

CLASSIFY TIGERS IN MACHINE LEARNING APPROACH

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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

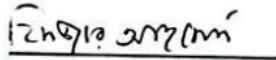
This Project/internship titled “CLASSIFY TIGERS IN MACHINE LEARNING APPROACH”, submitted by “Masrur Arafin”; “Rakibul Hasan , ID No: 172-15-10215, 171-15-8745 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment 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 28 / 1/2023

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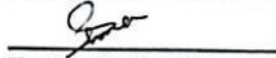
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We hereby declare that this study was conducted under the supervision of “ Ms. Nazmun Nessa Moon” Daffodil International University’s Department of CSE. We further confirm that no component of this project has been submitted to any other institution for the purpose of receiving a degree or diploma.

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ABSTRACT

The classification of tiger images in this research uses the Tensor Flow framework and deep learning, which is also known as machine learning. Python is used as a programming language because of how successfully it functions. In this study, three (3) different kinds of tigers were used, and this is where the input data is mostly addressed. It has been decided that this method is the optimal one for the training process because of the high percentage of accuracy it attained. In the results, it is discussed how accurate the image classification was in percentage terms. Similar results apply to another type of tiger, where the average result is up to 90% and higher. The majority of the image receives 90%. Classifier is the method of determining what an image shows. An image classifier is trained to identify various image classes. For instance, you could instruct a model to identify pictures of multiple distinct animal species. Its procedure of graphically picking tests (response variable) in an image and attributing those to or before subgroups (for example, that can be used for the entire photo. Classification technique and path length are multiple common techniques for categorizing the entire image using classification model. ' categorization scientific research the data characteristics by first computing.

TABLE OF CONTENTS

CONTENTS	PAGE NO
Approval	i
Declaration	ii
Acknowledgments	iii
Abstract	iv
List Of Figure	viii
List of table	ix
CHAPTER	
CHAPTER 1: INTRODUCTION	1-5
1.1 Introduction	1-2
1.2 Motivation	2
1.3 Rationale of the Study	3
1.4 Objectives	3
1.5 Research Questions	4
1.6 Expected Output	4
1.7 Report Layout	5
CHAPTER 2: BACKGROUND	6-8
2.1 Introduction	6
2.2 Related Works	6
2.3 Research Summary	7
2.4 Scope of the Problem	7-8
2.5 Challenges	8

CHAPTER 3: RESEARCH METHODOLOGY	9-16
3.1 Introduction	9
3.2 Research Subject and Instrumentation	10
3.3 Data Collection Procedure	10
3.3.1 Dataset	11
3.3.2 Category for Classes	11
3.3.3 Data Management	12
3.3.4 Organized Data	13
3.3.5 Data Storage	13
3.3.6 Approaches for Computer Vision	14
3.4 Statistical Analysis	14
3.5 Implementation Requirements	16
CHAPTER 4: EXPERIMENTAL RESULT AND DISCUSSION	17-27
4.1 Experiment Setup	17
4.2 Model Summary	17
4.3 Experimental Result and Analysis	18-26
4.4 Discussion	27
CHAPTER 5: SUMMARY, CONCLUSION, RECOMMENDATION, IMPLICATION FOR FUTURE RESEARCH	29-30
5.1 Summary of the Study	29
5.2 Conclusions	29
5.3 Recommendations	30
5.4 Implication for Further Study	30

CHAPTER 6 : IMPACTS OF OUR PROJECT	31-32
6.1 Impact on Society	31
6.2 Impact on Environment	31
6.3 Ethical Aspects	32
6.4 Sustainability Plan	32
REFERENCES	33
APPENDIX	34

LIST OF FIGURES

FIGURES	PAGE NO.
Figure 3.1: A Short Overview of Technique	9
Figure 3.2: Structure of the Dataset	10
Figure 3.3: Data Collected Proportions	11
Figure 3.4: Quantities of tigers	13
Figure 3.5:Tiger data management	12
Figure 3.6 :Tiger data management	13
Figure 3.7: Testing and Training Dataset Consists	13
Figure 3.8: System Structure For Analysis	14
Figure 4.1: Inception V3 Model Accuracy	19
Figure 4.2: Inception V3 Model Accuracy	19
Figure 4.3: Confusion matrix or classification Report	21
Figure 4.4:Vgg16 Model Accuracy	20
Figure 4.5:Confusion matrix or classification Report	21
Figure 4.6:MobileNet Model Accuracy	22
Figure 4.7:MobileNet Model Accuracy	22
Figure 4.8: Confusion matrix or classification Report	23
Figure 4.9: Vgg19Model Accuracy	22
Figure 4.10: Vgg19 Model Accurac	23
Figure 4.11: Confusion matrix or classification Report	23
Figure 4.12: CNN model accuracy	24
Figure 4.13: CNN model accuracy	24
Figure 4.14: Confusion matrix or classification Report	25
Figure 4.15: At Testing Dataset Prediction	25
Figure 4.16: Predict test dataset Results	26
Figure 4.17 : Predict test datasets output	26
Figure:4.18 :Test img shape	26

LIST OF TABLES

TABLE NAME	PAGE NO
Table 1.1 : Description Of Tiger Categories	2
Table 1.7 : Description of chapter Summery	5
Table 3.3.2 : The number of data	11
Table 4.1: Accuracy Table(Train Dataset)	18
Table 4.1: Accuracy Table(Test Dataset)	18

CHAPTER 1

INTRODUCTION

1.1 Introduction

In term of classification, this Tiger (*Panthera tigris*) is classified as a big cat and is a species of the Pantherinae group of the Felidae. Tiger identification is most commonly used in image classification processing. There are many kind of tiger behavior. Therefore, using this tiger as an example, The lions are the only felid (Felidae) species that can match the strength and hostility of the tiger (*Panthera tigris*), the largest cat species (*Panthera leo*). There are several different types of tigers, with the Siberian, or Amur, tiger (*P. tigris altaica*), being the largest. It may grow to a height of 4 meters (14 feet) and a weight of up to 400kg (660 pounds). The majority of tigers, about half of them, are the Indian or Bangladesh tiger (*P. tigris tigris*). Tiger of Siberia The Sumatran (*P. tigris sumatrae*) and Indo-Chinese (*P. tigris corbetti*) tigers are vivid reddish-tan in color and exquisitely characterized with dark, nearly black, vertical stripes. Larger, finer, and whiter fur can be seen on the rare Siberian tiger. So their physical fitness , behaviour will be different. The result will be get by image classification of tiger. In cooperation with local cultures and entities, green space preservation strategies and methods for sustainable resource management and tiger biosphere conservation are being established. Concurrently, public awareness is being raised on a local to global scale to encourage tiger biosphere sustainability, and educational materials are being developed for students, forest rangers, and others. Tigers are members of the Felidae family. The research categorizations of every tiger are classified in the paper's "Types of Tigers" category.

Table 1.1 : Description Of Tiger Categories

Name of the tiger	Scientific Structural description
Golden Tiger	This same multi band gene causes this in the golden tiger, while the image inhibitor () gene causes it in the white tiger. There are currently very few than thirty of these unique tigers in the world, but there are numerous carriers of the gene.
Mountain Tiger	It has become obvious that mountain tigers as a species are still quite flexible and can go from subtropical plains to warm woods and finally to mountain valleys,providing that there is proper habitat and communication. This shows how necessary interconnection across species and greater landscapes are to tiger wildlife conservation in the Himalayan range.
White Tiger	Due to the influence and interaction of genetics, the color of the stripe changes. White tigers of this type are called to as ice or "clear white," and another genetic characteristic leads the tiger's colors to be incredibly light. Its fur of white tigers, Oriental cats, and Himalayas rabbit contains an enzyme called that modify color in reaction to weather, getting darker in the cold.

1.2 Motivation

Many people in our country are unfamiliar with the various types of tigers and their proper classification. They have no understanding of tiger and classification resources. If they discover scientific classification and a limited number of tigers, it may be possible to conduct research on various types of tigers. A classification of animals is unquestionably important for the advancement of a country. And for a different class of tiger, and tiger resources can develop in the global animal sector.

1.3 Rationale of the Study

Computer vision (ML), recognized a subcategory of Machine Learning (AI), is a sector of CSE that focuses on knowledge discovery based on example recognition. A Device gained from previous failures after reread evaluation of knowledge and specialists' tasks that were originally believed to be too challenging for computers to measure.

A invention of this framework to comprehend information and information in industry area despair inquiry has provided vital data to determine in a matter of partnership, structure, and system of reasons for despair in job area both in Bangladesh.

Experimental research in cognitive is now implementing AI (ML) frameworks to construct imaging-based classification and characterization frameworks for a select neurological and image classification issues. In this essay, we look into the current use of AI by focusing on areas of employment that are in a downturn, evaluating the data using equations, and determining the major reasons behind the decline.

Many people in our country are unfamiliar with the various types of tigers and their proper classification. They have no understanding of tiger and classification resources. If they discover scientific classification and a limited number of tigers, it may be possible to conduct research on various types of tigers. A classification of animals is unquestionably important for the advancement of a country. And for a different class of tiger, and tiger resources can develop in the global animal sector.

1.4 Objective

To measure the accuracy and classification of tigers from multiple tigers image resources, three different types of tigers will be analyzed using Convolution Neural Network (CNN), Transfer Learning InceptionV3, VGG19, Mobile Net, and VGG16. A standard model development that can be used by the develop so that they can create different apps to detect three different types of tiger.

1.5 Research Questions

1. How does the system, given a sample of data, predict the actual output?
2. What is the thesis' key point of focus?
3. What data was collected and how was it made next to each other?
4. Every other identifying new reliable data and perform precisely (yes/no)?
5. What was the performance accuracy??

- It truly can, though. The dataset was correctly constructed, and all of the data implemented such a system. It was easy to forecast each unique tiger because each piece of information was used to classify the tiger's origins.
- The important purpose of the thesis is to spread awareness about the importance of tiger in environment and their ancient origins. Attempts have been made once again to develop a Tiger classification system that can be used to determine natural resources and balance them with environmental resources to support..
- Every piece of data was collected from websites as source data, including each of the various tiger kinds. Yes.

Five different models or algorithms have been used. We had successful outcomes from models like Convolution Neural Network (CNN), Transfer Learning InceptionV3, Vgg19, Mobile net, and VGG16 but the other models weren't as accurate or provided us with as much input.

1.6 Expected Outcome

To use the provided dataset and our tiger classification model, we can produce an expected result. In this case, 80% of the dataset was used as training data, and 20% was used as test data. The accuracy of the tiger classification that is completely dependent on the training dataset is what we are trying to find. Finding the training dataset's accuracy is our goal. Our classification of the tiger will be complete once all necessary measures have been completed. Our system achieved 96% accuracy at VGG19, 92% accuracy at inceptionV3, 83% accuracy at VGG16, and 79% accuracy at CNN.

1.7 Report Layout

Table 1.7 : Description of chapter Summery

Chapter	Description
Chapter 1	This portion has explored the motive for our work, our objectives, and the desired results of our work.
Chapter 2	In this part, we've discussed the theoretical basis of our project, other related research, similar research, the range of the topics, and problems.
Chapter 3	Here are describing our research topic, the method we utilized, our data collection method, scientific techniques, and deployment.
Chapter 4	Under this part, we discuss the results of our experimental tests, analysis, and conclusion.
Chapter 5	This section discusses the analysis of outcomes and recommendations and provides additional study methods.
Chapter 6	This section discusses the analysis of social issues and ethics and recommendations and provides additional study methods.

CHAPTER 2

BACKGROUND

2.1 Introduction

The main objective of tiger classification is to ensure that the ecosystem remains strong and usable. Although tiger classification can help with research, it is unable to fulfill the requirements of the environment in terms of prediction. But though Bangladesh's tiger production impairment has been fulfilled, the natural system problem remains significant. Like a consequence of this absence of knowledge, thousands of tigers in this country are dying as a of various environmental issues. Many different species of tigers, especially those that live in areas, are highly susceptible. Its ultimate focus of tiger categorization is to guarantee that now the ecosystem remains healthy and functional. Although tiger classification can help with research, it does not meet the needs of the environment when it comes to prediction. But though Bangladesh's tiger production deficit has been met, the systems theory issue remains severe. Like a consequence of this, thousands of tigers in this country are suffering from a variety of environmental issues and are dying on a routine basis. Many different species of tigers in rural areas are highly vulnerable.

2.2 Related Works

To determine tiger classification, the researcher [1] implements a machine learning method. To the researcher, [2] users are categorize three types of tigers. The primary goal of this paper was to help more people realize the multiple types of tigers. About there system was developed with a deep learning algorithm. The creator [3,] suggests that he utilized a machine learning process to identify the tiger and tiger biography. The tiger classification was tested for the first time using deep learning and prediction. In accordance with creator [4,], users investigated the impact of tiger in natural helps to identify tiger. As per the creator [5,], they collected Golden tigers and Mountain tigers from different locations to specify the amount of tigers and sub origins of tigers, and they found that the tiger classification could have more than two - thirds of tigers and sub origins of tigers. To the source [6], various forms of tigers were no longer classified as tigers. In this research, they find that tiger sub origin and tiger are constant for a while. According to the authority, they desired to develop the

system [7]. They were thoroughly examining all of the materials for an interesting story involving various tigers. The advantages it would bring to everyone inspired them to do so. That source [8,] says that they found through analysis that the golden tiger is a powerful of origin. Tiger Location, though, is not a place where people may live without risk. Therefore, their main objective was to discover how to apply this tiger physical therapy in urgent circumstances. The recommended method may be used to identify and count tigers in various classes in influence scientifically, based on the researcher [9]. To the article [10], those who created Tiger adopting both of the earlier methodology and machine learning. They even found that now the tiger's condition made a difference.

2.3 Research Summary

The major goal is to determine where the different types of tigers and sub classes of tigers came from. Since both tigers and lions have a variety of classes and sub classes, we looked for the origin of the tiger class or subclass that still represents the majority of the tiger classification. We classified the dataset into three key tigers, like the Golden Tiger, Mountain Tiger, and White Tiger because our project is image data to train. We'll identify the class of tiger sources from the image database.

To determine the model's accuracy, formulation, and estimation, investigators used Convolution Neural Networks (CNN), Transfer Learning INCEPTION V3, Vgg19 ,Mobile Net, , and VGG16 algorithms. Consultants put in the effort to get the accuracy obtained achievable given our model rewards from precision at a greater level.

That project's description is also important. Authentication means finding out which tigers demonstrate which natural behaviors. And at last, classifiers will allow us to identify the origins of tigers.

2.4 Scope of the Problem

One main cause we operate of tigers is because everyone can quickly tell when tigers or one of their sub classes, such as cats, jaguars, and lions, are there. Whenever we split the nation into different areas to perform our analysis, we can observe that most people have no idea of which subclass of tiger or lion contains a certain tiger.

Therefore, order to verify observations that cats and tigers increases class and subclass the tiger classification system, additional carefully controlled conventional rehabilitation studies are required. To establish the connection between tiger and subclass tiger or lion intake, it is still challenging to evaluate tiger administration accurately. Expense techniques for analyzing tiger and cats are needed. So even though evidence suggests a relation among cats and tigers and an underclass of sub-tigers in the prevalence and mortality of diseases like cancer and cardiovascular disease, there are still disagreements in the scientific establishment regarding the link, so more vast studies conducted over extended periods of time are recommended.

2.5 Challenges

It is very difficult to get information on the region of our countries. Because results depend on an exact information, predictive model. Because there is no one source for the statistics, we faced a lot of problems. We had to gather class and subclass tigers since that is what we were trying to determine out. They had to get data on other tigers or mountain tigers because information from the same tiger and lion can be equivalent. For example, unless a golden tiger shows natural behavior, then might image it. Then, after shooting three or four images, they might have to change it for a different tiger. Therefore, no relationships between the same tiger were found. Other issue we got into has been that they needed to gather all of the same tigers, and subclass tigers occasionally prevented us from taking pictures. A large dataset is necessary for good efficiency. They concentrated on getting nice shots of all the golden or mountain tigers while taking the shots. Other animals were just not used as statistics, either. That environment was also another problem. They made an attempt to collect images that had the same colour and brightness. To capture a decent pic was very tough. Because they took all of the images using an tiger,their documents changed to"heic"which are unsuitable with Open-source notebooks and cooperative tasks. Then they updated each image.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Lets will describe the study approach and methods in further detail in this section. For fact, the program's tools, information collecting, work area, processed, and post. That section will discuss data study and its application. In figure 3.1, the entire process is displayed.

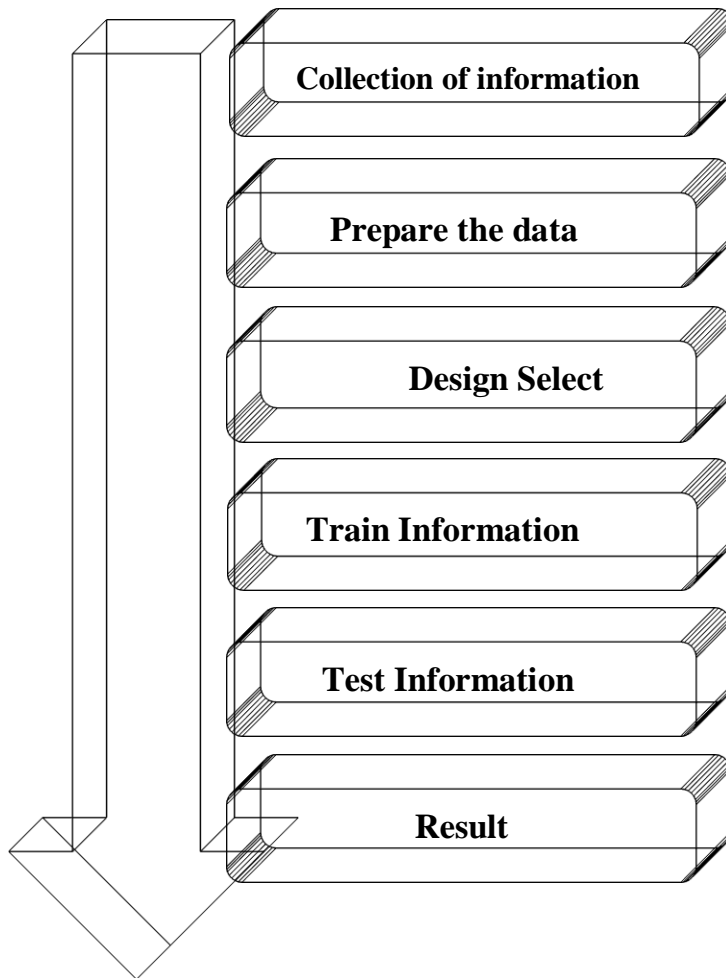


Figure 3.1: A Short Overview of Technique

3.2 Research Subject and Instrumentation

To discovered the identifying tiger origins from different tigers and tiger sub classes is a hard challenge. They really had to remain cautious on anything.

1. That set of data needs to be accumulated.
2. Making sure the selection was perfect.
3. Properly categorizing the information.
4. Making the information properly labeled.

3.3 Data Collection Procedure

The majority of the information we utilized in the research was taken via two main domains. A number of websites, such as Google Chrome and kaggle. They had collected about of these 3900. So we have choose 38,00 of those datasets for our project. Every piece of information was acquired online using a laptop. There will be almost three tigers in this datasets.

```
8 # Total number of validation images
9 num_of_validation_samples = 0
10 for validation_dataset in os.listdir(val):
11     in_folder_val = val + "/" + validation_dataset
12     in_folder_val_list = os.listdir(in_folder_val)
13     num_of_validation_samples = num_of_validation_samples + len(in_folder_val_list)
14 print("Number of Validation samples : ", num_of_validation_samples)
```

Number of Training samples : 1132
Number of Validation samples : 230

Figure 3.2: Structure of the Dataset

3.3.1 Dataset

The data has about three different types of tigers. Through the records, which are displayed in, there must be 355 white tigers, 380 mountain tigers, and 400 golden tigers. figure 3.3.1

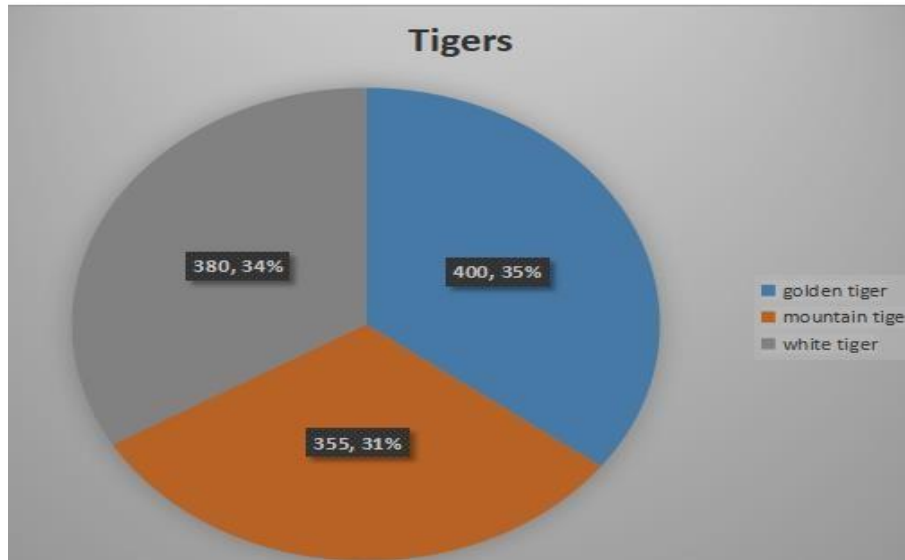


Figure 3.3: Data Collected Proportions

3.3.2 Category for Classes

There are three(5) categories represented. Are the classes:

- Golden tiger
- Mountain Tiger
- White tiger

The number of datasets that are available for each class is listed follows :

Table 3.3.2 : The number of data

Type	Number
Golden Tiger	400
Mountain Tiger	350
White tiger	380

As from information, the amounts of every tigers are as follows: Golden Tiger 35.0%, Mountain Tiger 34.0%, and White Tiger 31.0%. Figure shown at 3.3.2.

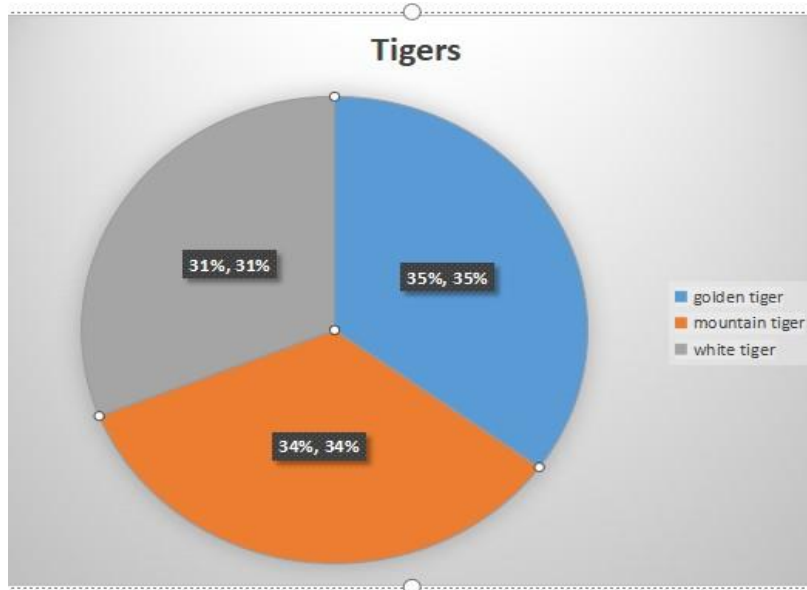


Figure 3.4: Quantities of tigers

3.3.3 Data Management

Having well before here all information in this area. since there are several methods of image limitation in the datasets. Efficiency rate will decline if all pictures really aren't transformed into a single set of rules. Figure 3.5 shows what an instance while editing a picture had about 2500*3000 pixel, however after editing, the picture was reduced to 224*224 pixels, as seen in figure 3.5

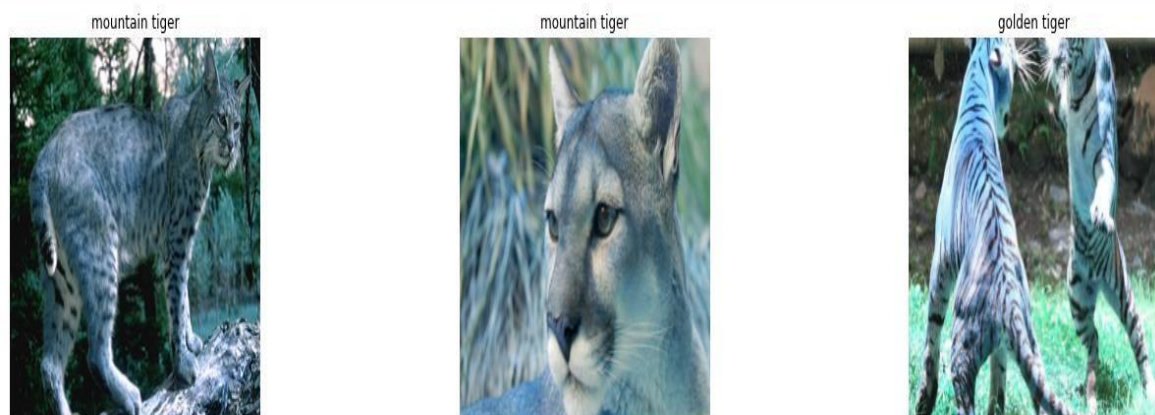


Figure 3.5 :Tiger data management

3.3.5 Data Storage

Following data collection, the process of data storing has proceeded. We saved the dataset in this part both on the computer folder and Google Drive. Because we used Google Colab, possessing a Google Drive directory was important. We have copied the datasets to Google Drive as a results. And uploading to Google Drive was the safest if we wanted to use those datasets in the future to enhance the service. All of the datasets will be deleted if there was a technical error with computer. Due to this, we also copied the dataset to Google Drive.

3.3.6 Approaches for Computer Vision

For about accuracy, we implemented CNN, INCEPTION V3, VGG19, MOBILE NET, and VGG16. We used training and test datasets to implement these methods. Python libraries like TensorFlow, Keras, NumPy, PyTorch, Flatten, etc. are used to implement all algorithms. These modules helps in the program's startup.

3.4 Statistical Analysis

There are 1300 images in the dataset that can be used to identify tigers. Nearly 1132 photos make up the training dataset, with the remaining ones served as the test dataset. We used analyzing the key, but better accuracy was our key goal. We obtained the desired accuracy from CNN, INCEPTION V3, VGG19, MOBILE NET, and VGG16. To determine the appropriate accuracy, we kept several guidelines in place. Such as: Real-time images of different items from different websites were taken by us. After that, the images were all modified to the 'jpg' type.

- After processing, we decided to get rid of all the unnecessary photos.
- Then, all of the images' height and width were fixed to 224*224.
- Categorize all datasets using names.
- We classified them into train and test datasets after classification.

Following separation, methods were in use.

- i .CNN
- ii.VGG 16
- iii. VGG19
- iv .MOBILE NET
- v. INCEPTIONV3

The diagram for how to perform:

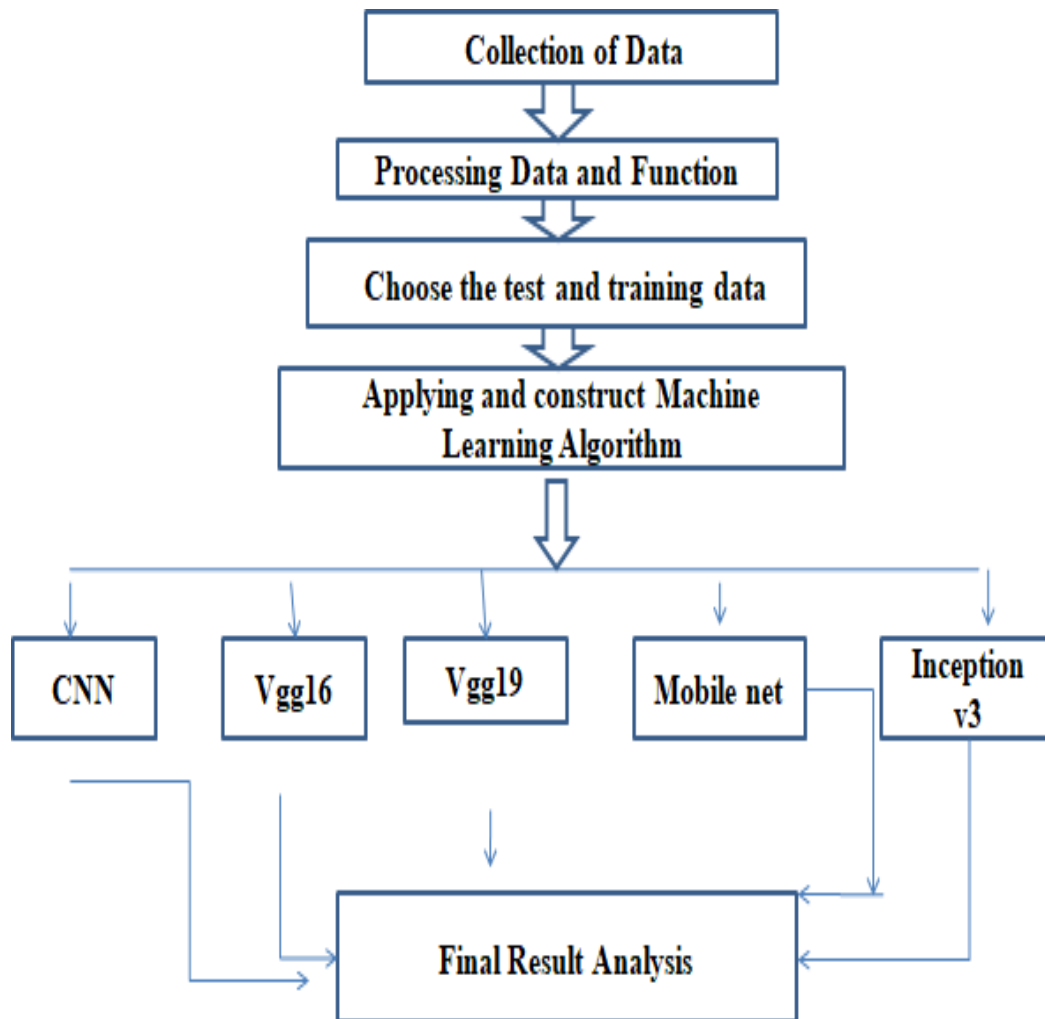


Figure 3.8: System Structure For Analysis

Figure 3.8 demonstrates the process flow. That flowchart shows demonstrated basic process was successful.

3.5 Implementation Requirements

Python 3.10.2

One of most stable Python release is version 3.10.2. Python is a high-level, open-source, browser programming language that is considered to be the strongest of all the computer languages. Using another language will be very complex because the architecture of CNN, vgg16, InceptionV3, and VGG 19 OR Mobile net is so sophisticated. It takes less time to implement because Python's built-in functions and commands are so simple. It would require a lot more time if other programming languages had been utilized.

Google Co-lab/Jupyter Notebook

Google Co-lab is a virtual Application that has been installed and set so that all work is done through the chrome browser using cloud's services. It operates just like Jupyter. Because only the Python kernel may now be deployed, instead of Jupyter Co-lab, they are based on notebooks or notebooks, which can be word, graphics, or program.

The same thing is also performed with Jupyter notebook. Hardware qualities set them from one another. The Jupyter notebook is suitable if one has an auxiliary GPU with an elevated build. As it was our responsibility, we had to access the Google Co-lab platform.

Device specifications

- 1.Version Of android (Linux or Windows 10 or above).
- 2.Web Application (Chrome, Firefox, or Microsoft Edge).
- 3.Computer (At at least 100GB above).
- 4.RAM (More over 4 GB).
- 5.GPU(At minimum 2GB)

CHAPTER 4

EXPERIMENTAL RESULT AND DISCUSSION

4.1 Experimental Setup

The initial objective was to prepare datasets for our analysis and program. The following system process is given:

- i. We had collected all the datasets from many websites since our objective was really to figure out the classification of the tiger among three (3) different sorts of tigers and their origins..
- ii. The hard step became collecting all the data. Due to the time-consuming process of collecting data.
- iii. Additionally, those datasets were changed to "jpg" format.

4.2 Model Summary

This Overview of the Algorithm was quite difficult because that was a sub image analysis. This is why we selected soft-max as the actuation. For each algorithm, the total, trainable, and non trainable parameters can be found here. Finally, the model is used to determine how the model is constructed. The dataset is compressed, and there are 3 dense layers. Each of the 10 to 70 epochs we used has 20 layers.

4.3 Experimental Result and Analysis

Our major goal is to find and classify the tiger origins from many tigers. Then, we predict our model using test datasets. The accuracy rate is important, and we're happy with the results we got in that approach. Additionally, our model was successful after already being tested. Accuracy of the training dataset. Additionally, tables 4.1 and 4.2 demonstrate the testing dataset's accuracy.

Confusion Matrix

A confusion matrix is a matrix which is frequently can use explain the outcome of a classification algorithm on a set of test data for which the true values can be determined. It depicts the visibility of a method's results.

Table 4.1 : Accuracy Table (train datasets):

Model Name	Accuracy (train datasets)
Vgg19	83%
CNN	79%
Vgg16	83%
Mobile Net	99%
InceptionV3	86%

Table 4.2 : Accuracy Table (test datasets):

Model Name	Accuracy (test datasets)
Vgg19	67%
CNN	75%
Vgg16	85%
Mobile Net	95%
InceptionV3	91%

So from tables 4.1 and 4.2, we can understand that the accuracy rate is highest at Mobile net. We have 99% of accuracy in both train and test datasets using the Mobile Net algorithm. Because as we have discussed before Mobile Net has the highest number of parameters. So the execution will be very fast and accurate. Now let's see the graphical view of training and lost dataset percentages.

The Model of InceptionV3 demonstration accuracy: In this section the inception v3 model execute the three classes of data processing from train sets and test sets .then epochs one to twenty counting the total datasets and then show the total accuracy and find out the accuracy graph.

Accuracy level for every epoch:

```

inc_training = inc_model.fit_generator(train_generator,
Epoch 1/10
35/35 [=====] - 532s 15s/step - loss: 1.9027 - accuracy: 0.3518 - val_loss: 0.9808 - val_accuracy: 0.5893
Epoch 2/10
35/35 [=====] - 21s 599ms/step - loss: 0.9039 - accuracy: 0.6355 - val_loss: 0.5495 - val_accuracy: 0.7991
Epoch 3/10
35/35 [=====] - 21s 587ms/step - loss: 0.7134 - accuracy: 0.7236 - val_loss: 0.4285 - val_accuracy: 0.8393
Epoch 4/10
35/35 [=====] - 21s 596ms/step - loss: 0.5830 - accuracy: 0.7873 - val_loss: 0.3466 - val_accuracy: 0.8795
Epoch 5/10
35/35 [=====] - 21s 593ms/step - loss: 0.5099 - accuracy: 0.8191 - val_loss: 0.3025 - val_accuracy: 0.8929
Epoch 6/10
35/35 [=====] - 20s 584ms/step - loss: 0.4322 - accuracy: 0.8391 - val_loss: 0.2711 - val_accuracy: 0.9062
Epoch 7/10
35/35 [=====] - 21s 591ms/step - loss: 0.4220 - accuracy: 0.8373 - val_loss: 0.2608 - val_accuracy: 0.9107
Epoch 8/10
35/35 [=====] - 21s 594ms/step - loss: 0.3763 - accuracy: 0.8691 - val_loss: 0.2249 - val_accuracy: 0.9196
Epoch 9/10
35/35 [=====] - 21s 598ms/step - loss: 0.3644 - accuracy: 0.8591 - val_loss: 0.2060 - val_accuracy: 0.9241
Epoch 10/10
35/35 [=====] - 21s 584ms/step - loss: 0.3565 - accuracy: 0.8636 - val_loss: 0.2024 - val_accuracy: 0.9196

```

Figure 4.1: Inception v3 model accuracy

```

Training Accuracy Inception : 0.8636363744735718
Training Loss Inception : 0.3565407395362854
Validation Accuracy Inception : 0.9196428656578064
Validation Loss Inception : 0.202354297041893

```

Figure 4.2: Inception v3 model accuracy

Confusion Matrix or Classification Report:

```

Confusion Matrix
[[72  4  6]
 [ 0 72  0]
 [ 9  0 67]]
=====
Classification Report
              precision    recall  f1-score   support

golden tiger      0.89      0.88      0.88         82
mountain tiger    0.95      1.00      0.97         72
white tiger       0.92      0.88      0.90         76

   accuracy              0.92
  macro avg              0.92
 weighted avg            0.92

```

Figure 4.3: Confusion Matrix or Classification Report

The Model of Vgg16 demonstration accuracy: In this section the vgg16 model execute the three classes of data processing from train sets and test sets .then epochs one to thirty counting the total datasets and then show the total accuracy and find out the accuracy graph.

```

17/17 [=====] - 215s 13s/step - loss: 0.5771 - accuracy: 0.7794 - val_loss: 0.6994 - val_accuracy: 0.7500
Epoch 17/30
17/17 [=====] - 215s 13s/step - loss: 0.5498 - accuracy: 0.8272 - val_loss: 0.4694 - val_accuracy: 0.8542
Epoch 18/30
17/17 [=====] - 215s 13s/step - loss: 0.5760 - accuracy: 0.8125 - val_loss: 0.3975 - val_accuracy: 0.8750
Epoch 19/30
17/17 [=====] - 215s 13s/step - loss: 0.5699 - accuracy: 0.7574 - val_loss: 0.6556 - val_accuracy: 0.7292
Epoch 20/30
17/17 [=====] - 215s 13s/step - loss: 0.6173 - accuracy: 0.7463 - val_loss: 0.9177 - val_accuracy: 0.6250
Epoch 21/30
17/17 [=====] - 215s 13s/step - loss: 0.5424 - accuracy: 0.8272 - val_loss: 0.4280 - val_accuracy: 0.8542
Epoch 22/30
17/17 [=====] - 215s 13s/step - loss: 0.5189 - accuracy: 0.8088 - val_loss: 0.3995 - val_accuracy: 0.8750
Epoch 23/30
17/17 [=====] - 215s 13s/step - loss: 0.5193 - accuracy: 0.8015 - val_loss: 0.5205 - val_accuracy: 0.8125
Epoch 24/30
17/17 [=====] - 215s 13s/step - loss: 0.5315 - accuracy: 0.8125 - val_loss: 0.5309 - val_accuracy: 0.8125
Epoch 25/30
17/17 [=====] - 214s 13s/step - loss: 0.5359 - accuracy: 0.7941 - val_loss: 0.6935 - val_accuracy: 0.7292
Epoch 26/30
17/17 [=====] - 214s 13s/step - loss: 0.5395 - accuracy: 0.7978 - val_loss: 0.4201 - val_accuracy: 0.8542
Epoch 27/30
17/17 [=====] - 214s 13s/step - loss: 0.4901 - accuracy: 0.7978 - val_loss: 0.5220 - val_accuracy: 0.8333
Epoch 28/30
17/17 [=====] - 214s 13s/step - loss: 0.5165 - accuracy: 0.7941 - val_loss: 0.5005 - val_accuracy: 0.8542
Epoch 29/30
17/17 [=====] - 215s 13s/step - loss: 0.4688 - accuracy: 0.8529 - val_loss: 0.5064 - val_accuracy: 0.8333
Epoch 30/30
17/17 [=====] - 217s 13s/step - loss: 0.4631 - accuracy: 0.8309 - val_loss: 0.4025 - val_accuracy: 0.8542

```

Figure 4.4: Vgg16 model accuracy

```

Training Accuracy VGG : 0.8308823704719543
Training Loss VGG : 0.4630524814128876
Validation Accuracy VGG : 0.8541666865348816
Validation Loss VGG : 0.4025299549102783

```

Figure 4.5: Vgg16 model accuracy

Confusion Matrix or Classification Report:

```

Confusion Matrix
[[74  5  3]
 [ 0 71  1]
 [26  4 46]]
=====
Classification Report
              precision    recall  f1-score   support

golden tiger      0.74      0.90      0.81         82
mountain tiger    0.89      0.99      0.93         72
white tiger       0.92      0.61      0.73         76

 accuracy              0.83         230
 macro avg              0.85         0.83         0.83         230
 weighted avg          0.85         0.83         0.82         230

```

Figure 4.6: Confusion Matrix or Classification Report

The Model of Mobile net demonstration accuracy: In this section the mobile net model execute the three classes of data processing from trainsets and testsets .Then epochs one to twenty counting the total datasets and then show the total accuracy and find out thre accuracy graph.

```

Epoch 1/20
29/29 [=====] - 5s 86ms/step - loss: 0.3372 - accuracy: 0.8972 - val_loss: 0.2244 - val_accuracy: 0.9251 - lr: 0.0010
Epoch 2/20
29/29 [=====] - 2s 56ms/step - loss: 0.0687 - accuracy: 0.9779 - val_loss: 0.2690 - val_accuracy: 0.9339 - lr: 0.0010
Epoch 3/20
29/29 [=====] - 2s 67ms/step - loss: 0.0489 - accuracy: 0.9845 - val_loss: 0.2634 - val_accuracy: 0.9207 - lr: 0.0010
Epoch 4/20
29/29 [=====] - 2s 67ms/step - loss: 0.0361 - accuracy: 0.9901 - val_loss: 0.2398 - val_accuracy: 0.9383 - lr: 1.0000e-04
Epoch 5/20
29/29 [=====] - 2s 56ms/step - loss: 0.0295 - accuracy: 0.9890 - val_loss: 0.2426 - val_accuracy: 0.9427 - lr: 1.0000e-04
Epoch 6/20
29/29 [=====] - 2s 55ms/step - loss: 0.0189 - accuracy: 0.9934 - val_loss: 0.2420 - val_accuracy: 0.9471 - lr: 1.0000e-04
Epoch 7/20
29/29 [=====] - 2s 56ms/step - loss: 0.0217 - accuracy: 0.9923 - val_loss: 0.2466 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 8/20
29/29 [=====] - 2s 56ms/step - loss: 0.0153 - accuracy: 0.9956 - val_loss: 0.2558 - val_accuracy: 0.9604 - lr: 1.0000e-04
Epoch 9/20
29/29 [=====] - 2s 56ms/step - loss: 0.0159 - accuracy: 0.9956 - val_loss: 0.2562 - val_accuracy: 0.9604 - lr: 1.0000e-04
Epoch 10/20
29/29 [=====] - 2s 68ms/step - loss: 0.0154 - accuracy: 0.9978 - val_loss: 0.2571 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 11/20
29/29 [=====] - 2s 59ms/step - loss: 0.0123 - accuracy: 0.9967 - val_loss: 0.2620 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 12/20
29/29 [=====] - 2s 56ms/step - loss: 0.0112 - accuracy: 0.9989 - val_loss: 0.2652 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 13/20
29/29 [=====] - 2s 56ms/step - loss: 0.0145 - accuracy: 0.9967 - val_loss: 0.2696 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 14/20
29/29 [=====] - 2s 56ms/step - loss: 0.0174 - accuracy: 0.9945 - val_loss: 0.2713 - val_accuracy: 0.9604 - lr: 1.0000e-04
Epoch 15/20
29/29 [=====] - 2s 56ms/step - loss: 0.0111 - accuracy: 0.9956 - val_loss: 0.2714 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 16/20

```

Figure 4.7: Mobile net model accuracy

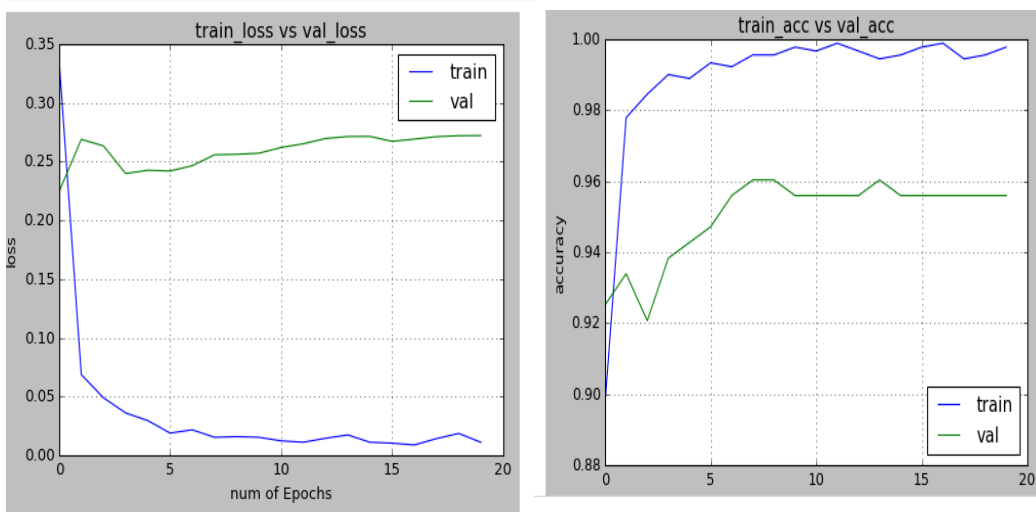


Figure 4.8: Mobile net model accuracy

Confusion Matrix or Classification Report:

```
10 print(classification_report(test_image_label, pred_label))
```

	precision	recall	f1-score	support
golden tiger	0.01	0.01	0.01	82
mountain tiger	0.00	0.00	0.00	72
white tiger	0.97	1.00	0.99	76
micro avg	0.33	0.33	0.33	230
macro avg	0.33	0.34	0.33	230
weighted avg	0.33	0.33	0.33	230
samples avg	0.33	0.33	0.33	230

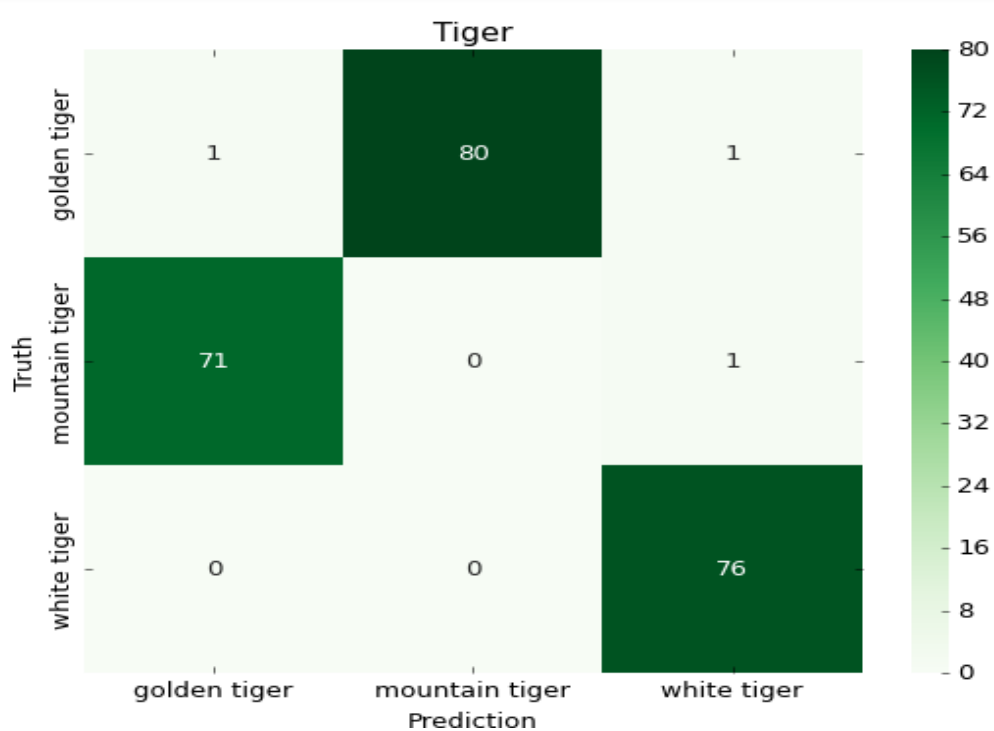


Figure 4.9: Confusion Matrix or Classification Report

The Model CNN demonstration accuracy: In this section the CNN model execute the three classes of data processing from trainsets and testsets .Then epochs one to ten counting the total datasets and then show the total accuracy and find out thre accuracy graph.

```

Epoch 1/10
35/35 [=====] - 18s 212ms/step - loss: 1.1872 - accuracy: 0.5223 - val_loss: 42.7900 - val_accuracy: 0.3542 - lr: 0.0010
Epoch 2/10
35/35 [=====] - 7s 208ms/step - loss: 0.9074 - accuracy: 0.6429 - val_loss: 8.1287 - val_accuracy: 0.3854 - lr: 0.0010
Epoch 3/10
35/35 [=====] - ETA: 0s - loss: 0.8560 - accuracy: 0.6616
Epoch 3: ReduceLROnPlateau reducing learning rate to 0.0003000000142492354.
35/35 [=====] - 7s 209ms/step - loss: 0.8560 - accuracy: 0.6616 - val_loss: 4.9189 - val_accuracy: 0.3542 - lr: 0.0010
Epoch 4/10
35/35 [=====] - 7s 213ms/step - loss: 0.7999 - accuracy: 0.6830 - val_loss: 1.4177 - val_accuracy: 0.5833 - lr: 3.0000e-04
Epoch 5/10
35/35 [=====] - 7s 212ms/step - loss: 0.6847 - accuracy: 0.7259 - val_loss: 0.9754 - val_accuracy: 0.6042 - lr: 3.0000e-04
Epoch 6/10
35/35 [=====] - 8s 217ms/step - loss: 0.6433 - accuracy: 0.7277 - val_loss: 0.7002 - val_accuracy: 0.6458 - lr: 3.0000e-04
Epoch 7/10
35/35 [=====] - 7s 214ms/step - loss: 0.5940 - accuracy: 0.7608 - val_loss: 0.4938 - val_accuracy: 0.7604 - lr: 3.0000e-04
Epoch 8/10
35/35 [=====] - ETA: 0s - loss: 0.5556 - accuracy: 0.7857
Epoch 8: ReduceLROnPlateau reducing learning rate to 9.000000427477062e-05.
35/35 [=====] - 7s 214ms/step - loss: 0.5556 - accuracy: 0.7857 - val_loss: 0.5675 - val_accuracy: 0.7500 - lr: 3.0000e-04
Epoch 9/10
35/35 [=====] - ETA: 0s - loss: 0.5417 - accuracy: 0.7893
Epoch 9: ReduceLROnPlateau reducing learning rate to 2.700000040931627e-05.
35/35 [=====] - 7s 213ms/step - loss: 0.5417 - accuracy: 0.7893 - val_loss: 0.5828 - val_accuracy: 0.7500 - lr: 9.0000e-05
Epoch 10/10
35/35 [=====] - ETA: 0s - loss: 0.5101 - accuracy: 0.7937
Epoch 10: ReduceLROnPlateau reducing learning rate to 8.100000013655517e-06.

```

Figure 4.10:CNN model accuracy

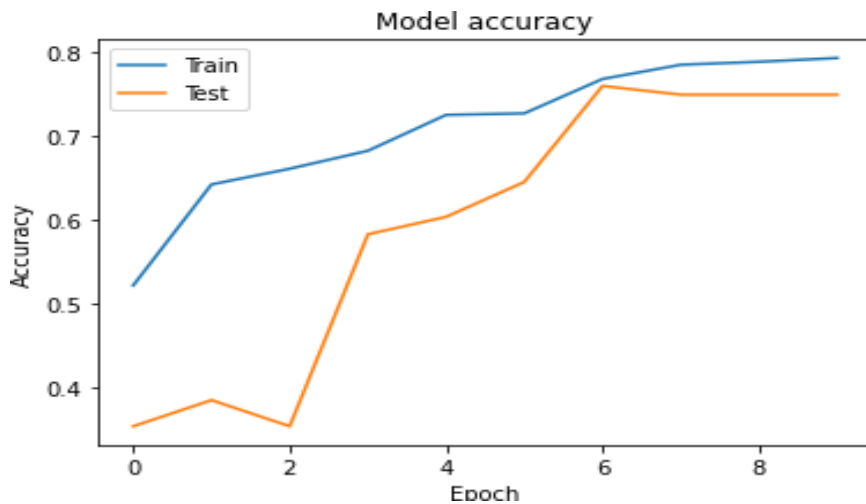


Figure 4.11: CNN model accuracy

Confusion Matrix or Classification Report:

	precision	recall	f1-score	support
0	0.90	0.60	0.72	30
1	0.69	0.94	0.79	33
2	0.87	0.82	0.84	33
accuracy			0.79	96
macro avg	0.82	0.79	0.79	96
weighted avg	0.82	0.79	0.79	96

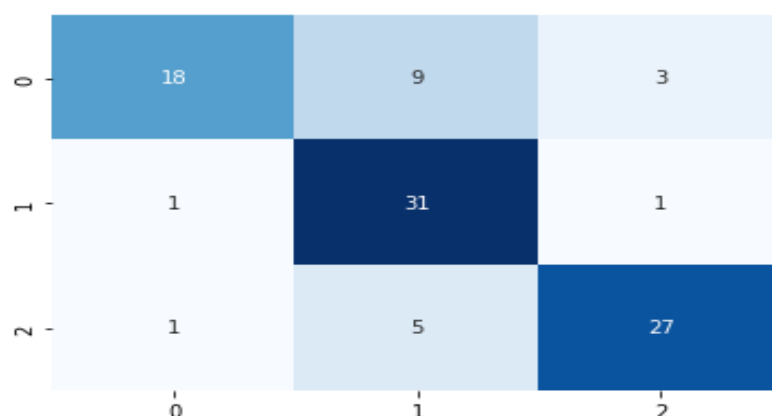


Figure 4.12: Confusion Matrix or Classification Report

The Model VGG19 demonstration accuracy: In this section the CNN model execute the three classes of data processing from trainsets and testsets .Then epochs one to ten counting the total datasets and then show the total accuracy and find out thre accuracy graph.

```

Epoch 1/20
29/29 [=====] - 5s 86ms/step - loss: 0.3372 - accuracy: 0.8972 - val_loss: 0.2244 - val_accuracy: 0.9251 - lr: 0.0010
Epoch 2/20
29/29 [=====] - 2s 56ms/step - loss: 0.0687 - accuracy: 0.9779 - val_loss: 0.2690 - val_accuracy: 0.9339 - lr: 0.0010
Epoch 3/20
29/29 [=====] - 2s 67ms/step - loss: 0.0489 - accuracy: 0.9845 - val_loss: 0.2634 - val_accuracy: 0.9207 - lr: 0.0010
Epoch 4/20
29/29 [=====] - 2s 67ms/step - loss: 0.0361 - accuracy: 0.9901 - val_loss: 0.2398 - val_accuracy: 0.9303 - lr: 1.0000e-04
Epoch 5/20
29/29 [=====] - 2s 56ms/step - loss: 0.0295 - accuracy: 0.9890 - val_loss: 0.2426 - val_accuracy: 0.9427 - lr: 1.0000e-04
Epoch 6/20
29/29 [=====] - 2s 55ms/step - loss: 0.0189 - accuracy: 0.9934 - val_loss: 0.2420 - val_accuracy: 0.9471 - lr: 1.0000e-04
Epoch 7/20
29/29 [=====] - 2s 56ms/step - loss: 0.0217 - accuracy: 0.9923 - val_loss: 0.2466 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 8/20
29/29 [=====] - 2s 56ms/step - loss: 0.0153 - accuracy: 0.9956 - val_loss: 0.2558 - val_accuracy: 0.9604 - lr: 1.0000e-04
Epoch 9/20
29/29 [=====] - 2s 56ms/step - loss: 0.0159 - accuracy: 0.9956 - val_loss: 0.2562 - val_accuracy: 0.9604 - lr: 1.0000e-04
Epoch 10/20
29/29 [=====] - 2s 68ms/step - loss: 0.0154 - accuracy: 0.9978 - val_loss: 0.2571 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 11/20
29/29 [=====] - 2s 59ms/step - loss: 0.0123 - accuracy: 0.9967 - val_loss: 0.2620 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 12/20
29/29 [=====] - 2s 56ms/step - loss: 0.0112 - accuracy: 0.9989 - val_loss: 0.2652 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 13/20
29/29 [=====] - 2s 56ms/step - loss: 0.0145 - accuracy: 0.9967 - val_loss: 0.2696 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 14/20
29/29 [=====] - 2s 56ms/step - loss: 0.0174 - accuracy: 0.9945 - val_loss: 0.2713 - val_accuracy: 0.9604 - lr: 1.0000e-04
Epoch 15/20
29/29 [=====] - 2s 56ms/step - loss: 0.0111 - accuracy: 0.9956 - val_loss: 0.2714 - val_accuracy: 0.9559 - lr: 1.0000e-04
Epoch 16/20

```

Figure 4.13: VGG 19 model accuracy

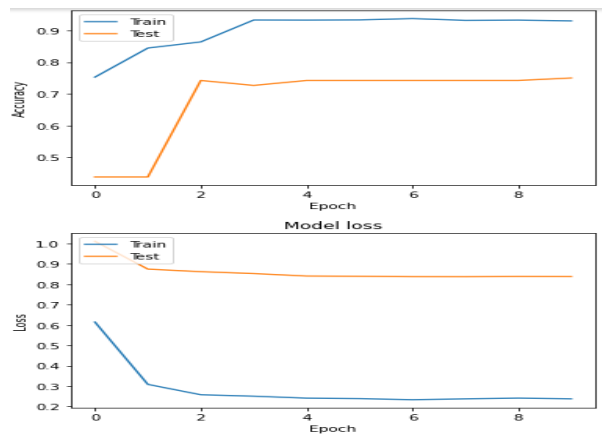


Figure 4.14: VGG 19 model accuracy

Confusion Matrix or Classification Report:

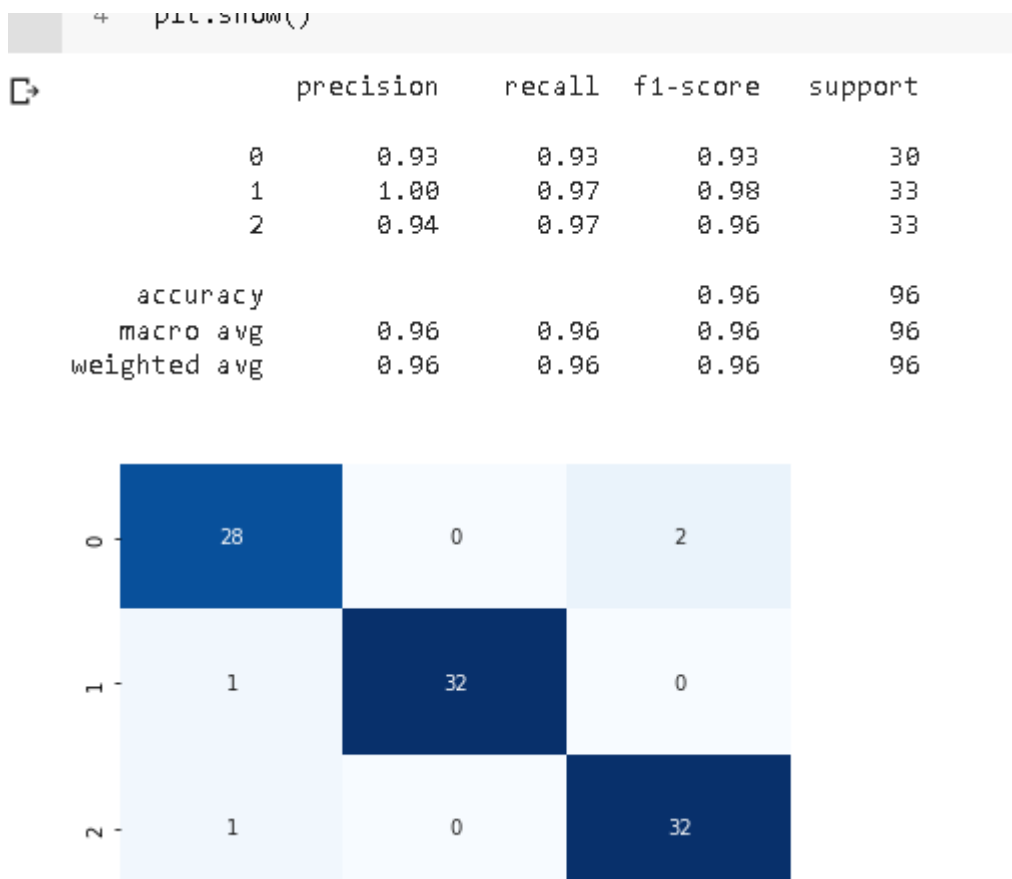


Figure 4.15: Confusion Matrix or Classification Report

Identification: In our approach, we attempt to determine using testing data. We will determine the tigers based on the evaluation information. The approach which requires is shown in picture following. 4.16 or 4.17

```

] 1 predict = np.argmax(model.predict(test_images), axis=1)
  2 predict

3/3 [=====] - 0s 118ms/step
array([[2, 2, 2, 0, 2, 1, 0, 1, 0, 2, 1, 1, 0, 0, 2, 0, 1, 1, 2, 2, 1, 2,
       1, 1, 1, 0, 2, 1, 0, 0, 0, 2, 0, 0, 0, 1, 1, 0, 2, 1, 2, 2, 1, 1,
       1, 1, 1, 0, 2, 0, 2, 0, 2, 1, 2, 2, 0, 2, 1, 1, 2, 1, 0, 0, 1, 2,
       0, 2, 2, 1, 1, 1, 0, 2, 0, 2, 2, 1, 1, 2, 2, 1, 0, 2, 0, 0, 0, 0,
       0, 1, 0, 2, 1, 2, 2, 2]])

```

Figure 4.16: predicting the test dataset

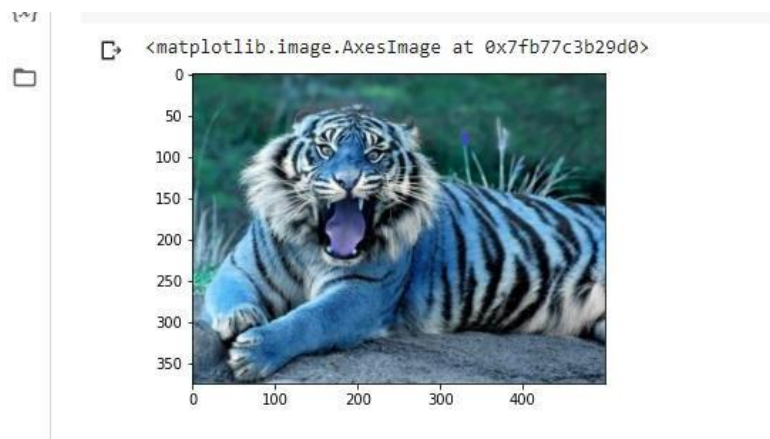


Figure 4.17: Predict test dataset output

Element transformation of the statistical image The solution may be given following.

```

{x}
[] test_img.shape
(375, 500, 3)

[] test_img = cv2.resize(test_img,(256,256))

▶ test_input = test_img.reshape((1,256,256,3))

[] model.predict(test_input)

1/1 [=====] - 0s 267ms/step
array([[0.]], dtype=float32)

```

Figure 4.18: Test img shape

4.4 Discussion

We have built up our model that can help to find out the sources. But primarily we find out the accuracy rate. This accuracy rate is the key to our further work. And accuracy mainly depends on the dataset. As it is image-based research so the image quality and sharpness might be very quality. And we were very much concerned about it. Secondly the algorithms. The algorithm is also a key factor of good accuracy. Because more parameters more accuracy. So for this reason our accuracy ratio was up to 91% for the training set and 90% accuracy for the test set.

CHAPTER 5

SUMMARY, CONCLUSION, RECOMMENDATION, IMPLICATION FOR FUTURE RESEARCH

5.1 Summary of the Study

To make a framework that properly shows Tiger and Classification for both of us. Their primary goal would have been to acquire concepts for Tiger classification or source identification. While our testing focuses on the information, precision had been a significant factor for this purpose since if it decreases, there will be no value. This testing set impacts both our testing and classification. As a result, both training and testing information correctness have to be carefully considered.

One could readily conclude that the three sets that VGG19 and inceptionV3 both provide us with about the same accuracy in terms of testing and training datasets. Our accuracy rate was around 90%. As a result, both our test and forecast will become more realistic.

5.2 Conclusion

The primary approach for learning about tiger origin and sub classes in the little level of information to produce animal prediction is through tiger categorization. This comes from our knowledge and imagination. Many community members in our area lack basic tiger classification knowledge. Those who have too little understanding about the genesis of animals. Our goal was to determine the classification of tigers so that people could locate the articles that were useful for their needs and could obtain the information they need.

5.3 Recommendations

Machine learning is an area of data science, which applies intellect and reasoning capacity. Machine learning, to sum it up, is the embodiment of intellect or intellectual skills via machines. Which is machine learning science's drawback for people? In several respects, the researcher is the solution to this query. However, if we can advance machine learning to far and, it will bring about the biggest or worst shift. Maybe humanity could have. Men, however, are clever and observant. We wish to observe what takes place. And it is spies who improve machine learning. Making algorithms as knowledgeable as people is our goal.

5.4 Implication for Further Study

To improve the quality of their analysis, it should study with much more information..

1. Let should find out a lot as it used to.
2. I'll attempt to provide the tiger% rate as well. What class of tiger already have too much .
3. The major objective is to develop applications for the observation information. Whether any picture of tiger or sub classes tiger.

CHAPTER 6

IMPACTS OF OUR PROJECT

6.1 Impact on Society

This research system is designed to meet tigers so that we can identify their class or subclass and save them. We think that our initiative will have a huge impact on society. We are in an overcrowded nation where the eco-system can support a large number of living creatures and preserve a large number of natural habitats. Interaction between humans and tigers is a persistent issue in India's Sundarbans Forest Area. This not only raised awareness of the fella tigers but also of the notable illness and death of those residing in this dis-positional zone. both Our research explored the tiger outcome of the man whose were attacked by tigers. As part of a fishing expedition. The tigers who kill the tiger must endure the permanent social with tiger slaying as well as subsequent societal alienation natural destroy. The current study examines how well these interpersonal exclusions contributed to the ' tiger killing issues.

6.2 Impact on Environment

The tigers are a crucial component of the environmental since their removal would have a significant impact on the natural stability. India is seeking to increase the tiger numbers by 35% in order to conserve forests, taking this into account. It could assist the economy as well. The tigers have a significant impact on livestock, which helps to keep environment in order. The proportion has been upset by livestock because of the large decrease in tiger populations. Therefore, in order to keep this environmental balance, we need some more tigers. Another crucial aspect is that, in order to safeguard the woods that produce rain, we must protect tigers if we desire a nice rainy each year for.

6.3 Ethical Aspects

Establishing a categorization is not a terrible idea when trying to locate a subclass of tiger like a cat or jaguar. It would be a huge assistance if our initiative cooperated with them throughout their rescue. For you folks, protecting the animals comes first when I attempt to save or rescue the victims in my capacity as a researcher. I could save life by locating tigers using our research, that has big impact. It is possible to prevent natural disasters from destroying the tiger and their ecology. There is nothing immoral about our project. That can save lives is the theme we're focusing upon, and also the phrase on its own is moral.

6.4 Sustainability Plan

The eight year implementation plan for tiger recovery in Bangladesh is outlined in this section. This BTAP was given an eight-year tenure because it would give enough time to mobilize a comprehensive conservation campaign and see goals realized. This strategy offers an outlook for tigers in Bangladesh in addition to a set of objectives to direct all sustainability initiatives. It includes a number of corporate strategy to address dangers and obstacles for each aim, as well as a set of targets for each aim. The BTAP lacks a comprehensive deployment plan with specific actions, roles, and funding because it is a comprehensive plan. The BTAP's materials will be transformed into approved program during following planned and mobilization meetings, which will also foster the essential cooperation. Keep enough resource basis to sustaining the Sundarbans tiger species by increasing or stabilizing. Keep a safe environment to ensure the communities of animals and tigers with in Himalayan region.

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APPENDIX RESEARCH REFLECTION

The system's construction proved challenging. We had a few issues with the operation. Getting the right datasets was the initial issue. First, we obtained basic online information. Choosing a suitable methodology was the current issue we ran into. They discovered a Classification technique which only provided 66% efficiency. However, after such investigation, we discovered that the settings weren't suitable; as a result, we adjusted the method a second time and obtained the correct efficiency. Building up this project was a difficult task. During the project, we faced a few problems. The first problem was collecting the proper dataset. At first, we collected some data online. But for better accuracy, those images were not appropriate. Each expansion of the images has a separate issue formatted as 'heic' to; image.

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