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WILD ANIMAL DETECTION IN FARMLAND

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Abstract: Animal assaults that cause crop damage are one of the main factors lowering agricultural yields. Crop raiding is turning into one of the most vexing human-wildlife conflicts as a result of the extension of farmed land into former animal habitat. India's farmers face significant risks from pests, natural disasters, and animal damage, which lowers production. In order to monitor crops and deter wild animals, farmers cannot afford to pay guards and their traditional tactics are not very efficient. Given the equal importance of ensuring the safety of humans and animals, it is crucial to safeguard crops from animal damage and safely redirect animals away from crops. Crop striking is turning into one of the most acrimonious human-wildlife conflicts due to the expansion of cultivated land into former animal habitat. It is essential to thoroughly and effectively verify that wild animals are allowed to remain in their natural habitat. Therefore, we employ deep learning to identify animals visiting our farm by applying the deep neural network idea, a branch of computer vision, in order to overcome the aforementioned issues and achieve our goal. This suggested system would use a camera to capture the surrounding area all day long and monitor the entire farm at predictable periods. When an animal enters the area, the system uses a deep learning model to recognise it and plays the proper noises to scare it away.

Keywords: Convolutional Neural network, Deep learning, Remote monitoring, Alert system.

I. INTRODUCTION

The various problems that arise when agriculture and wildlife coexist call for creative solutions. In addition to providing raw materials for other businesses, agriculture is the backbone of food production. On the other hand, crop productivity and public safety are seriously threatened by the existence of wild animals on agricultural land.

The harm that strays wild animals inflict to crops has become a major worry in many areas. Goats, cows, and wild buffalo are among the species infamous for their destructive foraging practices, which can occasionally cause human mortality. This puts farmers' lives, who depend on these crops for survival, at jeopardy in addition to causing financial losses. The entire agricultural productivity is severely harmed by animal intervention, especially for basic crops like potatoes and wheat.

Strict wildlife laws exacerbate the problem by frequently preventing small farmers from adopting practical precautions to safeguard their crops. Farmers may find themselves unable to fully handle the issue in spite of experiencing significant losses—up to 40–50% of their produce. Farmers feel vulnerable and helpless as a result of this regulatory restriction, which makes an already difficult situation worse.

Proactive steps to discourage wild animals are especially necessary in areas such as India where there is a high rate of conflict between humans and elephants. Elephants in particular have a reputation for seriously damaging property and crops, which exacerbates conflicts between local people and animals. To reduce these conflicts and protect lives and livelihoods, farmers need technology that makes it possible for them to quickly identify and react to animal invasions.

In addition, the situation is made worse by the deforestation caused by human growth, which leaves animals in their natural habitats with less access to food, water, and shelter. Conflicts between humans and animals increase when wild animals invade homes in quest of food, creating more difficulties for both communities and law enforcement.

Animal interference in agriculture has effects that go beyond short-term financial setbacks. Food insecurity is made worse by the ensuing rise in food costs, which disproportionately affects the poor and those who cannot purchase basic food items. Therefore, it is imperative to address the problem of wild animal detection on farms in order to maintain agricultural output as well as to guarantee that everyone in society has fair access to food.

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II. LITERATURE SURVEY

In [1] G. S. Gomez-Gomez et. al (2021) the research "Image-Based Animal Recognition based on Transfer Learning" shows how transfer learning may be used to effectively recognise animals, producing competitive results even with little data. It presents a new cow vs. non-cow database in addition to CIFAR, demonstrating a variety of architectures such as VGG-16, Google Net, and ResNet, demonstrating the effectiveness of the method in picture classification.

In [2] Tushar Atkare et. al (2021) the paper, highlights the move towards computer vision-based systems for quicker and more accurate detection while discussing several approaches for animal detection in agricultural settings. Techniques like FPGA implementations, complicated algorithms, and Python with TensorFlow and Google Vision API are mentioned. Sequence diagrams improve implementation efficiency by assisting with documentation and system comprehension.

In [3] Manasa Kommineni1 et. al (2022) the study suggests computer vision and machine learning system for agricultural animal detection is a viable way to protect crops from wildlife damage. It claims to reduce crop losses and environmental damage while being affordable and easily obtainable, thanks to its effective detection and alarm generation. It is consistent with the trend of using AI to improve agriculture.

In [4] R.S. Sabeenian et. al (2020) the review, addresses the drawbacks of conventional approaches to wildlife encroachment in agriculture and suggests AI-based alternatives that are more economical. It describes methods that have the potential to improve accuracy, but note additional hardware requirements. Examples of these methods are animal sound identification utilising signal processing and deep learning, and WCoHOG feature vectors using LIBLINEAR classifier.

In [5] T. Sandeep et. al (2022) this comprehensive review addresses the disastrous effects of agricultural depredation and emphasises the need of surveillance in farmlands to stop both human and animal incursion. It offers practical, non-lethal ways to protect crops while supporting farmers' decision-making processes by utilising edge computing, image processing platforms, and intelligent repelling systems.

In [6] Aniket Gat et. al (2022) this review various animal detection technologies, such as crop protection systems based on Raspberry Pi and distributed looking devices from ASFAR, are shown. These systems show good accuracy in identifying and tracking animals, promoting wildlife safety and conservation in various settings through the use of visual descriptors, gait analysis, and algorithms such as AdaBoost.

In [7] Abhineet Singh et. al (2020) this study emphasises transfer learning issues while examining deep learning for animal detection in human situations. It assesses the generalisation capabilities of eight detectors and suggests creating fake data for domain-specific training. In order to meet the constraints of real-time video sequences in animal recognition, the RETINA and YOLO models emerge as competitive options for multi-camera mobile deployment.

In [8] Kamepalli S et. al (2021) this study uses camera trap photos and deep learning, specifically CNNs, to present a bidirectional convolutional neural network for effective object detection, with a special emphasis on primate breed categorization. It demonstrates successful wildlife conservation applications with a trained model that achieves 80.5% accuracy on the training set and 73.53% on validation, backed by loss measures and sample photos.

In [9] Reddy B et. al (2021) this study creates a YOLOV3 model that detects animals by utilising a pre-trained coco dataset and the darknet method. Even with a few errors, it points to potential future gains with bespoke dataset training. It uses the Google API and the recognizer deep learning package with the Darknet-53 feature extractor to perform recognition. Matplotlib is used to visually represent the results.

In [10] Faseeha M et. al (2022) this research uses YOLOv3 to detect wild animals in agriculture in real-time with the goal of preventing dangers to rural areas and harm to crops. It proposes camera-based detection with farmer warnings to solve the limitations of infrared sensors and farming practices that are favourable to wildlife. The object grouping frameworks and loss function of YOLOv3 improve the precision of animal identification and categorization.

III. SCOPE AND METHODOLOGY

Aim of the project

The Aim of farmland wild animal detection is to create and put into place efficient technologies or systems that can quickly detect the presence of wild animals in agricultural regions. With the use of this technology, farmers should be able to identify incursions with greater speed and accuracy, enabling them to take prompt action to prevent or lessen any

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wildlife harm. The objective is to safeguard human life, reduce crop losses, and advance the sustainable coexistence of agriculture and wildlife by accomplishing this goal. Furthermore, the objective includes mitigating human-animal conflicts, improving food security, and safeguarding agricultural landscape ecosystems.

Existing system

In essence, the observation is made helpful by the existing systems. Furthermore, especially in an application area like this, these systems do not provide security against wild animals. Additionally, as different strategies are used to prevent different creatures from accessing such limited areas, they must act based on the type of animal that tries to enter the area. In a similar vein, the ranchers use other methods, such as keeping human replicas and sorts on their homesteads, which work slightly to deter birds but are ineffective at keeping out wild animals. In order to prevent animals from damaging their harvest, ranchers often employ many dangerous and comprehensive measures such as building physical barriers, using electric walls, conducting manual reconnaissance, and more.

Proposed system

Model Creation, Pre-processing, System Training, and Classification are the four primary components that make up the system. By scaling the dataset photographs to the necessary dimensions, the pre-processing module is utilised to pre-process them.

To create a machine language model with the necessary number of layers, utilise the Model Creation module. To train the system using dataset photos and store the model weight, utilise the system training phase. To identify the animal from the supplied test picture, a classification module is employed. The technology notifies the farm owner via email if it is caught as a wild animal.

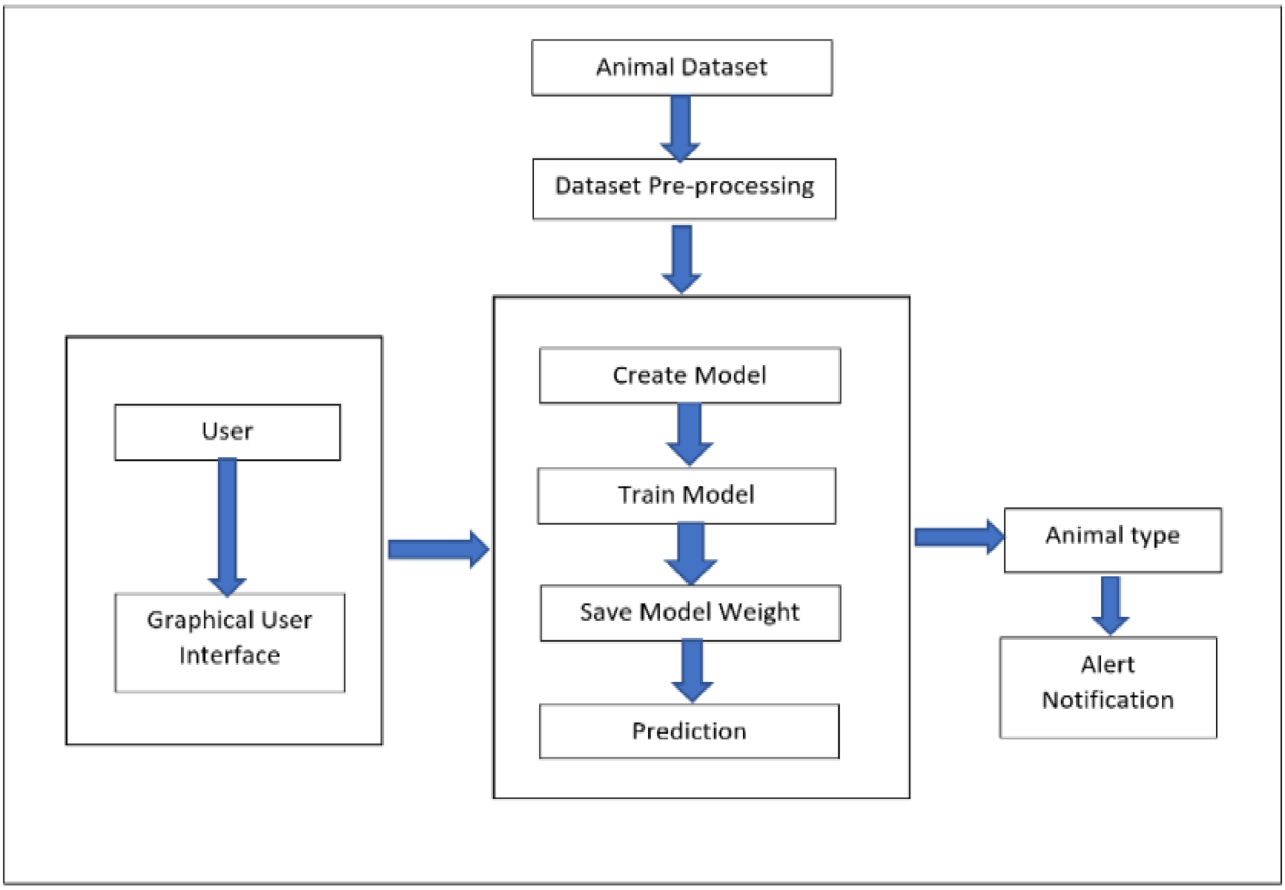

Fig 1. Proposed system

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System Architecture

A formal explanation of a system is provided by an architectural explanation, which is arranged to support reasoning regarding the system's structure, individual components' properties that can be observed from the outside, and the interactions between them. It also offers a framework from which systems can be developed and products acquired that will cooperate to implement the system as a whole.

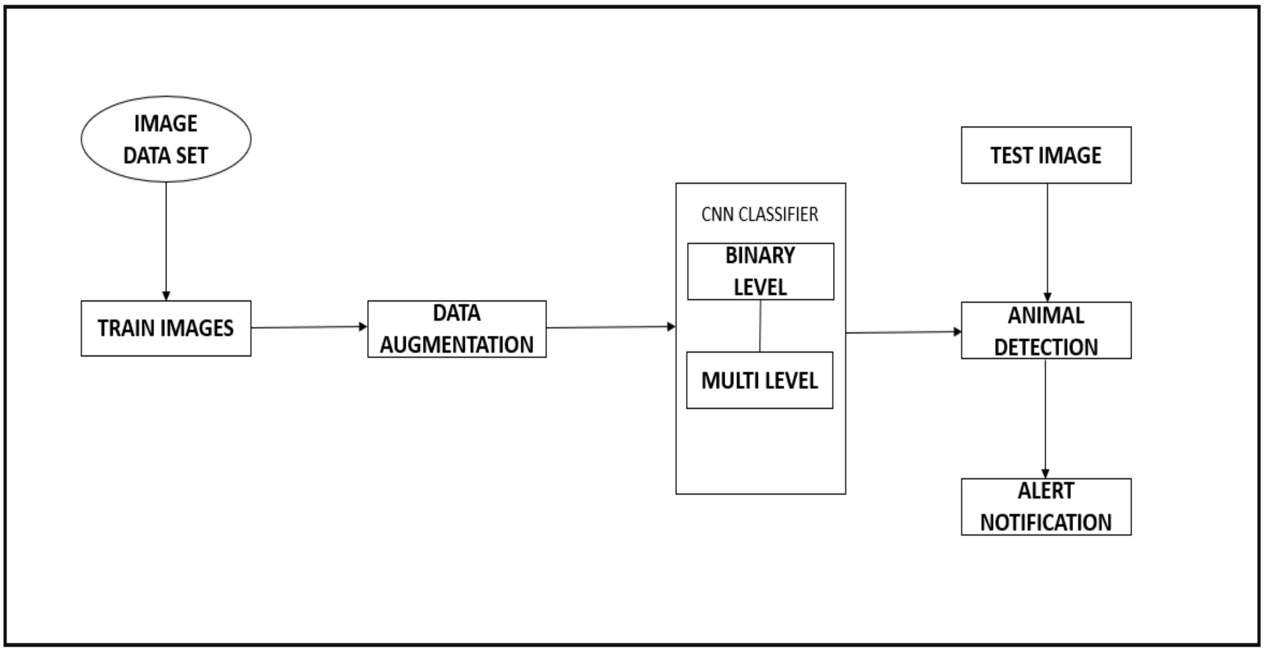

Fig 2. System Architecture

The wild animal detection system for agriculture is made up of multiple interrelated components that detect, identify, and respond to animal invasions in a timely and effective manner. The system achieves its goals by integrating alert technologies, data processing algorithms, and reaction mechanisms. The system then combines a variety of reaction mechanisms to efficiently prevent or reduce animal invasions. These can include automated deterrents like sound alarms. In more extreme circumstances, the system can send alarms to human operators or wildlife authorities requiring rapid action.

The architectural description provided above describes the structure, components, and interactions of a system for detecting wild animals in agriculture. The system attempts to efficiently identify and reduce animal invasions while minimising disturbance to farm activities by utilising alert technologies, data processing algorithms, and reaction mechanisms. Continuous development and adaptability are critical ideas driving the growth of the system architecture to handle emerging difficulties and increase its efficacy in protecting farmland and encouraging coexistence between agriculture and wildlife.

IV. CONCLUSION

In conclusion, there are a variety of issues that arise from the coexistence of wild animals on agricultural land, from possible safety risks to farmers suffering financial losses. Particularly in areas where human-animal conflicts are common, it is obvious that effective technology is needed to identify and prevent these creatures. By preventing food prices from rising and safeguarding food supplies for disadvantaged groups, such technology would safeguard livelihoods and agricultural productivity.

Long-term solutions further depend on addressing the underlying causes of wildlife infiltration, such as habitat degradation from deforestation. We may work to ensure cohabitation between people and animals while maintaining food security and ecological balance by encouraging creative thinking and fusing conservation initiatives with agricultural methods.

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