ANIMAL DETECTION USING MACHINE LEARNING

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PROBLEM STATEMENT

- In rural areas, the increasing frequency and severity of animal attacks pose a significant threat to the safety and well-being of residents, livestock, and local ecosystems.
- According to reports from the State Forest Ministry, a total of 637 people were killed due to wild animal attacks in the last 5 years in Kerala alone.
- India’s cost of human–elephant conflict is estimated at 1 million (destroyed crops), 10,000 to 15,000 damaged properties, 400 human deaths, and 100 dead elephants per year. Agricultural communities bear the brunt of wildlife attacks.
- This leads to major financial and agricultural losses.

LITERATURE REVIEW

- An Accurate and Fast Animal Species Detection System for Embedded Devices
- An Object Detection Method Using The Modified Yolo V4 Algorithm - An Abnormal Activity Detection In Roadways And Railways.
- CNN Based Animals Recognition using Advanced YOLO V5 and Darknet.

PROPOSED SOLUTION

- Our solution is to create an animal detection system using machine learning algorithms which can detect identify various animals using deep learning techniques.

- This model can be implemented in the existing cctv cameras across the major roads and railways routes where wildlife encroachment is usually seen and can provide assistance for reducing the number of fatalities caused by human and wildlife interactions..

- Strategically placed cameras analyze real-time video feeds, distinguishing between harmless and potentially dangerous animals. Upon detection, the system triggers immediate alerts to local authorities and communities, enabling swift response and intervention.

DESIGN STEPS

- Identifying routes which are linked to animal reserves, national parks and other common animal encroachment areas.
- Training a Model to identify a animal seen on the visuals.
- Employing YOLOv5 algorithm in cctv’s to detect animal.
- Incorporating dcnn alogorithm along with YOLOv5 to increase the efficiency.
- Categorizing the identified animal based on its nature.
- Emergency message system deployment

YOLOv5

Step 1: Image Preprocessing:

- Input Image: YOLOv5 takes an image as input and resizes it to a specific resolution (e.g., 640x640 pixels).
- Grid Division: The image is divided into a grid of equal cells (e.g., 20x20 cells).
- Anchor Boxes: For each cell, pre-defined anchor boxes are generated with different sizes and aspect ratios. These boxes represent potential object locations and shapes.

YOLOv5

Step 2: Feature Extraction:

- Backbone Network: The image is passed through a deep convolutional neural network (CNN) called the backbone network. This network extracts features from the image, such as edges, textures, and shapes.
- Focus Module: The Focus module is a unique element in YOLOv5 that combines feature maps from different layers of the backbone network, resulting in a more compact and information-rich representation.

YOLOv5

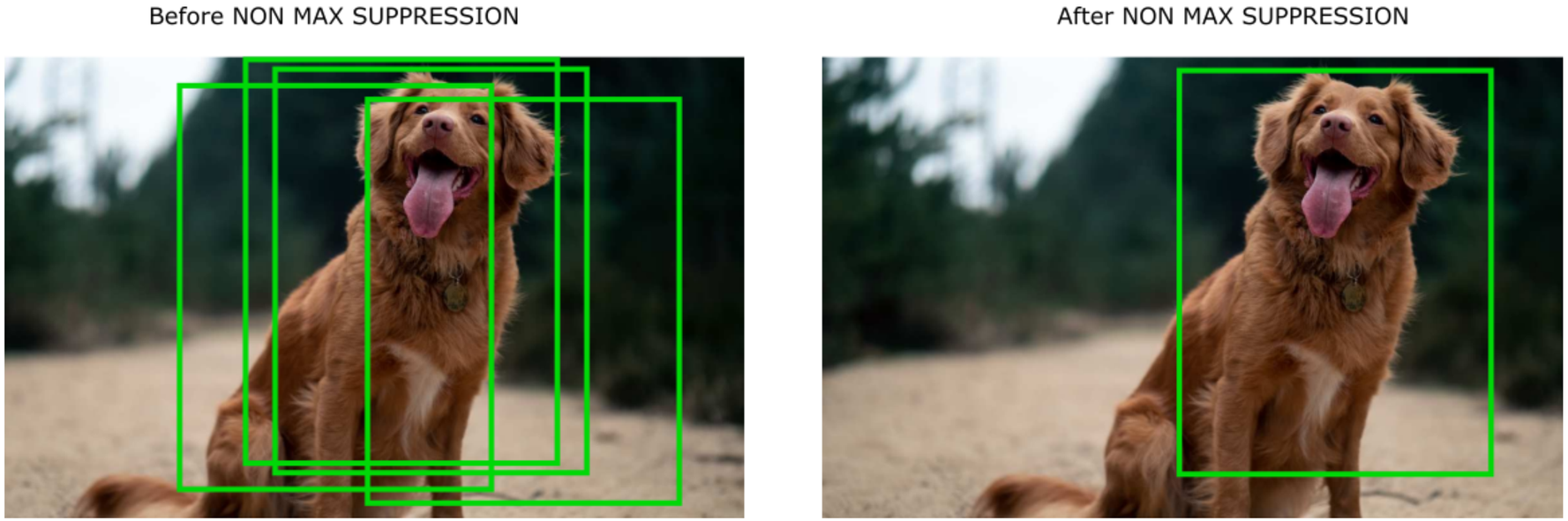
Step 3: Prediction and Detection:

- Head Network: The extracted features are fed into a head network, which consists of several convolutional and fully-connected layers. This network predicts:
- Objectness score: The probability of an object being present in each grid cell.
- Class probabilities: The probability of each object belonging to a specific class .
- Bounding box offsets: The adjustments to the pre-defined anchor boxes to fit the actual object size and location.

YOLOv5

Step 4. Non-Maximal Suppression (NMS):

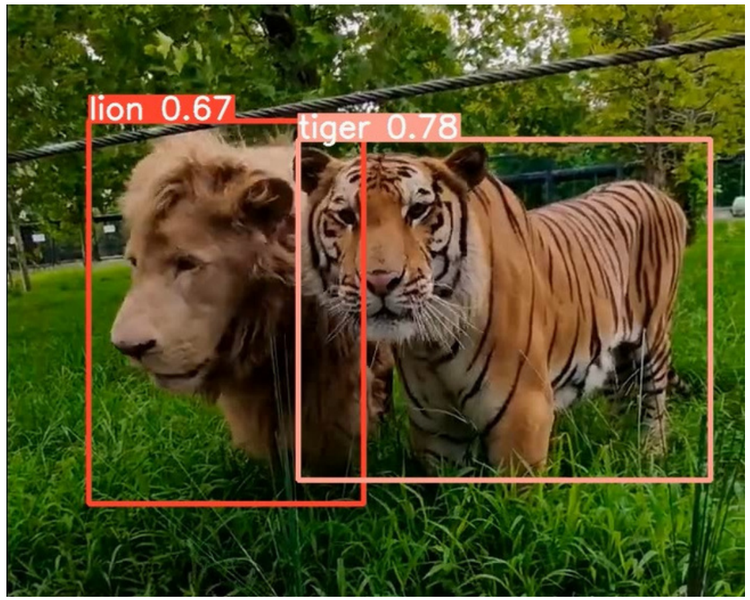
- Duplicate Box Removal: Multiple grid cells might detect the same object. NMS removes overlapping and redundant detections, keeping only the most confident and accurate one for each object.



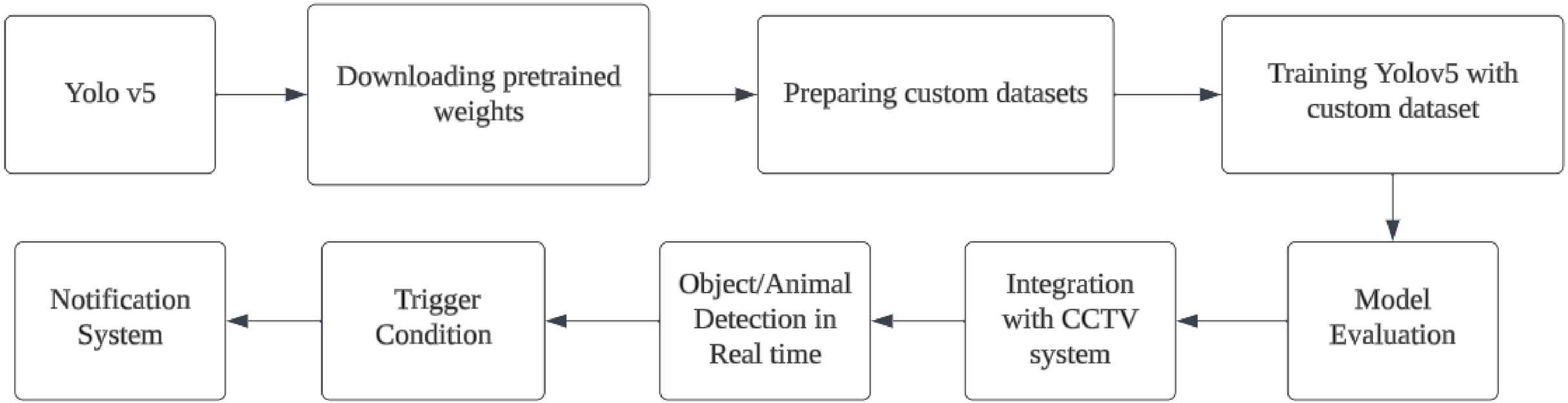
YOLOv5

Step 5. Output and Visualization:

- Bounding Boxes and Labels: The final output of YOLOv5 is a list of bounding boxes with their corresponding class labels and confidence scores. These can be visualized on the original image to highlight the detected objects.



METHODOLOGY



SOFTWARES USED

- Google Collab
- Python programming
- Openlabelling software

TIMELINE

- Currently, we have successfully completed the training of a basic model to detect and identify 3 wild animals Tiger, Lion and Elephants from various footages with minimal errors.

January

- Our next step is to incorporate the data sets of more wild animals and to train our model.

February

- We will then focus on increasing the efficiency of our model to detect animals from even low quality footages.

- Then we classify these wild animals between harmless and potentially dangerous animals

REFERENCES

- Mai Ibraheam; Kin Fun Li; Fayez Gebali, “ An Accurate and Fast Animal Species Detection System for Embedded Devices ”, IEEE Access, 13 March 2023.

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- Ms.V.Megala ; Dr.S.K.Jayanthi,“An object detection method using the modified YOLO V4 algorithm- An abnormal activity detection in roads and railways”.

THANK YOU