A paper was published by Mai Ibraheem with his group mates in (2020) [1]. Their research aim was reducing the detrimental effects of wildlife-human and wildlife-vehicle interactions in a way. By using CNN their accuracy achieved 99.80% in demonstrating the being either an animal or a human also got 97.60% accuracy in identifying species of animal. Another paper was published by Rashmi Jayakumar and his mates in (2019) [2]. They also detected animals by image detection with CNN. Their purpose to track animals, stop theft, and stop animal-vehicle collisions. Another paper was published by Dr. K. Paramasivam and his team mates in (2020) [3]. Animals enter the agricultural land from nearest forest and destroy crops also destroy human dwelling. In this case they create a system that can identify those animals and make a signal to security alert. In this system they used image data and video data both. Another paper was published by Peiyi Zeng and his mates in (2021) [4]. Their research was to identify comparable animal photos using Python and a simple 2D CNN algorithm. This system can differentiate normal animals and rare animals quickly. Another research published by Rajan Pandey and his friends in (2020) [5]. They classified 10 animals consists with 20000 data using CNN and got accuracy 77.20%. They operate with 5 main layers into CNN: Convolution, ReLU, Pooling or Sub-Sampling, Flatten, Fully Connected Layer.

Another paper was published by Hung Nguyen and his mates in (2017) [6]. They put forth a structure in their article with the intention of creating an automated system for tracking wildlife. They made use of the Wildlife Spotter dataset, which is made up of several trap camera photos. They used Lite AlexNet, ResNet-50 and VGG-16 model and achieved 96% accuracy. A paper published by Gyanendra Verma and P. Gupta in (2018) [7]. They concentrate on wildlife analysis using camera-trap networks' natural scene data to identify animals in it. They made use of a camera-trap database with potential animal suggestions. They have designed their self-learned DCNN features that provides 91.40% accuracy on standard camera-trap dataset. Another paper was published by Margarita Favorskaya and Andrey Pakhirka in (2019) [8]. Their project was based on muzzle and shape features using joint CNN. They propose VGG by three branches, two of them was VGG-16 for muzzle and another one was VGG19 for whole shape recognition. Another paper was published by Golnaz Moallem and his friends in (2021) [9]. They put in place a two-stage deep CNN pipeline. In the first stage they find animals related images. And then in the second stage they analyze these pictures to detect birds. The system is updated and data drift is detected using an automatic retraining technique. To detect drifted images and triggering the retraining procedure, they introduced a great technique. Another paper was published by Tibor trnovszky and his teammates in (2017) [10]. The ultimate goal of their project was to compare the overall detection accuracy of couple of popular methods like as PCA, LDA, LBPH and SVM with proposed CNN.

2.3 Research Summary

We use TensorFlow that is an open-source library for our system. To build neural network layer TensorFlow provides us a better way. Our system based on image detection by CNN. In our system we have used 4 types of CNN models to train our dataset and have gotten a better accuracy. We have collected 1200 images data from 3 different animals. And then process those data. After processed we create a dataset and used kears library to input our data. At last, we train our data into CNN models and got different types of result.

2.4 Related to our research

Many more researcher have research with animal identification or recognition. From those research couple of papers have related with my paper. Peiyi Zeng and his mates published a paper in 2021 that was to identify comparable animal photos that was likely to our paper cause we also identified animals by using CNN with animals photos. Rashmi Jayakumar and his mates also published a paper that also detected animals by image detection with CNN and the same way we had done. Their purpose was to reduce animal-human collision. Dr. K. Paramasivam research and published a paper for Animals enter the agricultural land from nearest forest and destroy crops also destroy human dwelling. They used CNN models to recognize animals like I used. I also compare some CNN by their accuracy level that works similar to Tibor trnovszky and his teammates done.

If any researcher wants to research similar kind of things, then it can be helpful to them. Also, who want to works with CNN and android development may be helpful by my work. Additionally, there is a lot of room to enhance the dataset and CNN architecture.

2.5 Challenges

Data collection was a biggest challenge for us. We tried to collect data from in field but when we try to remove background scenario at that time couple of images got damage. At that time when we tried to collect data from internet then it also made disturb to us because at a time, we were collecting same data from internet so we trouble with duplicating issue. In this case highly accurate data collection was very much challenging.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

We will talk about the steps we took to conclude our research in this phase. We will know those processes step by step.

Data gathering, data pre-processing, and noise reduction are couple of the steps we took to finish our system. We have taken help by using Tensorflow to train our dataset. Then we take a move to test our entire dataset. To research we have used CNN to implement our system. We have also used Mobile-Net, VGG19, Inception v3, RseNet50 to get better accuracy.

Research methodology that is shown on figure 3.1

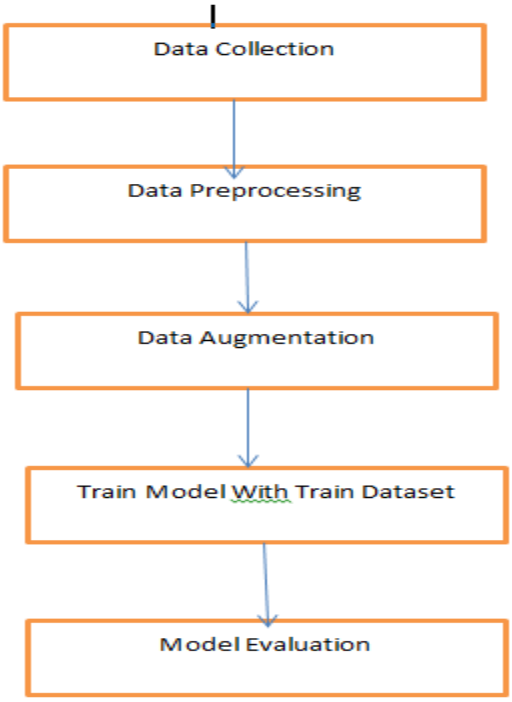

Figure 3.1: Research methodology

3.2 Data Collection Procedure

In data collection we have captured some image by mobile phone and also collected some data from Google-internet. We collected 3 different rural animal such as Cow, Cat and Rabbit. We have gathered 1200 data for our system. For training our system we have placed 700+ data into training set and also separate 500 data between testing set and validation set.

3.3 Statistics of Data

Here is the table for training dataset that is shown the table 3.1.

TABLE 3.1: Training dataset

Animal Name	Quantity
Cow	240
Cat	240
Rabbit	240

Here is the table for validation dataset that is shown the table 3.2.

TABLE 3.2: Validation dataset

Animal Name	Quantity
Cow	80
Cat	80
Rabbit	80

Here is the table for testing dataset that is shown the table 3.3.

TABLE 3.3: Testing dataset

Animal Name	Quantity
Cow	80
Cat	80
Rabbit	80

3.4 Image Preprocessing

Maximum time we had been failing to get our required outcome from raw dataset. We also suffer to collect better accuracy because of unnecessary data. In this case we were badly needed image pre-processing that plays a vital role in our system.

3.5 Training Model

Four types of convolutional neural network model we have used in our system.

Those are given below:

1. VGG-19
2. MobileNet
3. ResNet 50
4. Inception v3

3.6 Implementation Requirements

To develop our system we needed a full free platform that can also write python programing language and in this case we have chosen Google Colab. We can get pre-installed libraries and also supply us free GPU and TPU access.

Software

1. Windows 10
2. Tensorflow

Hardware

1. Intel i5 processor
2. 8 GB ram
3. 1 TB hard disk

CHAPTER 4
EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Introduction:

In this phase we will talk about model accuracy analysis and confusion matrix. Plot diagram also be shown for each one. Mobile-Net, Inception-v3, ResNet-50 and VGG-19 are some CNN models that we used for classifying result. To find out the best accuracy we use those models and tested our dataset individually.

Confusion Matrix:

Basically confusion matrix describes a classification model output of test data. It also shows us the imagination of an algorithm performance.

4.2 Experimental Result and Analysis for Inception v3 Model

Every single epoch accuracy level:

Top most accuracy is 1.000 in epoch 8 and 11 that is shown the figure 4.1.

```
Epoch 1/15
21/21 [==============================] - 143s 7s/step - loss: 7.5908 - accuracy: 0.8785 - val_loss: 0.1912 - val_accuracy: 0.9953
Epoch 2/15
21/21 [==============================] - 106s 5s/step - loss: 0.5215 - accuracy: 0.9908 - val_loss: 2.1029 - val_accuracy: 0.9767
Epoch 3/15
21/21 [==============================] - 106s 5s/step - loss: 0.9953 - accuracy: 0.9892 - val_loss: 3.8532e-04 - val_accuracy: 1.0000
Epoch 4/15
21/21 [==============================] - 122s 6s/step - loss: 0.7204 - accuracy: 0.9938 - val_loss: 1.1555 - val_accuracy: 0.9860
Epoch 5/15
21/21 [==============================] - 106s 5s/step - loss: 0.2388 - accuracy: 0.9954 - val_loss: 0.3645 - val_accuracy: 0.9907
Epoch 6/15
21/21 [==============================] - 106s 5s/step - loss: 0.4107 - accuracy: 0.9969 - val_loss: 0.0542 - val_accuracy: 0.9953
Epoch 7/15
21/21 [==============================] - 106s 5s/step - loss: 0.0779 - accuracy: 0.9985 - val_loss: 9.6854e-07 - val_accuracy: 1.0000
Epoch 8/15
21/21 [==============================] - 106s 5s/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 1.6634e-09 - val_accuracy: 1.0000
Epoch 9/15
21/21 [==============================] - 104s 5s/step - loss: 0.0896 - accuracy: 0.9969 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 10/15
21/21 [==============================] - 120s 6s/step - loss: 0.0646 - accuracy: 0.9985 - val_loss: 0.3858 - val_accuracy: 0.9907
Epoch 11/15
21/21 [==============================] - 105s 5s/step - loss: 1.8340e-10 - accuracy: 1.0000 - val_loss: 2.6999 - val_accuracy: 0.9860
Epoch 12/15
21/21 [==============================] - 106s 5s/step - loss: 0.0921 - accuracy: 0.9969 - val_loss: 2.1149 - val_accuracy: 0.9860
Epoch 13/15
21/21 [==============================] - 104s 5s/step - loss: 0.5311 - accuracy: 0.9923 - val_loss: 0.2947 - val_accuracy: 0.9907
Epoch 14/15
21/21 [==============================] - 106s 5s/step - loss: 0.4784 - accuracy: 0.9938 - val_loss: 0.0511 - val_accuracy: 0.9953
Epoch 15/15
21/21 [==============================] - 106s 5s/step - loss: 1.0631 - accuracy: 0.9908 - val_loss: 0.1350 - val_accuracy: 0.9953
```

Figure 4.1: Accuracy for inception-v3 model

Confusion Matrix that is shown the figure 4.2.

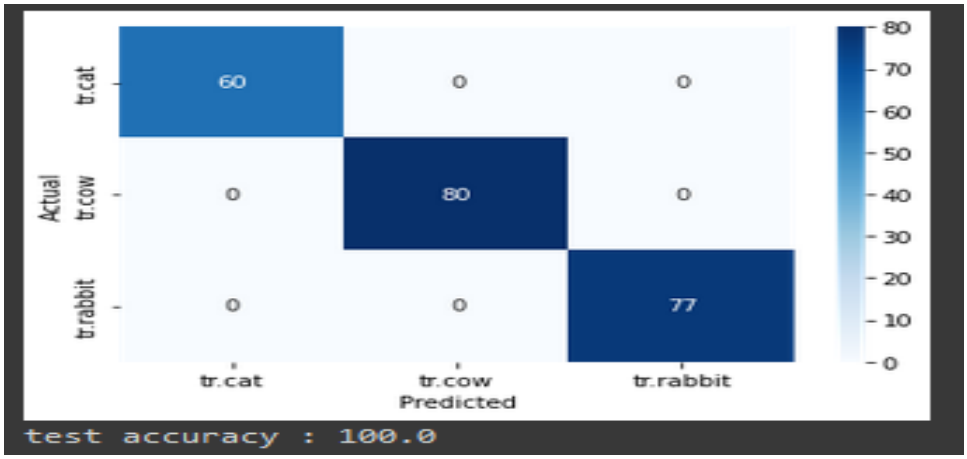

Figure 4.2: Confusion matrix for inception v3 model

Plot Diagram:
Train accuracy and Validation accuracy that is shown the figure 4.3.

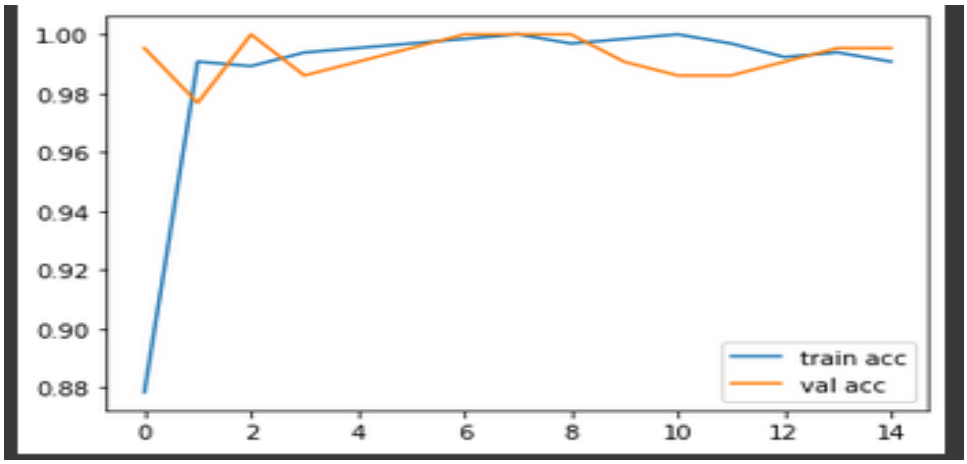

Figure 4.3: Train and validation accuracy for inception v3 model

Train loss and validation loss that is shown the figure 4.4.

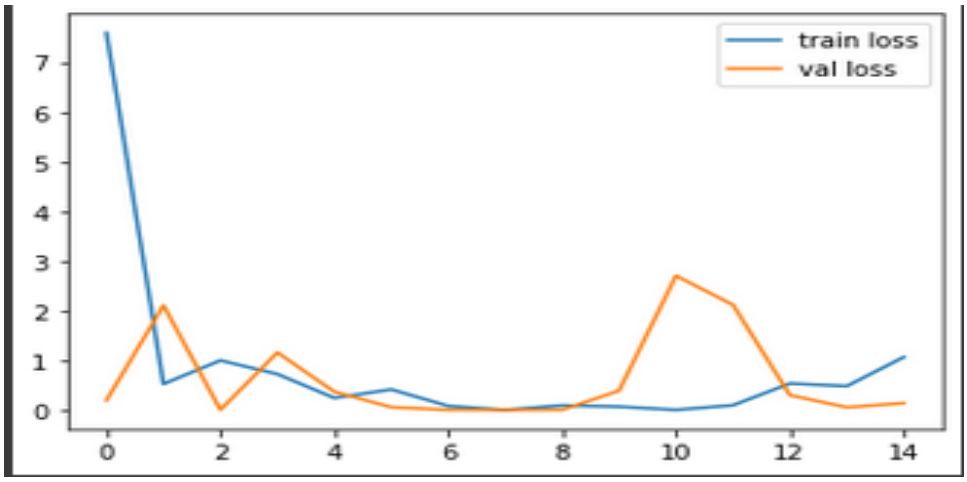

Figure 4.4: Train and validation loss for inception v3 model

4.3 Experimental Result and Analysis for MobileNet Model:

Every single epoch accuracy level:

Top most accuracy is 1.000 from 9 to 15 no epoch that is shown the figure 4.5.

```
Epoch 1/15
21/21 [==============================] - 181s 9s/step - loss: 9.9220 - accuracy: 0.8800 - val_loss: 0.1645 - val_accuracy: 0.9953
Epoch 2/15
21/21 [==============================] - 40s 2s/step - loss: 0.2177 - accuracy: 0.9908 - val_loss: 0.0172 - val_accuracy: 0.9953
Epoch 3/15
21/21 [==============================] - 42s 2s/step - loss: 0.0463 - accuracy: 0.9969 - val_loss: 0.1323 - val_accuracy: 0.9860
Epoch 4/15
21/21 [==============================] - 40s 2s/step - loss: 0.0332 - accuracy: 0.9969 - val_loss: 0.2743 - val_accuracy: 0.9860
Epoch 5/15
21/21 [==============================] - 43s 2s/step - loss: 0.1036 - accuracy: 0.9969 - val_loss: 2.7756e-06 - val_accuracy: 1.0000
Epoch 6/15
21/21 [==============================] - 41s 2s/step - loss: 0.0389 - accuracy: 0.9954 - val_loss: 0.0662 - val_accuracy: 0.9907
Epoch 7/15
21/21 [==============================] - 41s 2s/step - loss: 0.1691 - accuracy: 0.9985 - val_loss: 0.3840 - val_accuracy: 0.9907
Epoch 8/15
21/21 [==============================] - 44s 2s/step - loss: 0.0225 - accuracy: 0.9969 - val_loss: 0.2347 - val_accuracy: 0.9860
Epoch 9/15
21/21 [==============================] - 41s 2s/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 10/15
21/21 [==============================] - 44s 2s/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0917 - val_accuracy: 0.9907
Epoch 11/15
21/21 [==============================] - 40s 2s/step - loss: 1.6908e-07 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 12/15
21/21 [==============================] - 42s 2s/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 5.4454e-04 - val_accuracy: 1.0000
Epoch 13/15
21/21 [==============================] - 42s 2s/step - loss: 3.4569e-05 - accuracy: 1.0000 - val_loss: 6.6535e-09 - val_accuracy: 1.0000
Epoch 14/15
21/21 [==============================] - 44s 2s/step - loss: 6.9932e-07 - accuracy: 1.0000 - val_loss: 2.2733e-08 - val_accuracy: 1.0000
Epoch 15/15
21/21 [==============================] - 40s 2s/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
```

Figure 4.5: Accuracy for mobile-Net model

Confusion Matrix that is shown the figure 4.6.

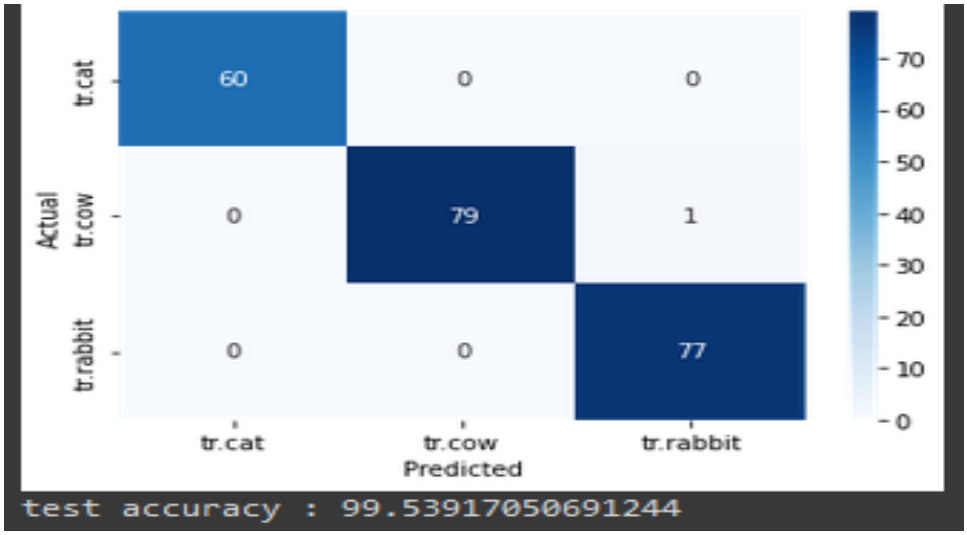

Figure 4.6: Confusion matrix for mobile-Net model

Plot Diagram:
Train accuracy and Validation accuracy that is shown the figure 4.7.

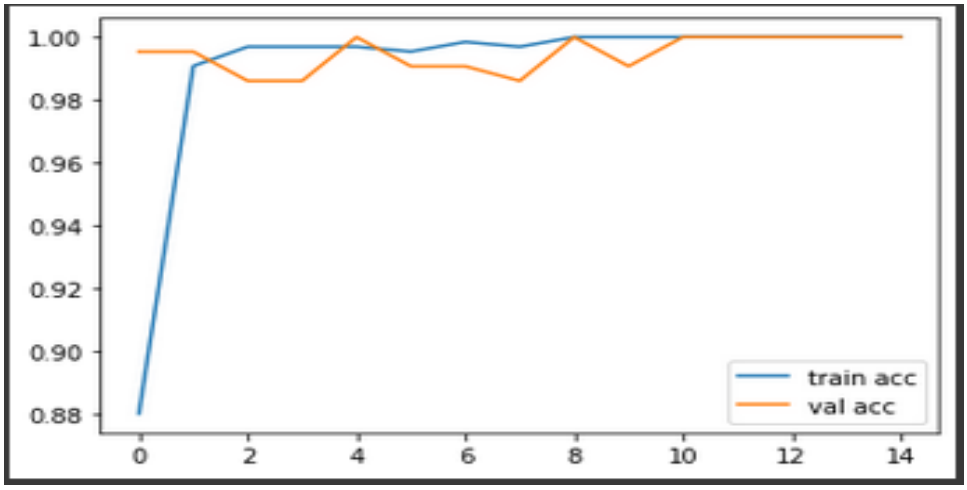

Figure 4.7: Accuracy for mobile-Net model

Train loss and validation loss that is shown the figure 4.8.

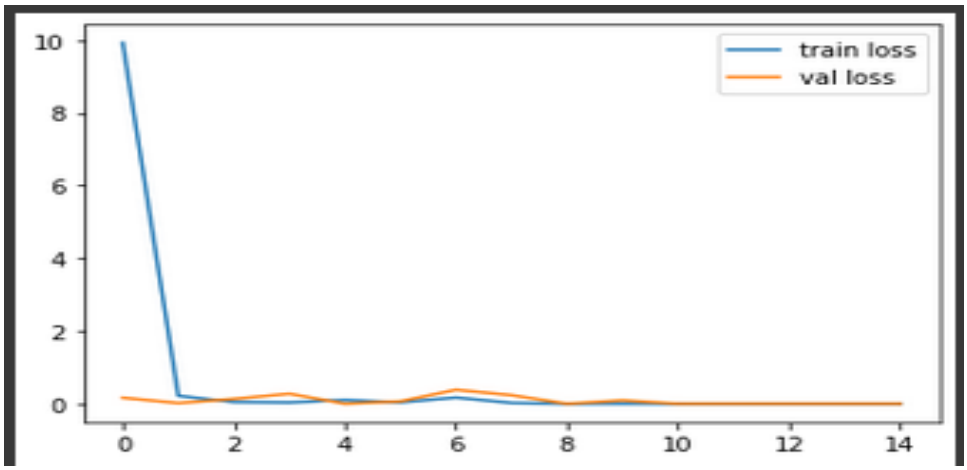

Figure 4.8: Train and validation loss for mobile-Net model

4.4 Experimental Result and Analysis for VGG-19 Model:

Every single epoch accuracy level:

Top most accuracy is 1.000comes from epoch 9 and 10 that is shown the figure 4.9.

```
Epoch 1/10
21/21 [==============================] - 595s 28s/step - loss: 8.6222 - accuracy: 0.5415 - val_loss: 0.4681 - val_accuracy: 0.8651
Epoch 2/10
21/21 [==============================] - 565s 27s/step - loss: 0.4529 - accuracy: 0.8754 - val_loss: 0.1186 - val_accuracy: 0.9442
Epoch 3/10
21/21 [==============================] - 563s 27s/step - loss: 0.0929 - accuracy: 0.9615 - val_loss: 0.0317 - val_accuracy: 0.9907
Epoch 4/10
21/21 [==============================] - 563s 27s/step - loss: 0.0514 - accuracy: 0.9831 - val_loss: 0.0927 - val_accuracy: 0.9674
Epoch 5/10
21/21 [==============================] - 563s 28s/step - loss: 0.0569 - accuracy: 0.9754 - val_loss: 0.0245 - val_accuracy: 0.9907
Epoch 6/10
21/21 [==============================] - 567s 27s/step - loss: 0.0344 - accuracy: 0.9862 - val_loss: 0.0128 - val_accuracy: 1.0000
Epoch 7/10
21/21 [==============================] - 564s 27s/step - loss: 0.0170 - accuracy: 0.9954 - val_loss: 0.0440 - val_accuracy: 0.9767
Epoch 8/10
21/21 [==============================] - 563s 27s/step - loss: 0.0171 - accuracy: 0.9938 - val_loss: 0.0616 - val_accuracy: 0.9628
Epoch 9/10
21/21 [==============================] - 564s 27s/step - loss: 0.0066 - accuracy: 1.0000 - val_loss: 0.0150 - val_accuracy: 0.9953
Epoch 10/10
21/21 [==============================] - 578s 28s/step - loss: 0.0056 - accuracy: 1.0000 - val_loss: 0.0371 - val_accuracy: 0.9814
```

Figure 4.9: Accuracy for vgg-19 model

Confusion Matrix that is shown the figure 4.10.

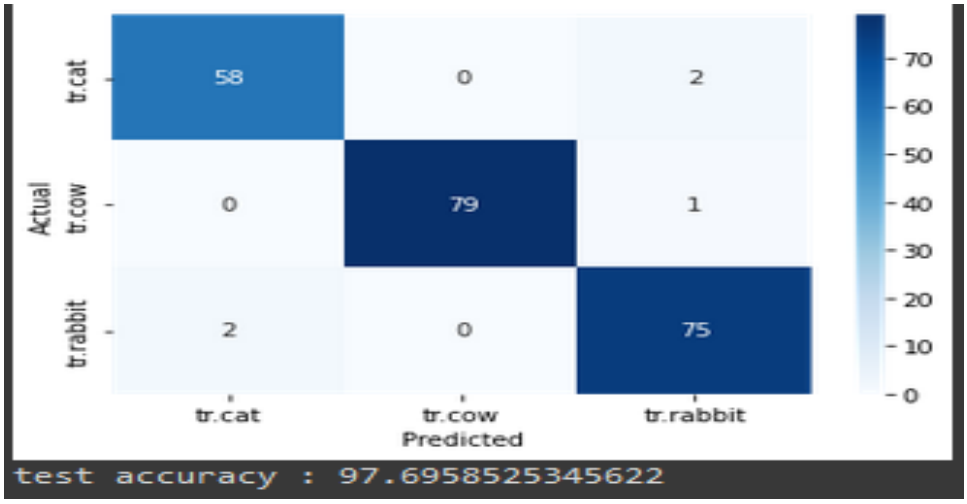

Figure 4.10: Confusion matrix for vgg-19 model

Plot Diagram:
Train accuracy and Validation accuracy that is shown the figure 4.11

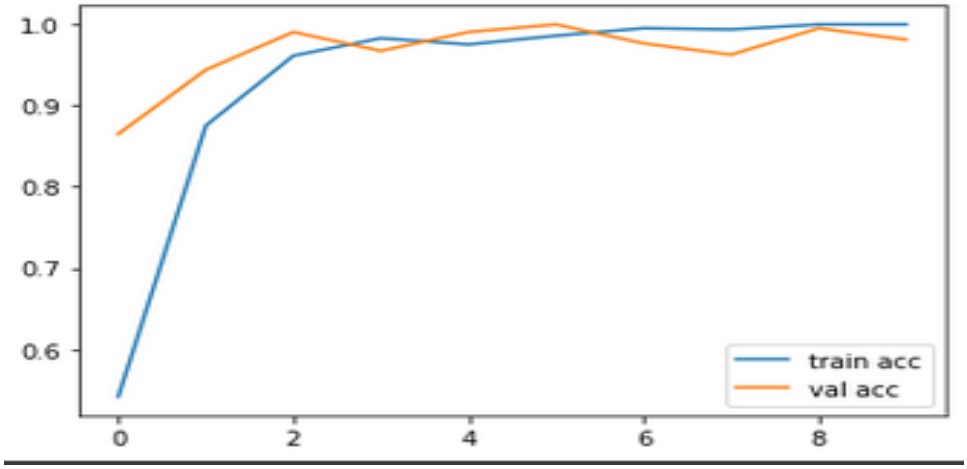

Figure 4.11: Train and validation accuracy for vgg-19 model

Train loss and validation loss that is shown the figure 4.12

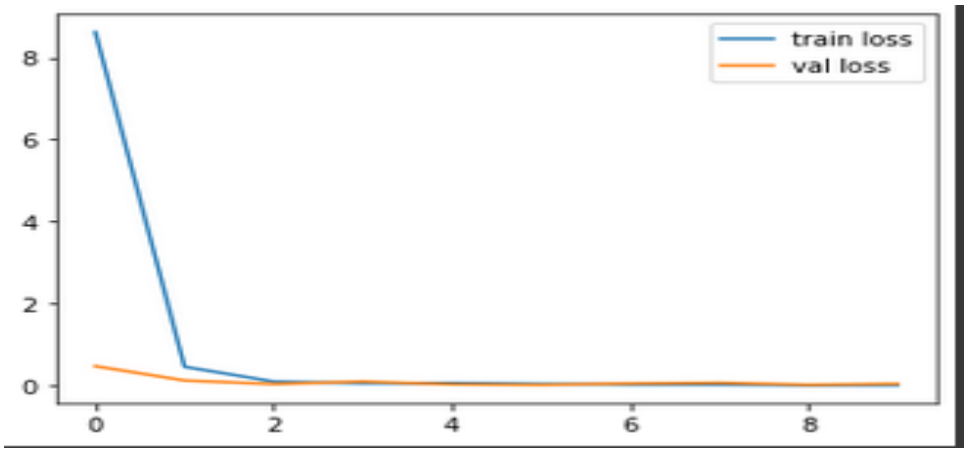

Figure 4.12: Train and validation loss for vgg-19 model

4.5 Experimental Result and Analysis for ResNet-50 Model:

Every single epoch accuracy level:

Top most accuracy is 79.9 at no 7 that is shown the figure 4.13

```
Epoch 1/10
21/21 [==============================] - 209s 10s/step - loss: 16.5152 - accuracy: 0.3615 - val_loss: 4.9939 - val_accuracy: 0.4000
Epoch 2/10
21/21 [==============================] - 157s 8s/step - loss: 1.7200 - accuracy: 0.5831 - val_loss: 0.8528 - val_accuracy: 0.6605
Epoch 3/10
21/21 [==============================] - 152s 7s/step - loss: 0.6920 - accuracy: 0.6892 - val_loss: 1.1061 - val_accuracy: 0.5302
Epoch 4/10
21/21 [==============================] - 153s 7s/step - loss: 0.6274 - accuracy: 0.7154 - val_loss: 0.5527 - val_accuracy: 0.7581
Epoch 5/10
21/21 [==============================] - 158s 8s/step - loss: 0.5581 - accuracy: 0.7415 - val_loss: 0.7043 - val_accuracy: 0.7023
Epoch 6/10
21/21 [==============================] - 158s 8s/step - loss: 0.4821 - accuracy: 0.7785 - val_loss: 0.3786 - val_accuracy: 0.8093
Epoch 7/10
21/21 [==============================] - 154s 7s/step - loss: 0.4867 - accuracy: 0.7969 - val_loss: 0.3992 - val_accuracy: 0.8279
Epoch 8/10
21/21 [==============================] - 161s 8s/step - loss: 0.4765 - accuracy: 0.7892 - val_loss: 0.6675 - val_accuracy: 0.7302
Epoch 9/10
21/21 [==============================] - 157s 7s/step - loss: 0.6224 - accuracy: 0.7477 - val_loss: 0.8153 - val_accuracy: 0.7442
Epoch 10/10
21/21 [==============================] - 155s 7s/step - loss: 0.9027 - accuracy: 0.7015 - val_loss: 1.0671 - val_accuracy: 0.6233
```

Figure 4.13: Accuracy for resnet-50 model

Confusion Matrix that is shown the figure 4.14

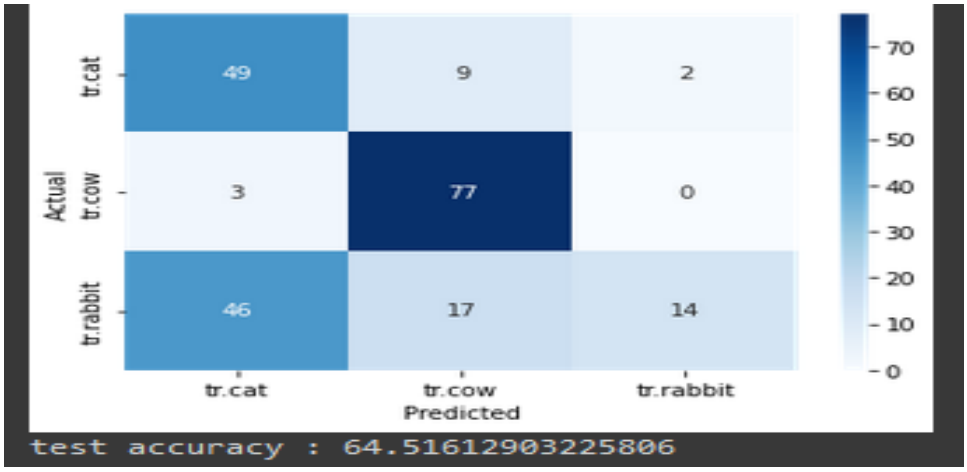

Figure 4.14: Confusion matrix for resnet-50 model

Plot Diagram:

Train accuracy and Validation accuracy that is shown the figure 4.15

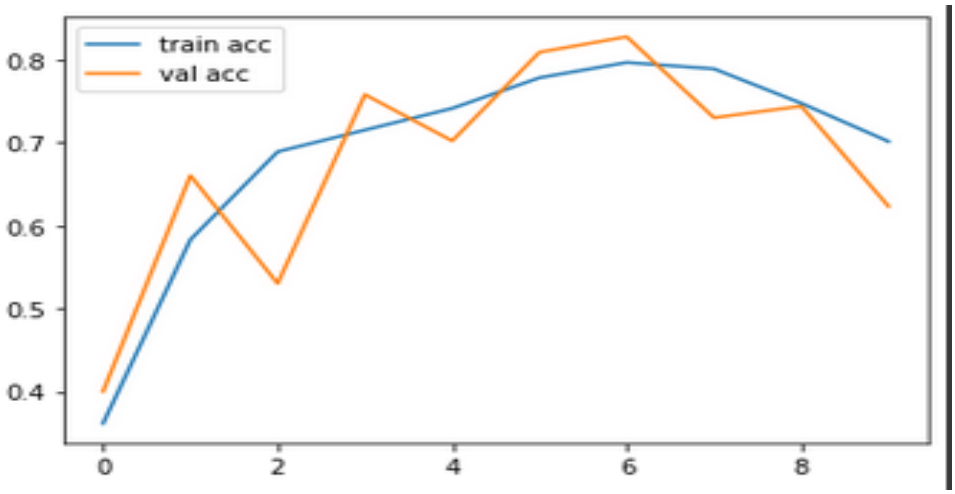

Figure 4.15: Train and validation accuracy for resnet-50 model

Train loss and validation loss that is shown the figure 4.16

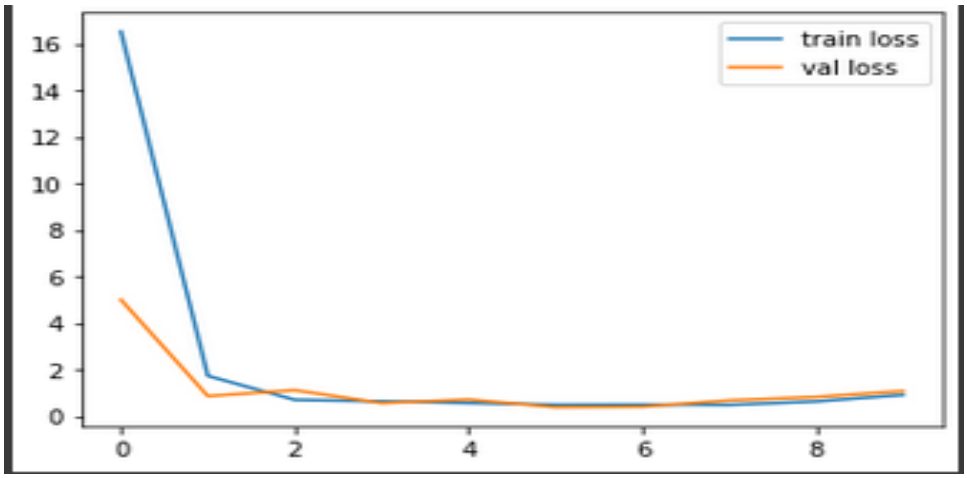

Figure 4.16: Train and validation loss for resnet-50 model

4.6 Experiment Summary

We have tried to identify some Bangladeshi rural animals in our system or project. In here we also focus on accuracy level. Actually, accuracy rate depends on accuracy of data and amount of data. We collected around 400 data for each three animals that contains the dataset around 1200 images. To find out the top most accuracy we use four types of CNN. Mobile-Net given us 100.00% accuracy where RseNet50 given us 64.52%. If we use more data then accuracy level might be down but if we collect noise free data then accuracy level will be at top most.

CHAPTER 5

Impact on Society, Environment and Sustainability

5.1 Impact on Society

If uneducated people can gather knowledge about those rural animals then it will definitely impact our society to be educated from ignorant. Also our little child will be safe from wasting their time from unusual things of internet and will know about animals and interested in it. Harmful animals can't destroy people's house and fields crops. Road accident between human vs animals and vehicles vs animals will be decrease.

5.2 Impact on Environment

People's awareness will be increase and they will empathetic to our animals. Conflict between human and animal will decrease and cross the Styx will rarefy. That will keep up human and animals environment safe. Illegal wild animal killing will be reduced. , that also keep environment balanced. By knowing about animals, people will aware from animals and keep themselves safe from them and that will safe human environment cool.

5.3 Ethical Aspects

People's awareness will be progress and they will empathetic to animals. Peoples will keep themselves away from harmful animals. They also know unknown animals and species. Animals affection and their positive view will come to forward.

5.4 Sustainability Plan

My plan is to educate illiterate people. Little children will interested in animals and in future they will research with those kinds of animals. Eager students also get interest in similar kind of works. Add animal's characteristics and behavior into the system and make easy to learn about animals for children.

CHAPTER 6
CONCLUSION, LIMITATIONS AND FUTURE WORK

6.1 Conclusion

Animal is a beautiful creation by Almighty Allah. Animals are most common things in our daily life but we don't have enough knowledge about their species and behavior. In this system we have proposed a novel algorithm to identify accurate animal. It may be the most significant thing that our result proved, biology researchers can save their huge amount of time by using deep-learning technology for their animal identification research. Our system main goal is to create a network for animal recognition and for the better output we must needed to choose quality data for input. Obviously training data find out the effectiveness of the system and for huge collection of data sturdy the system.

6.2 Future Work

In our system we're just identifying some animals with image training but we haven't made any application that can identify an animal when the applications camera turns onto the particular animal. We can also add the characteristics of animals into the system so that the system can automatically told us those characteristics at the same time. We obviously can expand our animal's type and data. We can investigate others identified methods, algorithms to increase accuracy.

6.3 Limitations

1. Though covid-19 situation is now better than previous times in our country but it exists, so in this circumstance it hampers our data collection physically.

2. As a student we have limitations in time that's why we can't take enough time that we need to complete a research with huge amount of data.

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