Automated License Plate Recognition

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Background

- Develop a **License Plate Recognition model** for tolling booths using V2X's custom project dataset.
- Design the system to process **3,000+ license plates** per hour per lane.
- Achieve a target accuracy of 95% in plate detection and recognition.

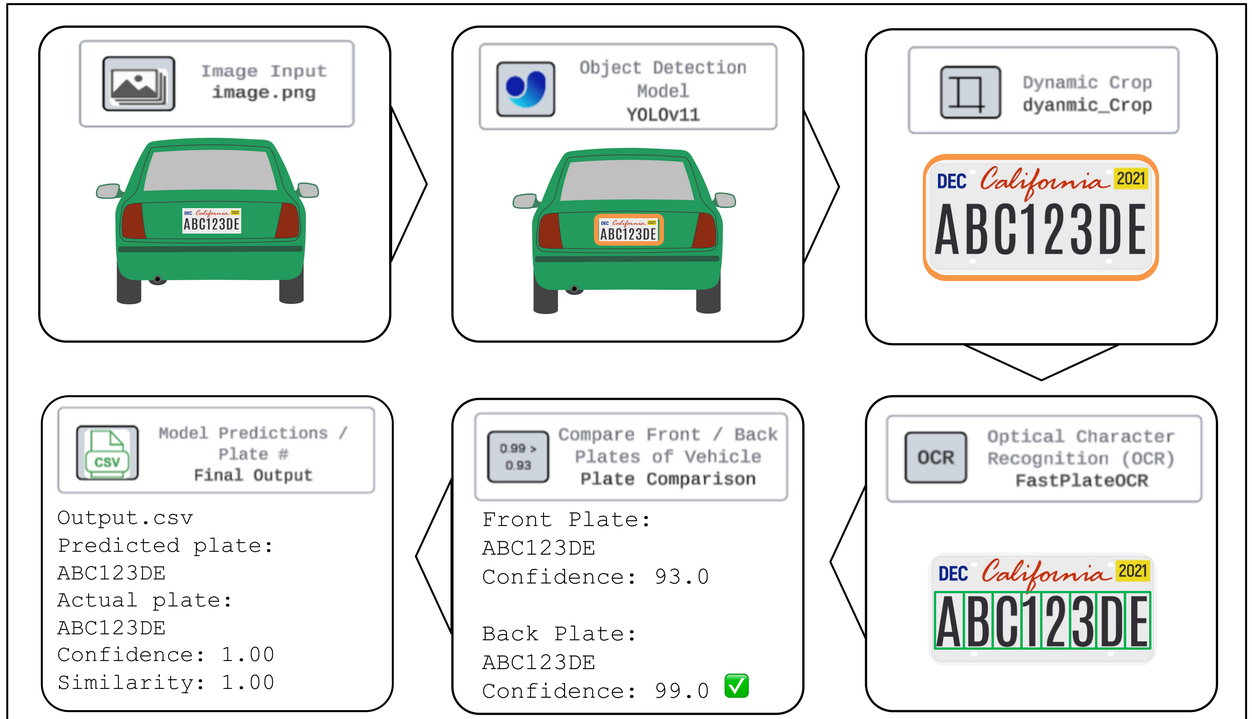
Our Data

- CSV containing PLATE_TYPE, PLATE_READ, PLATE_JURISDICTION, IMAGE<1-4>
- ~ 400,000 car images with license plate with various conditions (i.e rain, snow, etc.)

YOLO (You Only Look Once)

Used an off-the-shelf **YOLO11** model

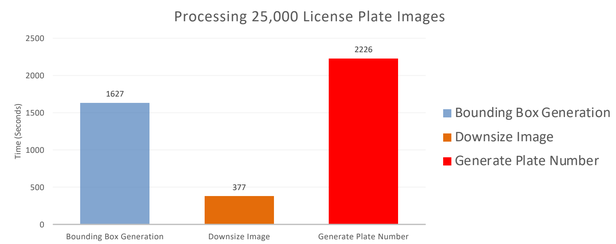
- It provides feature extraction and high-precision **bounding boxes**
- Reliably isolates **plates** from complex backgrounds, supporting high-speed inference for large-scale processing
- Processes and crops **12.63 Images** per second reaching **25,000 images** processed and ready for OCR passthrough **in 33 minutes** with the use of OpenCV2



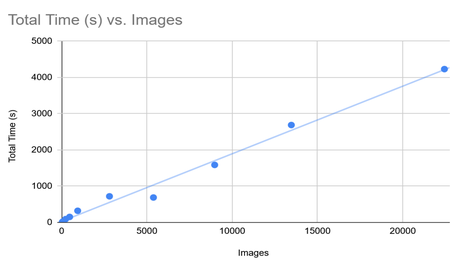
Character Recognition

- **Optical Character Recognition** (OCR) is used to classify letters, numbers and characters from an image
- We use **FastPlateOCR** to classify each letter of the cropped license plate to generate our final plate read
- Generates overall **confidence values** to compare with other images attributed to the same car

Results



Our model processed **25,000 images in 70.5 minutes**, achieving an overall accuracy of **91%** across all vehicle detections.



Edge Cases

Non-typical license plates hinder plate readings. These **outliers** in our system include:

- Emblems
- Stacked Letters
- Extreme Darkness
- Multiple Car Within Frame

Conclusion & Future Goals

- **Conclusion:** Our License Plate Pipeline integrates a series of recognition models to accurately detect the plate numbers of passing vehicles with an **accuracy of 91%** and outputs reads to a fully detailed csv file.
- **Future Goals:** Will strive to increase accuracy and speed of the system as well as better detect difficult edge cases, specifically those with badges and stacked letters

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References

https://github.com/ankandrew/fast-plate-ocr\

https://github.com/morsetechlab/Yolov11-License-Plate-Detection/