# Crop Protection Against Wild Animal and Alert System using Deep Learning

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## *ABSTRACT*

**A crop's vulnerability to animal assaults exists. Protecting agricultural areas is a difficult task these days. It is imperative to search for any critters that might have a more detrimental effect on the crop as a result. The following creatures can be found in the protected area: The preservation of the grain crop is of utmost importance due to its sustained attacks over time. The topic has been approached in a way that makes the current approaches ineffective; in this study, we propose a strategy to protect farms from wild animals without causing harm to them, thereby creating a system that considers their needs (deer, nilgai, wild boar, etc.). To find the animal and make a loud noise to frighten them. In order to address this issue, the suggested approach uses the Mobile Net concept to create an IOT and deep learning based model that detects the early arrival of wild animals. When a wild animal is spotted, an automatic stone gun controlled by an Arduino UNO with a relay module triggers a servo motor to launch stones at the animals without endangering them.**

**Keywords: Priority, Mobile Net, IOT, Deep Learning, Arduino UNO.**

## I. INTRODUCTION

For many individuals around the world, agriculture is their primary source of income. Regretfully, farmers continue to depend on age-old methods that were developed hundreds of years ago. As a result, crop yields are declining. The low yield of crops is also caused by a number of variables, one of which being animal encroachment. Wild animals have become a unique difficulty for farmers worldwide in recent years. Animals such as tigers, elephants, wild boars, and monkeys can seriously harm crops by racing over fields and trampling them. It puts the farmers in financial trouble. Manually irrigating a big piece of land can be exceedingly time-consuming for farmers. Animal assaults that cause crop damage are one of the main factors lowering crop productivity. The foundation of the economy is agriculture, however due to animal intrusion on agricultural fields, there will be significant crop losses. Farmers cannot afford to hire guards to monitor crops and deter wild animals because traditional methods are not very effective. Because animal and human safety are equally important. Therefore, in farm areas, animal detection systems are essential. Ever since the early days of agriculture, wild animals posed a serious threat to human safety. Existing/current approaches to solving this issue include the deployment of electric fences, the spraying of chemicals or organic materials, such as rotten egg odor, among others, and gas cannons, which typically require permission from the local authorities. The farmers also use balloons, shotguns, gas cannons, twine, stone, and other ancient techniques. These kinds of fixes are typically inhumane and only partially successful. However, impoverished people cannot afford the high installation and remittance costs associated with them, and some of the techniques may even pollute the environment, which could have an adverse effect on both humans and animals. However, the chemical used to stop these animal attacks are expensive to install per acre of land, and their effectiveness is dependent on the weather because rain can dilute their effects. This essay explains a cutting-edge automated approach that lessens human-animal conflict without endangering wild animals.

## II. PROPOSED METHODOLOGY

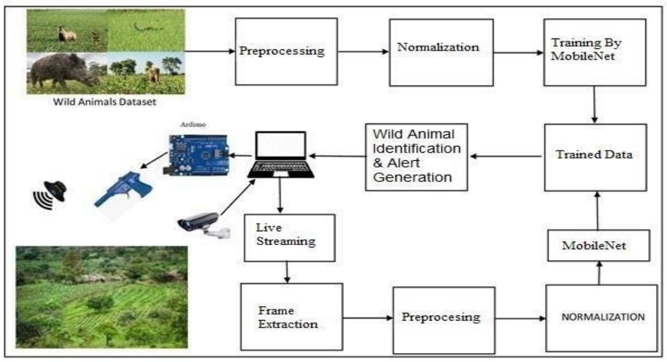


**Fig 1: System Overview Design**

### Module Description

**Module A: Preprocessing**

- Input: Synthetic dataset
- Process: Preprocessing
- Output: Preprocessed image

**Module B: Image Normalization**

- Input: Preprocessed Image
- Process: Pixel value normalization
- Output: Normalized and preprocessed image output

**Module C: Mobile Net**

- Input: preprocessed and normalized image
- Process: Hidden and output layer evaluation
- Output: Trained data

**Module D: Decision Making**

- Input: Live Streaming frames
- Process: Model Initialization and if-then rules
- Output: Activating hardware module
- If-then rules

**Module E: Stone throwing model**

- Input: Co-ordinates of the animal
- Process: Handling Arduino & shooter gun
- Output: Shooing away animals by throwing stones and intimation Via WhatsApp

## III. COMPONENTS

### A. Arduino

Electronics projects are built using the Arduino open-source platform. An Arduino system consists of an IDE (Integrated Development Environment) software that is installed on your computer and is used to develop and upload computer code to a programmable circuit board, also referred to as a microcontroller.

The Arduino platform has been increasingly popular among individuals who are new to the world of electronics, and with good cause. Unlike most previous programmable circuit boards, the Arduino can have its code updated via a USB cable rather using a separate hardware device called a programmer. Additionally, the Arduino IDE uses a simplified version of C++, which makes learning to program easier. Last but not least, Arduino provides a common form factor that condenses the functions of the microcontroller into a more manageable compact.

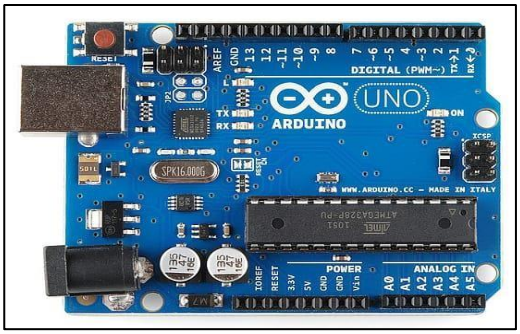


**Fig 2: Arduino Uno**

## B. USB 2.0 Cable Type A/B

Use it to connect any board, such as an Arduino Uno, to your computer's USB female A port.

**Fig 3: USB 2.0 Cable Type A/B**

## C. Servo Motor

A rotary or linear actuator that enables precise control of angular or linear position is called a servomotor, sometimes known as just servo. A servomotor, often known as a servo motor or just servo, is a rotary or linear actuator that permits precise control of angular or linear position, velocity, and acceleration in a mechanical system. When you want to rotate an object at a specific angle or distance, you utilize a servo motor.

**Fig 4: Servo Motor**

# IV. OBJECTIVES

**1)To maintain constant live stream of frames from camera to controller server** :

Assure continuous live camera frame delivery to the controller server, which will provide a steady flow of real-time data for monitoring and analysis.

**2)To detect presence of wild animal in every frame along with its position using deep learning model Mobile Net**

Using a deep learning model such as Mobile Net allows the live stream's frames to be automatically identified as belonging to wild animals. The exact location of the animals within the frame is one aspect of this detection.

**3)To focus on the wild animal position to throw stones at them through extensive use of IOT:**

The system can locate detected wild animals precisely and initiate actions like tossing stones to discourage them from approaching further by integrating IoT devices.

**4)To instant alert to Farmer on WhatsApp about the wild animals:**
By using messaging apps such as WhatsApp, local inhabitants can receive messages instantly, warning them about the presence of dangerous animals nearby and directing them to take the necessary precautions to keep themselves safe.

## V. RESULTS AND DISCUSSION

### 1. Detecting the Animal

We launch our core software initially in order to get our project started. Everything is set up for the following step by doing this. Following that, our system starts identifying the animal it is observing. It uses sophisticated algorithms and pattern recognition to achieve this. It labels the animal with its identification once it has identified it. This keeps us more organized and teaches us more about the many animals we work with. The system sounds like "Wild Animal Detected" after animal being labeled.

**Fig 5: Detection of animal**


### 2. Activation Protocol for Stone Throwing System

Once the animal is recognized, the system figures out where it is and aims a stone at it. It does this carefully, considering how far away the animal is and what direction it's in. Then, it throws stone to either scare the animal away or make it move to a safer place. This helps both people and animals out of harm's way.

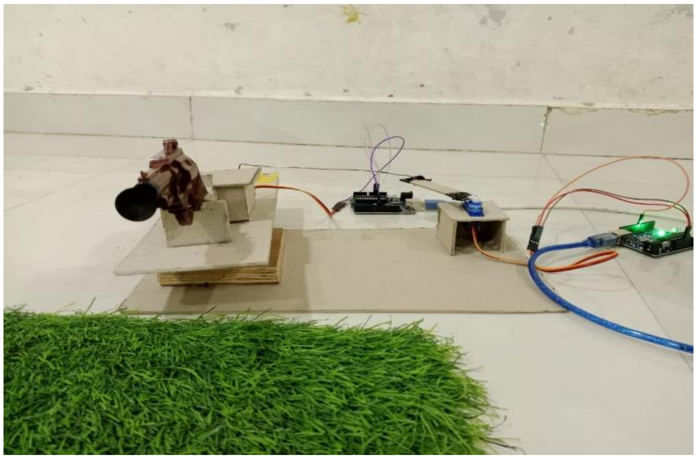

**Fig 6: Before Animal Detection Stone Throwing System**

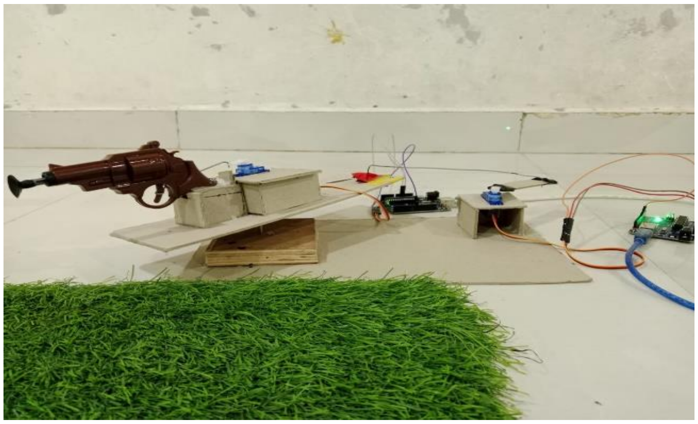

**Fig 7: After Animal Detection Stone Throwing System**

## 3.Instant Intimation through WhatsApp.

Using WhatsApp to instantly notify farmers of wild animals is similar to sending them a brief text message on their phones. We notify farmers via a dedicated WhatsApp number whenever we come across a wild animal close to their farms. This notification alerts them to the species of animal and its location so they can take immediate action to save their livestock or crops. This keeps farmers informed about any issues and helps to maintain the security of their fields.

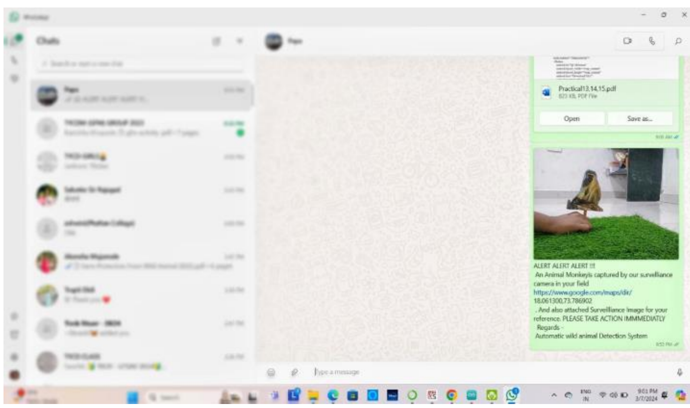

**Fig 8: Instant Intimation through WhatsApp.**

## 4. Google Maps Live Location

This image, which shows the location of the prototype, provides real-time information to farmers about the whereabouts of wild animals. It also shows the prototype's present location, which is used to tell farmers about animal sightings during the project.

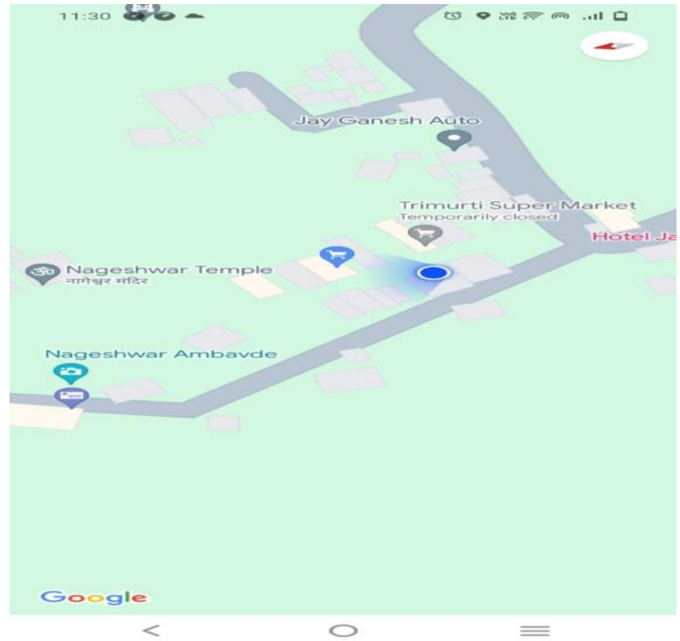


**Fig 9: Live Location**

## VI. APPLICATION AND BENEFITS

### Applications

**1. Agriculture:**

Use live camera feeds and deep learning models to locate wild animals in agricultural fields. Identify animals, activate IoT devices to deter them, and provide farmers an instant WhatsApp alert so they can respond quickly.

**2. Forest Department:**

Utilize surveillance cameras and deep learning algorithms to monitor wildlife behavior in wooded regions. As soon as you can, turn on deterrents and send a WhatsApp message to forest officials in an effort to decrease human-wildlife conflicts.

**3. State Borders:**

Install cameras to keep an eye on wildlife invasion along state borders. To prevent wildlife intrusion, use deep learning to activate deterrents and notify border police via WhatsApp so they can act quickly.

**Benefits:**

**1. Cost Effective:**

In comparison to more traditional methods such as hiring security guards or building physical barriers, the stone-throwing system is a more cost-effective choice. After setup, the system functions without ongoing human involvement. Farmers will benefit greatly from this automation in the long run since labor costs will go down and crop damage from wild animals will cost less.

**2. Life Saving:**

Potentially dangerous interactions between humans and wildlife can be avoided by the system, which uses stones to detect and dissuade wild animals. When alarmed or threatened, wild animals may act aggressively, endangering human safety. By acting as a non-lethal deterrence, the stone-throwing method successfully protects both people and animals from harm.

**3. Increase Awareness about Wild Animals:**

By putting the stone-throwing system into place, farmers and local communities become more conscious of the existence and behavior of wild animals nearby. People can obtain direct visual insights into wildlife activity through real-time photographs provided via WhatsApp notifications, which improves their comprehension of local wildlife behavior patterns. This raised awareness promotes peaceful coexistence between people and wildlife by enabling educated decision-making and motivating communities to take proactive steps for wildlife management and conservation.

## VII. CONCLUSION

The team successfully developed an Internet of Things system for crop security against wild animals using a mobile network and a stone-throwing mechanism. Through the utilization of sensors, mobile connectivity, and automated reaction mechanisms, the system effectively recognized and deterred wild animals from trespassing into agricultural areas, hence reducing the likelihood of damage to agricultural products. The non-lethal practice of throwing stones was an effective and humanitarian way to discourage animals from eating the crops. Overall, the trial demonstrated the viability and efficacy of utilizing IoT technologies for animal management in agricultural contexts.

## VIII. FUTURE SCOPE

- **The Proposed model can be deployed in real farm land**

The adaptability of the proposed model to real farm landscapes indicates its practical potential for on-the-ground deployment. By means of architecture optimization and farming-setting compatibility, the model effectively reduces the problem of wildlife intrusions on farms. Through seamless integration with existing farm infrastructure, including video systems and IoT devices, the concept provides farmers with a proactive approach to protect crops and uphold farm safety. Its application in real-world farming settings demonstrates its readiness to satisfy the pressing needs of farming communities, leading to higher crop yields, lower losses, and better living conditions for farmers.

- **The proposed model can enhance to work as mobile app connected to live cloud, that can be used by the farmer to view the live action**

The suggested improvement is converting the model into a mobile application that is specially designed for farmers to remotely monitor a stone-throwing system and smoothly integrated with a live cloud infrastructure. Farmers can use this app to control the stone throwing device that is installed in their fields and to view real-time video feeds. They may conveniently monitor the system's functioning, modify its configuration, and take appropriate action as needed, all from their mobile device. Farmers now have more flexibility, efficiency, and control over their farming techniques thanks to this integration, which eventually raises farm output and security.

## IX. ACKNOWLEDGEMENT

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