DePondFi'23

Pond vision

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introduction

- Objective
  - Detection of fish from underwater images and dynamic underwater environment with variable lighting conditions, water turbulence, and occlusion from other objects,
- Goal
  - Develop an accurate and efficient fish detection model to monitor fish population in ponds
- Approach
  - Utilize YOLOv5, a state of the art object detection algorithm to train and predict in pond image

Dataset and preprocessing

- Data has pond images labeled with bounding boxes around fish
- Data augmentation
  - Utilize Roboflow, an online platform, to augment the dataset by applying transformation like rotation, scaling and flipping.
- Each images in the dataset contains bounding box labels indicating the location of fish.

Yolov5 overview

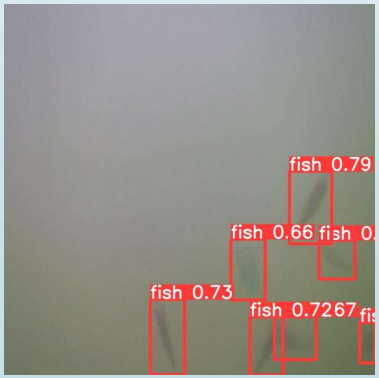
- YOLOv5 architecture
  - Backbone: CSPDarknet53 or EfficientNet
  - Neck: combine multi-scale feature maps
  - Head: Generates bounding box predictions and class probabilities
- Object detection process
  - Grid division: image divided into grid cells
  - Bounding box prediction: Each cell predicts object bounding boxes
  - Class probability Prediction: Each cell predicts class probabilities
  - Non- Maximum Suppression: Remove duplicates detections
- Benefits of yolov5
  - Real time performance
  - High accuracy
  - Flexibility for different detection task

Training process

- Split data into training, taste and validation sets
- Train YOLOv5 model on annotated dataset using GPU in google collab
- Fine tune the model by adjusting hyperparameters, optimizing data augmentation and retraining

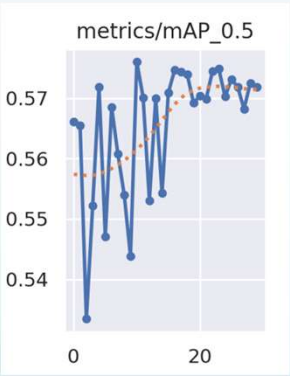
Model deployment

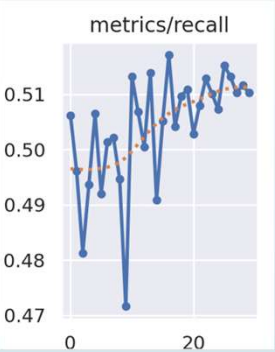
- Deployed the trained YOLOv5 model to detect fish in new, unseen pond images
- Model is also able to detect fishes in videos of pond, which enabling continuous monitoring of fish in ponds
- We can integrate the fish detection system with other technology like drones or underwater cameras.

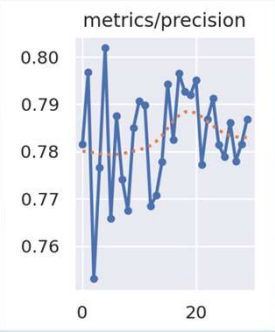


Result and Evalution

- mAP score , precision and recall is







- During training of Yolov5 model we are not able to train the model on huge dataset and also for large iteration
- So to tackle the problem of training on large dataset we train our model in 4 group of training set

Future Improvements

- We can improve our model accuracy by fine tunning, training on larger dataset and for more epoch
- We can also use pretrained model on fish detection and fine tune, to increase the mAP score