A

Major Project

On

WILDLIFE DETECTION

(Submitted in partial fulfillment of the requirements for the award of Degree)

BACHELOR OF TECHNOLOGY

in

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the project entitled "**WILDLIFE DETECTION**" being submitted by **TUDURU MONISHA (177R1A05B7), PAGADALA THARUN (177R1A0598)** and **T. NIKHIL SAI (177R1A05B5)** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science and Engineering to the Jawaharlal Nehru Technological University Hyderabad, is a record of bonafide work carried out by him/her under our guidance and supervision during the year 2020-21.

The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

This project is titled as “WILDLIFE DETECTION”. Monitoring wild animals became easy due to camera trap network, a technique to explore animal life using automatically triggered camera on the presence of animal and yields a large volume of multimedia data. Animal detection is a dynamic research field since the last several decades. In this paper, we propose a animal detection system to monitor wildlife and detect wild animals from highly cluttered natural images. The data acquired from the camera-trap network comprises of scenes that are highly cluttered that poses a challenge for detection of wild animals bringing about low recognition rates and high false discovery rates. To deal with the issue, we have utilized a camera trap database. The regions are utilized to make a validation stage that recognizes whether animals are present or not in an image. These features from cluttered images are extracted using Support Vector Machine .

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1. INTRODUCTION

1. INTRODUCTION

1.1 PROJECT SCOPE

Animal detection is a very important and emerging area due to a large number of real life applications. Various animal detection methods and warning systems are used for indicating the presence of animals on the roads or residential area. Applications which are very important in real life are preventing animal vehicle collision on roads, preventing dangerous animal intrusion in residential area, knowing locomotive behavioral of targeted animal etc. All these applications can be narrowed down to three areas namely detection, tracking and identification of animals.

1.2 PROJECT PURPOSE

One of the current challenges is to reduce collisions between vehicles and animals on roads, such accidents resulting in environmental imbalance and large expenditures in public coffers. This paper presents the components of a simple animal detection system and also a methodology for animals detection in images provided by cameras installed on the roads. This methodology allows the features extraction of regions of the image and the use of Machine Learning (ML) techniques to classify the areas into two classes: animal and non-animal. ML techniques were compared using synthetic images, traversing the pixels of the image using five distinctive approaches. Results show that the Suppot Vector Machine(SVM) identify animals on roads accurately.Support vector machine (SVM) and its variants are one of the most popular data mining technique and have shown astonishing performance for binary classification problems. The main advantage behind using SVM is that it can be paired with the kernel function.

1.3 PROJECT FEATURES

The main objective of this work is to develop a system by using a machine learning technique for detection of Wild animals. A support vector machine-based classification system is proposed for detection of animals. The output is shown in form of image, animal name and voice. The performance of the proposed SVM classifier is measured for different types of SVM kernel functions.

2. LITERATURE SURVEY

2. LITERATURE SURVEY

Researches regarding animals in image processing have been an important field to numerous applications. Many algorithms and methods have been developed by human being in order to have a better understanding on animal behaviour. Besides, these applications also can act as a warning system to human being from intrusion of dangerous wild animal for early precaution measures. These applications can be narrowed down to three main branches, namely detection, tracking and identification of animal. The first branch, which is the animal detection, has been applied in various fields of real life application. For example, a detection algorithm has been developed for light detection and ranging (LIDAR) data to enable fisherman to find the right location of fishes in deep sea.

Researchers in used airborne remote sensing images to detect moving wild animals. Work in on the other hand, used micro-Doppler signals to maintain the human security by detecting potential dangerous animal intrusion to residential area. The second branch, which is the animal tracking, is the main topic in monitoring animal locomotive behaviour and its interaction with the environment. With the technology of sensor, radio-frequency identification (RFID), and global positioning system (GPS), one of the applications is the development of new zoological systems for animal trace ability, identification, and anti-theft for the management and security of animal in zoo [4]. By tracking the animal movements, it helps human to have a better understanding on living creatures on earth, especially on how the animal interacts with its environment. The third branch, which is the animal identification, is used to identify the detected animal. It has been used in health monitoring system for domestic herds. Animal care management becomes an important issue as animals have aspectral. Work in found that the human observer will not prefer to use this approach if they want to quickly detect the animal.

3. SYSTEM ANALYSIS

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SYSTEM ANALYSIS

System Analysis is the important phase in the system development process. The System is studied to the minute details and analyzed. The system analyst plays an important role of an interrogator and dwells deep into the working of the present system. In analysis, a detailed study of these operations performed by the system and their relationships within and outside the system is done. A key question considered here is, “what must be done to solve the problem?” The system is viewed as a whole and the inputs to the system are identified. Once analysis is completed the analyst has a firm understanding of what is to be done.

3.1 PROBLEM DEFINITION

A detailed study of the process must be made by various techniques like Image processing, feature recognition etc. The data collected by these sources must be scrutinized to arrive to a conclusion. The conclusion is an understanding of how the system functions. This system is called the existing system. Now the existing system is subjected to close study and problem areas are identified. The designer now functions as a problem solver and tries to sort out the difficulties that the enterprise faces. The solutions are given as proposals. The proposal is then weighed with the existing system analytically and the best one is selected. The proposal is presented to the user for an endorsement by the user. The proposal is reviewed on user request and suitable changes are made. This is loop that ends as soon as the user is satisfied with proposal.

3.2 EXISTING SYSTEM

The existing systems mainly provide the surveillance functionality. Also these systems don’t provide protection from wild animals, especially in such an application area. They also need to take actions based on the on the type of animal that tries to enter the area, as different methods are adopted to prevent different animals from entering such restricted areas. Also the farmers resort to the other methods by erecting human puppets and effigies in their farms, which is ineffective in warding off the wild animals, though is useful to some extent to ward off birds .The other commonly used methods by the farmers in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences and manual surveillance and various such exhaustive and dangerous methods.

3.2.1 LIMITATIONS OF EXISTING SYSTEM

- Users should be alert for capturing images.
- Should minimize the image with accurate pixels.
- Dimensions less than 500 pixels will not be considered as valid images for dataset.
- It is not easy to detect all animals entering particular area with existing system.

3.3 PROPOSED SYSTEM

To resolve these issues, we propose an image-based animal detection system using method based on eigenface and using the SVM algorithm. The proposed system is better mainly due to the use of animal features rather than the entire animal.

3.3.1 ADVANTAGES OF THE PROPOSED SYSTEM

- An alerting system which is more efficient in predicting an animal.
- Less processing time to train SVM .
- Better discriminatory power computational cost because smaller images.
- Output is shown in images and audio.

3.4 FUNCTIONAL REQUIREMENTS

Functional requirements define the internal workings of the software: that is, the technical details, data manipulation and processing and other specific functionality that show how the use cases are to be satisfied. They are supported by non-functional requirements, which impose constraints on the design or implementation.

3.5 NON-FUNCTIONAL REQUIREMENTS

Usability:

Prioritize the important functions of the system based on usage patterns.

Frequently used functions should be tested for usability, as should complex and critical functions. Be sure to create a requirement for this.

Reliability:

Reliability defines the trust in the system that is developed after using it for a period of time. It defines the like ability of the software to work without failure for a given time period. The number of bugs in the code, hardware failures, and problems can reduce the reliability of the software. Your goal should be a long MTBF (mean time between failures). It is defined as the average period of time the system runs before failing. Create a requirement that data created in the system

will be retained for a number of years without the data being changed by the system. It's a good idea to also include requirements that make it easier to monitor system performance.

Performance:

What should system response times be, as measured from any point, under what circumstances? Are there specific peak times when the load on the system will be unusually high? Think of stress periods, for example, at the end of the month or in conjunction with payroll disbursement.

Supportability:

The system needs to be cost-effective to maintain.

Maintainability requirements may cover diverse levels of documentation, such as system documentation, as well as test documentation, e.g. which test cases and test plans will accompany the system.

3.6 FEASIBILITY STUDY

A feasibility analysis evaluates the project's potential for success; therefore, perceived objectivity is an essential factor in the credibility of the study for potential investors and lending institutions.

3.6.1 ECONOMIC FEASIBILITY

Cost/ benefits analysis of the project as over project is academic project, we will not have only basic cost for learning of the technologies.

3.6.2 TECHNICAL FEASIBILITY

Technical resources need for project Development.

- Windows family Operating System
- Python 3.8 Technology
- PyCharm IDE

3.6.3 OPERATIONAL FEASIBILITY

This assessment involves undertaking a study to analyze and determine whether and how well the organization's needs can be met by completing the project. Operational feasibility studies also examine how a project plan satisfies the requirements identified in the requirements analysis phase of system development.

3.7 HARDWARE & SOFTWARE REQUIREMENTS

3.7.1 HARDWARE REQUIREMENTS:

Hardware interfaces specifies the logical characteristics of each interface between the software product and the hardware components of the system. Thefollowing are some hardware requirements.

- Processor : Intel Dual Core@ CPU 2.90GH.
- Hard disk : 16GB and Above.
- RAM : 4GB and Above.
- Monitor : 5 inches or above.

3.7.2 SOFTWARE REQUIREMENTS:

Software Requirements specifies the logical characteristics of each interface andsoftware components of the system. The following are some software requirements.

- OS : Windows 7 and above.
- Languages : Python.
- Debugger : Pycharm.
- Libraries : Open CV, Numpy, Sklearn, Playsound.

4. ARCHITECTURE

4. ARCHITECTURE

4.1 PROJECT ARCITECTURE

This project architecture shows the procedure followed for detection of animals using machine learning algorithms.

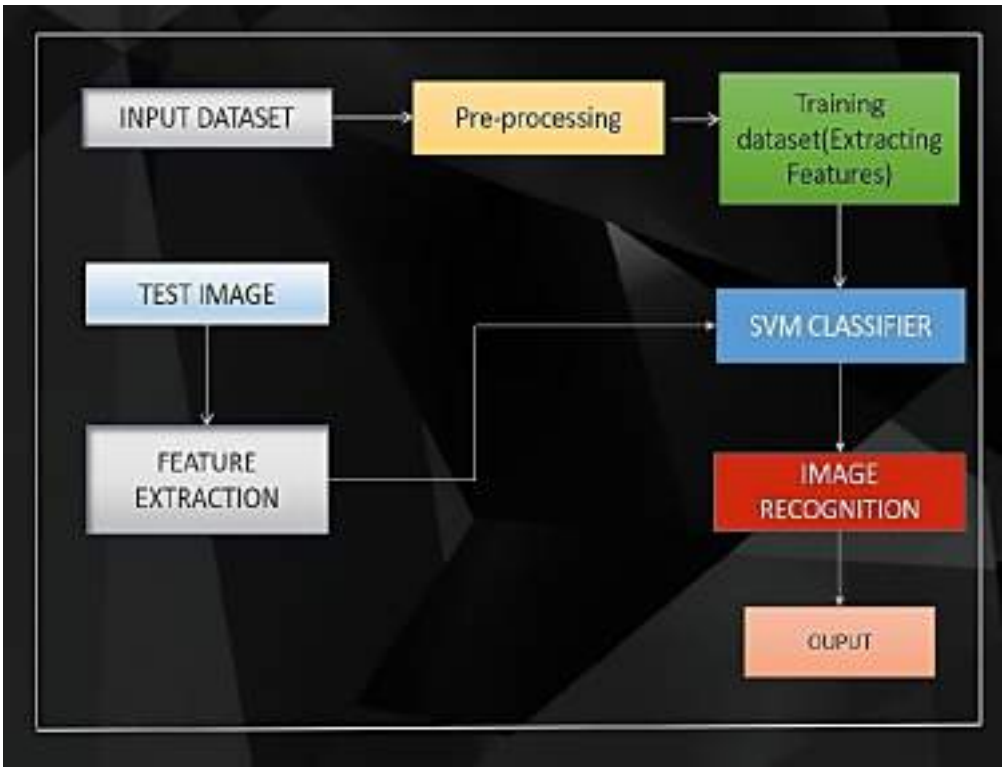


Figure 4.1: Project Architecture of Wildlife Detection.

4.2 MODULES DESCRIPTION

- **Registration and Login**

In this module users can register and login into the project.

- **Training Dataset**

In this module different types of animals are trained to the system. It stores all the animals with their features.

- **Prediction of Animal**

In this module animal image is given to the system then it predicts the animal.

- **Voice**

In this module the predicted animal is speak out by the system using voice.

4.2.1 TRAINING MODULE

Training module takes the input has images of animals dataset that should be given. The functionality of this module is the features of images the recorded and stored. Finally it gives output has how many animal images and labels are trained.

Initially, we wrote some code for the training of the whole dataset by implementing the SVM algorithm model. Preparing training data that takes all images into a list and also extracts features of all images into a list that are in the dataset. The list divides the data for training and testing. The data given to the model is labeled one. These labels are named in such a way that they express the name of the animal. Flatten function is used for converting a multi-dimensional array to a one-dimensional array and hog features are used for removing blur in images. The completion of training the model gives information about the number of animals the user has trained. The model trained for 30 different directories.

4.2.2 TESTING MODULE

Testing module input is an animal image is given. The functionality of this module is features of given image is determined. Finally the features are stored.

The testing begins by giving an input has an image to the model. About 30% of images are given for testing. The input is given to the testing model extracts the features and given to the SVC model. The model extracts the features of the image from the desired testing data.

4.2.3 PREDICTION MODULE

In the prediction phase comparison of the trained input image and testing, image is done.

Prediction module input is features of tested image. The functionality of this module is it detects the features of testing image with the training images. Finally it displays animal detected with label and also give voice message.

4.3 UML DIAGRAMS

The System Design Document describes the system requirements, operating environment, system and subsystem architecture, files and database design, input formats, output layouts, human-machine interfaces, detailed design, processing logic, and external interfaces.

4.3.1 USE CASE DIAGRAM

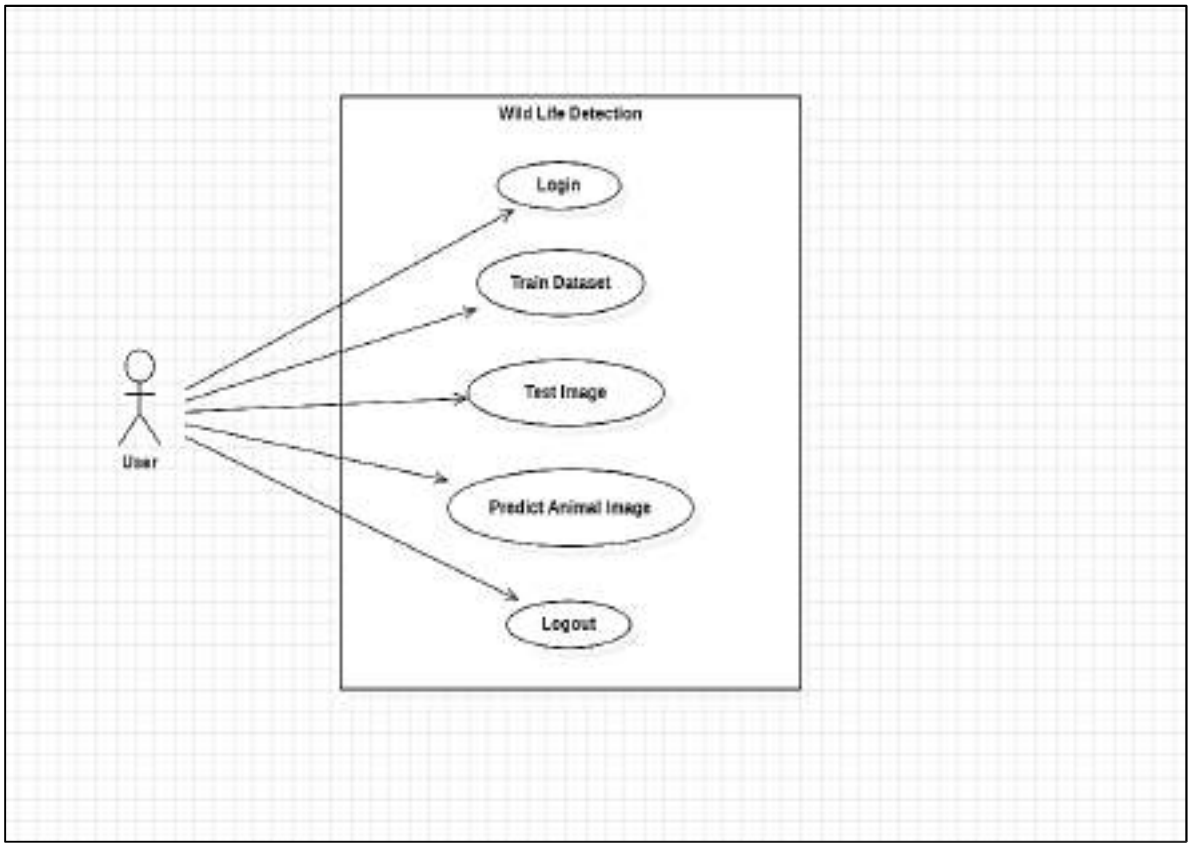


Figure 4.3.1: Use Case Diagram Wildlife Detection

4.3.2 CLASS DIAGRAM

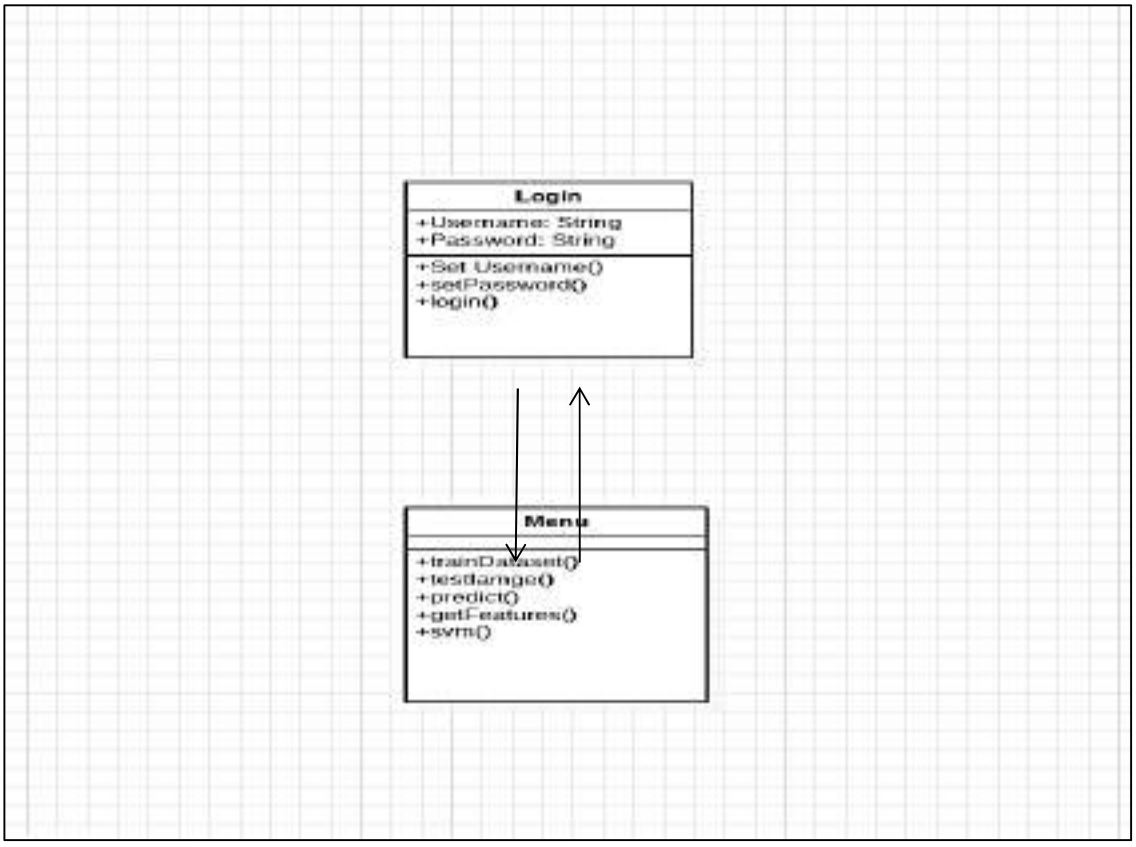


Figure 4.3.2: Class Diagram for Wildlife Detection

4.3.3 SEQUENCE DIAGRAM

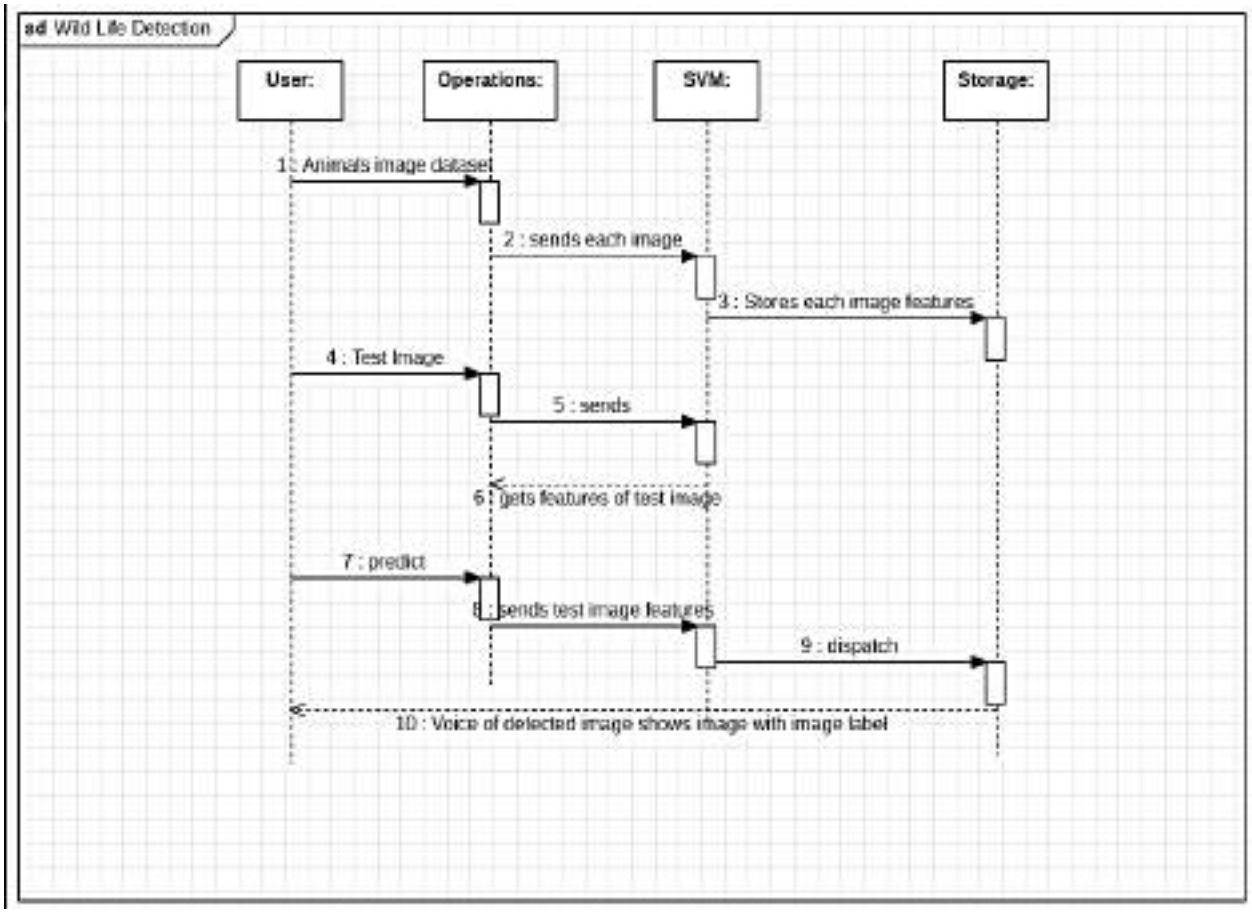


Figure 4.3.3: Sequence Diagram for Wildlife Detection.

4.3.4. ACTIVITY DIAGRAM

It describes about flow of activity states.

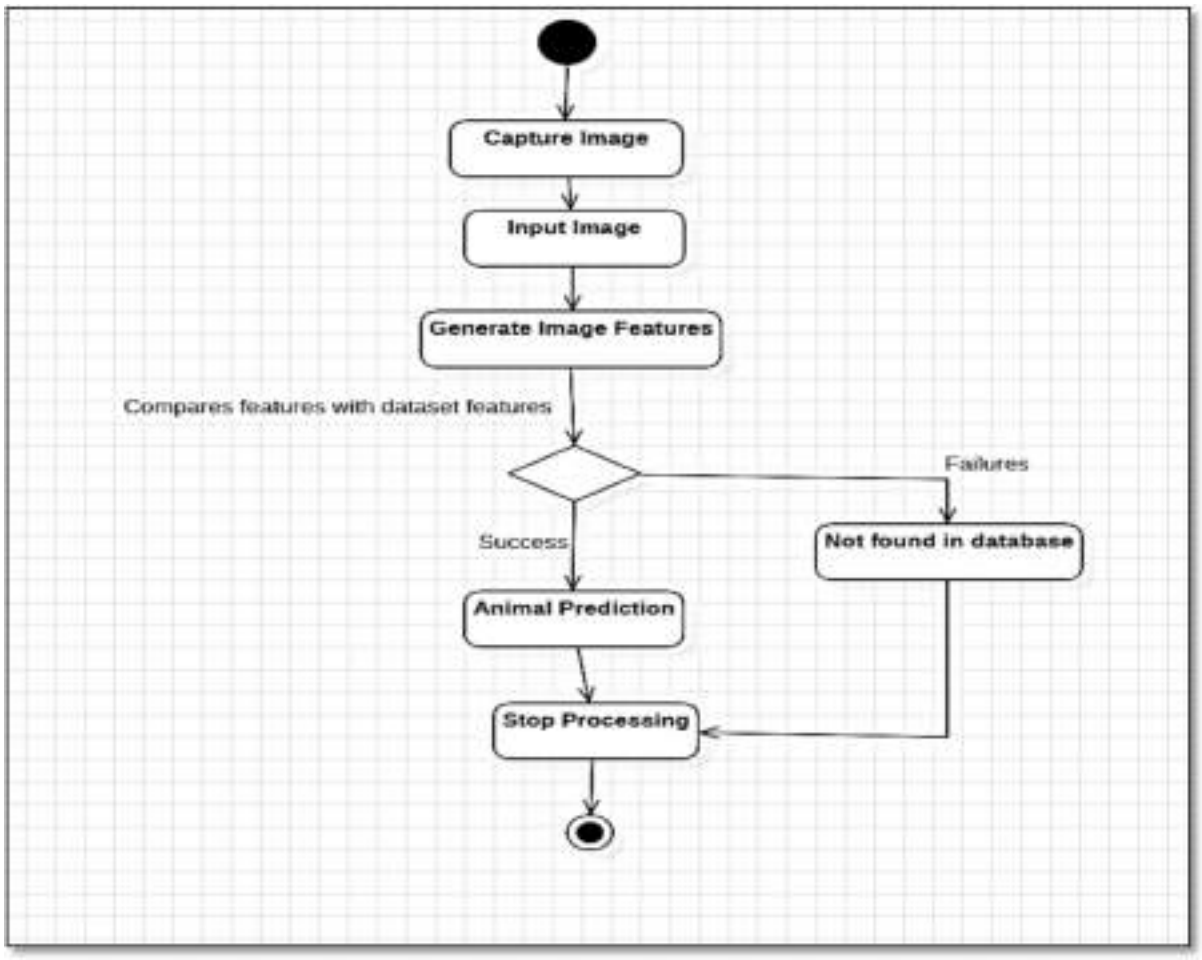


Figure 4.3.4: Activity Diagram for Wildlife Detection

5. IMPLEMENTATION

5. IMPLEMENTATION

5.1 Python Introduction

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

Python is a MUST for students and working professionals to become a great Software Engineer specially when they are working in Web Development Domain. I will list down some of the key advantages of learning Python:

Python is Interpreted − Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.

Python is Interactive − You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.

Python is Object-Oriented − Python supports Object-Oriented style or technique of programming that encapsulates code within objects.

Python is a Beginner's Language − Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

Python IDLE?

Every Python installation comes with an **Integrated Development and Learning Environment**, which you'll see shortened to IDLE or even IDE. These are a class of applications that help you write code more efficiently. While there are many IDEs for you to choose from, Python IDLE is very bare-bones, which makes it the perfect tool for a beginning programmer.

Python IDLE comes included in Python installations on Windows and Mac. If you're a Linux user, then you should be able to find and download Python IDLE using your package manager. Once you've installed it, you can then use Python IDLE as an interactive interpreter or as a file editor

5.2 SAMPLE CODE

UI CODE

```
importnumpy as np
fromtkinter import *
fromtkinter import ttk
fromtkinter import messagebox
fromtkinter import filedialog
fromsklearn.model_selection import train_test_split
import cv2
importos
fromsklearn import svm
fromsklearn import metrics
fromsvm import SVM

classTitleWindow:
parent=root=None
loginbtn=None
X_train=Y_train=None
   directory=""
   filename=""
animals=labels=None
trainData= testData=trainLabels=testLabels=None
obj=SVM()
defHomeScreen(self):
TitleWindow.parent=Tk()
TitleWindow.parent.title("MainWindow")
TitleWindow.parent.geometry("400x400")
Label(text="").pack()
title=Label(TitleWindow.parent,text="DETECTION OF ANIMAL",bg='yellow',fg='black',
                              font=('arial',16, "bold"))
title.pack()
```

```
Label(text="").pack()
    Label(width=50,font=('arial',10, "bold"),fg='blue', text="Farmers in India face serious threats from pests, natural calamities &damage \n by animals resulting in lower yields Traditional methods followed byfarmers \n are not that effective and it is not feasible to hire guards to keep an \neye on crops and prevent wild animals. Since safety of both human and animal is equally vital.\nSo, animal detection system is necessary in farm areas.").pack()
Label(text="").pack()
TitleWindow.loginbtn=Button(TitleWindow.parent,fg='red',
text="LOGIN",width=15,height=3,font=('arial',12,"bold"),command=self.login)
TitleWindow.loginbtn.pack()
Label(text="").pack()
TitleWindow.parent.mainloop()

def login(self):

self.loginwin=Toplevel()
self.loginwin.title("User Login")
self.loginwin.geometry("300x300")
Label(self.loginwin,text="").grid(row=1,column=1,columnspan=2)
self.title=Label(self.loginwin,text="LOGIN",fg='blue',
                        font=('arial',13, "bold"))

self.title.grid(row=2,column=1,columnspan=2)
Label(self.loginwin,text="").grid(row=3,column=1,columnspan=2)
self.userlbl=Label(self.loginwin,text="User Name",font=('arial',10, "bold"))
self.userlbl.grid(row=4,column=1)

self.usertxt=Entry(self.loginwin)
self.usertxt.grid(row=4,column=2)

self.pwdlbl=Label(self.loginwin,text="Passward", font=('arial',10, "bold"))
self.pwdlbl.grid(row=6,column=1)
```

```
self.pwdtxt=Entry(self.loginwin, show='*')
self.pwdtxt.grid(row=6,column=2)



Label(self.loginwin,text="").grid(row=7,column=1,columnspan=2)

self.loginbtn=Button(self.loginwin,width=8,height=2,text="LOGIN",fg='red',font=('arial',13,
"bold"),command=self.validateuser)
self.loginbtn.grid(row=8,column=1,columnspan=2)
self.loginwin.mainloop()



defvalidateuser(self):
      f=open('users.txt','r')
lines=f.read().splitlines()
username=self.usertxt.get()
password=self.pwdtxt.get()

if username==lines[0] and password==lines[1]:
TitleWindow.loginbtn.configure(state=DISABLED)
self.loginwin.destroy()

self.MainMenu()
else:
msg = messagebox.showinfo("Information","User Not Found, Try Again!!!")
```

5.3 ALGORITHMS

5.3.1 SUPPORT VECTOR MACHINE (SVM):

Support Vector Machine is an extremely popular supervised machine learning technique (having a pre-defined target variable) which can be used as a classifier as well as a predictor. For classification, it finds a hyper-plane in the feature space that differentiates between the classes. An SVM model represents the training data points as points in the feature space, mapped in such a way that points belonging to separate classes are segregated by a margin as wide as possible. The test data points are then mapped into that same space and are classified based on which side of the margin they fall.

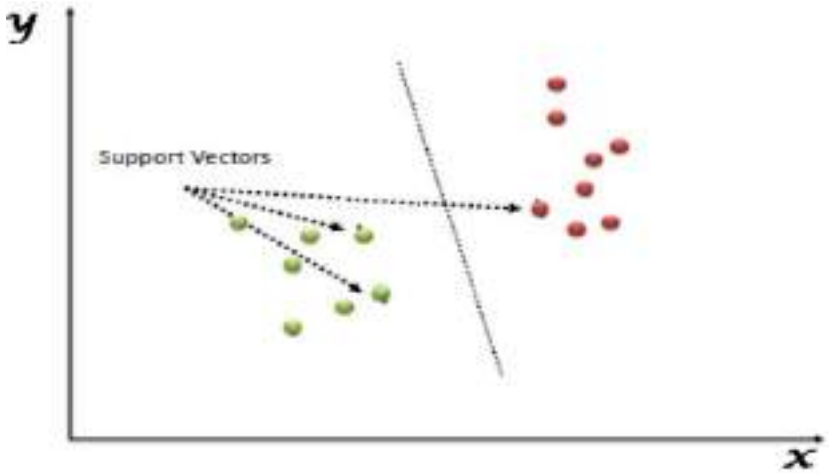


Figure 5.3.1: SVM

Support vector machines are a set of supervised learning methods used for classification, regression, and outliers detection. The motivation for this project was to develop a supervised machine learning model to identify an image of an animal. Support Vector Machine (SVM) was used to classify images for animal prediction. Classification SVM Type 1 (also known as C-SVM classification)is used in the project. Support Vector Classifier is the support vector machine algorithm for the multiclass problem. A Linear Support Vector Classifier is to fit the data you provide, returning the best fit hyperplane that divides or categorizes, our data. After getting the hyperplane, you can then have some features in your

classifier to see what the predicted animal is. Linear Kernel is used when the data is linearly separable, that is, it can be separated using a line. It is the most common kernel to be used. It is mostly used when there are a large number of Features in an animal-N30 data Set.

Training an SVM with a Linear Kernel is faster than with any other Kernel. In the project SVM use kernels they are linear, polynomial and Radial Basis Function. Radial Basis Function used for localization and finite responses across the range of real x-axis. The fig2 below explains the feature selection and kernels.

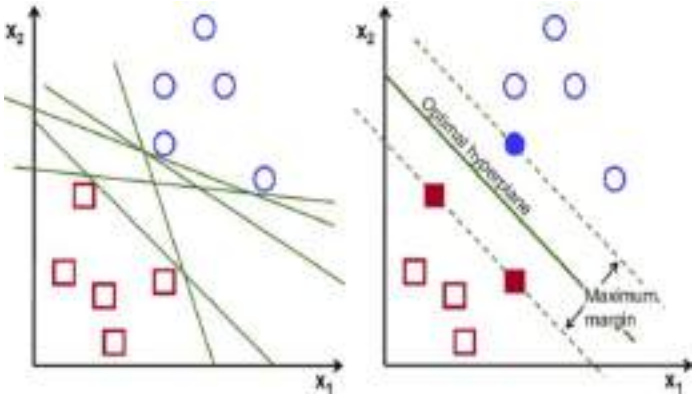


Figure 5.3.2 SVM: Feature selection and kernels

6. SCREENSHOTS

6. SCREENSHOTS

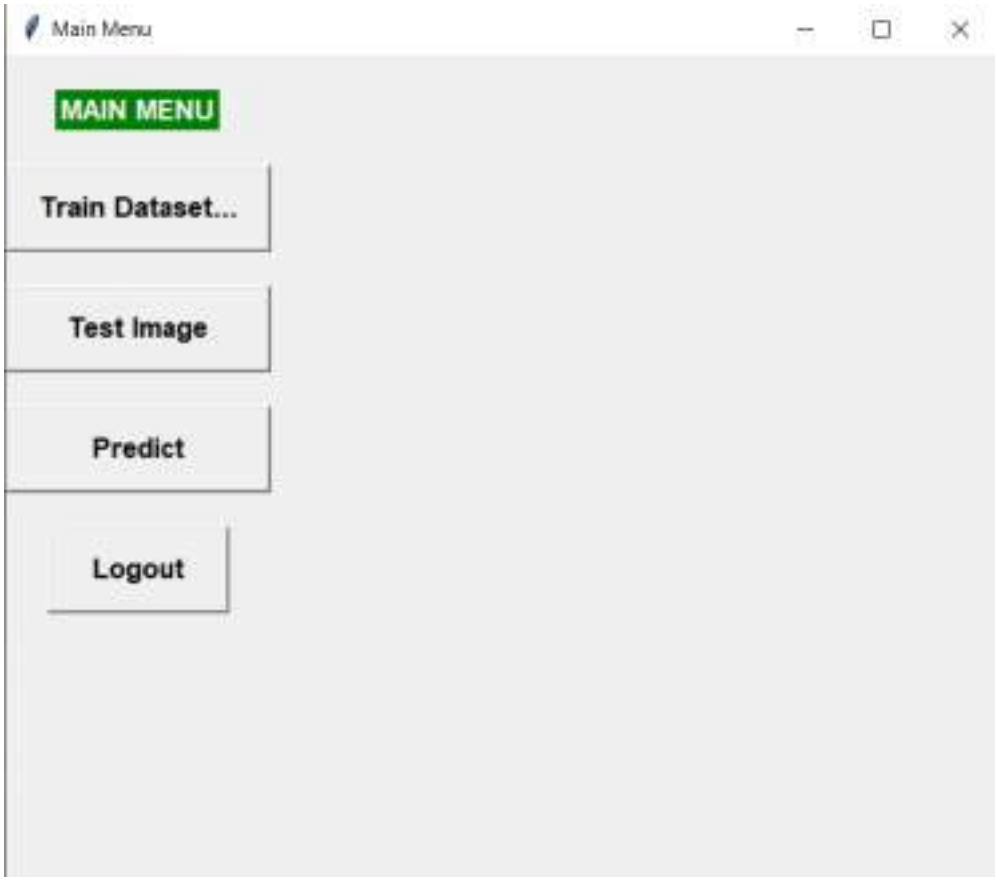
6.1 HOME PAGE

Screenshot 6.1: Home page for Wildlife Detection

6.2 LOGIN PAGE

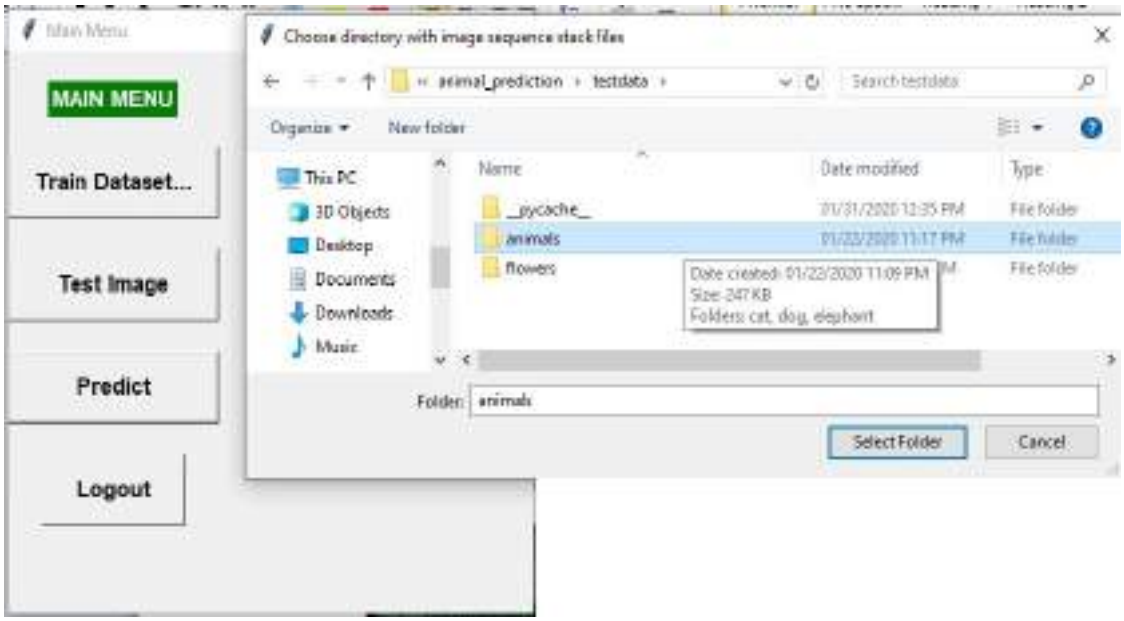
Screenshot 6.2: Login Page for Wildlife Detection.

6.3 MAIN PAGE



Screenshot 6.3: Main Page for Wildlife Detection.

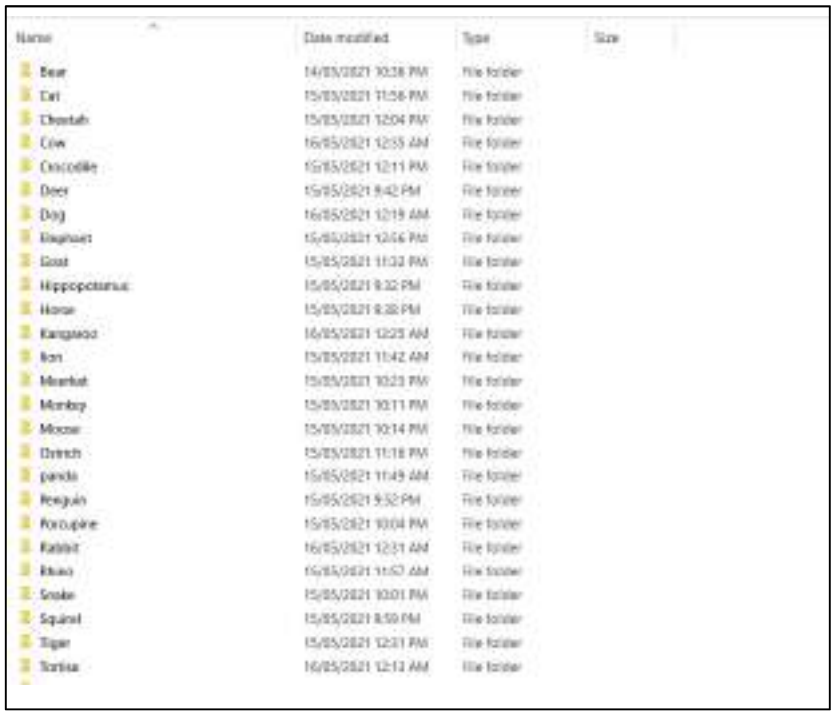
6.4 TRAINING DATA



Screenshot 6.4: Dataset Upload for Wildlife Detection

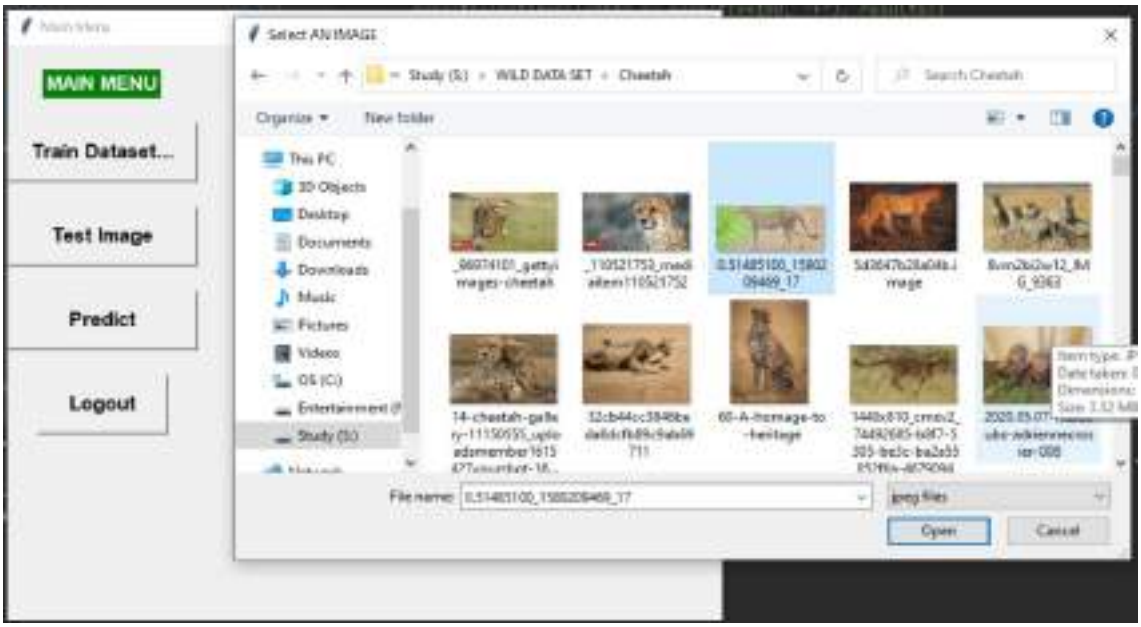
6.5 DATASET

The Dataset named “ANIMAL-N30” is used for training the algorithm. The size of dataset is 1GB and it consists of 30 types of animals.



Screenshot 6.5: Dataset for Wildlife Detection

6.6 TESTING IMAGE

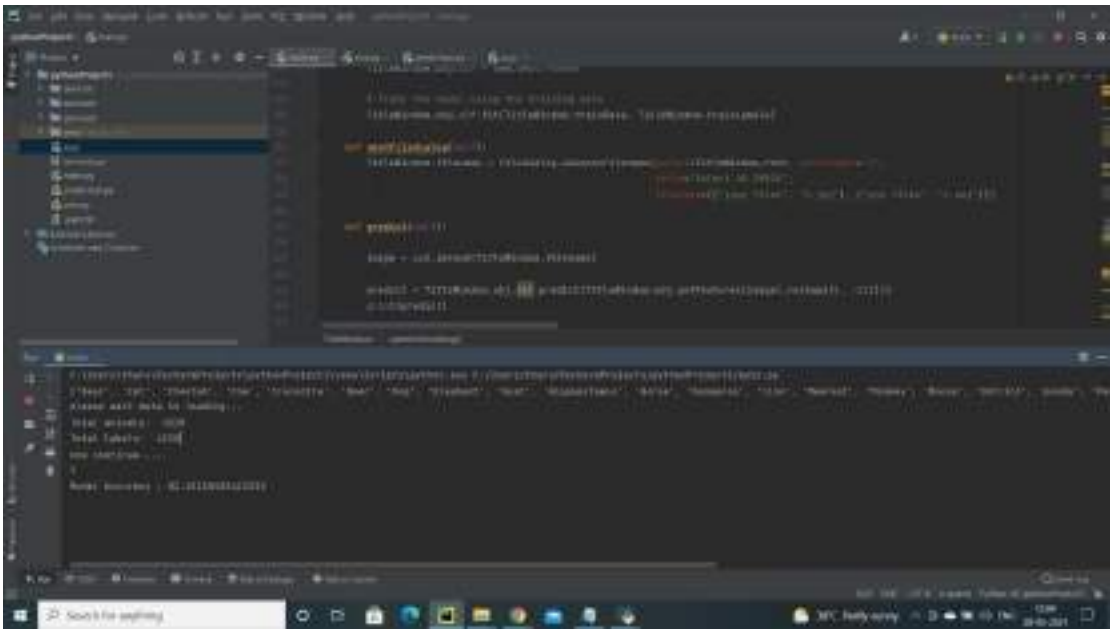


Screenshot 6.6: Training image for Wildlife Detection

6.7 RESULT

Screenshot 6.7: Test Screen.

6.8 MODEL ACCURACY



Screenshot 6.8: Model Accuracy for Wildlife Detection

7. TESTING

7. TESTING

7.1 INTRODUCTION TO 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, subassemblies, 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 expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

7.2 TYPES OF TESTING

7.2.1 UNIT TESTING

In the unit testing we test each module individually and integrate with the overall system. Unit testing focuses verification efforts on the smallest unit of software design in the module. This is also known as module testing. The module of the system is tested separately. This testing is carried out during programming stage itself. In the testing step each module is found to work satisfactorily as regard to expected output from the module. There are some validation checks for fields also. For example, the validation check is done for varying the user input given by the user which validity of the data entered. It is very easy to find error debut the system.

7.2.2 INTEGRATION TESTING

Data can be lost across an interface, one module can have an adverse effort on the other sub functions, when combined, may not produce the desired major functions. Integrated testing is the systematic testing for constructing the uncover errors within the interface. The testing was done with sample data. The developed system has run successfully for this sample data. The need for integrated test is to find the overall system performance.

7.2.3 FUNCTIONAL TESTING

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals. Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures : interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows, data fields, predefined processes.

7.3 TEST CASES

SNO	Test case	Results
1	Data Set Upload	Yes
2	Prediction	Yes

8. CONCLUSION

8. CONCLUSION

8.1 CONCLUSION

The proposed system is real time animal detection. It would detect the animals in the wild and alerts the authorities. It can solve all the problems of the existing system and we believe that this proposed system will be helping hand in wild-life monitoring .

8.2 GITHUB LINK

https://github.com/tharun-pagadala/WILD-LIFE-DETECTION.git

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3.https://www.sciencedirect.com/science/article/pii/S2211379721000012

Wildlife Detection

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***Abstract*: In this paper, an ML-based system was built for the Detection of wild animals using images that have been captured with the help of a camera. The main purpose of this project is to reduce collisions between vehicles and animals on roads, such accidents resulting in ecological imbalance and large expenditures in public coffers. This paper presents the components of a simple animal detection system and also a methodology for animal detection in images provided by cameras installed on the roads. This method allows the feature extraction of the image and the use of Machine Learning techniques to classify the areas into animal classes. ML techniques were compared using synthetic images, traversing the pixels of the image using five distinctive approaches. Results show that the Support Vector Machine(SVM) identifies animals on roads accurately.**

***Keywords*: Animal Detection, SVC ML Algorithm.**

1. Introduction

Wildlife detection may be a vital and rising space because of an outsized variety of real-life applications. numerous life detection ways and warning systems square measure used for indicating the presence of animals on the roads, village farming, or residential areas. Applications that square measure vital in reality square measure preventing AN animal-vehicle collision on roads, preventing dangerous animal intrusion in a very dominion, knowing the locomotive behavior of targeted animals, etc. of these applications is reduced right down to 3 areas specifically detection, tracking, and identification of animals.

This model offers the anticipated animal image, animal name, and animal name invoice in order that the user will merely perceive and understand what precautions are taken in the future. Identification of animals is extremely necessary for distinguishing the targeted animal and its behavior. Identification of animals helps groups of people to observe and manage animals easier.

The ML model is discussed in this paper was trained using the SVM ML Algorithm. The dataset used in our project is labeling data. These are further discussed in detail in the following paper.

2. Literature Survey

Researches concerning animals in the image process are a vital field to several applications. several algorithms and strategies are developed by persons so as to own a much better understanding of animal behavior. Besides, these applications can also act as a warning system to persons from the intrusion of dangerous wild animals for early precaution measures. These applications are reduced right down to 3 vital branches, specifically detection, tracking, and identification of animals. the primary branch, within which animal detection, has been applied in numerous fields of real-life application. as an example, a detection algorithmic program has been developed for light-weight detection and locomote (LIDAR) knowledge to alter the fisher to seek outreach to the proper location of fishes within the deep sea. Researchers in used mobile remote sensing pictures to discover moving wild animals. Work in, on the opposite hand, used micro-Doppler signals to take care of human security by detecting potential dangerous animal intrusion to the territorial dominion. The second branch, that is animal chase, is that the main topic in watching animal locomotive behavior and its interaction with the setting. With the technology of detector, radio-frequency identification (RFID), and international positioning system (GPS), one in all the applications is that the development of recent zoological systems for animal traceability, identification, and anti-theft for the management and security of animal within the zoological garden [4]. By chase the animal moves, it helps persons to own a much better understanding of living creatures on earth, particularly on however the animal interacts with its setting. The third branch, that is animal identification, is employed to spot the detected wild animal. it's been employed in health watching systems for domestic collections. life animal care management becomes the most issue as animals have spectral. Work is found that the human observer won't opt to use this approach if they require to discover the animal.

3. Methodology

A. System Architecture

In this project, real-time detection of animal recognition ML model was built with the help of captured images.

This system was divided into three main phases; Initially, we wrote some code for the training of the whole dataset by implementing the SVM algorithm model. Preparing training data that takes all images into a list and also extracts features of all images into a list that are in the dataset. The list divides the data for training and testing. The data given to the model is labeled one. These labels are named in such a way that they express the name of the animal. Flatten function is used for converting a multi-dimensional array to a one-dimensional array and hog features are used for removing blur in images. The completion of training the model gives information about the number of animals the user has trained. The model trained for 30 different directories.

The testing begins by giving an input has an image to the model. About 30% of images are given for testing. The input is given to the testing model extracts the features and given to the SVC model. The model extracts the features of the image from the desired testing data.

In the prediction phase comparison of the trained input image and testing, image is done.The fig1 explains the architecture of wildlife detection.

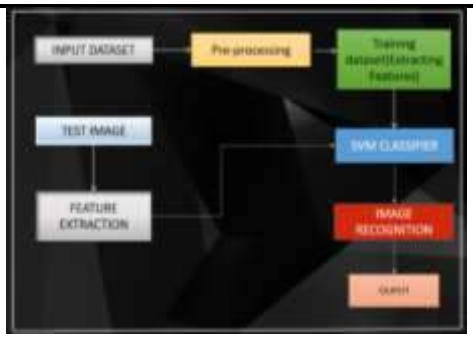

Fig1: System architecture

B. Machine learning

Support vector machines are a set of supervised learning methods used for classification, regression, and outliers detection. The motivation for this project was to develop a supervised machine learning model to identify an image of an animal. Support Vector Machine (SVM) was used to classify images for animal prediction. Classification SVM Type 1 (also known as C-SVM classification)is used in the project. Support Vector Classifier is the support vector machine algorithm for the multiclass problem. A Linear Support Vector Classifier is to fit the data you provide, returning the best fit hyperplane that divides or categorizes, our data. After getting the hyperplane, you can then have some features in your classifier to see what the predicted animal is. Linear Kernel is used when the data is linearly separable, that is, it can be separated using a line. It is the most common kernel to be used. It is mostly used when there are a large number of Features in an animal-N30 data Set. Training an SVM with a Linear Kernel is faster than with any other Kernel. In the project SVM use kernels they are linear, polynomial and Radial Basis Function. Radial Basis Function used for localization and finite responses across the range of real x-axis. The fig2 below explains the feature selection and kernels.

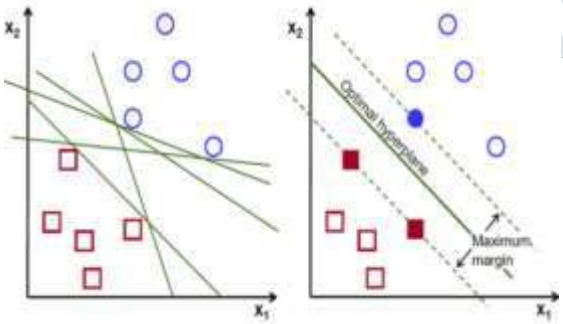

Fig2: SVM: Feature selection and kernels

Image manipulation with rgb2grey: RGB image has three channels they are red, green and blue but the grey scale image has only one channel. Image data is represented as a matrix, and the depth is the number of channels. Accordingly, the original color image has different dimensions but after calling "rgb2grey", the resulting greyscale image has only one channel, converting into one dimension. The below fig3 explains converting multi-dimensinal array into single dimensional array.

Fig3: Image manipulation

Histogram of oriented gradients: The images are converted into a format that SVM can understand. An image is divided in a grid fashion into the pixels within each cell, a histogram of gradient directions is compiled. To improve evenness to highlights and shadows in an image, pixels are blocked normalized. The HOG feature vector for the image is the sequence of those cell-level histograms.

Train model: To classify dataset– Support Vector Classifier (SVC), a type of SVM is used.

```
# define support vector classifier
svm = SVC(kernel='linear', probability=True, random_state=42)
# fit model
svm.fit(X_train, y_train)
```

C. Flattening

Flattening is the procedure for converting the two-dimensional array into a single-dimensional array, a long continuous linear vector. It receives the output from the list, flattens its structure to create a single, long feature vector to use the next layer for the final classification. This is shown in Fig 4 and Fig 5.

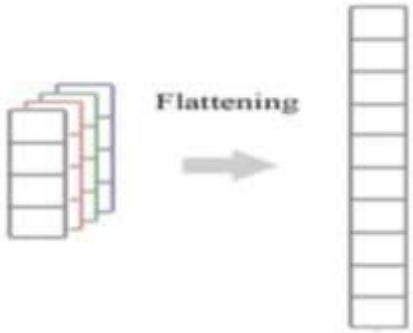

Fig. 4: Flattening

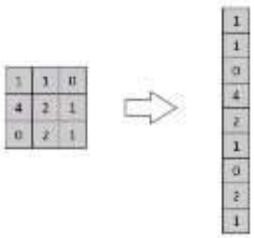

Fig. 5: Flattening

D. Dataset

Animal-N30 dataset has 4220 images. The N30 explains that it includes about 30 different animal directories. This dataset contains clear pictures of animals and each picture contains different pixels. The dataset is divided training and testing in the ration 70:30 respectively.

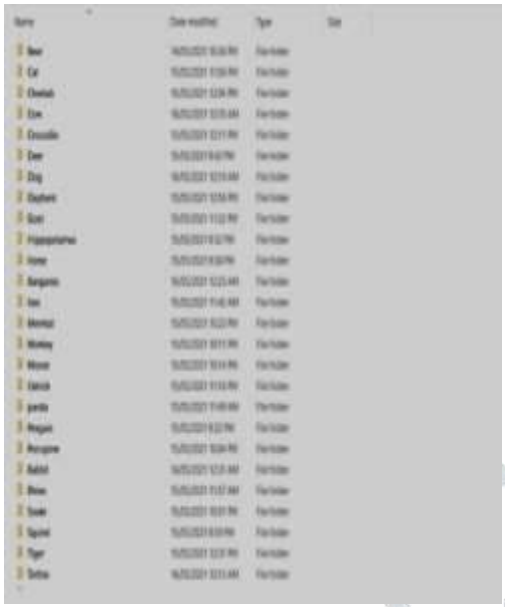

Fig. 2: Animal-N30 Dataset

a. Train Dataset

The percentage of images that were used for trained puroses in our project is seventy percent. Fig 3 and Fig 4 showing training images of dog and lion directories. The two directories are among the 30 directories of the animal-n30 dataset. We can observe Fig 3 having different images of Dog expressing in different ways. A single image is different from other images.

Dog Train Dataset

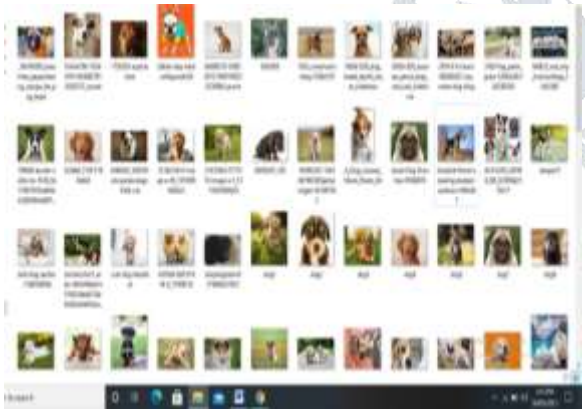

Fig. 3: Dog Train Dataset

Lion Train Dataset

We can observe Fig 4 having different images of Lion expressing in different ways. A single image of Lion is different from other images.

Fig. 4: Lion Train Dataset

b. Test Dataset

The percentage of images that were used for testing purposes in our project is thirty percent. Fig5 and Fig 6 showing testing images of dog and lion directories. The two directories are among the 30 directories of the animal-n30 dataset. We can observe Fig 5 having different images of Dog expressing in different ways. A single image is different from other images.

Dog Train Dataset

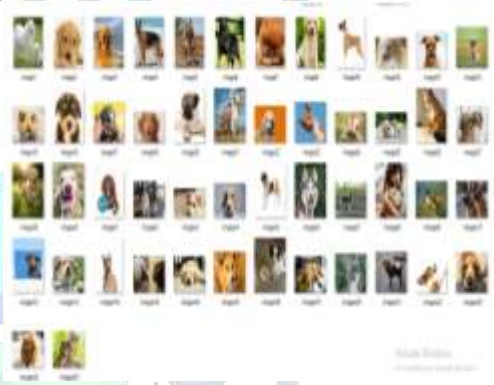

Fig. 5: Dog Test Dataset

Lion Train Dataset

We can observe Fig 6 having different images of Lion expressing in different ways. A single image of Lion is different from other images.

Fig. 6: Lion Test Dataset

4. Results and Discussions

Detection of wildlife animals with an SVM algorithm using captured images from a camera was introduced. In this paper, users can recognize animal names, take precautions for future use, and be safe. This system showed good results by taking advantage of machine learning techniques. This section discusses the results obtained by the system. Fig 7 shows the user's welcome and login page. The user after entering login credentials then he can directly go to the main page.

Fig. 7: Welcome Page and Login Page

Fig 8 shows the main page of the project. User can continue the execution from training the data to predicting the data.

Whenever the user clicks the training button it prompts to select the dataset from his storage. After completion of training, the user can select the testing button it prompts to select a testing image from the storage. Finally selecting the prediction button shows the final results of the project.

Fig. 8: Main Page

Whenever the user selects the prediction button after training and testing it shows the results Fig 9 shows the results of the identification of an animal. It also shows the animal name in the window.

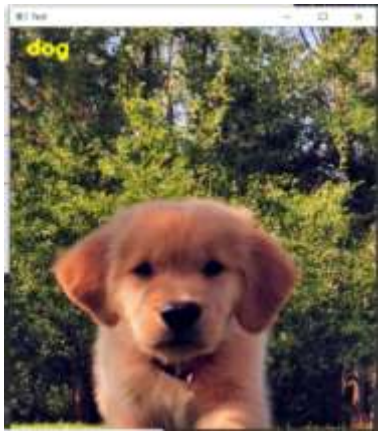

Fig. 9: Animal Identification

Apart from the above information 4220 images were trained and real time images were tested and got the result. The results have shown up to average accuracy of 85%.

5. Conclusion

In this paper, a real-time ML-based Wildlife Detection was built using images that were taken with the help of a camera. Images were built to contain different types of features for example containing different pixels, different angle of images means image containing only face or complete body animal image, etc. The projected system is real-time animal detection. it might notice the animals within the wild and alerts the authorities. It will solve all the issues of the prevailing system and that we believe that this projected system are hand in life observance.

In addition, there is a lot of scope for this, project, since we have label images.

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