



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 7, July 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 [ijrset@gmail.com](mailto:ijrset@gmail.com)

 [www.ijrset.com](http://www.ijrset.com)

# An AI-Based Solution for Detecting Birds and Quadcopters Based On the Yolov5 Object Detection Paradigm

Rahul S Nadig<sup>1</sup>, Hemanth Kumar<sup>2</sup>

PG Student, Dept. of Master of Computer Applications, Jawaharlal Nehru New College of Engineering,  
Shivamogga, India

Assistant Professor, Dept. of Master of Computer Applications, Jawaharlal Nehru New College of Engineering ,  
Shivamogga , India

**ABSTRACT:** This work propose the development of a model for bird and drone detection using the You onlyLook Once version 5 (YOLOv5) model. The increasing use of drones poses a significant threatto bird populations and it is essential to develop a system that can detect and classify drones and birds accurately. The developer will train the YOLOv5 model on the training set using transfer learning. Once the models have been trained, it will evaluate their performance on thevalidation set and test their performance on a test set. Then compare the performance of the YOLOv5 models and identify the best-performing model for bird and drone detection and obtained results conclude that YOLOv5 identifies the bird as well as drone.

## I. INTRODUCTION

Birds are an important component of our ecosystem and play a vital role in maintaining the balance of nature. They are also at risk due to the increasing number of drone flights in their habitats. The increasing use of drones has brought with it various benefits, such as aerial photography and surveillance but it also poses a significant threat to birds. Drones can cause disturbance to bird populations, leading to displacement, stress, and even injury or death. Drones can also damage bird habitats and cause significant ecological harm.

To minimize this risk, it is important to develop a system that can detect and classify drones and birds accurately. Object detection is a challenging task in computer vision, but the YOLO family of models has shown significant improvements in object detection accuracy

## II. LITERATURE REVIEW

Following are the literature works conducted by various researches on object identification in recent years. B Kim et al. [1] brought some reliable results in year 2019 for their Dynamic computation offloading scheme for drone-based mobile surveillance systems. YOLO9000, the latest technology, was invented in 2017. It was an improvement in the field of object recognition technology. As an improved version of YOLOv2, The design was created to bet-ter detection and classification together, and it was later refined, in terms of speed by YOLOv3,they thought about a question that the article was not thinking much about the big- gest problem of drones: battery consumption. Such improvements on a drone's computationalcapabilities for sure would lead to energy-related issues that have not been discussed in a study. Chen et al. [2] proposed a way to detect the electrical components in the Unmanned Aerial Vehicle (UAV) inspection image based on You Only Look Once (YOLO) v3 algo- rithm. Due to some of the inspection images were not clear, which resulted in the reduction ofthe available dataset. On this basis, Super-Resolution Convolutional Neural Network (SRCNN) to realize super-resolution reconstruction on the blurred image, which achieves the expansion of the dataset. The experimental findings validate the suggested method's efficacy, and the technology achieves high identification accuracy, good resilience, and strong real- time performance for UAV power inspection systems.

Unlu et al. [3] in this work, An autonomous drone surveillance and tracking architecture. used to test set of 221 bird and 82 drone images and reached correct detection percentages of93.7% and only 64.6%, respectively with a convolutional neural network(CNN). However, for other algorithms, Also claimed better findings, but they appear to be less dependable be- cause the test sets had less than 50 photos in total. The data was obtained from open sources. A. Coluccia et al. [4] issued a drone-vs-bird detection challenge whose goal was to detect a drone appearing at some point

in a video where birds could also be present. The system included an object detection method before the convolutional neural network will do, but different from ours. The images were from the internet and acquired specifically for the work. Even though it is rather similar to the present work, Schumann did not train a classifier to distinguish drones from larger aircraft do. In addition, their convolutional neural network is standard and less advanced than our residual neural network.

Ahmed S. Naseri and Nada Hussein M. Ali [5] have developed Detection of drones with YOLOv4 deep learning algorithm. In this work, they presented a solution to detect drones before they can reach a sensitive area or residence using the latest YOLOv4 deep learning algorithm while using Darknet as a backbone. They trained the model on different images at different distances and climatic conditions and trained to detect birds and aircraft that are very similar to drones at higher distances. Ammar et al. [6] has proposed a unique deep learning framework for automatic palm tree counting and geolocation from aerial photo- graphs using convolutional neural networks. It used two DJI drones to take aerial photo- graphs from two distinct places in Saudi Arabia for this purpose, resulting in produced a dataset of roughly 11,000 palm tree instances. Detected palms and other trees using multiple contemporary convolutional neural network models (Faster R-CNN, YOLOv3, YOLOv4).

Subroto Singha and Burchan Aydin [7] proposed an project titled Automated Drone Detection Using YOLOv4. In this work, they designed an automated drone detection system using YOLOv4. The model was trained using drone and bird datasets, then evaluate the trained YOLOv4 model on the testing dataset, using mean average precision (MAP), frames per second (FPS), precision, recall, and score as evaluation parameters. After that they collect their own two types of drone videos, performed drone detections, and calculated the FPS to identify the speed of detection at three altitudes. Shikha Tiwari et al. [8] designed the YOLOv5 Grounded Drone Discovery task, which is today's one of the most popular modules not only for entertainment purposes but also for a variety of activities such as engineering, security in field disaster operations, delivery of commodities, and others. In addition to their useful applications, frightening concern regarding physical infrastructure safety and airports surveillance has arisen due to the frequency of their use in nasty activities and to identification of two types of drones, birds and helicopter to solve this problem Burchan Aydin et al. [9] has developed a technique to overcome the challenges of previous study by proposing a one-shot detector called You Only Look Once version 5 (YOLOv5), which can train the proposed model using pre-trained weights and data augmentation. The trained model was evaluated using mean average precision (mAP) and recall measures. The model achieved a 90.40% mAP, a 21.57% improvement over the previous model that used You Only Look Once version 4 (YOLOv4) and was tested on the same dataset. Yating and Liu et al. [10] have developed Drone Detection using Deep Learning In this work, deep-learning-based detection algorithms on surveillance cameras have been investigated to be integrated into the RF anti-drone system. The objective of this work is to evaluate state-of-the-art models and training strategies for drone detection. The main challenges in this work is detecting small drone targets at long distances and running the model in real-time. It is difficult to find a publicly available dataset of small drones online, so a real-world small drone dataset was constructed and used in this work.

### III. PROBLEM STATEMENT

The increasing use of drones poses a significant threat to bird populations, and it is essential to develop a system that can detect and classify drones and birds accurately. To minimize this risk, it is important to develop a system that can detect and classify drones and birds accurately.

### IV. EXISTING SYSTEM

Existing systems for bird and drone detection vary depending on the application and environment. Some common methods for detecting birds and drones include:

**Visual observation:** This is the most common method for detecting birds and drones. Human observers visually scan the sky for any activity or signs of movement.

**Acoustic sensors:** Acoustic sensors can detect the sound of birds or drones flying in the area.

**Radar:** Radar systems can detect birds and drones in the airspace.

**Thermal cameras:** Thermal cameras can detect the heat signatures of birds and drones in the airspace. This method is particularly useful for detecting birds at night when visual observation is difficult.

## V. PROPOSED SYSTEM

The proposed system for a machine learning project on bird and drone detection using YOLOv5 involves collecting datasets of birds and drones, pre-processing the input data, training the models, evaluating the models, developing a user interface, and deploying the system in the target environment.

### 5.1 Advantages of Proposed System

- 1) **High accuracy:** The YOLOv5 models have shown high accuracy in object detection, making the system highly reliable.
- 2) **Non-invasive observation:** The system allows for non-invasive observation of birds in their natural habitats, reducing the need for intrusive monitoring methods.
- 3) **Protecting birds:** The system can protect birds from the harmful effects of drones, reducing the negative impact on bird populations.
- 4) **Regulating drone usage:** The system can be used to regulate drone usage in sensitive areas, preventing disturbances to bird habitats and breeding areas.

## VI. METHODOLOGY

In the YOLOv5 algorithm for bird and drone detection involves training a deep neural network on annotated images, fine-tuning the model, and performing inference to detect and classify birds and drones accurately. The iterative training process and post-processing steps contribute to the overall effectiveness and reliability followed by the YOLOv5 algorithm

### 6.1 YOLOv5 Algorithm

Step 1: Start

Step 2: Collection of datasets includes images which featuring pictures of birds and drones

Step 3: Spiting datasets to train and validate them known as Data Preparation

Step 4: To set-up the YOLOv5 model configuration

Step 5: Training prepared datasets using YOLOv5 model

Step 6: Checking model accuracy and other metrics

Step 7: Using Inference to obtaining bounding box predictions

Step 8: Stop

First step is to initialize the process, After initialization the next step tells about a labelled da-taset that includes images containing bird and drone instances. Annotate the dataset with bounding boxes around the objects of interest (birds and drones).

In third step, Split the dataset into training and validation sets. Make sure the data is well-or-ganized and properly formatted for the YOLOv5 model. This typically involves creating a text file that lists the paths to the images and their corresponding annotation files.

After splitting the dataset, next step is to instruct Set up the YOLOv5 model configuration. This includes specifying the network architecture, hyper parameters, and training settings. You can customize these settings based on your specific requirements and available re- sources.

Next Step is to Train the YOLOv5 model using the prepared dataset. The training process in- volves optimizing the model parameters to accurately detect birds and drones. You can fine- tune the pre-trained YOLOv5 models or train from scratch.

After training the model, the Model Evaluation process takes place where, It evaluate the trained model and performance on the validation set. This step helps assess the model accu- racy and other metrics. You can adjust the model and training parameters based on the evalu- ation results to improve performance.

The final step is Testing and Inference, here it apply the trained YOLOv5 model to unseen images to detect birds and drones. This involves running the inference process on new data and obtaining bounding box predictions for the objects of interest.

After completing all the above steps the process will be terminated, and return the results by telling whether its a drone or a bird through bounding boxes .

## 6.2 System Architecture

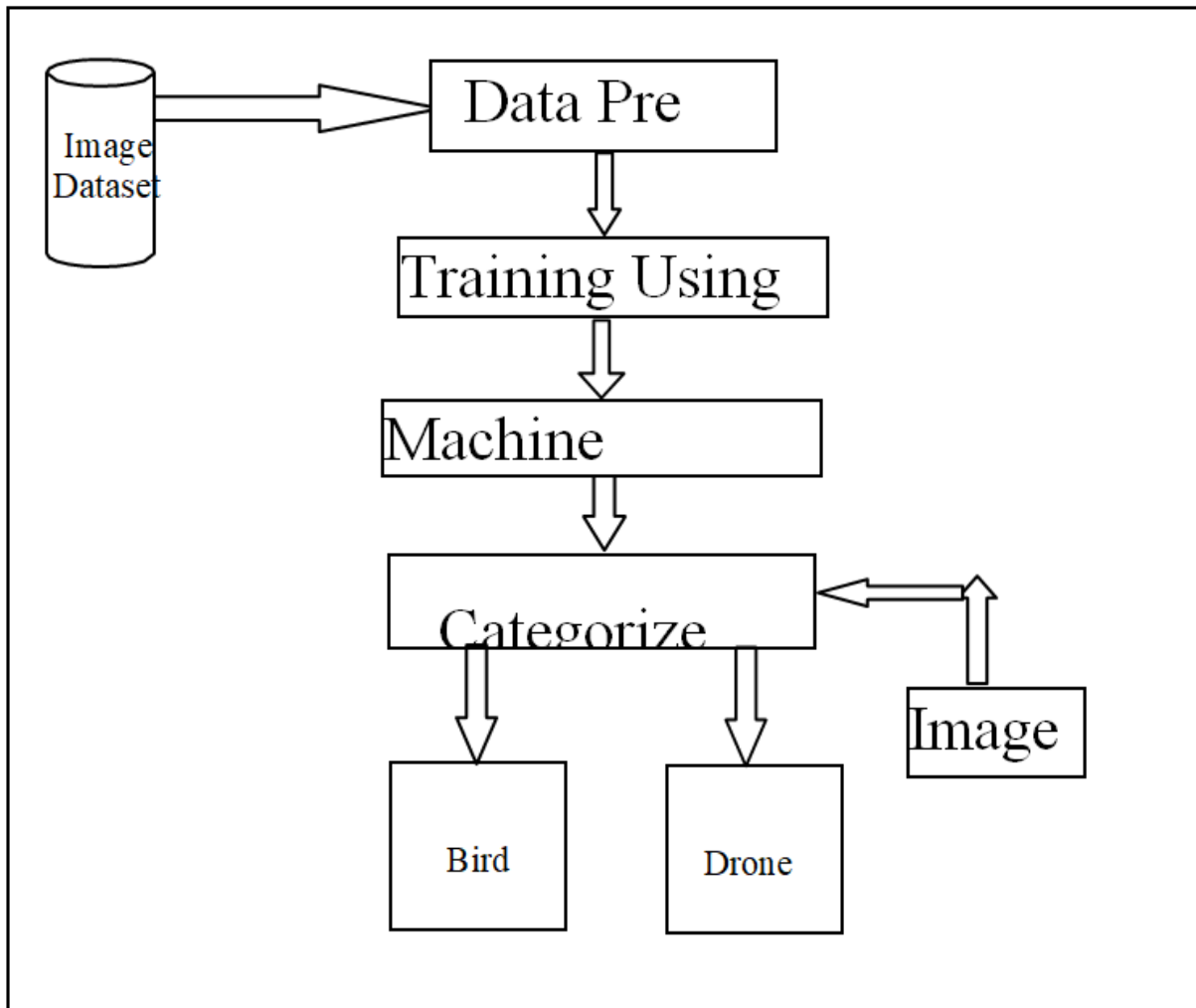


Fig.1: System Architecture

In This Fig.1 the design reflects cutting-edge object detection models. To recognize and categorize objects in photos and videos, these models employ a deep neural network architecture and are trained on massive datasets. A collection of bird and drone photos is utilized to detect the birds and drones.

Where we were showing Fig.1 tells the collection of image datasets and that will be stored, data pre-processing tells the process of preparing (cleaning and organizing) raw data in order to train the models. Then we train using YOLOv5 by the help of pre-processing data models .

Mainly we are using the convolution neural network as a machine learning module to differentiate the image using metrics and calculate the image for testing and categorize bird or drone in given data.

## VII. RESULTS

In our work the image will be collected and models are Trained, mainly YOLOv5 actually based on CNN it will classify the image to matrices and predict the out put that the image is drone or bird. In my work a graphical it will shows how the model vary over the time period .

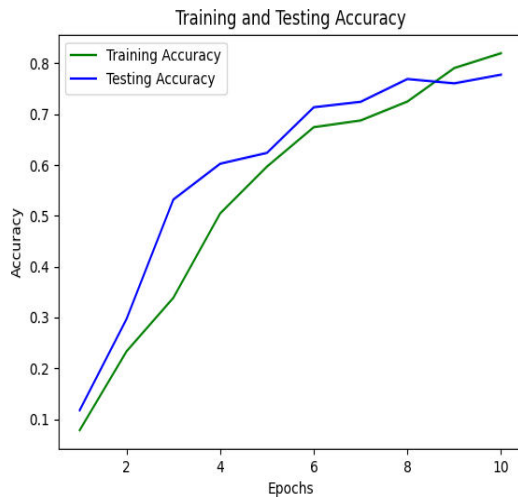


Fig.2 Training and Testing Accuracy

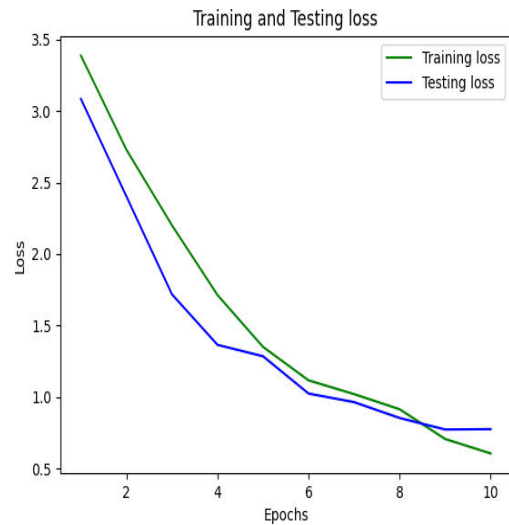


Fig.3 Training and Testing loss

In Fig.2 ,Accuracy is defined as the number of correctly identified samples as a percentage of all samples in a dataset. A model's precision is displayed as a line or curve over time on a graph, demonstrating how successfully it projected the targeted labels. As the y- axis grows,so does the accuracy.

In Fig.3, loss measure and reflects the model's predictions' divergence from target values.

Loss is calculated using cross-entropy loss. Loss graphs display how the loss measure varies throughout training. The model's predictions get more accurate as one moves closer to the y-axis optimum loss values.

## VIII. CONCLUSION

The goal of this work is to create a model for bird and drone detection using the YOLOv5 models. Proposed model use a deep neural network architecture trained on a large dataset of bird and drone images, and evaluate the performance of our models using metrics such as precision, recall, score, and identify the best-performing model for bird and drone detection. This work has significant implications for bird conservation and defence safety. It accurately detects and classifies birds and drones.

## REFERENCES

1. B Kim , Min H, Heo J and Jung J, "Dynamic computation offloading scheme for drone-based surveillance systems", Sensors 18, MDPI, pp. 2982, 6<sup>th</sup> Sep. **2018** .
2. Chen, Haipeng, Zhentao He, Bowen Shi and Tie Zhong, "Research on recognition method of electrical components based on YOLO V3", IEEE Access , Vol. 7, pp. 157818-157829, 30<sup>th</sup> Oct. **2019**.
3. Unlu, Eren, Emmaneul Zenou, Nicolas Riviere and Paul-Edouard Dupouy, "An autonomous drone surveillance and tracking architecture", AVM 2019, In 2019 Autonomous Vehicles and Machines Conference, HAL, vol. 2, pp. 35-1, **2019**.
4. Coluccia, Alessio Fascista, Arne Schumann, Lars sommer and Anastasios Dimou, "Drone-vs-Bird Detection Challenge at IEEE AVSS2019", 16th IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS),pp. 1-7, Nov. **2019**.
5. Naseri, Ahmed, and Nada Hussein M. Ali. "Detection of drones with YOLOv4 deep learning algorithm", International Journal of Nonlinear Analysis and Applications , Vol. 13, page no. 2709-2722, Jul. **2022**.
6. Ammar , Anis Koubaa and Bilel Benjdira . "Deep-learning-based automated palm tree counting and geolocation in large farms from aerial geotagged images", Agronomy (2021), Vol. 11, pp. 1458 , Jul. **2021**.
7. Subroto Singha and Burchan Aydin, "Automated drone detection using YOLOv4", Drones 5, MDPI , Vol. 5, pp. 95, Sep. **2021**
8. Shikha Tiwari, "YOLOv5 Based Drone Detection and Identification", Neuro Quantology, Vol. 20, Issue 13,



|| Volume 12, Issue 7, July 2023 ||

| DOI:10.15680/IJIRSET.2023.1207127 |

pp. 2559-2563, Dec. **2022**.

9. Burchan, Subroto Singha and Aydin, "Drone Detection Using YOLOv5", ENG4, MDPI and ACI style, Vol. 4, Issue 1, pp. 416-433, Feb. **2023**.
10. Yating and Liu, "Drone Detection using Deep Learning", Dissertation, Digitala Vetenskapliga Arkivet, TRITA-EECS-EX, 2023:32, pp. 58, Feb. **2023**.



**INNO SPACE**  
SJIF Scientific Journal Impact Factor  
**Impact Factor: 8.423**



**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

**9940 572 462** **6381 907 438** **ijirset@gmail.com**



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details