CLASSIFYING ANIMAL ATTACKS IN CROPLAND USING WEKA TOOL

A MINIPROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

K.RAMAKRISHNAN COLLEGE OF ENGINEERING
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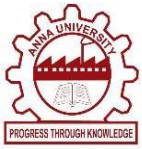

ANNA UNIVERSITY

CHENNAI –600025

MAY 2024

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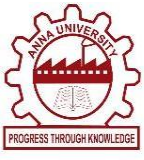

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BONAFIDE CERTIFICATE

Certified that this project report titled **"CLASSIFYING ANIMAL ATTACKS IN CROPLAND USING WEKA TOOL"** is the bonafide work of **HARISHMITHA P (8115U22CS036), JANANI L S (8115U22CS038),** and **KOWSHIKA T (8115U22CS051)** who carried out the work under my supervision.

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ACKNOWLEDGEMENT

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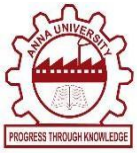

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TABLE OF CONTENT

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	ix
	LIST OF FIGURES	x
1	**INTRODUCTION**	**1**
	1.1 INTRODUCTION TO WEKA Tool	3
	1.1.1 Scope of WEKA Tool	3
	1.1.2 Overview of WEKA Tool	4
	1.1.3 Concept of WEKA Tool	4
	1.2 AIM & OBJECTIVE	5
2	**LITERATURE SURVEY**	**6**
3	**SYSTEM ANALYSIS**	**11**
	3.1 EXISTING SYSTEM	11
	3.1.1 Limitations	12
	3.2 PROPOSED SYSTEM	13
	3.2.1 Advantages	14
4	**SYSTEM REQUIREMENTS**	**15**
	4.1 HARDWARE REQUIREMENTS	15
	4.2 SOFTWARE REQUIREMENTS	15
	4.3 TECHNOLOGIES USED	16

5	**MODULE DESCRIPTION**	**24**
6	**SYSTEM DESIGN**	**25**
	6.1 USE CASE DIAGRAM	26
	6.2 ACTIVITY DIAGRAM	27
	6.3 STATE DIAGRAM	28
	6.4 CLASS DIAGRAM	28
7	**SYSTEM TESTING**	29
	7.1 UNIT TESTING	29
	7.2 INTEGRATION TESTING	30
	7.3 USER ACCEPTANCE TESTING	30
8	**CONCLUSION AND FUTURE ENHANCEMENTS**	**31**
	8.1 CONCLUSION	31
	8.2 FUTURE ENHANCEMENTS	33
	APPENDICES	**34**
	APPENDIX A(SAMPLE CODINGS)	34
	APPENDIX B(SCREENSHOTS)	35
	REFERENCES	**36**
	CERTIFICATES	37

ABSTRACT

The encroachment of wildlife into agricultural areas is an increasing concern for farmers worldwide, as it leads to significant crop damage and economic loss. This study aims to develop an efficient system for classifying animal attacks in Croplands using WEKA tools. By leveraging machine learning algorithms and data mining techniques, the research focuses on identifying patterns and predicting potential animal incursions based on historical data. The datasets, comprising various features such as crop type, time of year, geographical location, and previous attack incidents, is processed and analyzed using WEKA's comprehensive suite of tools. Several classification algorithms, including Decision Trees,Random Forest, Naive Bayes, and Support Vector Machines, are evaluated to determine the most accurate model. The performance of these models is assessed using metrics such as accuracy, precision, recall, and F1-score.The results demonstrate that machine learning models can effectively classify and predict animal attacks, thereby providing farmers with a proactive tool to mitigate damage and optimize crop protection strategies.This research highlights the potential of data-driven approaches in addressing agricultural challenges and promoting sustainable farming practices.

LIST OF FIGURES

FIGURE NO.	FIGURE NAME	PAGE NO.
Figure 3.1	Block Diagram of Existing System	12
Figure 3.2	Block Diagram of Proposed System	15
Figure 6.1	Use Case Diagram	27
Figure 6.2	Activity Diagram	28
Figure 6.3	Architecture Diagram	29
Figure 6.4	Class Diagram	29

CHAPTER 1

INTRODUCTION

In India, agriculture has always been a major contributor to the country's GDP. The majority of Indians find work in agriculture, yet this sector is filled with challenges. Animal-human conflict has long been a big problem that has wasted countless resources and put people's lives in danger. In recent years, there has been an increase in the frequency of these sorts of conflicts. Therefore, this area needs continual surveillance to deter the introduction of such animals and other undesirables. To get over these obstacles and accomplish our goal, we employ the deep learning concept of convolutional neural networks, a sub-field of computer vision, to identify animals as they enter our farm. The primary goal of this project is to constantly monitor the entire farm using a camera that records the surroundings at all hours of the day. We identify animal infiltration using a CNN algorithm

Convolutional neural networks (CNN's) are a kind of neural network that significantly improves image-based recognition by doing away with the need for picture pre-processing and allowing intrinsic feature selection. Another difficulty is acquiring a large datasets sufficient for these contests. When the datasets size is limited, it is better to use a model that has been pre-trained on a large datasets. A good crop yield with minimal expenditure is the need of the hour, and farmers who want to try this method need not spend much. Each farmer expects a good harvest at the beginning of every planting season. Farmers of the state face serious threats from frequent natural calamities like cyclone, flood, draught etc.

In agriculture, one of the main social issues that is existing in the present is the damaging of the crops by the wild animals. Wild animal intrusion has always been a persisting problem to the agriculturalist. Some of the animals that act as a threat to the crops are monkeys, elephants, cow and others. These animals may feed on crops and also they run around the field in the absence of farmer and thus can cause damage to those crops. This may results in significant loss in the yield and will cause additional financial protection to the farmer in order to deal with the aftermath of the damage.

Every farmer, while utilizing his production, should also be aware of the fact that animals are also live in the same place and they need to be secured from any probable suffering. This problem need to be attended immediately and an effective solution must be created and accomplished. Thus, this project aims to address this problem which is caused to farmer. One of the applications of the deep learning technique called Convolutional Neural Network is animal detection. The rapid growth in the human population and the continuous economic development are making over-exploitation of mineral deposit, causing fast, novel and remarkable changes to ecosystems. The large amount of land surface has been converted by human action, making changes in wildlife population, habitat and their behaviour. Which result in more serious thing that is many wild animals on Earth have been driven to extinction, and many species are entered into new areas where they can disturb both natural and human systems. Therefore, observing the wild animals is essential as it provides evidences to the researchers to inform conservation and management decisions for maintaining diverse, balanced and maintainable ecosystems

1.1 INTRODUCTION TO WEKA TOOLS

Waikato Environment for Knowledge Analysis (WEKA) is a collection of machine learning and data analysis free software licensed under the GNU General Public License. It provides you a visualization tool to inspect the data. The various models can be applied on the same datasets. You can then compare the outputs of different models and select the best that meets your purpose. Thus, the use of WEKA results in a quicker development of machine learning models on the whole.

WEKA contains a collection of visualization TOOLS and algorithms for data analysis and predictive modelling, together with graphical user interfaces for easy access to these functions. The original non-Java version of WEKA was a TCL/Tk front-end to (mostly third-party) modelling algorithms implemented in other programming languages, plus data preprocessing utilities in C, and a make file-based system for running machine learning experiments. This original version was primarily designed as a tool for analyzing data from agricultural domains, but the more recent fully Java-based version (WEKA 3), for which development started in 1997, is now used in many different application areas, in particular for educational purposes and research.

1.1.1Scope of WEKA TOOLS

WEKA offers numerous classification algorithms, including decision trees, support vector machines, naive Bayes, k-nearest neighbours, and neural networks, allowing users to build models for predicting categorical outcomes. WEKA offers numerous classification algorithms, including

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WEKA includes regression algorithms for predicting continuous numerical values, such as linear regression, multi layer perceptron, and support vector regression. WEKA supports various clustering algorithms, including k-means, hierarchical clustering, and density-based clustering, for discovering natural groupings in data. WEKA offers techniques for anomaly detection, which involve identifying unusual patterns or outliers in data, essential for fraud detection and cyber security applications.

1.1.2 Overview of WEKA TOOLS

WEKA provides a user-friendly graphical interface called the WEKA Explorer, which allows users to interactively explore datasets, preprocess data, build predictive models, and evaluate their performance. WEKA includes a wide range of TOOLS for data pre-processing, including filtering, normalization, attribute selection, discretization, and handling missing values, essential for preparing data before building predictive models

Overall, WEKA provides a versatile and powerful toolkit for machine learning and data mining tasks, suitable for researchers, practitioners, and students in various domains. Its extensive set of algorithms, coupled with user-friendly interfaces, make it a popular choice for both beginners and experienced users.

1.1.3Concept of WEKA TOOLS

The concept of WEKA TOOLS centre around providing a versatile, accessible, and powerful platform for machine learning and data mining tasks, catering to the needs of both beginners and experienced practitioners

in the field. Its modular design, extensive algorithm library, user-friendly interfaces, and active community support make it a popular choice for research, education, and practical applications.

WEKA benefits from a large and active user community, which contributes to its development, documentation, and support. Users can access forums, mailing lists, tutorials, and documentation to seek help, share knowledge, and stay updated on the latest developments in the WEKA ecosystem. WEKA is designed to be highly flexible and extensible, allowing users to customize and extend its functionality according to their specific needs.

1.2 AIM & OBJECTIVE

The proposed work has two goals:

i. The aim of using WEKA TOOLS for predicting animals in Croplands is to develop a robust and accurate predictive model that can assist farmers and agricultural stakeholders in managing and mitigating the impact of animal presence on crop production.

ii. The goal of WEKA TOOLS is to provide a comprehensive and accessible platform for machine learning and data mining tasks. Specifically, the overarching goal of WEKA TOOLS is to empower users, including researchers, practitioners, and students.

CHAPTER 2

LITERATURE SURVEY

Literature survey is a text written by someone to consider the critical points of current knowledge including substantive findings, as well as theoretical sections.

2.1 ASSESSMENT OF CROP DAMAGE BY PROTECTED WILD MAMMALIAN HERBIVORES ON THE WESTERN BOUNDARY OF TADOBA-ANDHARI TIGER RESERVE (TATR)

AUTHORS: Abhijeet Bayani, Dilip Tiwade, Ashok Dongre, Aravind Dongre, Rasika Phatak, and Milind Watve

PUBLICATION: Central India, 2016.

Crop raiding by wild herbivores close to an area of protected wildlife is a serious problem that can potentially undermine conservation efforts. Since there are orders of magnitude difference between farmers' perception of damage and the compensation given by the government, an objective and realistic estimate of damage was found essential. We employed four different approaches to estimate the extent of and patterns in crop damage by wild herbivores along the western boundary of TADOBA-ANDHARI Tiger Reserve in the state of Maharashtra, central India. These approaches highlight different aspects of the problem but converge on an estimated damage of over 50% for the fields adjacent to the forest, gradually reducing in intensity with distance. We found that the visual damage assessment method currently employed by the government for paying compensation to farmers was uncorrelated to and grossly underestimated actual damage. The findings necessitate a radical rethinking of policies to assess, mitigate as well as compensate for crop damage caused by protected wildlife species.

2.2 RECOMMENDATION AND VISUALIZATION OF SIMILAR MOVIES USING MINIMUM SPANNING DENDROGRAMS

AUTHORS: Michael Vlachos and Daniel Svonava

PUBLICATION: Info Vis, 2012

Exploration of graph structures is an important topic in data mining and data visualization. This work presents a novel technique for visualizing neighbourhood and cluster relationships in graphs; we also show how this methodology can be used within the setting of a recommendation system. Our technique works by projecting the original object distances onto two dimensions while carefully retaining the 'backbone' of important dis_x0002_tances. Cluster information is also overlayed on the same projected space. A significant advantage of our approach is that it can accommodate both metric and non-metric distance functions. Our methodology is applied to a visual recommend-er system for movies to allow easy exploration of the actor–movie bipartite graph. The work offers intuitive movie recommendations based on a selected pivot movie and allows the interactive discovery of related movies based on both textual and semantic features.

Data visualization is an inherent task in data analysis and data mining, because it 'forces us to see' (in the words of John Tukey1) hidden or obvious properties and relationships of the data examined. The abun_x0002_dance of highly dimensional and complex data intensi_x0002_fies the need for advanced visualization techniques that are able to translate the original object relation_x0002_ships into a form easily comprehensible by the human brain, i.e. translated into two or three dimensions.

2.3 ANIMAL DETECTION IN FARM AREA

AUTHORS: Nagashree K*1, Devadiga Varshini Vasantha*2, Deekshitha*3, Mehnaz*4,
Aishwarya D Shetty*5

PUBLICATION: International Research Journal of Modernization in Engineering Technology and Science, 2021.

Animal attack in the farm area is considered as the major threat, which will reduce the amount of crop. The main reason for this is the expansion of cultivated land. Human-wildlife conflicts occur through crop raiding which is common in these days. The farmers in India face huge loss through natural calamities, animal attacks etc. The old age methods practiced by the farmers are not efficient. It is practically impossible to appoint guards to monitor the farm area. The main aim of the project is to help the farmer to save the crops without harming the animals. The steps performed here is to protect the crops from animal attack by taking appropriate measure to keep the animal away by producing appropriate sound without killing or harming the animals. Thus, to reach our goal and solve the problem, we make use of machine learning technique to detect the animal entering into the farm area using convolutional neural network. Here in this project, the entire farm area is monitored at regular interval of time through the camera, which helps to record the entire surrounding of the farm. Machine learning model is designed to detect the animal entering the farm and plays the appropriate sound to shoo an animal away from the farm such that the crops are prevented from damage. Different types of packages and concepts of the convolutional neural network is used to design the model to achieve the desired aim in the project.

2.4 ECONOMIC ASSESSMENT OF CROP DAMAGES BY ANIMAL MENACE IN MID HILL REGIONS OF HIMACHAL PRADESH

AUTHORS: Rajesh Kumar Thakur, Aditi Walia1, Kanika Mehta1*, virender Kumar1 And Harbans Lal

PUBLICATION: Indian Journal of Animal Sciences, 2021.

The present study assessed the extent of animal menace and its impact on the economic losses of crops in mid_x0002_hill regions of Himachal Pradesh. The study was conducted in Kangra district of Himachal Pradesh and was based on the primary data collected from 60 farm households selected through three stage random sampling process. It was observed that in the existing scenario, due to animal menace, the net and total cropped area has declined by 12.66 and 17.35%, respectively in comparison to the before menace period. Out of the total cropped area, 33.03% was prone to animal menace out of which 54.69 and 45.31% was affected by wild and stray animals, respectively. The extent of animal menace varied across the crops. On an average, 45.76, 43.07 and 31.25% of total area under maize, wheat and paddy, respectively was prone to animal menace and it was relatively lower in vegetable crops vis-a-vis cereals. The overall productivity levels of cereal crops decreased by about 16 to 24% due to the problem of animal menace in the study area. The total cost of cultivation of field crops in menace prone areas and overall situation (menace prone + non menace prone) was significantly higher compared to the non-menace prone areas due to the cost of watch landward and fencing activities on sample farms. The total economic losses on account of animal menace in field crops were estimated at ` 25358/farm in which the share of wheat was highest (32.48%), followed by paddy (13.27%) and maize (12.22%). In the total economic loss, the share of loss in production was slightly higher (53.63%) compared to increase in total cost of cultivation on account of management of animal menace.

2.5 DETECTION OF ANIMALS IN AGRICULTURAL LAND USING CNN ALGORTHIM

AUTHORS: Mrs. D. Maalini, S. Nivetha, C. Priya, P. Sangavi.

PUBLICATION: International Journal Of Progressive Research In Engineering Management And Science, 2023.

Crop damage caused by animal attacks is one of the major threats in reducing the crop yield. Due to the expansion of cultivated land into previous wildlife habitat, crop raiding is becoming one of the most antagonizing human-wildlife conflicts. Farmers in India face serious threats from pests, natural calamities & damage by animals resulting in lower yields. Traditional methods followed by farmers are not that effective and it is not feasible to hire guards to keep an eye on crops and prevent wild animals. Since safety of both human and animal is equally vital, it is important to protect the crops from damage caused by animal as well as divert the animal without any harm. Thus, in order to overcome above problems and to reach our aim, we use deep learning to detect animals, entering into our farm by using deep neural network concept, a division in computer vision. In this project, we will monitor the entire farm at regular intervals through a camera which will be recording the surrounding throughout the day. With the help of a deep learning model, we detect the entry of animals and we play appropriate sounds to drive the animal away. This report specifies various libraries and concepts of convolutional neural networks used to create the model.

CHAPTER 3

SYSTEM ANALYSIS

The process of analyzing the system that existed and alterations that are made in the proposed system is stated in system analysis.

3.1 EXISTING SYSTEM

The existing system uses Estimation of economic loss in crops, Production losses, Additional cost on watch and ward and fencing (ACWF),Cost of cultivation, Cost of cultivation on non-menace prone areas, Total fixed cost, Total variable cost, Cost of cultivation in menace prone areas. The existing system uses Estimation of economic loss in crops, Production losses, Additional cost on watch and ward and fencing (ACWF),Cost of cultivation, Cost of cultivation on non-menace prone areas, Total fixed cost, Total variable cost, Cost of cultivation in menace prone areas.With help of these datasets we are going to take a survey and create a datasets on animal attacks in cropland.

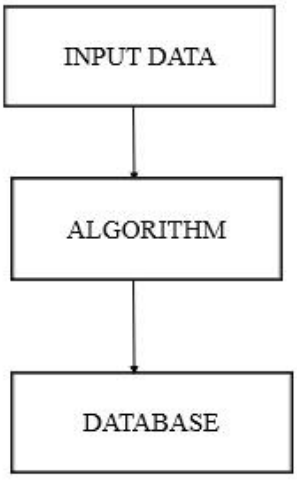


Figure 3.1 Block Diagram of Existing System

3.1.1 Limitations

1. Limited Feature Set: The existing system may rely on a limited set of features to classify animal attacks, which might not capture the full complexity of the problem. For example, it may only consider factors like crop type, time of attack, and location, while other relevant features such as weather conditions, soil quality, and presence of natural predators could be overlooked.

2. Imbalanced Data: Imbalance in the datasets, where certain types of animal attacks are more prevalent than others, can lead to biased classification results. If the datasets contains significantly more instances of attacks by certain animals, the classifier may become biased towards predicting those types of attacks more frequently.

3. Data Quality Issues: Inaccuracies or inconsistencies in the data can adversely affect the performance of the classifier. This could include mislabeling of instances, missing values, or errors in data collection.

4. Over-fitting: Over-fitting occurs when the classifier learns the training data too well, capturing noise or random fluctuations as if they were meaningful patterns. This can result in poor generalization to new, unseen data, leading to decreased accuracy when the classifier is applied to real-world scenarios.

5. Limited Model Selection: WEKA offers various classification algorithms, but the existing system may be limited to using only a subset of these algorithms. The chosen algorithm might not be the most suitable for the specific characteristics of the datasets, leading to sub optimal performance.

3.2 PROPOSED SYSTEM

- It describes the problem that are faced by our faced by our farmers due to wild animal attack on their fields and orchards along with the current solutions and methods that have been adopted to address this problem.it then describes our project proposal and elucidates our method of addressing this problem i.e. how this project can solve this problem. The main aim of this project is to provide and an effective solution to this problem, so that the economic losses incurred by our farmers are minimized and they have a good crop yield.

- The problem of wild animal attacks on crop fields i.e. crop vandalization is becoming a very common phenomenon in the state of Himachal Pradesh, Punjab, Haryana and many other states. Wild animals like monkeys, estray animals especially cows and buffaloes, wild dogs, nilgais, bison, elephants, deer, wild pigs and even birds like parakeets cause lot of damage to crops. This leads to significant financial loss to the farmers and orchard owners. This problem is so pronounced that sometimes farmers decide to leave the area barren due to these animal attacks.

- The significant intention of our project is to guard the crops from damage caused by animal as well as distract the animal without any harm. Animal recognition system is planned to detect the presence of animal and offer a warning. In this project we use CNN algorithm in the Agricultural land detect the animal.

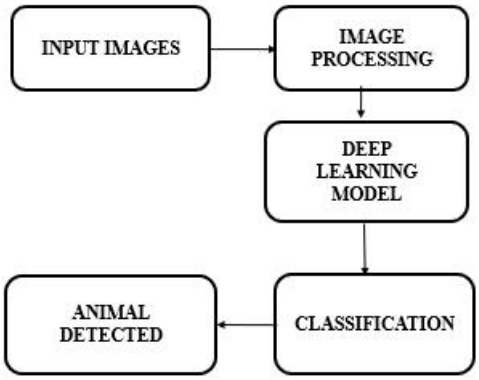


Figure 3.1 Block Diagram of Proposed System

3.2.1 Advantages

1.Real-time Monitoring: The proposed system can be designed to provide real-time monitoring of animal presence in Croplands, enabling prompt intervention and mitigation measures to prevent damage and losses.

2.Scalability: WEKA's scalability allows the system to handle large volumes of data efficiently, making it suitable for monitoring extensive Croplands and diverse animal populations.

3.Continuous Learning: The system can be integrated with techniques such as online learning and incremental model updates, enabling continuous improvement and adaptation to changing conditions and new data.

CHAPTER 4

SYSTEM REQUIREMENTS

The requirements specification is a technical specification of requirements for the hardware products. It is the first step in the requirements analysis process it lists the requirements of a particular hardware system including functional, performance and safety requirements. The requirements also provide usage scenarios from a user and an operational perspective. The purpose of hardware requirements specification is to provide a detailed overview of the hardware project, its parameters and goals. This describes the project target and its user interface, hardware and software requirements.

4.1 HARDWARE REQUIREMENTS

Ram	:	16.0 GB
Processor	:	13th Gen Intel(R) Core(TM)i5-1335U1.30 GHz
Hard Disk	:	512 GB
Memory	:	3.80 GB
Display	:	1920 x 1080 x 60.06 Hz

4.2 SOFTWARE REQUIREMENTS

Operating System : Windows 11

Language : Python

Back-end : Python Idle

Front-end : Python shell

4.3 **TECHNOLOGIES USED**

4.3.1 Software

4.3.1.1 Python

Python is a popular programming language. It was created by Guido van Rossum, and released in 1991. It is used for:

- Web development (server-side),
- Software development,
- Mathematics,
- System scripting

1. Python is an interpreted language, which precludes the need to compile code before executing a program because Python does the compilation in the background. Because Python is a high-level programming language, it abstracts many sophisticated details from the programming code. Python focuses so much on this abstraction that its code can be understood by most no vice programmers.

2. Python code tends to be shorter than comparable codes. Although Python offers fast development times, it lags slightly in terms of execution time. Compared to fully compiling languages like C and C++, Python programs execute slower. Of course, with the processing speeds of computers these days, the speed differences are usually only observed in bench marking tests, not in real-world operations. In most cases, Python is already included Linux distributions and Mac OS X machines.

3. Python is a dynamic, high level, free open source and interpreted programming language. It supports object –oriented programming as well as procedural oriented programming. Python is a very easy to code as compare to other language like c, c ++, java etc.. It is also a developer- friendly language. Python is also an Integrated language because we can easily integrated python with other language like c, c ++, etc..

History Of Python

The programming language in which Python is said to have succeeded is ABC Programming Language, which had interfacing with the Amoeba Operating System and had the feature of exception handling. He had already helped create ABC earlier in his career and had seen some issues with ABC but liked most of the features. After that what he did was very clever. He had taken the syntax of ABC, and some of its good features. It came with a lot of complaints too, so he fixed those issues completely and created a good scripting language that had removed all the flaws. The inspiration for the name came from the BBC's TV Show – '**Monty Python's Flying Circus'**, as he was a big fan of the TV show and also he wanted a short, unique and slightly mysterious name for his invention and hence he named it Python! He was the "Benevolent dictator for life" (BDFL) until he stepped down from the position as the leader on 12th July 2018. For quite some time he used to work for Google, but currently, he is working at Dropbox.

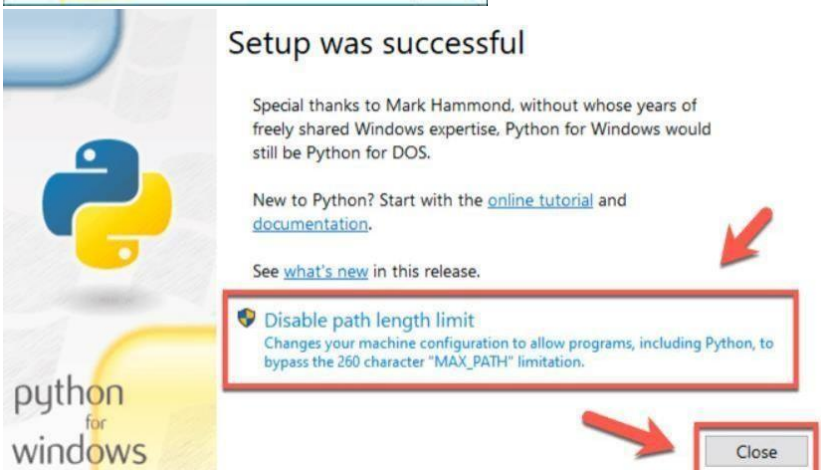
The language was finally released in 1991. When it was released, it used a lot fewer codes to express the concepts, when we compare it with Java, C++ & C. Its design philosophy was quite good too. Its main objective is to provide code readability and advanced developer productivity.

When it was released, it had more than enough capability to provide classes with inheritance, several core data types of exception handling and functions.

4.3.1 SETTING UP THE PYTHON IDLE

Step 1 –Download the python IDLE software

Open your web browser and navigate to the Downloads for Windows section of the official python website.



4.3.2.2 CONVOLUTIONAL NEURAL NETWORK

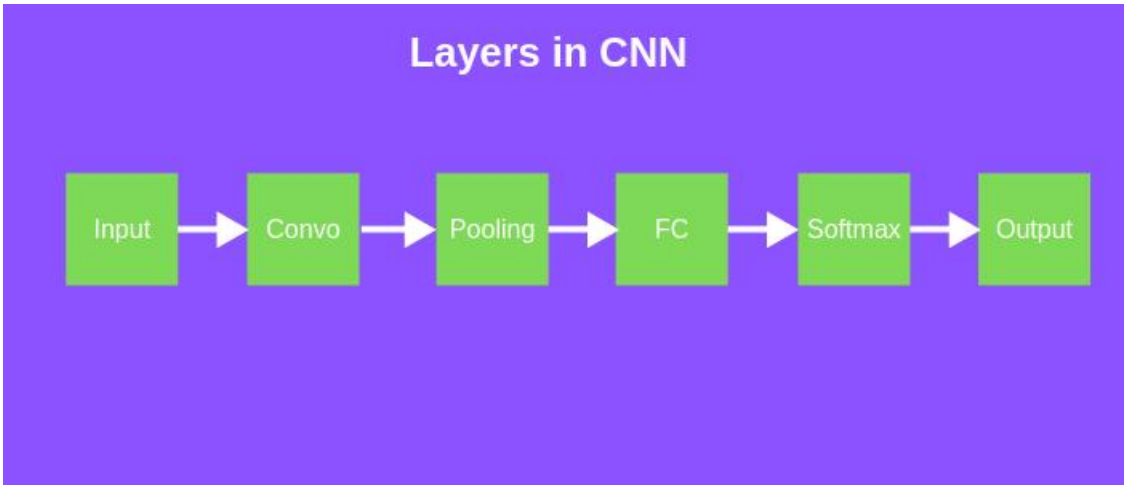
- Layers in CNN

There are five different layers in CNN

- Input layer

- ✓ Convo layer (Convo + ReLU)
- ✓ Pooling layer
- ✓ Fully connected(FC) layer
- ✓ Soft-max/logistic layer

- Output layer



4.3.2.3 Different layers of CNN

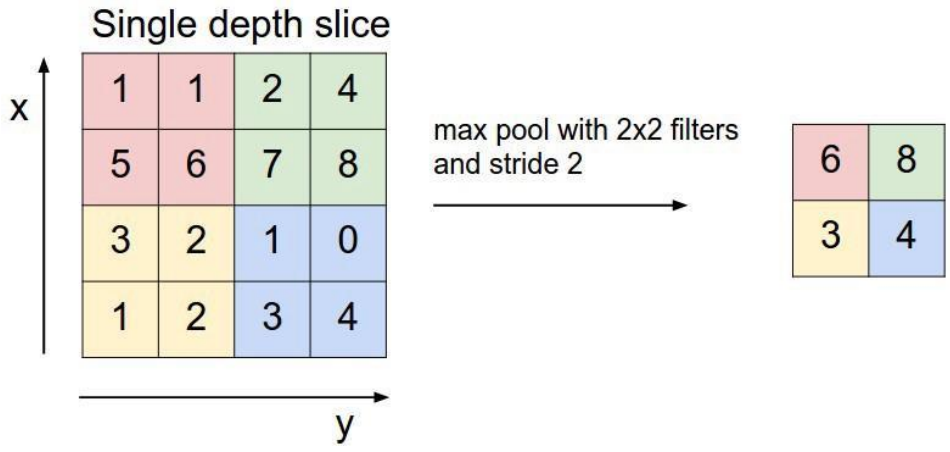
- **Input Layer**

CNN's input layer ought to hold image data. As we previously saw, a three-dimensional matrix represents image data. It must be rearranged into a single column. Assume that an image with dimensions of 28 x 28 = 784 needs to be converted to 784 x 1 before being fed into the input. Should you own "m" training samples, the input dimension would be (784, m).

✓ Convo Layer

✓ CNN's input layer ought to hold image data. As we previously saw, a three-dimensional matrix represents image data. It must be rearranged into a single column. Assume that an image with dimensions of 28 x 28 = 784 needs to be converted to 784 x 1 before being fed into the input. Should you own "m" training samples, the input dimension would be every negative value is equal to zero(784, m).

✓ Pooling Layer



After convolution, the input image's spatial volume is decreased using the pooling layer. Between two convolution layers, it is utilized. Applying FC after the Convo layer without using pooling or max pooling will result in high computing costs, which is something we do not want. Thus, the only method for reducing the input image's spatial volume is to use max pooling.

We have used max pooling in a single depth slice with a stride of two in the example above. As you can see, the input's 4 x 4 dimensions are reduced to 2 x 2 dimensions.The pooling layer has two hyper-parameters, Filter (F) and Stride (S), but no parameter.

In general, if we have input dimension W1 x H1 x D1, then

• $W2 = (W1-F)/S+1$

• $H2 = (H1-F)/S+1$

• $D2 = D1$

Where W2, H2 and D2 are the width, height and depth of output.

✓ Fully Connected Layer (FC)

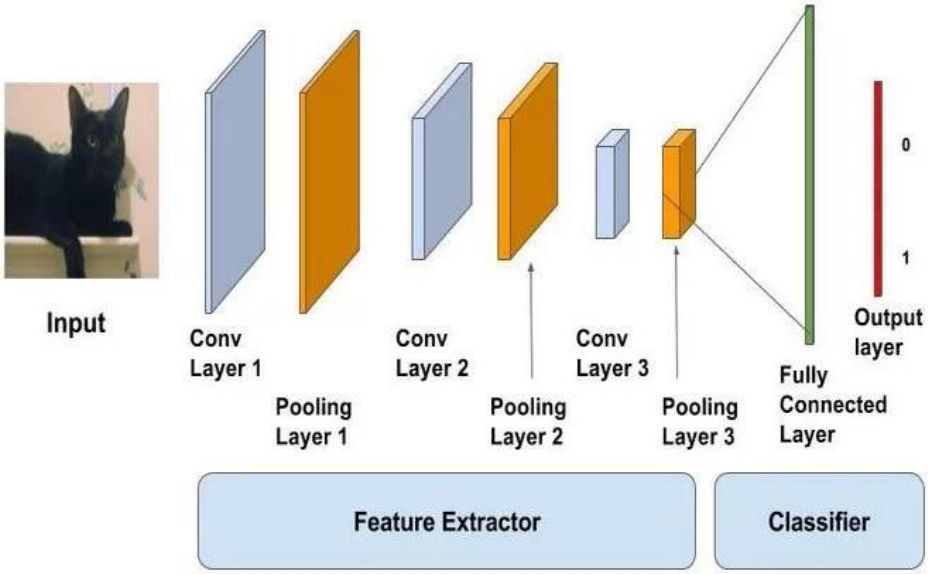
A fully connected layer consists of neurons, weights, and biases. It establishes connections between neurons in different layers. Through training, it is utilized to classify photos into many categories.

✓ Soft-max / Logistic Layer

The final layer of CNN is called the Logistic or Soft-max layer. It is located at the FC layer's terminus. Soft-max is used for multi-classification, and logistic is used for binary classification.

- Output Layer

The label is present in the output layer and is one-hot encoded.



CHAPTER 5

MODULE DESCRIPTION

Module description describes about the various modules that are used in the database to perform the task.

1. IMAGE DATASET COLLECTION

2. IMAGE PREPROCESSING

3.IMPORTING MODULES

4.CAPUTURING THE IMAGES OFANIMALS

5.CAMERA INTERFACING

1.IMAGE DATASET COLLECTION

For this project, we need to collect any images that show an automobile as an animal. This is the project's most important step. As a result, all of the visuals we see are taken from live or recorded CCTV footage. After receiving the data, we can proceed with the next steps.

2.IMAGE PREPROCESSING

After collecting all of the photos, pre-processing is required. Thus, not all visuals may effectively convey information. To prepare the photographs, rename, resize, and label them. After the procedure, we may utilize the photographs to train our deep learning model.

3. IMPORTING MODULES

Following that, we need to import all of the necessary library files. Library files consist of functions and short execution routines. These library files will let us detect objects and handle images. This project makes use of key library files such as TensorFlow, opencv, Kerssas, and others. These libraries will improve our deep learning model's efficiency and adaptability for processing real-time photos and videos.

4. CAPUTURING THE IMAGES OF ANIMALS

For this project, we need to collect all images that depict an animal crop. This is the project's most critical step. As a result, all of the visuals we see are derived from live or recorded CCTV footage. After receiving the three animal datasets, we can proceed with the methods listed below.

5.CAMERA INTERFACING

One of the most important steps in image processing is computer vision. As a result, we must connect the camera to our deep learning model. Because the computer will see all real-world objects through the camera. Motoring of all kinds of medium can be done using camera. The captured animal detecting can be produced as main source of proof if needed

Sample datasets collection of 8 classes.

CHAPTER 6

SYSTEM DESIGN

System architecture is the process of defining the architecture, modules, interfaces and data for a system to satisfy specified requirements.

6.1 USE CASE DIAGRAM

In software and systems engineering, a use case is a list of actions or event steps, typically defining the interactions between a role (known in the Unified Modelling Language as an actor) and a system, to achieve a goal. The actor can be a human or other external system. In systems engineering, use cases are used at a higher level than within software engineering, often representing stakeholder goals. The detailed requirements may then be captured in the System Modelling Language (SysML).Use Case analysis is an important and valuable requirement analysis technique that has been widely used in modern software engineering. Use case driven development is a key characteristic of many process models and frameworks such as ICONIX, the Unified Process (UP), the IBM Rational Unified process (RUP), and the Oracle Unified Method (OUM). A UML use case diagram is the primary form of system/software requirements for a new software program underdeveloped. Use cases specify the expected behaviour (what), and not the exact method of making it happen (how). Use cases once specified can be denoted both textual and visual representation (i.e. use case diagram). A key concept of use case modelling is that it helps us design a system from the end user's perspective. It is an effective technique for communicating system behaviour in the user's terms by specifying all externally visible system behaviour.

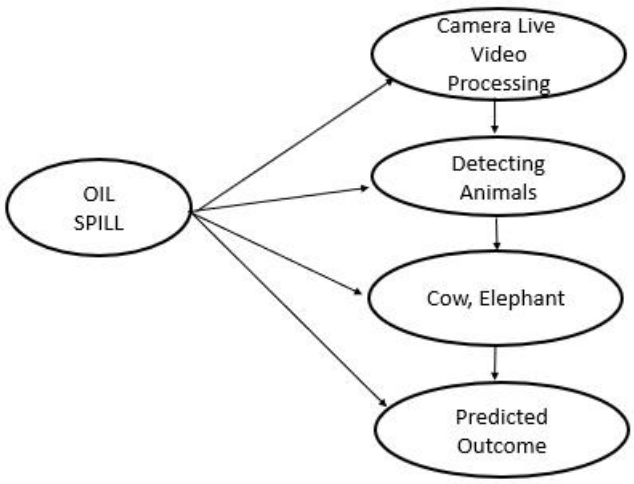


Figure 6.1 Use Case Diagram

6.2 ACTIVITY DIAGRAM

Activity diagrams are graphical representation of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modelling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control. It does not show any message flow from one activity to another. Activity diagram is sometimes considered as the flowchart. Although the diagrams look like a flowchart, they are not. It shows different flows such as parallel, branched, concurrent, and single. The basic purposes of activity diagrams are similar to other four diagrams. It captures the dynamic behaviour of the system. Other four diagrams are used to show the message flow from one object to another but activity diagram is used to show message flow from one activity to another.

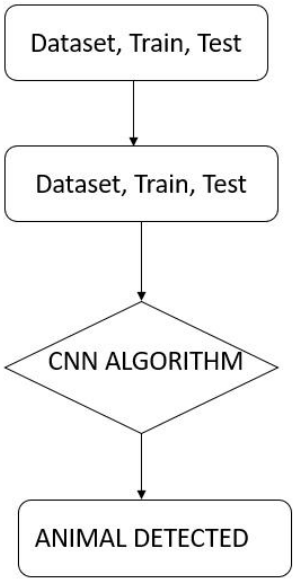


Figure 6.2 Activity Diagram

6.3 ARCHITECTURE DIAGRAM

An architecture diagram is a visual representation of the structure, components, and interactions of a system or application. It provides a high-level overview of how various elements of the system are organized and how they communicate with each other to achieve specific functionalities or objectives. Architecture diagrams typically use standardized symbols, shapes, and connectors to depict different components, such as servers, databases, clients, API's, and other software or hardware entities. These diagrams help stakeholders, including developers, architects, and project managers, to understand the system's design, flow of data, and relationships between different parts.

Overall, architecture diagrams serve as valuable communication tools for conveying the system's architecture, facilitating discussions, and guiding the development and maintenance of the system throughout its life cycle.

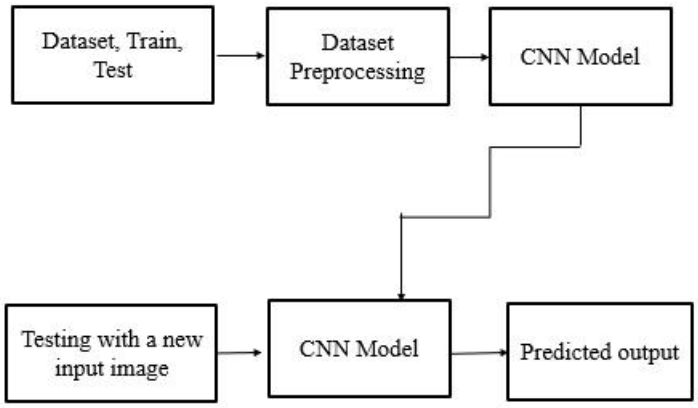


Figure 6.3 ARCHITECTURE DIAGRAM

6.4 CLASS DIAGRAM

A class diagram is a type of UML (Unified Modeling Language) diagram used to represent the structure of a system or application. It shows the classes, interfaces, attributes, and operations of the system or application, as well as the relationships between them. Class diagrams are useful for designing and documenting the architecture of a system, as they provide a clear view of the classes and their relationships.

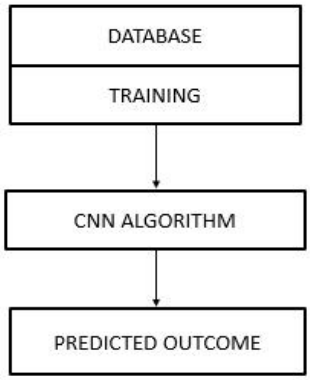


Figure 6.4 Class Diagram

CHAPTER 7

SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, Sub-assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the software system meets its requirements and user expectation and does not fail in an acceptable manner. There are various type of testing addresses a specific testing requirement.

TESTING STEPS

- Unit Testing
- Integration Testing
- User Acceptance Testing

TYPES OF TESTS

7.1 UNIT TESTING

Unit testing involves the design of test cases to validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies and knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration.

7.2 INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is an event-driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactions, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problem that arise from the combination of components. Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects. The task of integration test is to check that components or web applications, e.g. components in a software system or – one step up – web applications of the company level – interact without error. Test Results: All the test cases are mentioned above passed successfully. No defects encountered.

7.3 USER ACCEPTANCE TESTING

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENTS

Conclusion conveys the completion and also defines the limitations that are not processed. Future enhancements provide an innovation that could be made in this project.

8.1 CONCLUSION

- Numerous incidents involving human-animal conflict have been documented in the past; these have seriously harmed crops, negatively impacted the economy, and endangered the lives of both farmers and animals. In light of this, it is imperative to keep animals away from crops and to prevent injuring them. The proposed system aims to resolve conflicts between humans and animals. In crop field settings, a real-time deep learning-based system was proposed to detect animals and prevent confrontations between humans and animals. Elephants, buffaloes, and wild boars were intended to be automatically detected by the system and scared off. Three goals have been established by the system's implementation: identifying animals, keeping animals out of the field, and warning the user. In a nutshell, an animal that registered a temperature higher than 350C.The camera received a trigger when the infrared thermometer was positioned in that location.The camera captured a photo of the animal based on the infrared thermometer's trigger. After the photo was shot, the classification algorithm was tasked with predicting the animal from the obtained image. The categorization model's output included an appropriate scare mechanism, such as an abrupt flash of lights, an ultrasound, or the buzzing sound of bees. The

farmer will receive information about the animals at the same time via the mobile application. According to our research, the detecting system had an accuracy rate of 77% on average.

- The entire process, from temperature detection to scare-away device, takes about 40 seconds.The quantity of data we have utilized may have an impact on the model's accuracy.The quantity of photos and epochs may not be sufficient in this situation. Furthermore, the application of the transfer learning strategy may result in over-fitting; in particular, the absence of any pooling layer in the transfer learning method contributes to over-fitting.To enhance the system and get better results, some cutting-edge features can be implemented.

- Using pre-trained API's, one can decrease the constraints of the system by increasing the accuracy of animal detection and the quantity of animals present. By switching between thermometers with higher range sensing, the thermometer's efficiency may rise. To increase the overall system's accuracy and efficiency, it will be preferable to use a high number of cameras and sensors. Moreover, the system may transmit text messages in the event that the internet is down by installing a SIM (subscriber identification module) module. A modified version of the technology can be used to resolve further human-animal conflicts in the future. It might be altered to frighten off other creatures including birds, insects, porcupines, and monkeys. In addition, it can be altered to frighten and scare away wild creatures before they reach the boundaries, protecting towns and residences from them.

8.2 **FUTURE ENHANCEMENTS**

Deep learning-based animal detection is already a promising field of study that has made great strides recently, and it is probably going to remain a focus for improvement in the future. Convolutional neural networks (CNNs), one type of deep learning algorithm, have demonstrated amazing accuracy in identifying and categorizing animals in pictures and videos. Using deep learning for animal detection allows for the creation of more precise and effective models. This can be accomplished by developing more sophisticated deep learning architectures and optimization strategies, as well as by using bigger and more varied datasets for training.

APPENDICES

APPENDIX A

SAMPLE CODINGS

DATASET

Image datasets is used to this model. We use 8 classes, they are elephant, tiger, leopard, wild boar, deer, wild buffalo, monkey and peacock. These animals are some of the main intruders of the agriculture area and they are also threat to human life. Datasets are mainly divided into 2 parts. The majority will go for training and the other for testing

The training datasets includes:

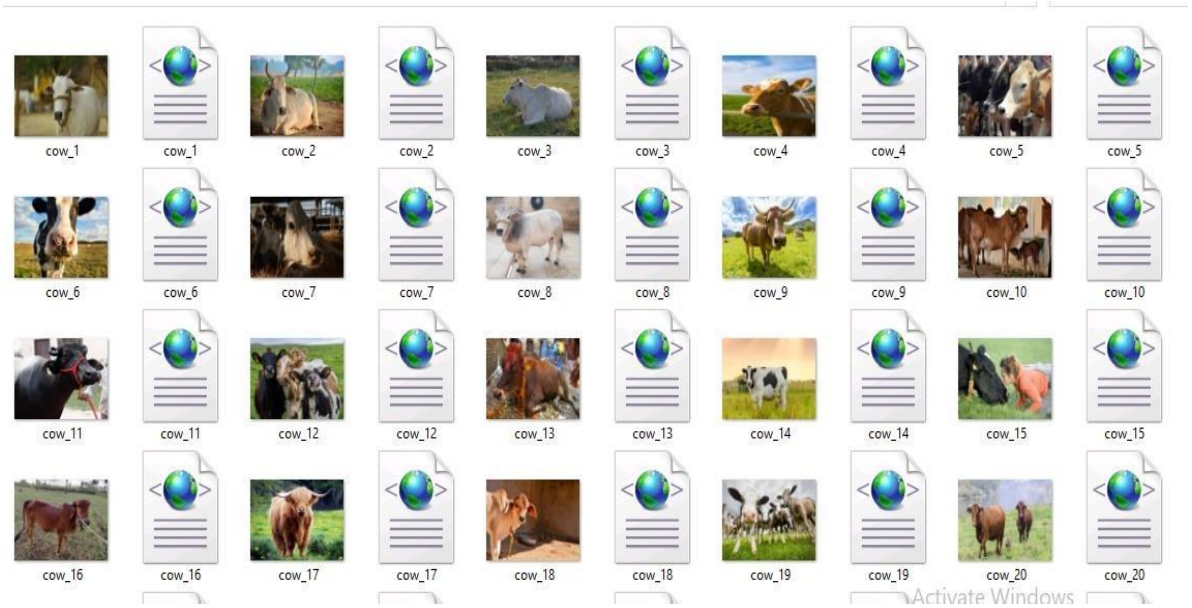
Elephant – 523 images
Cow– 550 images
Leopard – 670 images
Wild boar – 520 images
Deer – 560 images
Wild buffalo – 534 images
Monkey – 600 images
Peacock – 533 images

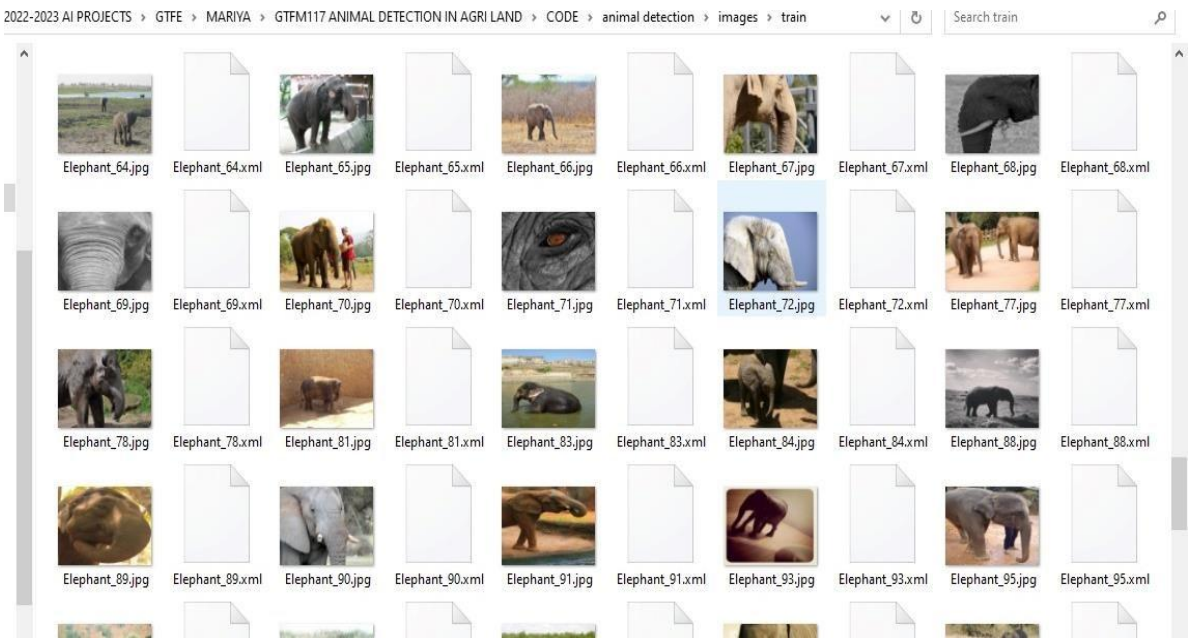
The testing datasets includes:

Elephant – 103 images
Cow – 100 images
Leopard – 110 images
Wild boar – 90 images
Deer – 98 images
Wild buffalo – 69 images
Monkey – 80 images
Peacock – 92 images

APPENDIX B

SCREENSHOTS





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[12] Wild Animals Intrusion Detection using Deep Learning T Techniques DR.R.S. SABEENIAN1* , N.DEIVANAI2 , B. MYTHILI3 1M.E., Ph.D.,Received: 12.04.20, Revised: 24.05.20, Accepted: 04.06.20