Oyster Orientation PROPOSAL

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Abstract –

1 Background and Objectives

This project originates from a NSF REU summer project, Oyster Orientation and Deep Learning Image Processing by Joshua Comfort, Ian Rudy, and Dr. Yunawei Jin. In the results, the research team was able to implement YOLOv5, a deep-learning detection model used to recognize and classify the oysters into 3 different states: slightly open, open, and closed.

1.1 Objectives

We want to build off of previous work with the goal of improving and updating the usage of the program and implementing the newest version of YOLOv8, utilizing the new features to advance the project from using images to videos of oysters by collecting still images, implementing DenseDepth software to create 3D bounding boxes as opposed to 2D to improve the confidence of the data, and improving user quality within the code. Once the results are finalized, we will work to publish our results via conference paper.

2 Methods and Approach

We plan on working on this project via Google Colab, which allows access to GPUs, requires zero configuration, and is easy to share. We will also implement the newest version of YOLOv8 by using the Ultralytics guide and pip package as well as previous work done as a guide for what to replace within the code. 3D boundary boxes to add depth to outlining oysters will be added through the use of DenseDepth and will work similarly to Figure 1. By using DenseDepth, we'll be able to accurately convey the orientation of the oysters numerically, which allows for improved image processing. DenseDepth was a recommendation of the previous team working on this project and will be implemented during these 10 weeks. [2]

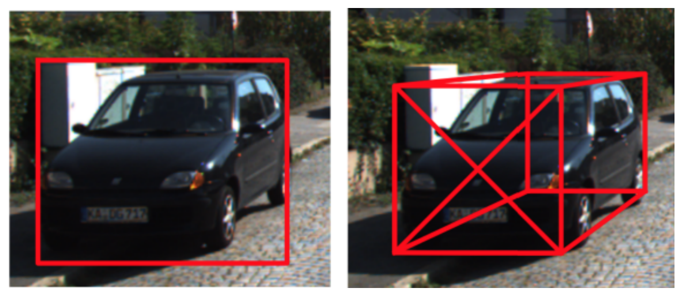

Figure 1: Depicts what identification of objects within images would look like with 3D boundary boxes[1]

3 Expected Results and Impact

By implementing the newest version of YOLO to YOLOv8 we expect to have a faster and more precise detection of oysters from multiple shots that variety in both quality of imagine and states of the oysters. Also, we are expecting that by updating the version of YOLO to broaden our detection to video, we will expand the usability for USDA to better monitor the health and number of oysters within a gathered video or imagine.

4 Timeline

The timeline of this project will span 10 weeks with work done at Salisbury University. Our objectives for each week will be as follows:

Week 1: Familiarization with past projects and develop ideas/methods of new applications for the project.

Week 2: Search through existing code, keep note of possible places for improvement, and research new software additions to be made.

Week 3: Implement new software changes such as YOLOv8 and DenseDepth to existing code, maintaining the structure of the project and increasing accuracy.

Week 4: Continue to implement new software to existing code, and begin to annotate training images for the YOLOv8

Oriented Bounding Boxes format.

Week 5: Once accuracy has been increased, start utilizing new additions to YOLOv8, iterating the current project to include processing still camera videos.

Weeks 6-8: Continue to work on processing still videos with YOLOv8

Week 9: Once accuracy has been increased, start writing a Conference paper covering the process, trials, and results of previous contributors, while documenting our progress and results.

Week 10: Continue to work on the Conference paper and present our findings.

References

Mousavian, Arsalan, et al. "3d bounding box estimation using deep learning and geometry." *Proceedings of the IEEE conference on Computer Vision and Pattern Recognition*. 2017. [1]

Comfort, Joshua, et al. "Detecting the Multiple States of Oyster Activity and Orientation using Deep Learning Image Processing and Computer Vision Algorithms." [2]