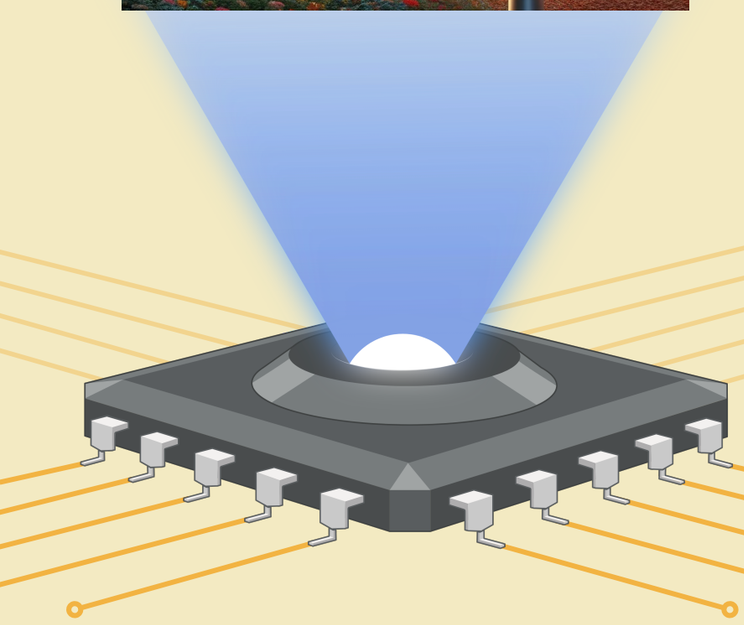
Smart Bird Feeder CV Project Poster

Harnessing the power of Computer Vision

What is a Smart Bird Feeder?

A smart bird feeder is a device whose main purpose is to dispense mealworms or other bird feed to specific species of birds while preventing access to other pests like squirrels. It works by coordinating function between various sensors, cameras and machine learning based algorithms to identify different species of bird and to distinguish them from other pests. This selective dispensing of the bird feed helps to prevent budget issues that are caused by unintended species of birds or pests feeding on high cost mealworms meant for specific species of birds. This promotes more efficient and effective feeding practices.



1 Introduction

- It is very common for different species of birds to feed on the meal worms that are Now why might this be a problem? Mealworms for certain species of birds cost more than the others. Hence, when a different bird consumes it, it could result into budget issues.
- There is also the situation where other pests like squirrels feed on the mealworms that are meant for birds.
- This is where the smart bird feeder comes into picture. The smart bird feeder is capable of identifying both these cases i.e the different species of birds, as well as whether or not the animal feeding on the mealworm is a pest or a bird.
- This capability is used to selectively dispense the meal worms to the birds.meant specifically for other species of birds.

2 Authors & Affiliations

• Yatharth
•Mayur
•Kaushik

We've all equally contributed by organizing meetings and collaboratively solving problems.

3 Future Work & Conclusion

Future work:

- The model could be deployed on an IoT based system which could add functionality for the selective dispensing of the meal worms after the detection has been done via the model.

Conclusion:

- In this project we have attempted to develop a model that could be integrated with a bird feeder, thereby making it "smart" in the sense that it could work differently for different species of birds and pests.

4 References & Acknowledgements

•[1512.03385] Deep Residual Learning for Image Recognition (arxiv.org)

•YOLOv9: Learning What You Want to Learn Using Programmable Gradient Information (arxiv.org)

•CUB-200-2011 Dataset | Papers With Code

•Fine-grained Visual Classification with High-temperature Refinement and Background Suppression | Papers With Code

Methodology

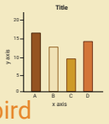
Data collection and cleaning: We have acquired a data from UIUC for bird species classification.

Model selection: We have trained 3 main models, i.e ResNet, YOLO, and RCNN.

Evaluation metrics: We evaluate the model on 2 major parameters. One of them being the capability of the model to classify birds into their respective classes and second, the capability of the model to draw the bounding box around the bird.

Self-training pipeline: We have tried to implement a self training pipeline so that the model could be updated without needing to retrain the model for new classes. This can be done by simply entering a new species of the bird or pest and automatically model could be trained.

Data & Results



The data being used to trained the bird species is a dataset gathered by UIUC. There are a total of approximately 11K images, consisting of the most common bird species. There are a total of 200 species of bird present in the dataset. Further, we have split the data into a train and test size of 80% and 20%.
We have trained 3 main models, i.e ResNet, YOLO, and RCNN. The reason for choosing these models are their performance for our specific task, i.e object detection.

The results we got on our models are as follows:
1. YOLO V5:
- Training and testing accuracy for classification: 50%

2. YOLO V8:
- Training and testing accuracy for classification: 75%

3. YOLO V9:
- Training and testing accuracy for classification: 80%

Further we are experimenting with ResNet and RCNN model for the bird species detection and classification.