Flower and Bug Image Detection

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Introduction

This report outlines our design for the “Design Challenge for IEEE day Celebration”. In this challenge, the competitor must detect flowers and bugs in a given image. This report is broken down into Method, which explains the design of our model and the justification behind it, Results, which displays the strengths and weaknesses that were found in the model after training, and finally the conclusion.

Method

For our design we decided to utilize the YOLOv3 (You Only Look Once) Algorithm. This algorithm utilizes anchor boxes which are able to detect multiple objects which can even overlap each other. The output for each anchor box contains the x and y coordinates of the bounding box of the image as well as the class of the image(whether the image shows a bug or a flower. A problem may occur with the output showing multiple boxes for the same object. The solution to this problem is to run an algorithm called non max suppression on each class. This algorithm will first get rid of low probability predictions in order to reduce the number of bounding boxes. The non-max suppression will be run on each class of image. When multiple bounding boxes overlap over an image, only the box with the highest probability will be kept. Ideally, what we will be left with is the objects with a single bounding box around them.

There were many benefits to using YOLO as opposed to other methods of image detection. The YOLO algorithm less computationally expensive than other image detection algorithms like the sliding window algorithm. In the sliding window algorithm we are moving many square windows across the image which will result in many iterations over an image when training. On the other hand, the YOLO algorithm applies the entire image to a single neural network, hence the name You Only Look Once. In addition, many of the images that contain bugs and flowers have multiple objects overlapping. The YOLO algorithm utilizes anchor boxes, which give us the ability to detect multiple overlapping boxes.

In order to train a custom model, we gathered a database of image, about 100 or so, and trained it with Darknet. Darknet is an object detection framework which is used to train a YOLOv3 model.

Results

To train our model we found 100 images which contain bug or flowers or both. We put boundary boxes around the bugs and the flowers in the images. The result was that the model was able to predict and label where the bugs and flowers were in an image with some degree of error. We noticed that the model had an easier time identifying flowers compared to bugs. As shown in **Figure 1** the model was able to correctly identify all the flowers in the image but could not identify the bug. However there were many examples of the model being able to correctly identify the bug like in **Figure 2** and **Figure 3.**

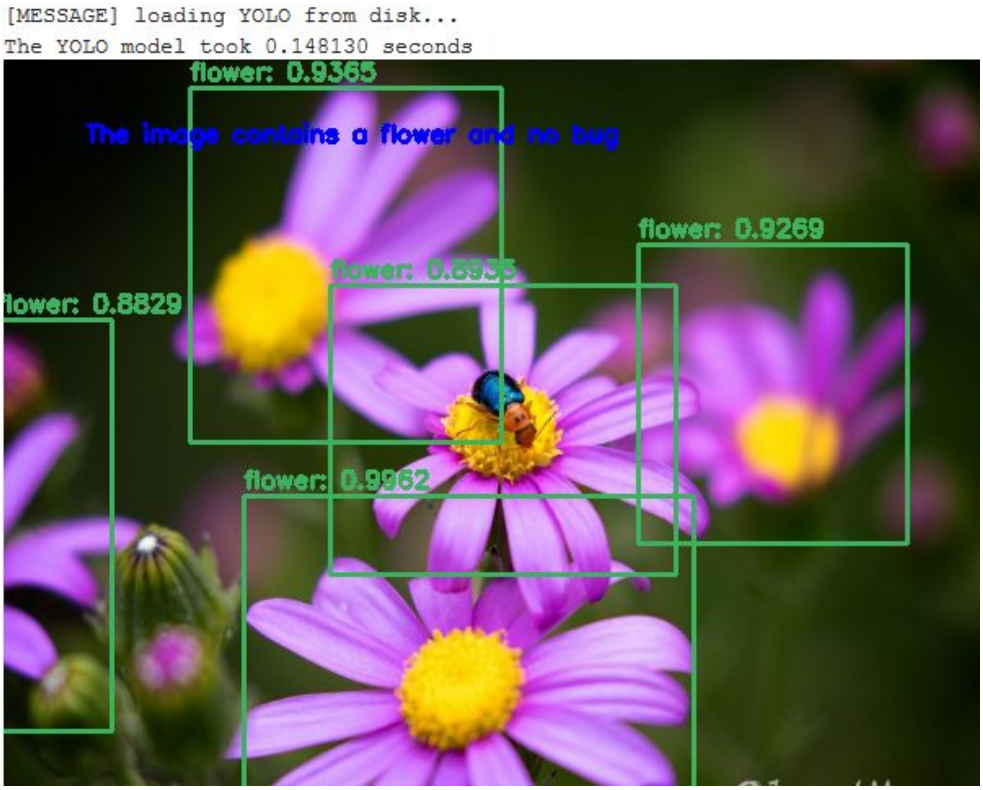

Figure 1 Model was able to correctly identify the flowers in the image but not the bug

```
[MESSAGE] loading YOLO from disk...
The YOLO model took 0.142671 seconds
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Figure 2 The model was able to correctly identify the bug and the flower in the image

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[MESSAGE] loading YOLO from disk...
The YOLO model took 0.147009 seconds
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Figure 3 The model was able to correctly identify the bug in the image

Conclusion

The YOLO algorithm worked fairly well and was able to effectively detect the location of bugs and flowers in most cases. The model had some difficulty in detecting bugs in some images. The algorithm was effective in detecting multiple overlapping images which was the case in many of the pictures found. In conclusion, despite some flaws, our model able to correctly identify and locate bugs and flowers in most images