

# Smart Farm Alerting and Safeguard System

**Prof. Swapnalini Pattanaik<sup>1</sup>, Rushikesh Suryawanshi<sup>2</sup>, Shridatt Bhimanvaru<sup>3</sup>, Sachin Bake<sup>4</sup>**

Professor, Department of Electronics & Telecommunication Engineering<sup>1</sup>

Students, Department of Electronics & Telecommunication Engineering<sup>2,3,4</sup>

JSPM's Rajarshi Shahu College of Engineering, Tathawade, Pune, Maharashtra, India

**Abstract:** The agriculture sector is vital to India's economy; however, animal attacks on crop fields have become a common issue. Traditional methods, such as humanoid scarecrows and electric fences, have proven ineffective in protecting crops. To address this problem, a concept has been proposed that aims to protect crops without causing harm to animals. The concept proposes using image processing technology and machine learning concepts to detect animal movements. Once detected, a signal is sent to a controller which activates a device to create sound, and a signal is also transmitted via GSM to alert farmers and the forest department. The proposed system uses Raspberry pi, GSM, Buzzer, and CNN for animal detection and alert generation. This system aims to enhance agricultural security and mitigate the problem of animal attacks on crop fields.

**Keywords:** Machine Learning, GSM, CNN

## I. INTRODUCTION

It is important to find a sustainable solution to the issue of human-animal conflict. One potential solution is the use of automation methods, such as artificial intelligence (AI) and machine learning (ML) to help detect and track animal behavior.

One approach could be to use drones equipped with high-resolution cameras and ML algorithms to detect and track animal movement in real-time. These drones can be programmed to fly over agricultural lands and forest areas, capturing video footage of animal behavior. The video data can then be processed using ML algorithms to identify the species of animals and their behavior patterns.

Another approach could be the use of smart sensors that can be deployed in agricultural fields and forest areas. These sensors can detect and track animal movement, and the data can be analyzed using ML algorithms to provide insights into animal behavior.

The use of automation methods in human-animal conflict mitigation can also provide motivation to farmers and forest officials by making their work more efficient and effective. With the help of technology, they can protect their crops and lands while also preserving the environment and promoting coexistence with wildlife.

In addition, the development and implementation of such systems can foster innovation and collaboration between different sectors, including technology, agriculture, and wildlife conservation.

The motivation behind this concept is not just limited to protecting crops, but also to reduce the negative impact of human-animal conflict on the environment and the economy.

By preventing damage to crops, this system can also contribute to food security and sustainable agriculture, which are important global goals.

Moreover, the use of automation methods can help reduce the human-wildlife conflict, which can often lead to the killing or displacement of animals. This, in turn, can help preserve the biodiversity and ecological balance of the region. Overall, the motivation behind this concept is to find innovative and sustainable solutions that can protect the interests of both humans and animals, and promote coexistence and harmony between them.

### 1.1 Objectives

- The main objective is to protect the crops in farm area from animals.
- It also helps in Protecting crops from Animals The system ensures that the alarm is not triggered by the presence of a human in the field, or via any random motion.

- This system will continuously check for any animals entering inside the field.

## II. METHODOLOGY

The proposed "Smart farm alerting and safeguard system using machine learning" is an interesting application of machine learning in agriculture. The system aims to monitor the crop fields automatically using a Raspberry Pi, webcam, GSM, and buzzer.

The system uses OpenCV data sets to control all operations in the Raspberry Pi. When an animal intrusion occurs, the webcam continuously monitors the crop field and takes pictures every second. These pictures are sent to the Raspberry Pi for image processing using machine learning concepts.

The system uses trained images from various resources like Kaggle and RMFD datasets, which are compared with the webcam images. The trained images are reference pictures of animals in different shapes and positions, and the system is trained to recognize specific animals like elephants and pandas.

The model is evaluated using metrics like accuracy, precision, and recall, and the best performing machine learning model is selected with 100% precision and 99% recall. This makes the system computationally efficient and easier to install in embedded systems.

If an animal is detected, the buzzer generates a sound signal to divert the animal, and the GSM is used to inform the farmer and forest officers about the intrusion. The system also indicates the type of animal in the message bar.

Overall, this system has the potential to prevent animal damage to crops and reduce human-wildlife conflicts in agriculture.

## III. LITERATURE SURVEY

This project is used to protect the farmland from animals by using Raspberry pi. Wild animals are special challenge for the farmers throughout the world. Animals like wild boars, elephants, monkeys etc...cause serious damage to crops. This project utilizes the RFID (Radio Frequency Identification Device) module and GSM (Global System Mobile) modem for this purpose. Forest officer and farmers will get these SMS containing area in which that animals observe.[1]

India is mostly an agricultural nation. Security on agricultural farms is crucial to safeguarding the harvest. Animals or people with malicious intent to rob or damage the property have the power to wreck valuable assets. Introduction of modern technologies into agriculture has made it possible to consider developing security systems for farmlands. IoT technology facilitates the development of a number of applications for smart agriculture. The possibilities are unlimited when vision is integrated with IoT.[2]

Animal intrusion is a major threat to the productivity of the crops, which affects food security and reduces the profit to the farmers. This proposed model presents the development of the Internet of Things and Machine learning technique-based solutions to overcome this problem.[3]

Agriculture is essential for the development of India especially economically. Every sector needs security for its development. Similarly, agriculture also needs security. Farmers are facing many problems like animals damaging their crops or someone is stealing their crop. For crops like paddy, after harvesting farmers gather the paddy stalks and dry them. At this time, they have to stay on farm to protect the crop from animals or intruders but it will increase workload on farmers.[4]

## IV. BLOCK DIAGRAM & DESCRIPTION

In this proposed model "Smart farm alerting and safeguard system using machine learning" its main function is to achieve an automatic crop field monitoring system. The Raspberry pi is interconnected with the webcam, GSM, and buzzer. In Raspberry pi to control all operations, the program code written in OPEN CV data set is taken according to the need. During the animal intrusion the webcam is continuously monitoring the crop field and take the pictures in each and every second. These pictures send to the raspberry pi for image processing in machine learning concept. The webcam image and trained image will be compared. The trained pictures were taken from various resources like Kaggle and RMFD datasets. The reference pictures are 360 degree rotation of animals in different shapes and positions. These pictures are trained in the board. The model was inferred on images and live video streams. To select a base model, we

evaluated the metrics like accuracy, precision and recall and selected machine learning with the best performance having 100% precision and 99% recall. It is also computationally efficient by using Machine learning Embedded in raspberry pi which makes it easier to install the model to embedded systems. If the compared information gets matches with trained data, recognized animal (Elephant, Panda) the buzzer generated a sound signal to divert the animal. Further the GSM is used to intimate the information to farmer and also forest officers. In normal method simple electronics components were used, here image processing with machine learning concept is proposed to detect the animals and also indicate the type of animal (Elephant, Panda) in the message bar.

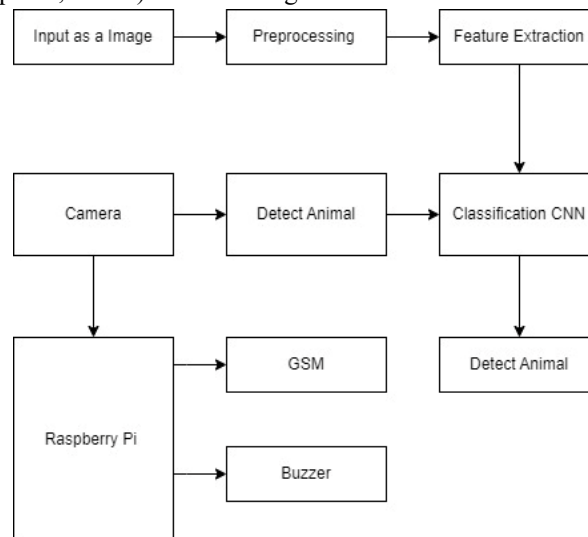


Fig. IV.1: Block Diagram

## V. CONCLUSION

The proposed low cost Animal Detection model using Machine learning methods in neural networks detects Animal into farmland. To train, validate and test the model, the dataset consists of 1000 views of animal faces and body images of each particular animal are used. These images were taken from various resources like Kaggle and RMFD datasets. The model was inferred on images and live video streams. To select a base model, we evaluated the metrics like accuracy, precision and recall and selected machine learning with the best performance having 100% precision and 99% recall. It is also computationally efficient by using Machine learning Embedded in raspberry pi which makes it easier to install the model to embedded systems. This animal detector can be deployed in many areas like crop fields, nearby forest areas and other hill station to monitor the public and to avoid the spread of the animal kills as well as human kills and also to increase the farmers protection. The proposed idea is expected to hamper the market in near future.

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