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# **An Accurate and Fast Animal Detection System**

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**ABSTRACT**: Animal identification plays a critical role in fields such as biodiversity monitoring, wildlife conservation, and precision agriculture. Traditional methods of animal monitoring are labor-intensive and prone to human error. Recent advances in computer vision, especially deep learning, have opened new avenues for automating this process. This project focuses on the application of the YOLO (You Only Look Once) object detection algorithm for real-time animal identification. Problem Statement: There is a growing need for an accurate, real-time, and automated animal identification system that can operate in diverse environmental conditions. Objective: To design and implement an efficient animal identification system using YOLO that can detect and classify multiple animal species from images or video streams. Methodology: We employed different versions of the YOLO architecture, trained on publicly available animal datasets. The system is evaluated based on its accuracy, speed, and robustness across various scenarios. Key Results: The YOLO-based system demonstrated high accuracy (up to 92%) in detecting and classifying animals in real-time with minimal latency.Conclusion: YOLO proves to be an effective solution for animal identification tasks, offering real-time performance and scalability. Further improvements can be achieved through model optimization and dataset augmentation.Keywords: YOLO, Animal Identification, Object Detection, Deep Learning, Wildlife Monitoring, Real-Time Detection

#### I. INTRODUCTION

Our project focuses on developing a wildlife tracking system designed to enhance both human safety and the safety of pet animals. Accurate identification and monitoring of animals in the wild are crucial to preventing dangerous encounters between humans and wildlife, as well as protecting domestic animals from potential threats. By tracking wildlife movement, the system aims to provide timely alerts and valuable data that can help manage and reduce conflicts, ensuring safer coexistence in shared environments.

Identifying animals accurately plays a vital role in many fields, including ecology, agriculture, and wildlife conservation. Traditionally, these identifications have relied on manual methods, which are often time-consuming, labor-intensive, and prone to errors. Automating the process of animal identification can significantly improve monitoring efficiency by reducing human effort and increasing data accuracy. This advancement can lead to better-informed decisions for wildlife management and conservation, as well as improved safety measures for both humans and animals.

**Structure**: This paper is organized as follows: Section 2 reviews related works, Section 3 describes system design, Section 4 covers implementation, Section 5 presents testing, Section 6 discusses results, and Section 7 concludes with future work.





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## **II. LITERATURE SURVEY**

Sr. No.	Name of Paper	Publisher	Authors	Year	Description	Algorithm Used
1	Creating Alert Messages Based on Wild Animal Activity Detection Using Hybrid Deep Neural Networks	IEEE Access	B. NATARAJAN1 , R. ELAKKIYA	2023	To track the movement of wild animals, surveillance cameras and drones are often employed. However, an efficient model is required to detect the animal type, monitor its locomotion and provide its location information. Alert messages can then be sent to ensure the safety of people and foresters	LSTM
2	An Accurate and Fast Animal Species Detection System for Embedded Devices	IEEE Access	MAI IBRAHEAM , KIN FUN L	2023	Animal species detection methods based on regular Convolutional Neural Networks (CNNs) have been widely applied	YOLO v2
3	WildARe-RCNN: A lightweight and efficient wild animal recognition model	IEEE Conference	Vishwas jain	2023	The system would collect the micro-climatic as well as positional information of the animal and communicate it to a base station through flooding of data using peer-to-peer network.	RCNN





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4	Detection and Recognition of Animals Using RCNN Algorithm	IEEE Access	Swethaa Prabhu	2023	Animal recognition and tracking systems have the potential to provide accurate and cost-effective monitoring of animal populations and their behaviour in the wild, which can be crucial for conservation efforts and ecological research.	CNN
5	Convolutiona 1 Network based Animal Recognition using YOLO and Darknet	International Conference on Inventive Computation Technologie	B. Karthikeya Reddy;	2021	The manual detection of animals with their names is a very tedious task. To overcome this challenge, this research work has developed a YOLOV3 model to identify the animal present in the image given by user.	Yolov3
6	IOT Based animal tracking using GPS	IEEE Access	V. Sangeetha	2020	The goal of this project is to track the location of Animal in the zoo or national parks. This system would include a temperature sensor and PIR sensor. The temperature sensor senses the temperature of each animal and PIR sensor senses the human presence inside the animal boundaries or restricted areas.	LSTM
7	A Zigbee-Based Animal Health Monitoring System	IEEE conference	Anuj Kumar and Gerhard P. Hancke	2015	This paper state that variations in temperatureon animals health has harmful effect leading to diseases suchas foot and mouth disease, swine fever, bovine spongioformencephalopathy (mad cow disease), bovine rhinotracheitis,squamous cell carcinoma, warts, web tear, necrotic pododer-matitis, polioencephalomalacia, hypomagnesaemia, clostridia disease and hypoglycemi	Yolov 2





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# **III. IMPLEMENTATION**

#### **Tools Used**:

- Programming: Python
- Frameworks: PyTorch, OpenCV
- Model: YOLOv5 and YOLOv7

#### **Techniques Implemented:**

- Preprocessing: Image resizing and normalization
- Training: Transfer learning using annotated datasets
- Inference: Real-time detection on live video

#### **Development Steps**:

- 1. Data collection and preprocessing
- 2. YOLO model training
- 3. Integration with camera input
- 4. Performance tuning and testing



Fig 1. System Architecture

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**IV. ALGORITHM USED** 



#### Fig 2: Yolo Algorithm architecture

The **YOLO v7** architecture, an evolution of the popular You Only Look Once (YOLO) object detection family, adopts a streamlined design characterized by a single neural network with a high-resolution input image, which is processed through convolutional layers, including backbone and neck networks, followed by multi-scale prediction heads to detect objects at various sizes and aspect ratios. Notable improvements in YOLO v7 include a focus on model scaling, efficient training strategies, and advanced augmentation techniques, resulting in enhanced accuracy, speed, and versatility for real-time object detection tasks.

The figure 2 shows YOLO 7 Architecture for project Animal Intrusion Detection System. The proposed The YOLO v7 architecture marks a significant advancement in real-time object detection, refining the principles established by its predecessors. At its core lies a deep convolutional neural network (CNN) acting as the backbone, extracting high-level features from input images. This backbone, often based on architectures like CSPDarknet or Efficient Net, is augmented by a neck network that further refines the extracted features. These additional convolutional layers, pooling operations, and feature fusion modules enhance the model's ability to discern objects accurately. An innovative aspect of YOLO v7 is its multi-scale prediction heads, attached to different layers in the backbone network. This design allows the model to detect objects of various sizes and aspect ratios, providing greater versatility. The model's training is facilitated by a combination of loss functions, including localization and classification losses, along with techniques like focal loss or objectless loss. Moreover, YOLO v7 introduces a flexible model scaling strategy, empowering users to adjust the model size based on specific requirements, balancing accuracy, speed, and computational resources. Efficient training strategies, such as mixed-precision training and transfer learning from pre-trained models, expedite convergence and improve generalization. Advanced data augmentation techniques, like random scaling, cropping, rotation, and color jittering, enrich the training dataset and enhance model robustness.

**Model Compilation:** Model compilation is a critical step in the training process of the YOLO v7 algorithm, involving the configuration of various parameters to optimize the model for training. During compilation, parameters such as the choice of optimizer (e.g., Adam, SGD), learning rate, loss function, and performance

metrics are specified. Additionally, any custom callbacks or regularization techniques may be incorporated to enhance model performance and prevent overfitting. The compilation process ensures that the model is equipped with the necessary components and settings to effectively learn from the training data and improve its ability to detect and classify farm animals accurately.

**Model Training:** Model training in the YOLO v7 algorithm involves iteratively optimizing the network parameters to minimize a predefined loss function, typically a combination of localization and classification losses. During training, the





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model is presented with batches of preprocessed images along with their corresponding ground truth bounding box annotations. The model then predicts bounding boxes and class probabilities for objects in the images, and the predicted outputs are compared against the ground truth annotations. Through backpropagation and gradient descent optimization, the model adjusts its parameters to minimize the discrepancy between predicted and ground truth values. Training is typically conducted over multiple epochs, with the model learning to accurately detect farm animals and optimize its performance metrics such as precision, recall, and F1-score.

## **IV. TESTING AND EVALUATION**

#### **Testing Methods:**

- Unit testing for individual modules
- Integration testing for system-level functionality

#### **Test Cases**:

- Multiple species detection
- Detection under different lighting conditions
- Performance on static images vs live feed

#### **Performance Metrics**:

- Accuracy: up to 92%
- Inference time: ~30ms per frame

#### Challenges:

- Misclassification of visually similar species
- False negatives in dense foliage

## V. RESULT AND DISCUSSION

#### Step 1: Registration and Login Page:

# **REGISTRATION PAGE**

			All Fields are Mandatory		
	First Name *				
	Last Name *				
	Your Email *				
	Vaux Dhana t				
	rour Phone *				
	Your Address*				
			1		
	50				
		Register			
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#### **Step 3: Wild Animal Detection:**



#### Step 4: Send Alert message & trigger a siren



projectsystem21@gmail.com to me • @ Mar 20, 2025, 12:16 PM

Hello User, PIs find attached Image for Suspicious Activity. https://maps.app.goo.gl/4BRMfG6JU8qACT5F6

One attachment • Scanned by Gmail (i)



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#### **Step 5: Send Location of Animal**



#### VI. CONCLUSION

Identifying and classifying species is an essential first step in determining the long-term viability of animals and understanding how human actions may affect them. It helps people recognize both predatory and non-predatory animals, which can pose significant threats to local wildlife and human safety. Additionally, this knowledge can help reduce the number of traffic accidents in regions where animals are frequently seen on roadways, as such encounters often lead to collisions with vehicles.Overall, accurate species identification is key to promoting safer human-wildlife interactions and supporting effective conservation efforts.

#### **VII. FUTURE SCOPE**

Wearable technology for pets and livestock can monitor vital health metrics, alert owners to potential health issues, and significantly improve animal welfare. Additionally, animal detection technology can be used in zoos and wildlife parks to enhance entertainment and educational experiences by providing visitors with real-time information about animals and their behaviors. Together, these advancements contribute to better animal care and more engaging human-animal interactions.

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