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# *WILD ANIMAL INTRUSION DETECTION AND REPELLENT SYSTEM*

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***Abstract*—This paper focuses on providing Surveillance to the agricultural fields and tribal areas to protect their agricultural fields and properties from wild animal intrusion.Due to the intrusion of animals the farmers face lots of difficulties including damage of crops and their properties.When animal is intruding to the land the camera will capture the image and the images are gone under image pre-processing after feature extraction. Then compare the extracted features of animal with already predefined images using CNN classifier to find out which animal is intruding into the site.As a result after finding the animal the system produce a particular frequency of sounds which cause a neurophysiologic effect in the animal and drive that animal away from the site. After that an alert mail will be sent to the owner of the land. Here we are trying to reduce the damage or the man animal conflict,we are using the principles of bio-acoustics and image processing.***

***Keywords*—image pre-processing; feature extraction; CNN; neurophysiologic; bio-acoustics**

## I. INTRODUCTION

Animal intrusion into farmlands is becoming a major issue today. The owners of farmland suffer a great deal of loss as a result of animal invasion, including decreased crop yield and damage to the farmland. We are introducing our paper animal intrusion detection and repellent system in order to prevent this scenario. In this study, we provide a system that can detect animal trespass and drive the animals away from farmland by making a bothersome noise.We can prevent human-animal conflict and save a great deal of human lives by driving animals away from fields. Other conventional techniques exist to stop the animal, but they are extremely expensive. For instance, electric fencing can be installed around farmland to prevent animal infiltration, but it is impractical to construct a fence across a large area because it would be too expensive to maintain. We keep an eye on the farmland using this technology.When an intrusion is found, we record a video of the animal passing by and then cut the movie into frames to identify the species. then the image's preprocessing is completed. Preprocessing involves removing noise from the image, enhancing its clarity and sharpness, and cropping out undesired items. The features of the animal in the image are extracted after preprocessing. The features of the animals are compared to the training model after being extracted from the photos. For classification, we use the CNN classifier. The training model includes a collection of animal photos that have been specifically selected, allowing us to compare the extracted characteristics to these images.The animal is then classified using the CNN classifier, and a suitably repulsive sound is subsequently created to drive it away. The noises will irritate the animal, which will then flee. A warning email is sent to the owner of the farm after the animal is found so they are aware there may be an attack and can take precautions.Here, the user can manage the system as they see fit without having to do anything else; the system will handle all other tasks on

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its own. Here, we're utilizing the Yolo v5 algorithm to recognize animals. Yolo v5 is a powerful object detection method. If a particular animal is detected, the sound will be created using the if-else condition. Using this system, we may lessen human-animal conflict while protecting our crops and farmland from animals.

## II. PREVIOUS WORK

In this paper,introduced a new application to defend crops from ungulate attacks that takes advantage of the latest technological developments in different ICT areas, such as AI, Edge Computing, IoT and LPWAN. The creation of a sophisticated system for intelligent animal repulsion was necessary for the application's implementation. This system integrates newly created HW and SW components and allows for the real-time identification of ungulate species and presence, as well as the prevention of ungulate-related crop damage.. The system has been designed taking into account application requirements (response time, accuracy, precision), resource limitations (computational power, memory) and constraints (network coverage, energy consumption coming from the rural environment and the impact of all these factors on the HW and SW components, so as to achieve a satisfactory trade-off between requirements and performance. Concerning animal recognition, YOLOv3 and TinyYOLOv3 have been evaluated and adopted as detectors for their ability to work in real-time at high performance as well as to adapt, after training their neural network models, to different edge computing platforms, such as RPi (with or without NCS) and Jetson Nano.Finally, this work delivers an innovative, perfectly working system that could be integrated with other HW devices and SW modules, thus opening the way to the introduction of unprecedented applications and services, not only in Smart Agriculture, that take advantage of both open hardware and cognitive approaches[1]

In this paper,it provides a comprehensive survey of recent advances in visual object detection with deep learning. Covering about 300 publications that we survey 1) region proposal-based object detection methods such as R-CNN, SPPnet, Fast R-CNN, Faster R-CNN, Mask RCN, RFCN, FPN, applications, namely Object Detection in Surveillance, Military, Transportation, Medical, and Daily Life. This paper's survey examines a number of variables in depth that have an impact on detection performance.classification/regression base object detection methods such as YOLO(v2 to v5), SSD, DSSD, RetinaNet, RefineDet, CornerNet, EfficientDet, M2Det 3) Some latest detectors such as, relation network for object detection, DCN v2, NAS FPN.Also, five publicly accessible benchmark datasets are reviewed, as well as their common evaluation metrics. This study focuses primarily on the use of deep learning architectures in five key applications: object detection in surveillance, the military, transportation, medicine, and daily life. This paper's study covers a variety of parameters, including I a large range of object categories and intra-class differences, ii) constrained storage space and compute power, in detail. Lastly, summarize the study by pointing out fifteen current trends and promising lines of enquiry[2]

In this paper, a study of animal detection using deep learning was provided. Eight cutting-edge detectors were examined in a variety of settings. Evaluation of their generalization skills in non-matching training and test scenarios was a specific emphasis of the study. It was demonstrated that none of the detectors can generalize sufficiently to offer deploy able models, with missed detection's on previously unobserved backgrounds being the main problem. Tracking and multimodel pooling attempts to boost recall were futile. An efficient approach was demonstrated via synthetic data generation, which extracts animals from photos of natural environments and places them in target settings using segmentation masks. This was accomplished using a method that was virtually entirely automated by the performance of detectors trained on the equivalent synthetic images, and the competitiveness of coarse unsupervised masks with precise manual ones. It was demonstrated that RETINA and YOLO could compete with more powerful models while still being light enough for mobile deployment of several cameras[3]

In this paper,it encompasses the entire planet, with writers snooping around the wild. On the other hand, wildlife discovers altered habitats and blocked resettlement pathways. Conflicts between people and wild animals over food and habitat have gotten worse over time, harming people physically and financially through personal assaults and cattle predation. In defensive and out of retaliation, wildlife can be killed. Conflict between people and wildlife exists everywhere. From elephants eating Indian crops to tigers preying on Nepalese cattle to polar bears raiding Arctic villages' waste bins. It's crucial to find a harmless way to coexist with wildlife. Several technologies have been created to aid in reducing human-wildlife conflict, in addition to education, profit-allocation schemes, and healthier land use design. They include block-making ditches and electric fences.between people and animals. Wild animals are kept away from human communities and their valuables by flashlights and guard dogs. Nonetheless, the animal might suffer harm as a result. So, the proposed architecture promises a new platform to ensure conservation of trespassing wild animals and the human settlements, avoiding compromising both safety measures[4]

This paper discusses how effective automatic animal identification and warning systems can assist drivers in lowering the frequency of animal-vehicle incidents on roads and highways. This study discusses the need for

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automatic animal detection systems as well as our HOG and cascade classifier-based animal detection technique. The programme is capable of spotting animals on highways in a variety of situations. The suggested method detects animals (cows) with an accuracy of almost 82.5%. It is also estimated how far the animals are from the testing truck. Despite the fact that the suggested study has been concentrated on automatic animal detection in relation to Indian highways, it will also work in other nations. The suggested approach is easily expanded to include different types of after adequate testing and training, animals too. To prevent crashes and the loss of life on highways, the proposed system can be used with other effective, currently available pedestrian and vehicle detection technologies[5]

This paper discusses a variety of factors to take into account while developing an animal detection system. As wild animals come into touch with human habitat in quest of food and migration routes that have been disrupted by development operations, they often come into confrontation with people. As a result, to keep wild animals out, this region needs to be regularly watched. Also, changes in the natural environment from day to night can generate a brightness issue, which can make it difficult to notice an external monitoring device. The studies mentioned above use sensors and cameras to monitor the field, and the photos they capture are compared to pictures in the database, including pictures of threatened and endangered species of wildlife. The controller transmits information to the database if the final image confirms an image there.the planter receives a warning message from the GSM module. so that the appropriate steps will be automatically done by the repelling mechanisms. There are fixed ultrasonic wave repellent devices available. Animals may therefore become accustomed to the generated ultrasonic sound after a certain amount of time. The animal cannot adapt to a certain frequency because there is no repellent mechanism that automatically switches the ultrasonic frequency within a predetermined range. To determine the frequency of the individual animal's undesirable behaviors, extensive research should be conducted. The majority of encounters between people and animals happen at night when standard cameras have poor visibility, making it impossible for the systems currently in use to recognize the animal and alter the frequency. Thermal and/or night vision cameras should be integrated into new systems, which even in the absence of light, track the animal's movement[6]

In this paper, the issue of wild animals damaging crops is discussed. It has grown to be a significant social issue in the present. In other words, every farmer should be conscious of the fact that animals are living things who need to be protected from any potential pain while using his or her food produce. It needs immediate attention and a workable solution. So, this initiative has substantial social significance since it will assist farmers in safeguarding their crops, save them from suffering significant financial losses, and spare them from making futile efforts to safeguard their farms. This paper uses machine learning to recognize animals in order to overcome the aforementioned issues and achieve its goal.the farm using the computer vision subfield of deep neural networks. In this project, a camera that records the environment throughout the day will be used to periodically monitor the entire farm. A machine learning model is used to detect the presence of animals and play the right sounds to scare them away. The many convolutional neural network libraries and principles that were used to build the model are described in this research[7]

This paper discusses the issue of wild animals harming crops. It has grown to be a significant social issue in the present. It needs immediate attention and a workable solution. As a result, this project has significant social significance because it seeks to solve this issue. The suggested Raspberry Pi-based system is discovered to be more portable, user-friendly, and less sophisticated, which can be used to perform. a number of boring and repetitive tasks. In this project, the entire process is automated and uses repellent without harming any animals. The project's next goals include employing GPS and RFID injectors to locate the animals[8]

This paper presents an architecture to alert drivers on roads as well as a system to detect the presence of animals on roadways; capable of learning characteristics of each pixel to distinguish between what is an animal and what is not an animal using synthetic images. The features were processed using KNN and RF, and the classification outcomes were compared to determine which type of approach and ML was most effective based on the F-measure. Although the technique is being used to detect animals on Brazilian highways, it can also be used to achieve any other objective with a visually detectable condition. It thinks that this paper's contributions are an important step in ensuring the long-term survival of species and a reduction in car accidents, which in turn leads to a drop in pollution.the public purse and preventing the fatalities of drivers and passengers. Install cameras on roadways as part of this paper's ongoing research to obtain a set of accurate photographs. Use additional methods in addition to deep learning to determine which approach works best under various circumstances. Ultimately, an algorithm was built to help this application function well in real-time and distinguish among-st these discovered creatures. A greater understanding of the behaviour s of each type of animal that inhabits the fauna may result from the information generated, which will also make the work of experts or those in related fields like biology easier[9]

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In this paper,A WSN with stationary sensors set in broad areas and polar regions that turn ON and OFF in order to save energy and successfully identify the animal was proposed in this research for the remote monitoring of Long-tailed Ducks, an Arctic species that is now thought to be endangered. A Discrete Time Markov Chain was created and numerically solved to serve as the foundation for a mathematical model that calculates the success detection probability, or Psuc. To do this, we suggested two basic approximations to simplify the model: First, a model based on a random walk that closely resembles the animal's actual trajectory is developed. Markovian models can be used using this approximation in future studies in the area. Second, a single sensor technique is utilized to focus solely on one node's activity rather than that of all the other nodes in the system. This single sensor approximation also makes it simple for the model to scale when more nodes are added. This approximation also closely resembles the outcomes when looking at the entire network. By contrasting these approximations with comprehensive simulation data, they were found to be valid. It's crucial to keep in mind that the single sensor approximation yields incredibly accurate findings[10]

In this paper, an efficient end-to-end network for segmenting chicken images is proposed. This paper creates a chicken dataset for research usage in order to explore the segmentation of chicken images for improved animal welfare. This work suggests the use of multi-scale information and attention-based strategies, including channel attention and edge attention for efficient feature extraction, for enhanced segmentation performance. Additionally, to effectively carry out deep supervision in the network, a mixed loss technique based on multi-scale outputs is used. The proposed MSAnet performs well for chicken picture segmentation, according to experimental findings. The chicken dataset will continue to be expanded in subsequent studies to include more variations and situations for the study of chicken behaviour, including detection, segmentation, tracking, and recognition[11]

This paper takes into account the issue of minimizing the visual disruption brought on by up-close animal observation drones. With the aim of limiting the maximal visual disturbance (represented by bearing changes) of many moving targets, an optimization problem was developed. To address this issue, sliding-mode-based navigation laws were presented, which direct the drone to reduce the maximum bearing changes while carrying out a task requiring close observation. One of the first inquiries on how to motion-control drones used for wildlife observation are presented in this article. Via computer simulations, the effectiveness of the suggested approach was evaluated. Extending the existing technique to dynamic situations with either moving or static impediments that the drone must avoid is one of our future endeavour's.Conducting field studies to assess the efficacy of the established method is a key area of future research.Investigating strategies to lessen drones that are used to observe wildlife's aural disturbance is another area of research. Also, it would be highly intriguing to develop a navigation law that produces trajectories on an ellipsoid rather than a sphere as a consequence of future research[12]

In this paper uses an Internet of Things-based wild animal infiltration detection system. This technology enables us to identify any wild animal entrance, reducing the risk of crop damage and human casualties. Several sensors and an Arduino uno are used to construct the current model. Wide-angle and infrared cameras could be added to the system in the future to expand system adaptability. This study presents a system that monitors the field to help detect wild animal invasions on agricultural farms using the Internet of Things. Around the field's edges, ultrasonic sensors are used to identify intrusions first. A camera mounted on an electric vehicle equipped with a Node MCU subsequently takes pictures of the intruders.a microcontroller that is keeping an eye on the scene. The farmer receives a warning via an IoT application. With regard to the intruder's photographs that were captured and the notification alert, the performance of the suggested system has been examined. Anyone can effectively detect any kind of intrusion around the pitch by using the proposed model[13]

In this paper created technique in this research is efficient in automatically identifying the walking human in remote sensing photos. And the method that was created to extract 2 dummy masses from 2000x2000 pixels is legitimate as a system to facilitate the interpretation of moving wild animals in aerial images. To detect moving animals, it will apply the created algorithm to all of the photos. Also, we'll investigate how to use observed moving animals to get biological data such as population estimates, habitat, etc. The direct discovery of wild creatures by visual inspection of remote sensing photos, however, requires considerable labour. Also, because remote sensing images are obtained from above rather than the side, certain wild creatures may be missed. We created an algorithm for the automatic detection of moving wild animals in order to address these issues.photos from aircraft remote sensing that have 60% overlap that show snow[14]

This paper sought to determine why CNN models perform less well when they attempt to detect animals behind cages. Considering that there are typically fewer images of animals in cages than there are without them, our first hypothesis is that this is the case. In order to overcome this difficulty, transfer learning was used to

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retrain the pre-trained model using images of animals in cages. Because of the remarkable performance of the chosen model, M2Det, the target animals were the panda and the deer because of the complexity of their respective appearances. When the photographs of the animal behind the cage were used instead of the typical animal pictures, the performance for the caged panda greatly improved, with the detection results increasing from 0.8043 AP to 0.9568 AP.used.Combining images from datasets of caged and uncaged animals significantly enhanced performance. As a consequence, the AP was 0.9819[15]

In this paper, we enter the wilderness as the human population spreads across the globe. On the other hand, wildlife discovers altered habitats and blocked resettlement pathways. Conflicts between people and wild animals over food and habitat have gotten worse over time, harming people physically and financially through personal assaults and cattle predation. In defensive and out of retaliation, wildlife can be killed. Conflict between people and wildlife exists everywhere. From elephants eating Indian crops to tigers preying on Nepalese cattle to polar bears raiding Arctic villages' waste bins. It's crucial to find a harmless way to coexist with wildlife. Several technologies have been created to aid in reducing human-wildlife conflict, in addition to education, profit-allocation schemes, and healthier land use design. Among them are electric fences and Ditch barriers that stand between people and wildlife. Wild animals are kept away from human communities and their valuables by flashlights and guard dogs. Nonetheless, the animal might suffer harm as a result. So, the proposed architecture promises a new platform to ensure conservation of trespassing wild animals and the human settlements, avoiding compromising both safety measures[16]

In this paper,Farmers could avoid crop loss and animal encroachment by using an effective animal detection and repellent system. This project develops a deep learning animal detection model to identify and deter animals from farmland. Animal identification and classification accuracy is 93.64 percent accurate. Convolution neural network (CNN) is the algorithm used for animal detection, and the number of epochs for total detection is utilized to quantify accuracy. The finished model was eventually supplied as an online platform to provide useful information to crop owners by identifying critters and repelling them using saltines sound. This has not yet been live-located and is being created as a site page.It is expected that as a result of these efforts, more species will eventually receive government support in the future. The suggested approach can surely be used, after proper planning and testing, for the discovery of several other animals as well. The suggested architecture can be used as a complete solution to avert animal extinction along with other readily available, capable humans on foot[17]

In this paper,It talks about the issues that humans have when animals intrude on their land. Even at the time of the Bible, animals were a concern when they entered lands used for farming. But many human lives have been at risk, and large deaths and serious injuries have reportedly occurred in several of them. These attacks have also instilled fear in the minds of many, including both the public and forest officials. This essay aims to allay the farmers' fears and worries about how these animals are trampling on their laborious efforts. But because these animals are also a part of our ecosystem, we need to watch out that their protective responses don't endanger them. And as people Do coexist, we must also learn to coexist in harmony with these animals by limiting the quantity of forest that is taken down year. With the aid of cameras and image processing, this project implements an animal trespass detection system. They intend to use a camera on a location farther from the property to carry out this endeavour. The system examines the output image using machine learning and deep learning algorithms when an animal enters the Field of View (FOV) of the camera to identify the animal's characteristics. An alarm will sound throughout the area if the equipment identifies the animal as an elephant or a boar, enabling the farmers to take appropriate action.avoid the animal with or without suffering little damage. By alerting farmers to the location of the animal, the gadget can also be utilized to reduce the risk of human casualties in the event that a wild animal trespasses. Using the Python programming language, cameras and a Raspberry Pi 4 were employed as the project's primary hardware components[18]

## III. PROPOSED SYSTEM

Animal invasion in agricultural areas is a significant problem today. animal invasion causes a tremendous deal of cost for farmland owners, including decreased crop yield and damage to the farmland. This situation is being avoided by the introduction of our paper animal entry detection and repellent technology. In this study, we provide a system that can recognize animal trespass and scare away the animals from farms by producing a loud noise. By chasing animals out of fields, we can stop human-animal conflict and save a lot of human lives. Other traditional methods to halt the animal are available, but they are very expensive. As one illustration, it is impractical to erect electric fencing around fields to prevent animal intrusion.For example, farmland can have electric fencing placed around it to keep animals out, but it is impracticable to build a fence across a vast region since the cost of upkeep would be prohibitive. We use this technology to monitor the fields. When an intrusion is discovered, we film the animal as it passes by and then chop the footage into frames to determine the animal's species. then the pre-processing of the image is finished. In pre-processing, the image's noise is eliminated, its clarity and sharpness are improved, and unwanted objects

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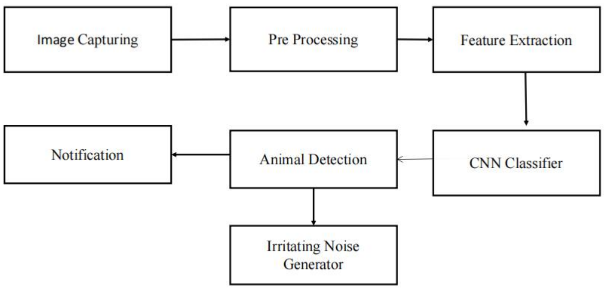
are cropped out. After pre-processing, the animal's features are taken from the image. Following their extraction from the images, the features of the animals are compared to the training model.Following their extraction from the images, the features of the animals are compared to the training model. We employ the CNN classifier to perform classification. We can compare the retrieved attributes to these photographs because the training model includes a set of carefully chosen animal shots. The animal is then identified using the CNN classifier, and a sound designed to repel it is then produced. The animal will become agitated by the noises and run away. After the animal is discovered, a warning email is sent to the farm owner so they are aware there may be an attack and can take precautions.




A.Image Pre-processing

The purpose of picture pre-processing is to enhance certain image features necessary for subsequent processing or suppress unintentional distortions in the image data although geometric transformations of images like rotation, scaling, translation are classified among pre-processing methods here since similar techniques are used

B.Feature Extraction

Feature extraction is the process of converting unprocessed raw data into numerical features that may be processed while preserving the information of the original data set. It delivers superior outcomes than directly using machine learning on the raw data. After pre processing the acquired image, the animal's features are recovered. Here, we're mostly capitalizing on an animal's general appearance, including its head, body, ears, and eyes.

C.CNN Classifier

For deep learning algorithms, a CNN is an unique kind of network design that is used for tasks like image recognition and pixel data processing. CNNs are the chosen network architecture for recognizing objects in deep learning, despite the fact that there are several types of neural networks. Convolutional neural networks, or CNNs for short, are the best at handling this problem among classifiers. An algorithm that identifies patterns in data is called a neural network, or CNN. Here, we use the CNN classifier to categorize the animal. By contrasting the animal's acquired traits with existing images of animals, the animal is determined.

IV. DESIGN

A. DFD - Level 0

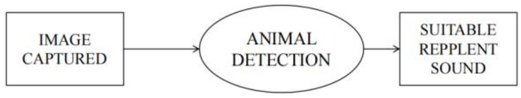



Figure 1. DFD Level 0

In this level, a simple representation of system and which all data is transmitted from one module/operation to other module/operation.Technical interview questions were fed into the model by the admin. Applicant should respond to those questions and then provide the outcome.

B. DFD-Level 1


Figure 2. DFD Level 1

The Level 0 DFD is broken down into more specific, Level 1 DFD. Level 1 DFD depicts basic modules in the system and flow of data among various modules. Level 1 DFD also mentions basic processes and sources of information. It provides a more detailed view of the Context Level Diagram.

Users must provide their credentials to authenticate themselves on the system. After logging in, user data is saved in a database called "user records." Administrators can simultaneously see who among all candidates has logged into the system. Next the admin adds the interview question on the portal. The candidate must then appear for the interview questions that were chosen at random. An interview analysis report isprepared based on the candidate response, and the admin then confirms it

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C.DFD - Level 2

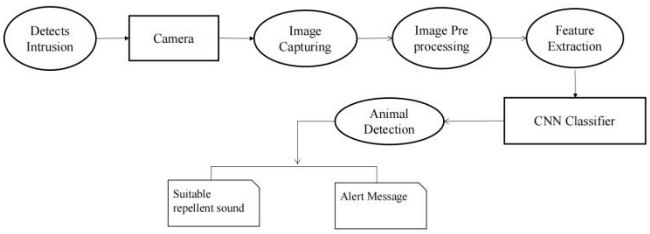



Figure 3. DFD Level 2

A level 2 data flow diagram (DFD) offers a more detailed look at the processes that make up an information system than a level 1 DFD does.

Users must provide their credentials to authenticate themselves on the system. After logging in, user data is saved in a database called "user records." Next the admin adds the interview question on the portal. The database of interview questions contains these queries. The interview's questions will be generated at random based on the skills that are automatically extracted from the candidate's resume. Candidate must then respond to these questions. An interview analysis report is prepared based on the candidate response, and the admin then verifies it.

## V. METHEDOLOGY

### A. Data Collection And Labelling

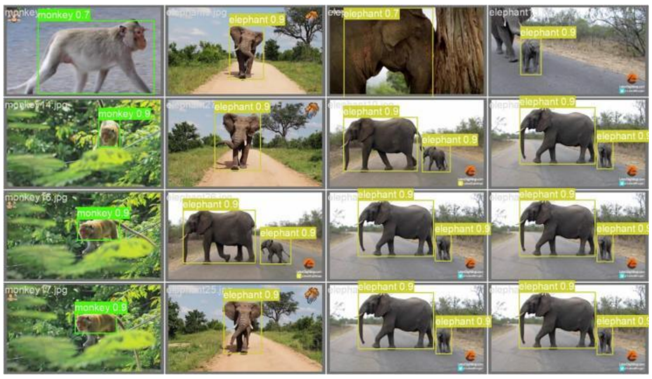
we gathered 120 photos each of 8 different wild animals systematically and gathered observations which helped to gain first hand knowledge and original insights into research there are total 960 images belonging to 8 classes in our dataset.

Labeling is to identify the raw data and adding suitable labels or tags to that data to specify what the data is about which allows ML models to make an accurate prediction.The tool used for labeling is labelImg

LabelImg:

LabelImg is a graphical annotation tool which allows you to draw visual boxes around your object in the each image,it is a free and easy way to label your images

(a)



(b)

Figure a & b shows the images of animals used to label

### B. Data Preprocessing

The input image is resized to a specific resolution for training in all item screening. Input resolution for the feature extractors used by deep learning frameworks is typically square. By design, YOLO resizes the input image to 416 × 416 pixels while preserving the original aspect ratio for the smaller of the two dimensions—height or width. It is order to manipulate the network resolution to allow larger input images, but doing so would consume more memory and computing power. Before to training the image, data augmentation was essential to boost image variation and improve photo representation. More recognition accuracy and robustness were reached by pre-processing the images using augmentation techniques such as jitter, image rotation, and flipping.adopting efficient data augmentation. In order to obtain the improved recognition accuracy and robustness provided by efficient data augmentation, pre-processing the photos with augmentation techniques such as jitter, image rotation, flipping, cropping, multi scale progression, hue, saturation, Gaussian noise, and intensity was required. Labeled data, such as the class label and coordinates for each ground truth bounding box in training images, are required for developing object detection models. especially for images

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that contain several objects and clusters, manual labeling I is tedious, time-consuming, and prone to user prejudice.

C.YOLO v5

The anchor boxes are now generated using a new technique dubbed "dynamic anchor boxes" in YOLO v5. It entails employing the centroids of the clusters as the anchor boxes after using a clustering method to organize the ground truth bounding boxes into clusters. The YOLOv5m at 640 resolution will perform well when fine-tuned from the YOLOv5 family. Even on a more dated GPU like the Tesla P100, it is capable of running at a frame rate of above 80. An mAP of 45.4 is nevertheless provided throughout. The implementation in the newly developed PyTorch open-source ML framework is one of the most significant advantages of YOLOv5 over earlier versions. Other advantages include less volume, greater speed, and improved precision.

## VI. EXPERIMENTAL RESULT

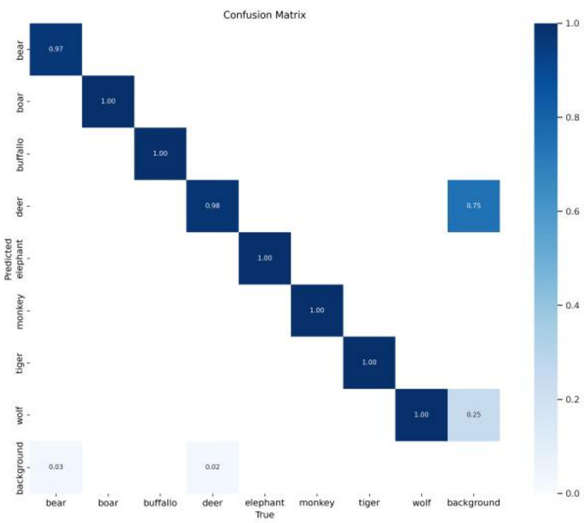


Figure 4. Confusion Matrix

A confusion matrix aids in visualizing the results of a classification task by providing a table arrangement of the various outcomes of the prediction and findings. It displays a table with all of a classifier's predicted and actual values.here we have the actual animal detection values and predicted animal detection values.sometimes the system detects the background of the images here we can see that in bear,deer and wolf at some point the system detected the background of the images.here we can see how many times the animals were detected currectly.the value of detecting the bear correctly is 0.97.the value of predicting wolf,tiger,monkey,buffallo,boar,elephant is 1.0 this animal prediction was accurate.the value of prediction of deer is 0.98.A confusion matrix can be used to perfectly analyze the potential of a classifier. All the diagonal elements denote correctly classified outcomes. The misclassified outcomes are represented on the off diagonals of the confusion matrix. Hence, the best classifier will have a confusion matrix with only diagonal elements and the rest of the elements set to zero. A confusion matrix generates actual values and predicted values after the classification process. The effectiveness of the system is determined according to the following values generated in the matrix.

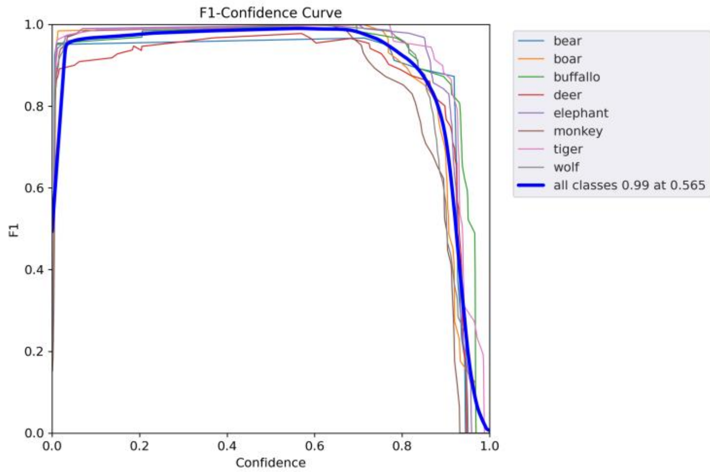


Figure 5. Confidence Curve

The confidence curve can be conceptualized as a representation of nested confidence intervals at all levels, ranging from 0% to 100%. The plot is simple to follow and swiftly provides a lot of information.here we can see the confidence intervals of detecting each animals and the confidence interval of all classes here we can see that each animals have different colors from them so we can easily find the confidence curve of every animals.

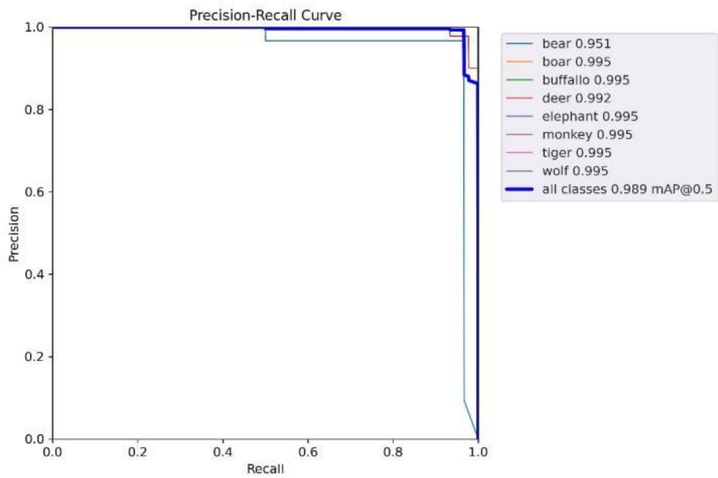


Figure 6. Precision Recall Curve

The trade off between precision and recall for various thresholds is depicted by the precision-recall curve. High

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precision is correlated with a low false positive rate, while high recall is correlated with a low false negative rate. A big area under the curve denotes both high recall and high precision.Precision-Recall is a useful measure of success of prediction when the classes are very imbalanced. In information retrieval, precision is a measure of result relevancy, while recall is a measure of how many truly relevant results are returned.The precision-recall curve is constructed by calculating and plotting the precision against the recall for a single classifier at a variety of thresholds.

Precision can be represented as:

Precision = True positives/ (True positives + False positives) = TP/(TP + FP)

where TP is the number of true positives and FP is the number of false positives. Precision can be thought of as the fraction of positive predictions that actually belong to the positive class.

Recall can be represented as:

Recall = True positives/ (True positives + False negatives)= TP/ (TP + FN)

where TP is the number of true positives and FN is the number of false negatives. Recall can be thought of as the fraction of positive predictions out of all positive instances in the data set.

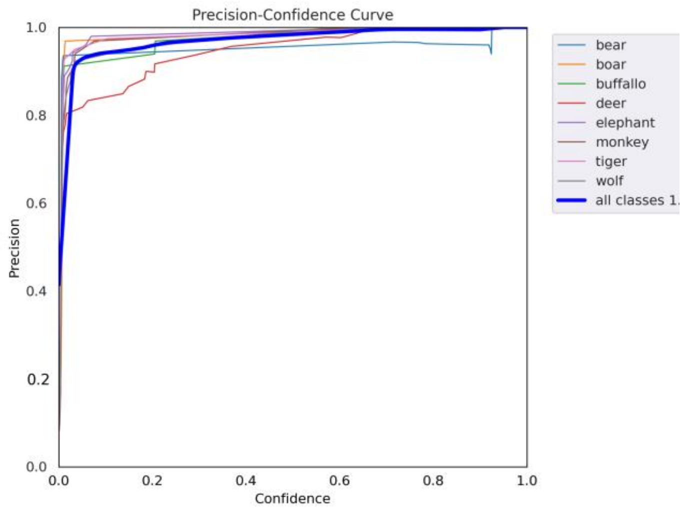


Figure 7.Precision Confidence Curve

A precision-confidence curve is a plot of the precision (y-axis) and confidence (x-axis) for various thresholds.here we can see each animal is represents with different colors.If the confidence interval is relatively narrow (e.g. 0.70 to 0.80), the effect size is known precisely. If the interval is wider (e.g. 0.60 to 0.93) the uncertainty is greater, although there may still be enough precision to make decisions about the utility of the intervention.As confidence level increases, the critical values also increase so the precision decreases.The confidence curve can be conceptualized as a representation of nested confidence intervals at all levels, ranging from 0% to 100%. The plot is simple to follow and swiftly provides a lot of information.here we can see the confidence intervals of detecting each animals and the confidence interval of all classes here we can see that each animals have different colors from them so we can easily find the confidence curve of every animals.

Precision can be represented as:

Precision = True positives/ (True positives + False positives) = TP/(TP + FP)

where TP is the number of true positives and FP is the number of false positives. Precision can be thought of as the fraction of positive predictions that actually belong to the positive class.

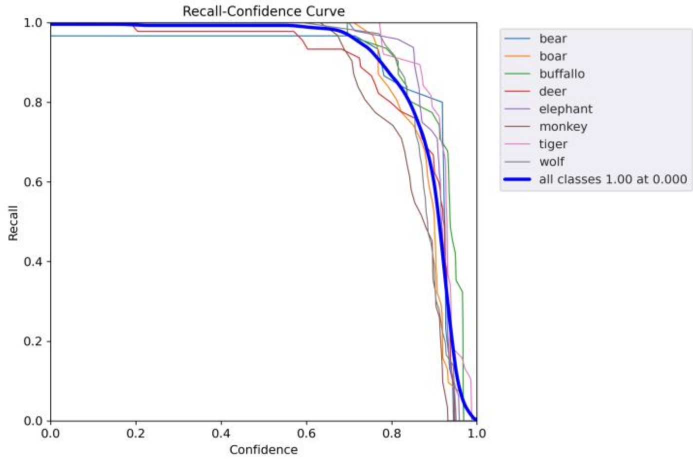


Figure 8.Recall Confidence Curve

A recall-confidence curve is a plot of the recall (y-axis) and confidence (x-axis) for various thresholds.here we can see each animal is represents with different colors.The confidence curve can be conceptualized as a representation of nested confidence intervals at all levels, ranging from 0% to 100%. The plot is simple to follow and swiftly provides a lot of information.here we can see the confidence intervals of detecting each animals and the confidence interval of all classes here we can see that each animals have different colors from them so we can easily find the confidence curve of every animals.

Recall can be represented as:

Recall = True positives/ (True positives + False negatives)= TP/ (TP + FN)

where TP is the number of true positives and FN is the number of false negatives. Recall can be thought of as the fraction of positive predictions out of all positive instances in the data set.

## VII. CONCLUSION

The farmers could be protected from animal trespass with the use of an effective animal recognition and repellent system. In order to identify and deter animals from farmland, a deep learning animal detection model is

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created. With a data set of 8 classifications, convolution neural network (CNN) is the technique utilized to detect animals. The suggested approach can surely be applied to the search for other organisms as well. While offering excellent farmland and crop security, it also protects wildlife. Farmers will receive a warning letter to remind them to exercise caution..

Today, animal invasion of farmlands is a significant problem. Animal invasion causes significant losses for farmland owners, including decreased crop yield and farmland damage. To avoid this situation, we are presenting our paper animal entry detection and repellent system. In this study, we provide a system that can recognize animal trespass and scare off the animals by creating a loud noise on farmland. By chasing animals away from fields, we can avoid conflicts between humans and animals and save many lives. There are also traditional methods to stop the animal, but they are very expensive.

In this case, all system management is left up to the user; the system will take care of all other duties on its own. The Yolo v5 method is being used in this case to recognize animals. A potent object detecting technique is Yolo v5. The if-else condition will be used to make the sound if a specific animal is spotted. By employing this system, we could reduce animal-human conflict while safeguarding our fields and agriculture.

## *Acknowledgment*

We take this opportunity to express our deep sense of gratitude and sincere thanks to all who helped us to complete the project design phase successfully. With pleasure, we express our sincere thanks to our Principal, Dr. Jose K Jacob for rendering all the facilities for the completion of our project within campus. We are deeply indebted to Professor Sreeraj R, Head of Department, Computer Science and Engineering, our project guide Professor Ms Meera V M, Assistant Professor of Computer Science and Engineering , for their excellent guidance, positive criticism and valuable comments. We express deep gratitude to all the faculties and staff members of the Department of Computer Science and Engineering for their unflinching support and encouragement throughout the course of work. Finally we thank our parents and friends, near and dear ones who directly and indirectly contributed to the successful completion of our project.

## *References*

[1] Davide Adami, Mike O Ojo, Stefano Giordano "Design, development and evaluation of an intelligent animal repelling system for crop protection based on embedded edgeai" https://ieeexplore.ieee.org/abstract/document/9543659

[2] Md.Sah Bin Haji Salam,Usmanullah Sheikh,Sara Ayub"Exploring deep learning-based architecture, strategies, applications and current trends ingeneric object detection:a comprehensive review" https://ieeexplore.ieee.org/document/9186021

[3] Abhineet Singh, Marcin Pietrasik, Gabrieli Natha, Nehla Ghouaiel, Ken Brizel, Nilanjan ray "animal detection in man-made environments" https://ieeexplore.ieee.org/document/9093504

[4] Hardiki Deepak Patil, Namrata Farooq Ansari "Intrusion detection and repellent system for wild animals using artificial intelligence of things" https://ieeexplore.ieee.org/document/9793504

[5] Sachin Umesh Sharma, Dharmesh J Shah "Practical animal detection and collision avoidance system using computer vision technique" https://ieeexplore.ieee.org/document/7792584

[6] Ashok Kumar, R.Neelaveni, M.Kathiresh, P.Sweety jose, N.Archana,S.Saravanakumar "A literature research review on animal intrusion detection and repellent systems" https://eudl.eu/pdf/10.4108/eai.7-12-2021.2314718

[7] Dr.Sabeenian RS "Wild animals intrusion detection using deep learning techniques" https://www.researchgate.net/publication/357565926_a_literature_research_review_on_animal_intrusion_detection_and_repellent_systems

[8] S.Santhiya, Y.Dhamodharan, NE.Kavi priya, CS.Santhosh, M.surekha "A smart farmland using raspberry pi crop prevention and animal intrusion detection system" https://www.irjet.net/archives/V5/i3/IRJET-V5I3895.pdf

[9] William H, S. Antônio, Matheus Da Silva, Rodrigo S. Miani& Jefferson R. Souza "A proposal of an animal detection system using machine learning" https://www.tandfonline.com/doi/full/10.1080/08839514.2019.1673993

[10] Rodolfo Vera-Amaro, Mario E. Rivero Angeles ,And Alberto Luviano-Juarez "Design and analysis of wireless sensor networksfor animal tracking in large monitoring polarregions using phase-type distributions and single sensor model" https://ieeexplore.ieee.org/search/searchresult.jsp

[11] Wei Li, Yang Xiao, Xibin Song, Xinbo Jiang, Yan Huang,and Jingliang Peng "Chicken image segmentation via multi-scale attention-based deep convolutional neural network" https://ieeexplore.ieee.org/search/searchresult.jsp

[12] Xiaohui Li, Hailong Huang, and Andrey v. Savkin "autonomous navigation of an aerial drone to observe a group of wild animals with reduced visual disturbance" https://ieeexplore.ieee.org/search/searchresult.jsp

[13] Prabhat Kumar Panda, Cherlopalli Srujan Kuma, Bommu Sai Vivek, Shashi Kant Dargar "implementation

**DOI:**

[14] of a wild animal intrusion detection model based on internet of things" https://ieeexplore.ieee.org/search/searchresult.jsp
[15] Yu Oishi and Tsuneo Matsunaga "Automatic detection of moving wild animals in airborne remote sensing images" https://ieeexplore.ieee.org/search/searchresult.jsp
[16] Unapparent Li, Workman Kusakunniran, Seiji hotta "detection of animal behind cages using convolutional neural network" https://ieeexplore.ieee.org/search/searchresult.jsp
[17] Hardiki Deepak Patil, Dr. Namrata Farooq Ansari "Intrusion detection and repellent system for wild animals using artificial intelligence of things" https://ieeexplore.ieee.org/document/9793504
[18] Naveenkumar M, Manoj R, Nandhakumar, Rahul r "densenet201 for animal detection and repellent system" https://ieeexplore.ieee.org/document/9783582
[19] Anand Rakesh, Mridhul Madhu, Jisha Jose, Anand Vinod, Roshan Daniel, Robin Joseph "animal trespassing detection system