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FARM PROTECTION FROM ANIMALS USING DEEP LEARNING

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ABSTRACT: The protection of farms from animal intrusions is a critical concern for farmers worldwide. Conventional methods of farm protection often fall short in providing effective and efficient solutions. However, recent advancements in deep learning techniques offer a promising approach to mitigate these challenges. Deep learning, a subset of artificial intelligence, involves training neural networks on extensive datasets to recognize patterns and make intelligent decisions. By harnessing the power of deep learning algorithms, farmers can develop sophisticated systems that detect, classify, and deter animal intrusions, safeguarding their crops and livestock. This abstract provides a concise overview of how deep learning can revolutionize farm protection from animals, highlighting its applications in detection, classification, behavior analysis, and predictive analytics. Additionally, it emphasizes the benefits of intelligent deterrence systems driven by deep learning algorithms. The integration of deep learning into farm protection practices has the potential to enhance agricultural security, reduce losses, and ensure sustainable productivity in an increasingly challenging environment.

Key words: Image Processing, Deep learning, Wild animals attack, Crop protection, Animal detection, Classification.

PROBLEM STATEMENT:

Agriculture plays a huge role in India. Animal intrusion in farms causes huge losses in agricultural revenue which a farmer cannot bear, especially if they have small farming areas as majority of the farmers in India. Computer Vision are being increasingly applied in agricultural field for higher productivity by automating tasks. We propose an AI based system which monitors the field using cameras for any intrusion by the animals and alerts the farmer or can even take certain actions on its own.

INTRODUCTION:

The coexistence of agriculture and wildlife can be a delicate balance, as wild animals often pose a significant threat to the livelihood of farmers. Crop damage and livestock predation can result in substantial economic losses and jeopardize food production. Traditional methods of farm protection, such as physical barriers and manual surveillance, have limitations in their effectiveness and efficiency.

However, with the advent of deep learning, a powerful subset of artificial intelligence, farmers now have a groundbreaking tool to mitigate these challenges and bolster farm protection against wild animal intrusions. Deep learning algorithms are capable of analyzing large datasets and learning intricate patterns, making them ideal for tasks such as image and video analysis. By harnessing the potential of deep learning, farmers can develop advanced systems that detect, identify, and deter wild animals, revolutionizing the way agricultural security is approached.

OBJECTIVE:

Animal intrusion in farms causes huge losses in agricultural revenue which a farmer cannot bear. Computer Vision are being increasingly applied in agricultural field for higher productivity by automating tasks. We propose an AI based system which monitors the field using cameras for any intrusion by the animals and alerts the farmer or can even take certain actions on its own.

EXISTING METHOD:

Since most of the farms in India are small, most farmers relies on medieval techniques like using a scare crow, or relying on guards to monitor crops. More recently, crops are also being protected using electric fencing but it can be highly cost inefficient which a small farmer cannot afford. Even if they can afford it, in most cases it is illegal to use such fences which governments uses as a measure to conserve the wildlife populations. Also, in busy seasons like the harvesting time, it can get difficult to have a guard, guarding and monitoring the crops from animals.

PROPOSED METHOD:

We propose an AI based surveillance system to detect and monitor the presence of any animal. A camera can be placed conveniently at location(s) where any possible animal might enter from. The system uses computer vision using OpenCV to process the feed from the camera. Pre-trained model Mobile Net SSD (Single Shot Detector) is used to detect the animals in the farms. The model is trained on MS COCO image dataset. A siren is fired on detecting an animal which can act as a deterrent to the animal. It can also notify the farmer so that he/she can take the concerned action as required in time.

SCOPE:

1) Automatic animal intrusion allows farmers to increase yield and revenue.

2) Industry relying on agriculture in their business can have better control on the supply.

3) Agri Tech industries can depend more of AI so that they can handle the labour issue during seasonality which is common due to the default nature of agriculture.

4) Government agencies and Policy makers can also utilize the system to better ensure the crop supply and prevent high inflation of crop prices.

FLOW CHART:

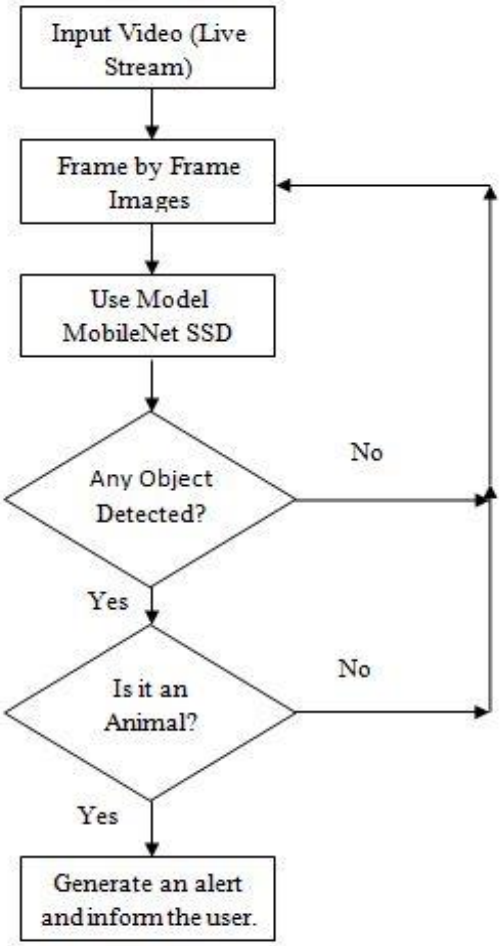


Fig: Flow chart of the working model

MODULES:

Upload (Live):

Upload a video as a live feed using a webcam (or any camera attached in a farm).

View:

Video can be viewed live in a dialog box.

Preprocessing:

Data Preprocessing is a technique that is used to convert the raw data into a clean data set. Cleaning the data refers to removing the null values, filling the null values with meaningful value, removing duplicate values, removing outliers, removing unwanted attributes. If dataset contains any categorical records means convert those categorical variables to numerical values. In this case, we are taking a live video feed in the form of images and resizing them to a standard size.

Identifying Features:

We use MobileNet SSD pretrained model which identifies features in any image using a Convolution Neural Network (CNN) model.

The model:

- SSD (Single Shot Detector) is a popular algorithm in object detection.
- It's generally faster than RCNN.
- SSD has two components: a backbone model and SSD head. *Backbone* model usually is a pre-trained image classification network as a feature extractor.
- Here, we will use MobileNet SSD model to detect the objects.
- Here, VGG Net is used as a backbone model to extract the features from the images.
- Convolution layers (CNN) are then used for object detection in the images using the feature map generated by VGG net layer.
- The model is able to detect multiple objects in any given image.
- For the purpose of classification, the model uses softmax in the last layer.
- Softmax takes in a vector of numbers and converts them to probabilities which are then used for image generating results.
- Softmax converts logits into probabilities by taking the exponents from every output and then normalize each of these numbers by the sum of such exponents, such that the entire output vector adds up to one.

Prediction:

A live video feed is taken in frame by frame as individual images. These images the then fed into the model after preprocessing to detect animals (if any exists).

User Interface:

A dialog box opens up while taking in the live video feed. The frames or images from the video are used to detect objects. The objects are then bounded in a bounding box along with a label and the probability of success in also displayed in there. A siren is then played if any animal is detected for a while.

UML DIAGRAMS:

- Farm Protection System: The main component representing the farm protection system itself.

- User Interface: This component provides a graphical user interface (GUI) for users to interact with the system. It can include features like configuring the system, monitoring farm activities, and receiving alerts.

- Farm Dashboard: This component displays important information and statistics about the farm, such as real-time animal detection results, sensor data, and system status.

- Animal Detection and Recognition: This component is responsible for using deep learning algorithms to detect and recognize animals in the farm environment.

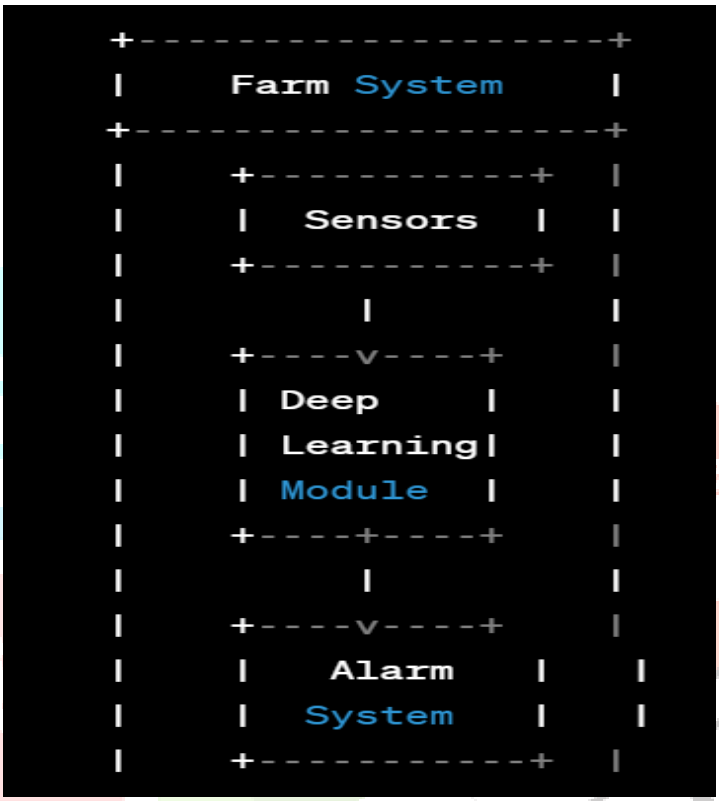
- It analyzes input data (e.g., images or video streams) and identifies animals based on trained models.

- Deep Learning Model: This component represents the trained deep learning model used for animal

detection and recognition. It could be based on popular architectures like convolutional neural networks (CNNs) or object detection models.

➢ Farm Alerts and Notifications: This component handles the generation and delivery of alerts and notifications to the farm owner or relevant personnel. It can send alerts for various events, such as the presence of intruding animals or unusual behavior.

➢ Training Data Collection: This component is responsible for collecting and preparing training data for the deep learning model. It may involve gathering labeled images or videos of animals in the farm environment to train the model effectively.



SOFTERWARE CONFIGURATION:

➢ Operating System : Windows 7+

➢ Server side Script : Python 3.6+

➢ IDE : PyCharm

➢ Libraries Used : Pandas, Numpy, play sound, collections, time, OS, imutils, OpenCV.

➢ Dataset : MS COCO Image Dataset.

ADVANTAGES:

- Helps increasing the yield in farming by preventing animals from entering.
- Higher revenue can be generated due as increase in yield.
- Farmers don't need to hire any guards anymore which saves money.
- Agri Tech industries can reduce the affects of seasonality of agriculture in their business by relying more on AI.

DISADVANTAGES:

- High cost.
- Prone to seasonality.
- Requires costly equipments and infrastructure.
- Are highly inefficient.

APPLICATIONS:

Wildlife conservation: Deep learning algorithms can be used to monitor and protect endangered species by detecting and tracking them in their natural habitat. This can help to prevent illegal poaching or hunting and ensure the survival of these species.

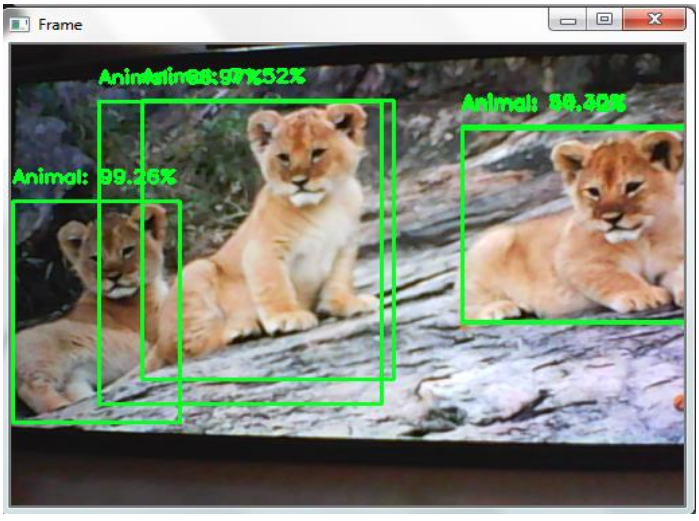
Livestock protection: Deep learning can be used to detect and deter predators that threaten livestock on farms. This can help to reduce the loss of animals to predators and prevent damage to crops or other resources.

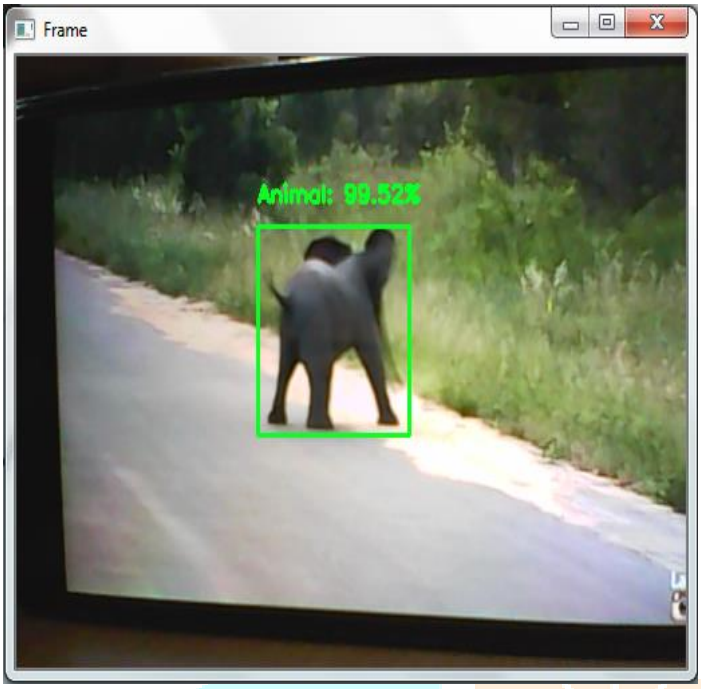
Crop protection: Deep learning algorithms can be used to detect and classify pests or diseases that affect crops. This can help farmers to identify and treat affected plants, reducing crop losses and increasing yields.

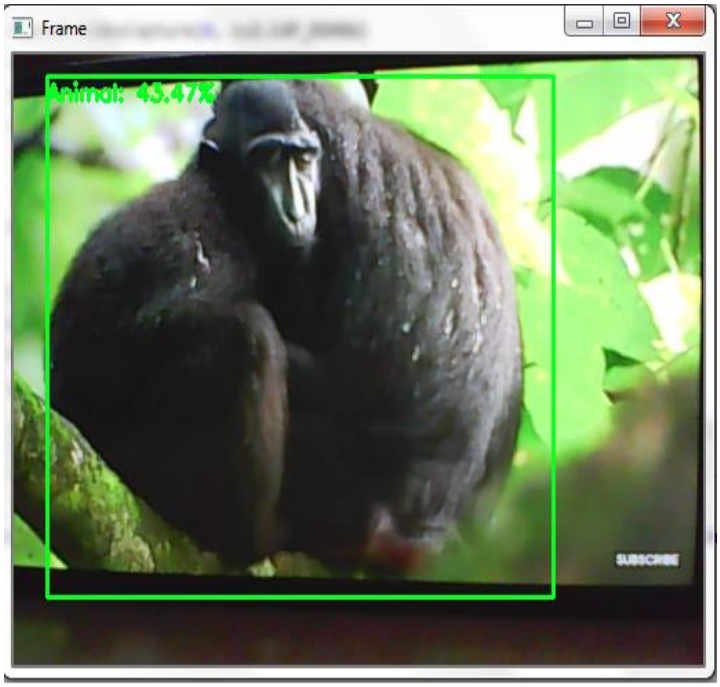
Security monitoring: Deep learning can be used to monitor farm perimeters and detect intruders, helping to prevent theft or other security breaches.

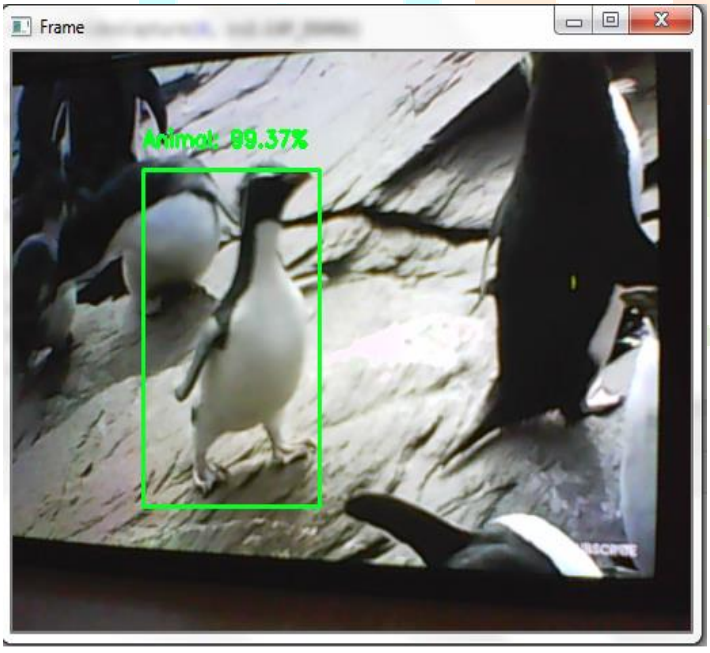
Environmental monitoring: Deep learning algorithms can be used to monitor environmental factors such as soil moisture, temperature, and weather conditions. This can help farmers to optimize their planting and harvesting schedules and improve overall crop yields.

RESULTS:









CONCLUSION:

In conclusion, deep learning provides a promising solution for farm protection from animals. By leveraging smart surveillance systems, acoustic sensors, and drones, farmers can enhance their ability to monitor and respond to potential threats. Implementing deep learning-based approaches can lead to early detection of animal intrusions, minimizing losses and damages to crops and livestock.

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