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OBJECT DETECTION AND OPTICAL CHARACTER RECOGNITION COMPUTER VISION FOR VEHICLE LICENSE PLATE DETECTION

Number Plate

Detection

Research Reason

Ensuring safety and traffic control is important in urban mobility management. License plate detection serves as a unique identifier to track vehicles. However, manual identification faces challenges such as inefficiency.

Utilizing advanced technologies like Artificial Intelligence, there's potential to enhance license plate detection accuracy and speed. These methods enable rapid and accurate capture of license plate images, even in diverse conditions.

A license plate detection system using Artificial Intelligence can help speed up vehicle identification in various scenarios.

Research Tools

Tesseract

Optical Character Recognition (OCR) tools

EasyOCR

Multi Language Optical Character Recognition (OCR)

YOLO v9

Fast real-time object detection

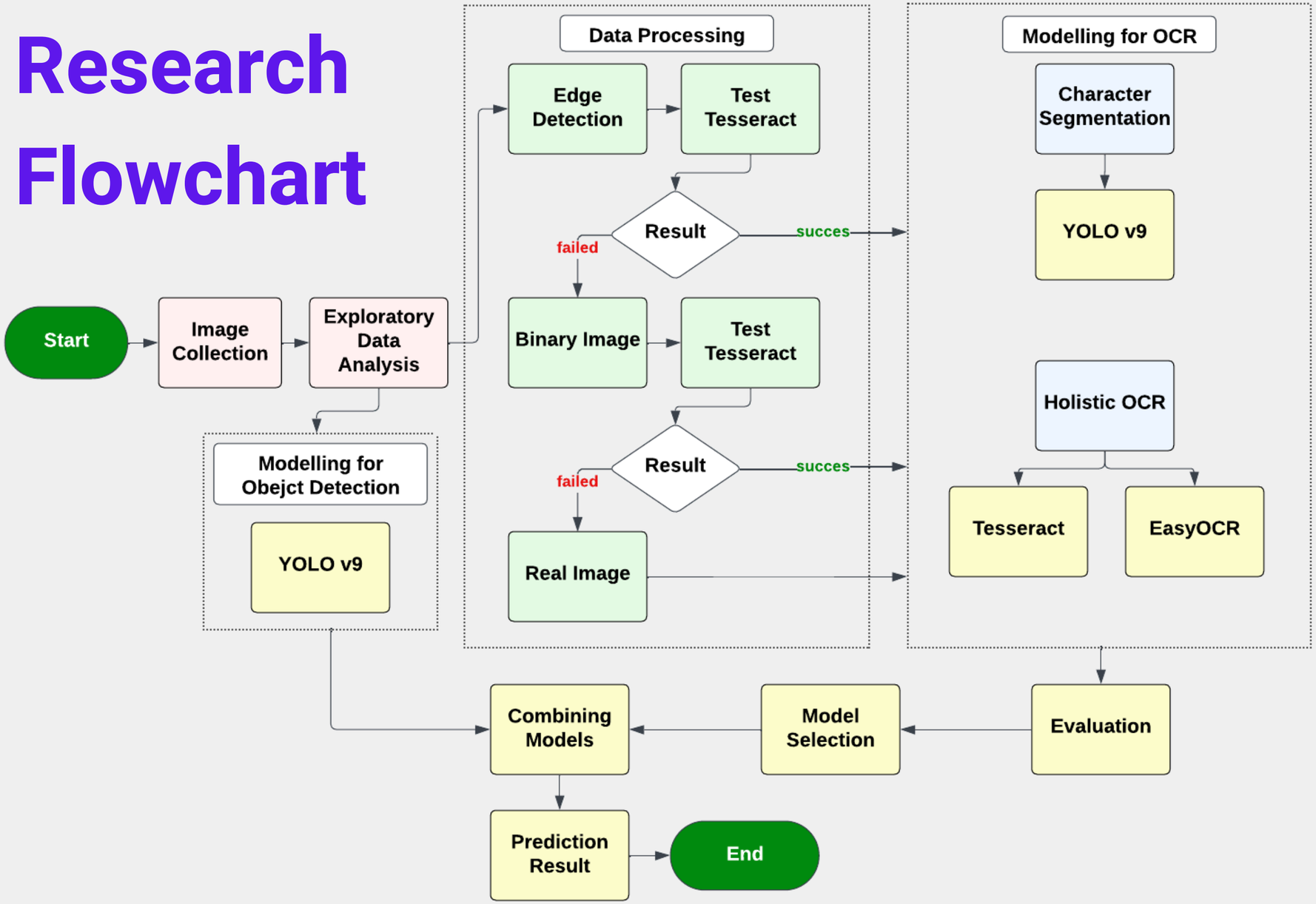
OpenCV

Image and video manipulation for AI

Dask

A library for easily performing parallel and distributed computing

Research Flowchart



Dataset

Dataset For Object Detection

Roboflow

Dataset For Optical Character Recognition

Roboflow

Data Processing

01.

Edge Detection With Cany

02.

Binary Image

03.

Real Image

Data Processing

Holistic OCR Test

Results
Edge Detection With Cany

Results
Binary Image

Results
Real Image

The original image is better than the processed image, but the binary image has the potential to be improved further if additional processing is applied

Modelling Results For Plate Detection

YOLO v9

Precision

0.973

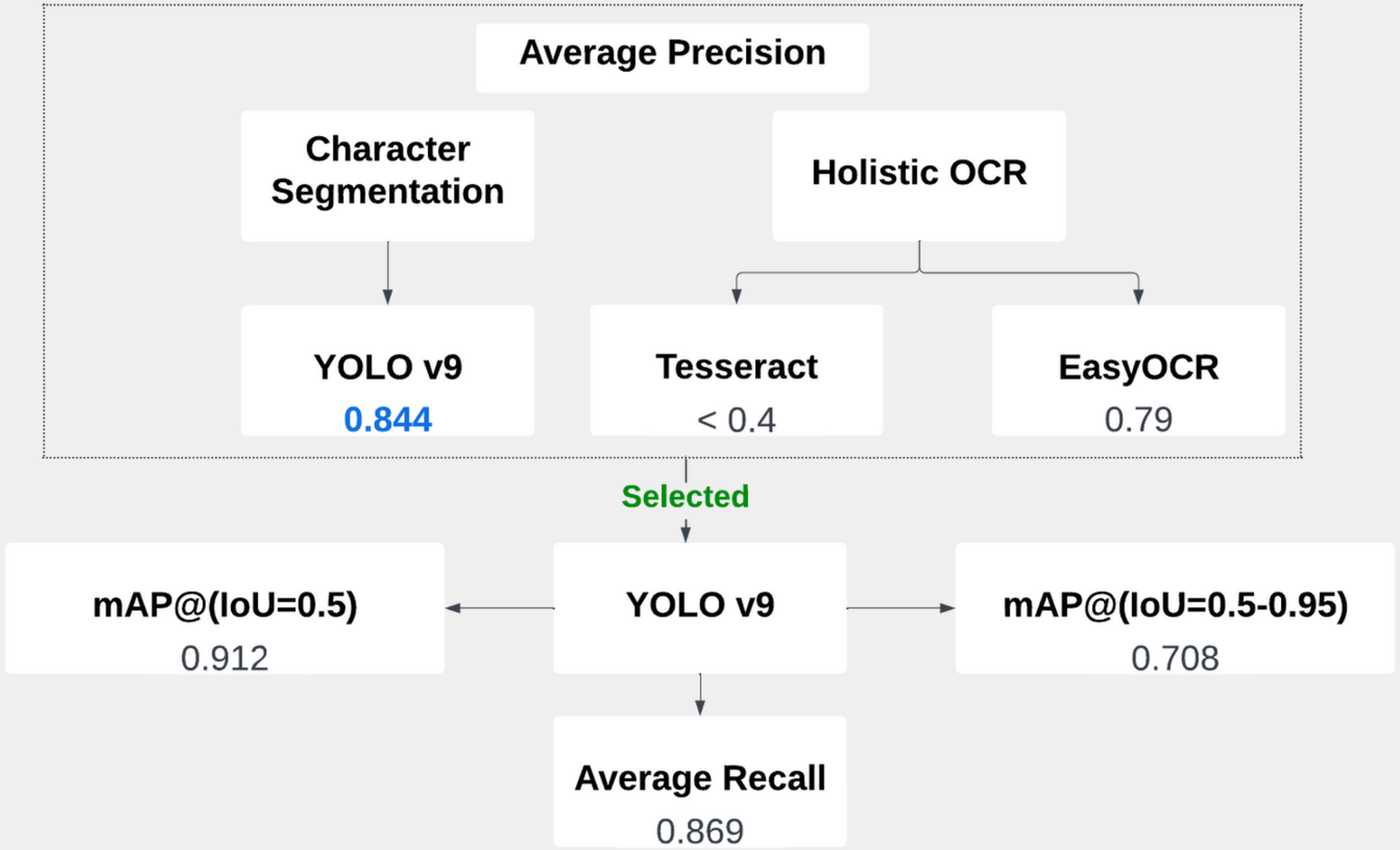
Recall

0.898

mAP@(IoU=0.5-0.95)

0.684

Modelling Results For OCR



Example of Prediction and Speed

Predicted Plat: AA8144C

Execute time without dask: 1.18872 seconds
Execute time with dask: 0.80686 seconds

Predicted Plat: B3023KEZ

Execute time without dask: 1.71949 seconds
Execute time with dask: 0.99104 seconds

Predicted Plat: N1075CM

Execute time without dask: 3.92261 seconds
Execute time with dask: 1.77012 seconds

Conclusion

This model is able to produce license plate license predictions with an accuracy of 84% on validation data, especially on clear images. However, the model has difficulty when dealing with unclear or blurry images.
The character segmentation approach proved to be more effective than the holistic approach. This is due to the possibility that a holistic approach to optical character recognition requires further image processing.
The use of Dask has significantly increased the prediction speed. Parallel computing can speed up response time in number plate recognition.

Suggestion

- Segmenting all characters can help improve prediction accuracy
- Applying data augmentation techniques can improve model performance as well as generalization. By introducing variety and diversity in the training data.

Reference

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Attachment

Thank You