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ĐẠI HỌC BÁCH KHOA HÀ NỘI

HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

ONE LOVE. ONE FUTURE.

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MINI PROJECT

SUBTITLE. SUBTITLE. SUBTITLE. SUBTITLE. SUBTITLE.

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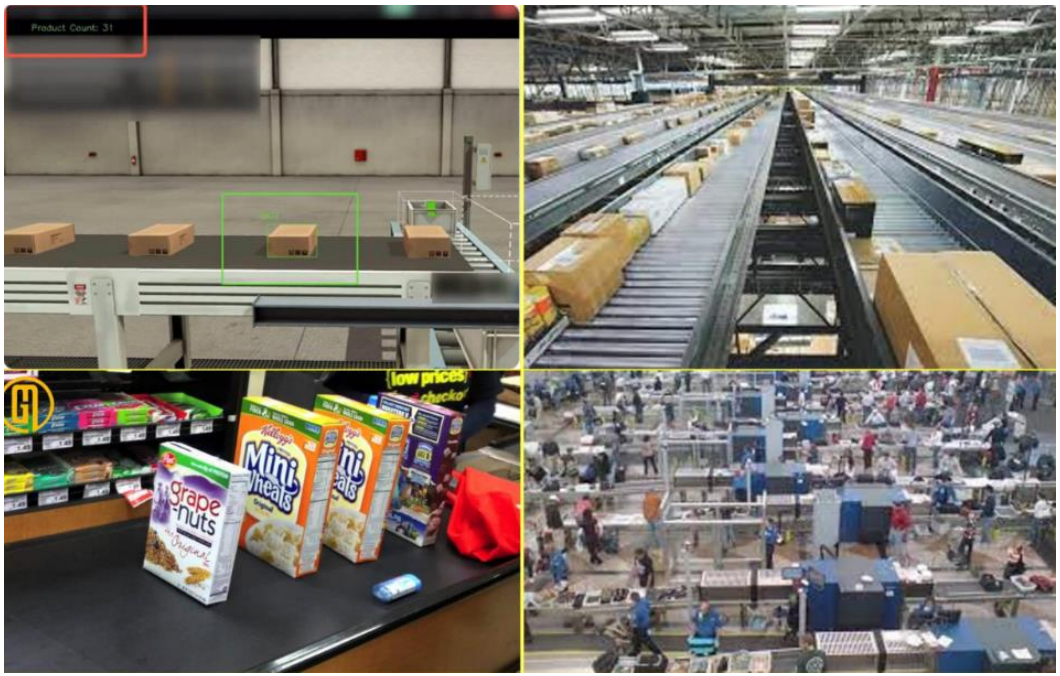
OUTLINE

1. Problem
2. Method
3. Details
4. Test and Evaluate
5. Conclusion
6. Improvement

1. Problem

MINI PROJECT : Solve the object detection problem:

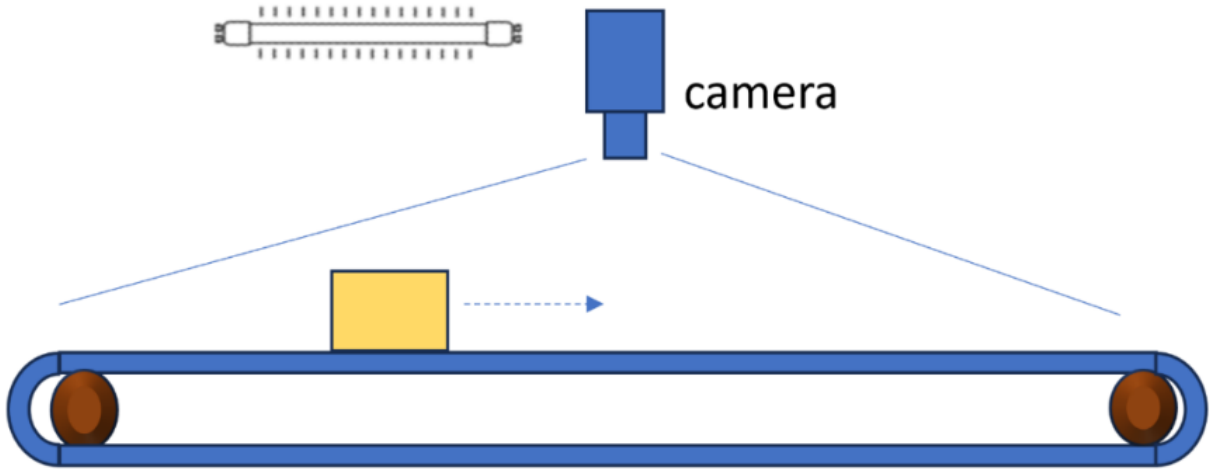
- Identify goods
- Counting number of products moving on the conveyor



1. Problem

DESCRIBE the Problem:

Image below represents the components of the problem



- Conveyor transport objects
- Fixed cameras
- Products : goods, confectionarys

1. Problem

TARGET

1. Classify the goods
2. Count the number of each class
3. Show results

1. Problem

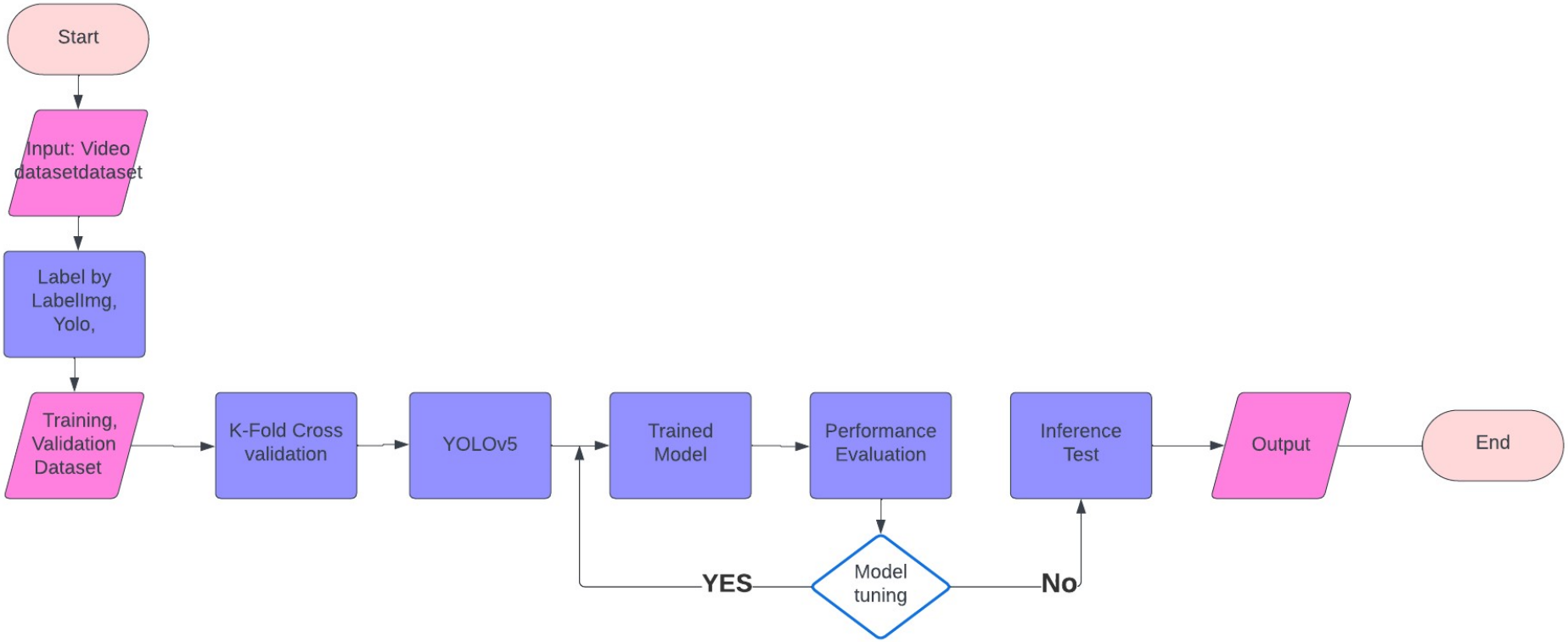
CHALLENGES :

- Speed and time processing
- Diversity in Size and Shape
- Complex and Noisy Background
- Changes in Lighting Conditions

❖In **actual problem**, we can face additional problem such as :

- Object interaction
- High throughput
- Continuous Operation Mode
- Resource Limitations

FLOWCHART about method proposed



DATA PROCESSING

- Data : conveyor_video_for_train, cellphone_video_for_train
- Data preparation : Label each object in the frames. Split data into training and validate sets, using tool LabelImg or YOLOv5 for auto labeled images
- Data augmentation : Enhance the diversity of training data by creating variations of origional images, using OpenCV for this.

3. Details

➢ This is **object detection** problem, there are many models used for this problem include:

- FASTER_RCNN
- CENTERNET
- YOLO
- DETR
- SSD
- Etc…

3. Details

How to select best Model for this Problem?

➔ Survey of recent research on the **performance** and **inference speed** of object detection models

GLE-Net: A Global and Local Ensemble Network for Aerial Object Detection

JiaJia Liao, Yujun Liu

Method	Params (MB)	inference time (ms)
Yolov5	89.0	6.6
CenterNet	74.99	28

Detection of Tip-Burn Stress on Lettuce Grown in an Indoor Environment Using Deep Learning Algorithms

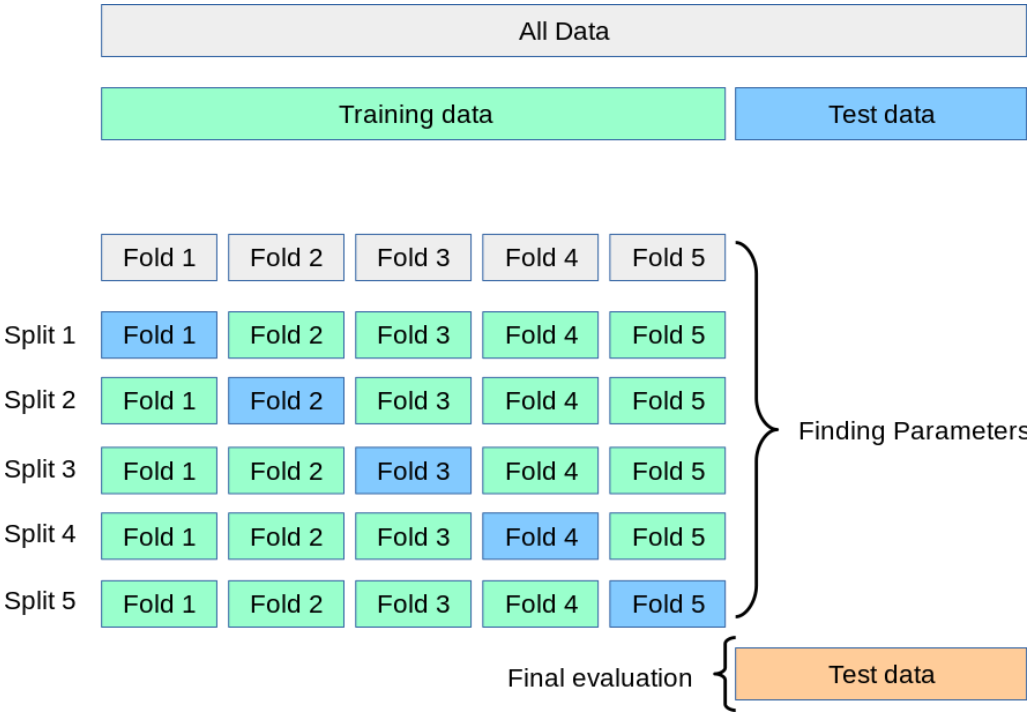
Muniyah Harati Hamidon, Tofael Ahamed

Model	Recall (%)	mAP (%)
CenterNet	58.0	81.2
YOLOv4	74.0	76.2
YOLOv5	79.4	84.1

3. Details

Choose YOLOv5 for this project

➔K-Folds cross validation for YOLOv5n



➔Overall evaluate about performance of YOLOv5

➔

Model Tuning (Optional)

Fine-tune hyperparameters of the model to optimize performance on custom data

3. Details

Model Training

- Train the YOLOv5n model on the prepared dataset
- On the period of training time with train and val dataset, evaluate model's performance by mAP, precision, recall

Inference

- Use the trained model for inference test data

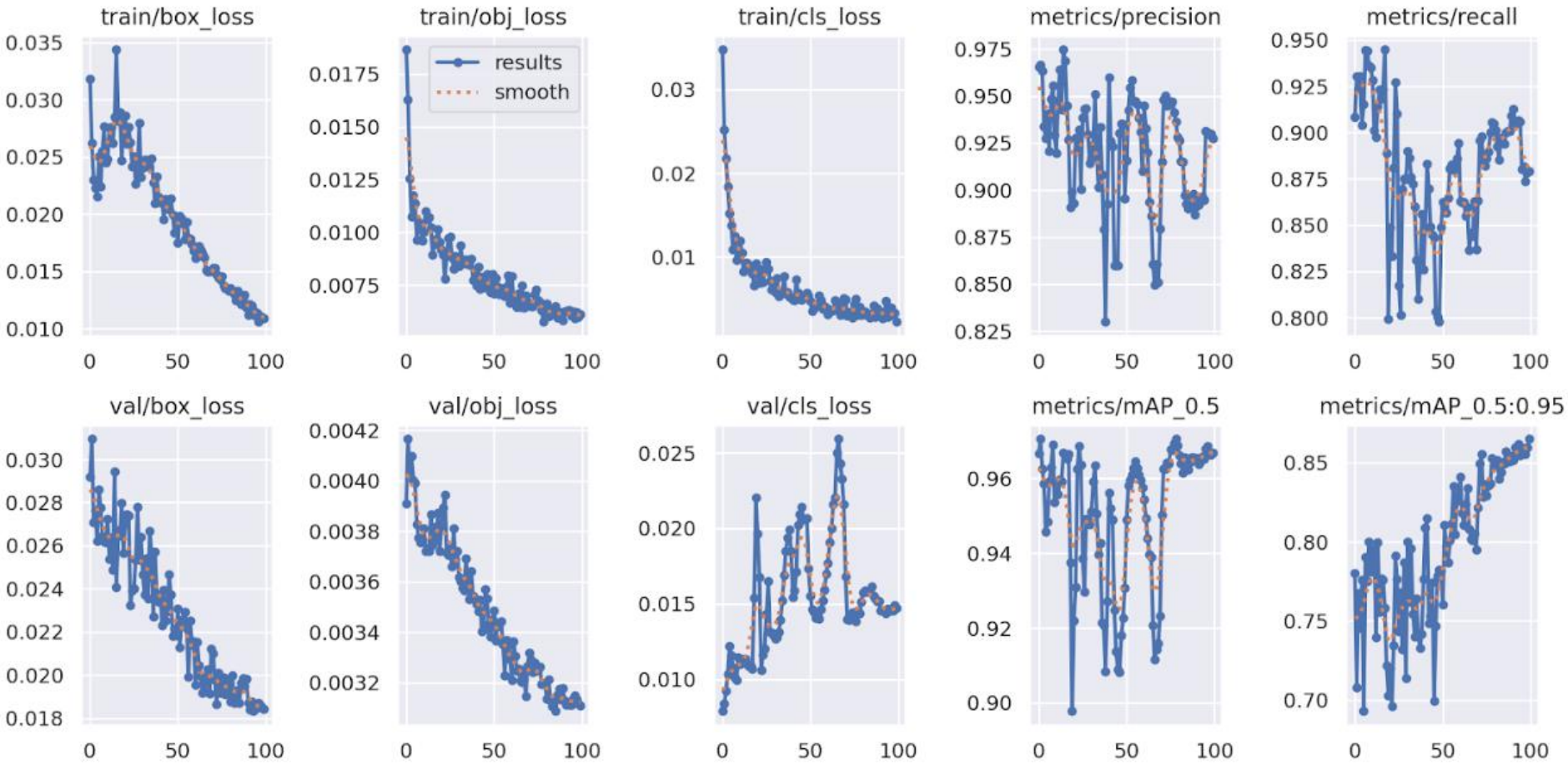
3. Details

Optimization

- Improve inference speed by resize image to 320x320, but this can affect to the model's performance

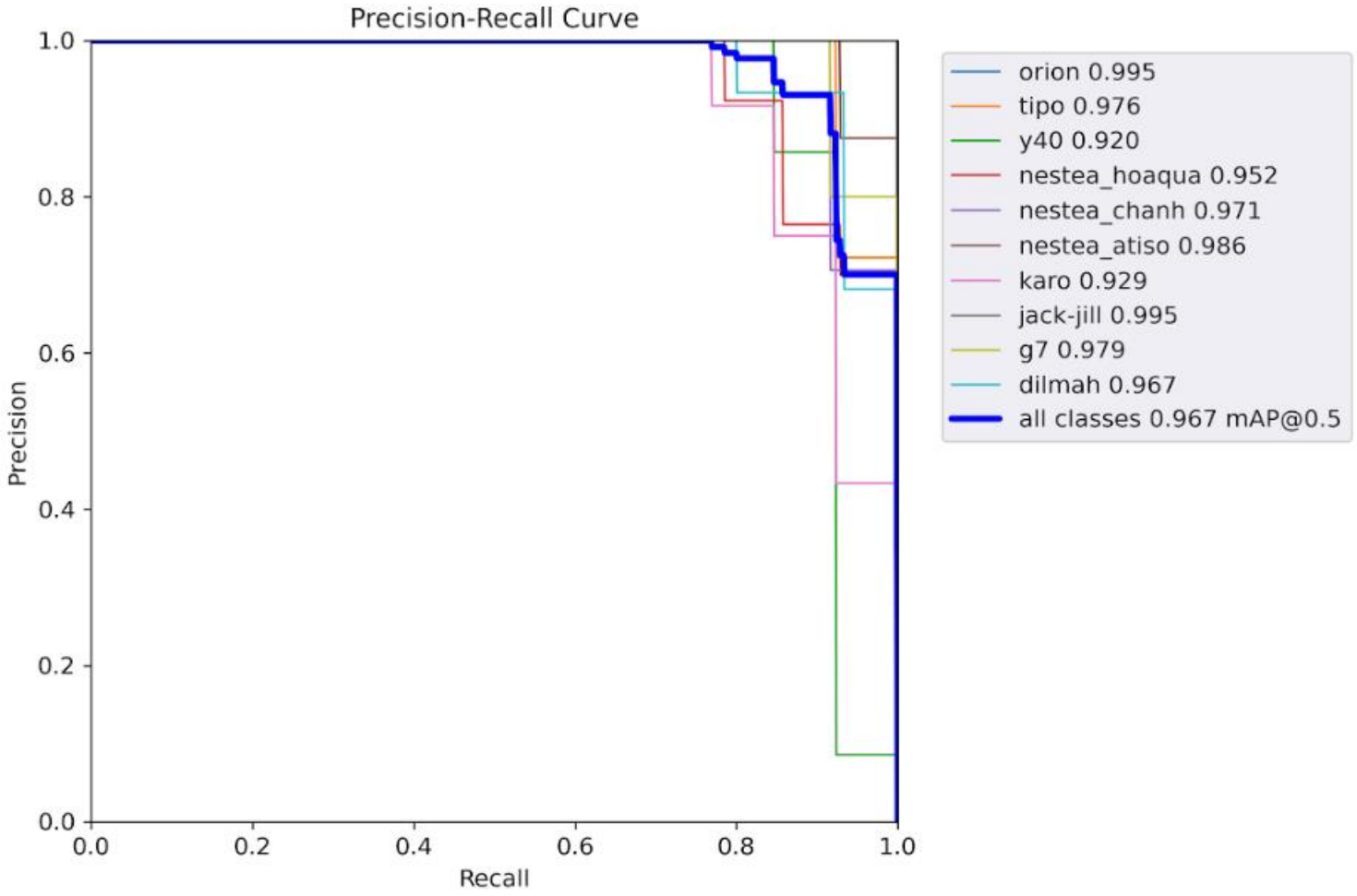
4. Test and Evaluate

Performance Evaluate (Precision, Recall, mAP)



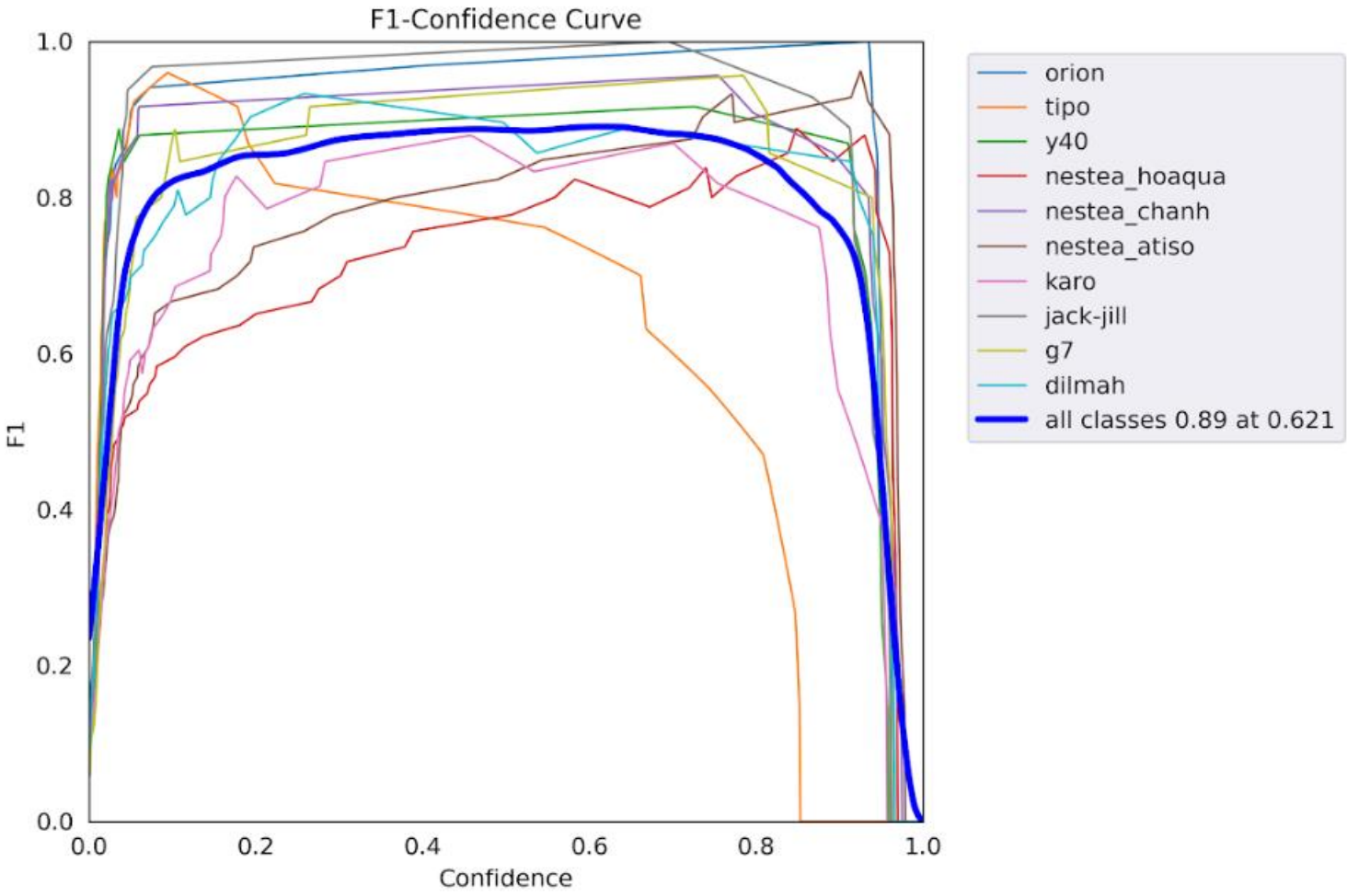
3. Details

- **Precision-Recall Curve**

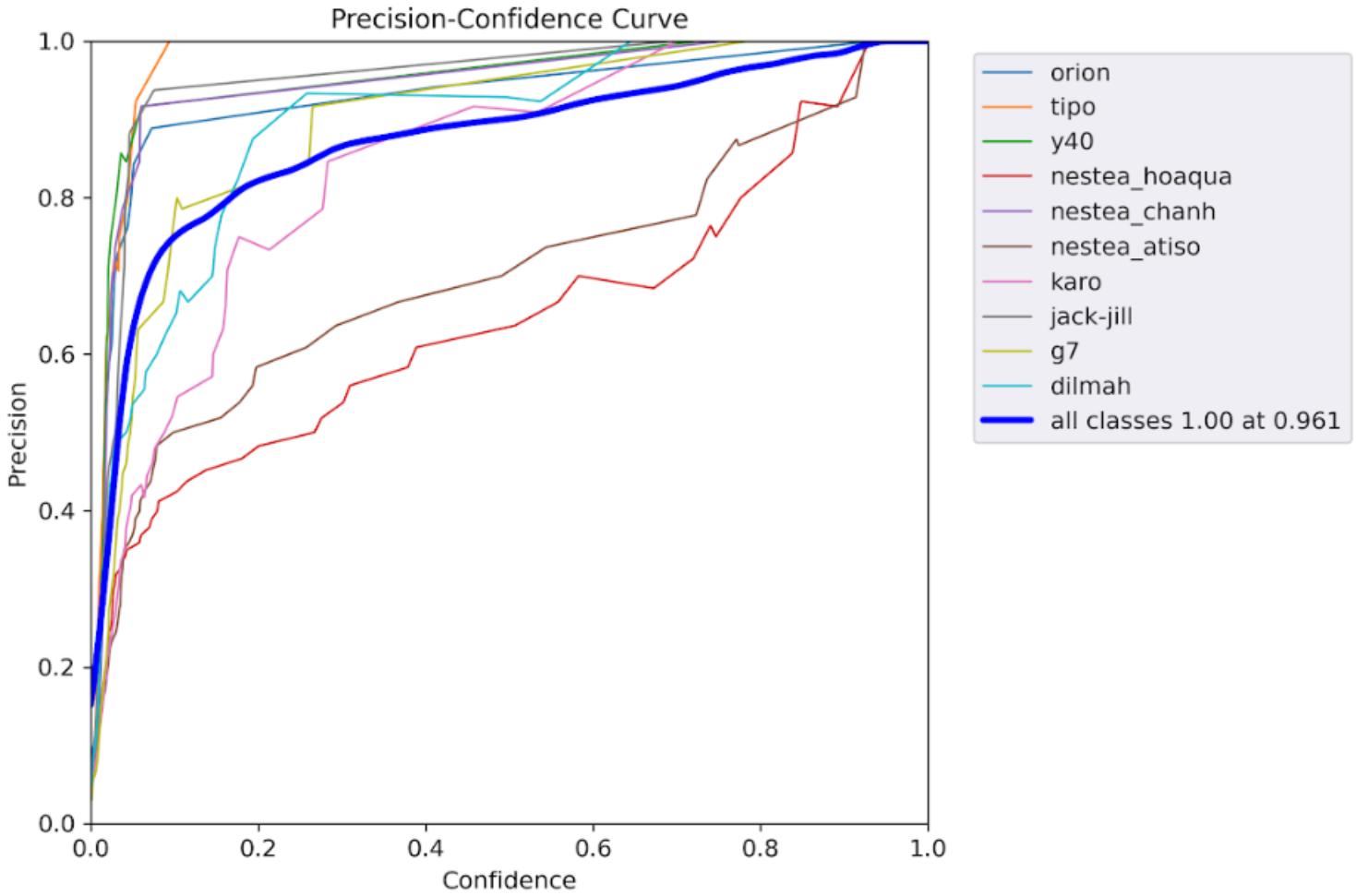


4. Test and Evaluate

F1-Score

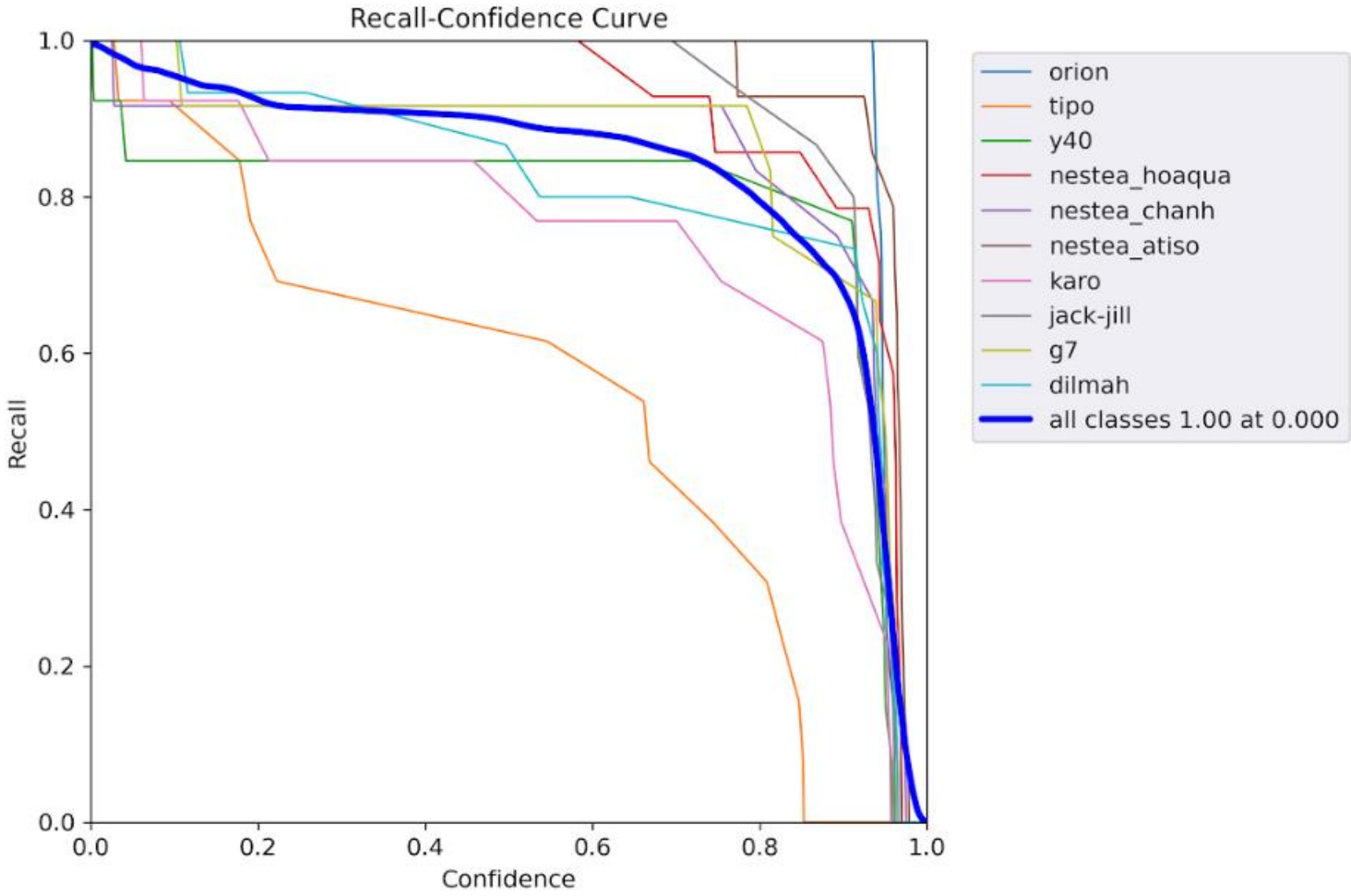


Precision-Confidence Curve



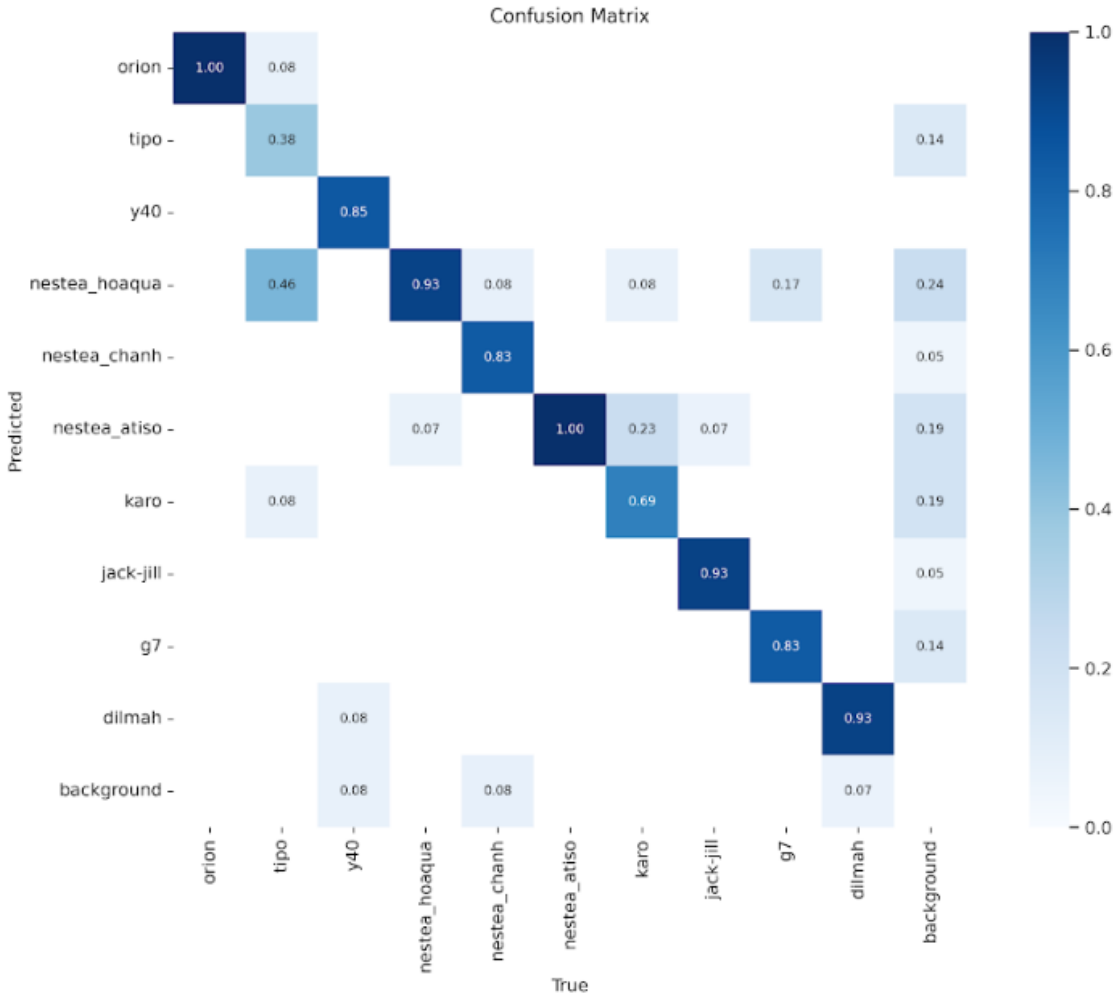
4. Test and Evaluate

Recall-Confidence Curve



4. Test and Evaluate

Confusion Matrix



5.Conclusion

6.Improvement

- Object Tracking (Yolov5 + DEEPSORT, SORT)
- Quantization
- Ensemble Learning

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THANK YOU !