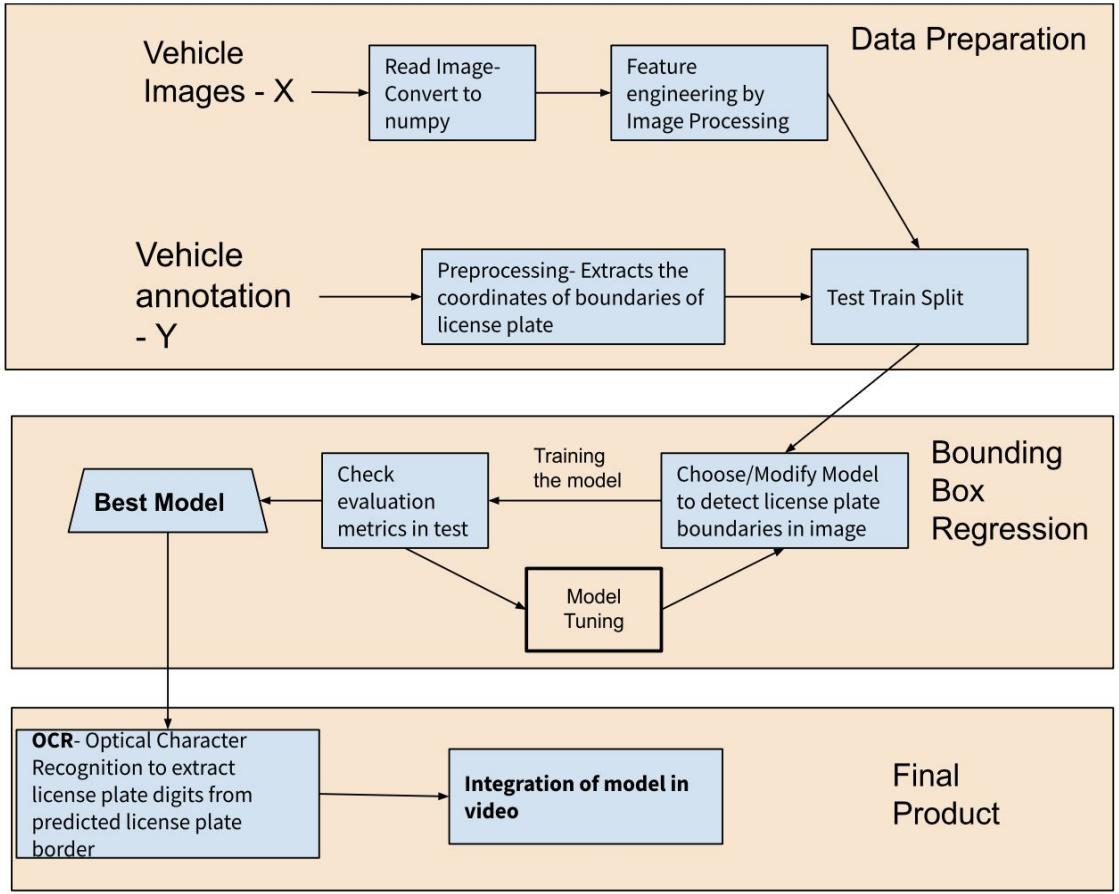
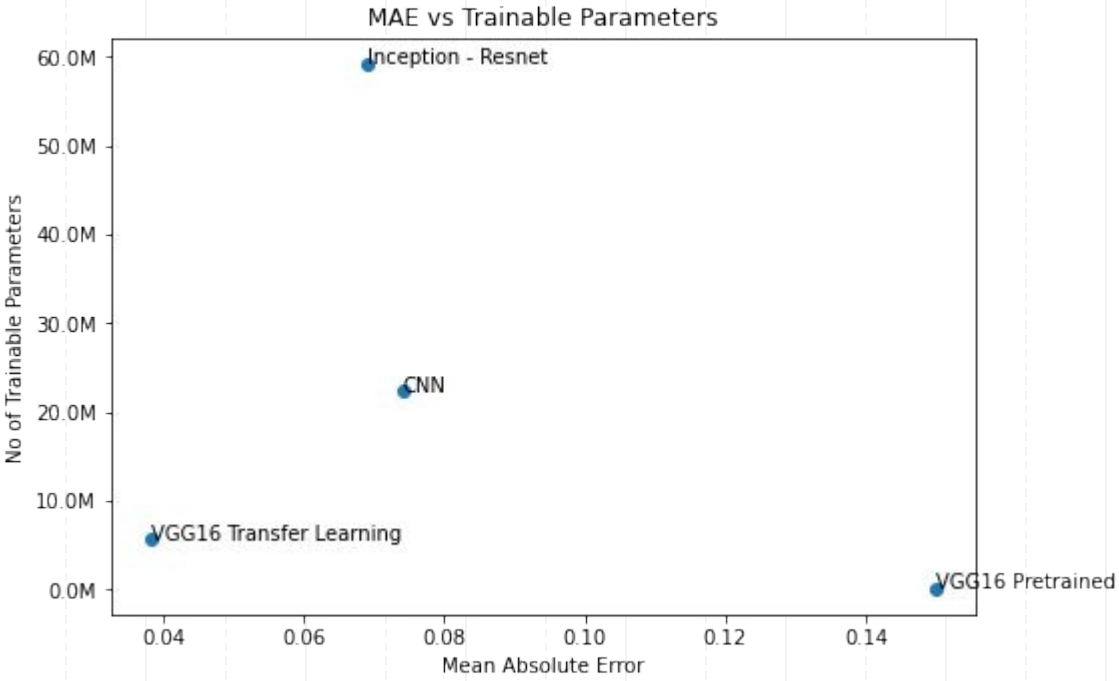
# Automatic Vehicle License Plate Detection



# Model Comparison- Baseline

| | CNN | VGG16- Pretrained | VGG16-Transfer Learning | Inception Resnet- Fully trained |
|---|---|---|---|---|
| **Layers** | 7 Layers -<br>3 Convolution Layers<br>2 Max Pooling<br>1 Final Output with sigmoid activation | 2 Layers-<br>1 VGG16 Layer<br>1 Final Output with sigmoid activation | 5 Layers-<br>1 VGG16 Layer<br>3 Output Layers with relu activation<br>1 Final Output with sigmoid activation | 5 Layers-<br>1 Inception Resnet Layer<br>3 Output Layers with relu activation<br>1 Final Output with sigmoid activation |
| **Comment** | Simple Implementation | Pretrained Weights | Last Convolution Layer Retrained | Fully trained |
| **MSE (testing)** | 0.0139 | 0.0492 | 0.0044 | 0.0122 |

# Model Performance vs Complexity



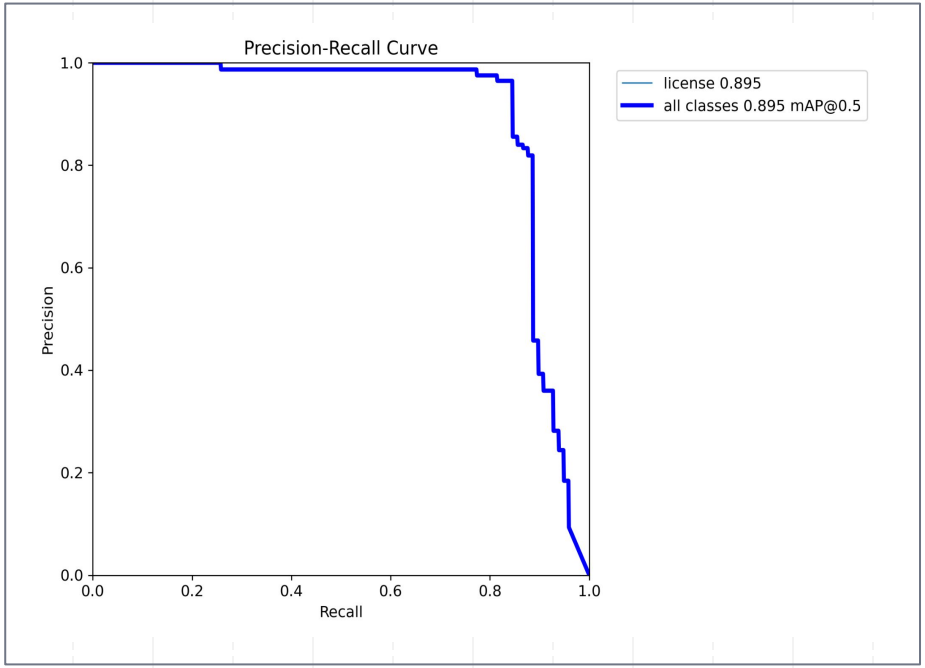
# YOLO V5- Chosen Model

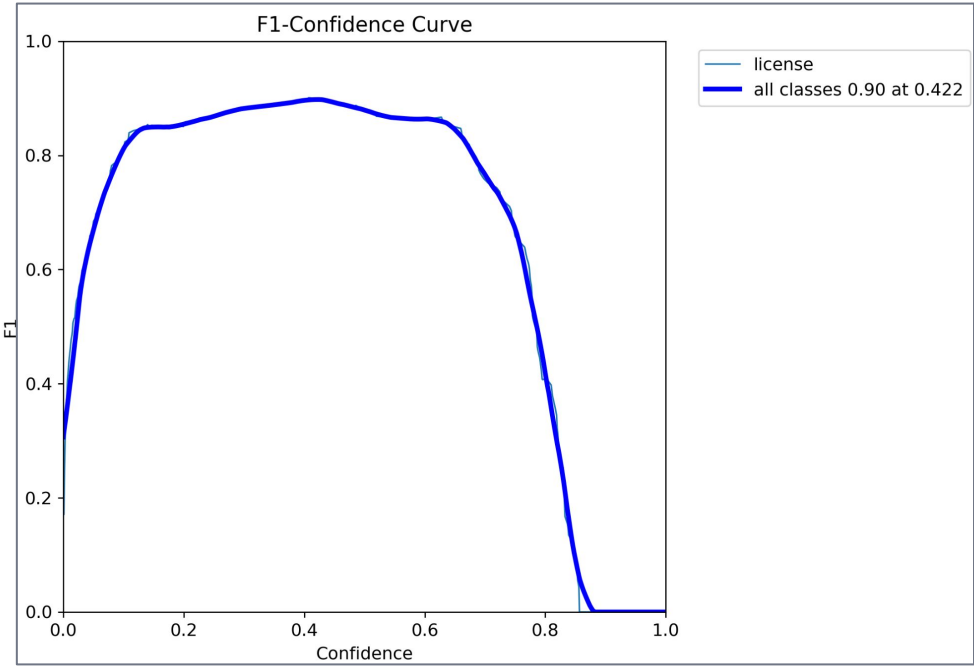
## How does it work?

# YOLO V5- Results


| | | Predicted as license plate |
|---|---|---|
| Actual | license | **0.86** |
| | background | **0.14** |

# YOLO V5 - Results (Cont'd)

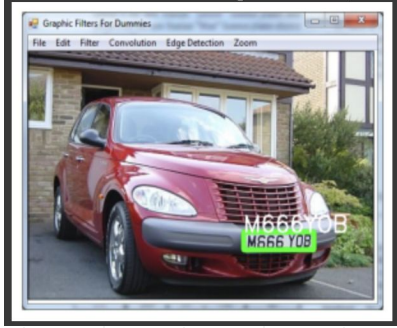


# OCR - Results

```
Photo width,height: 400,225. Detected plates: 1
Detection: 1. YOLOv5 prob: 0.79, easyOCR results: ALR486
```


```
Photo width,height: 507,388. Detected plates: 1
Detection: 1. YOLOv5 prob: 0.67, easyOCR results: M666YOB
```




```
Photo width,height: 400,248. Detected plates: 1
Detection: 1. YOLOv5 prob: 0.77, easyOCR results: PGQMN112
```


```
Photo width,height: 500,375. Detected plates: 1
Detection: 1. YOLOv5 prob: 0.74, easyOCR results: 802LIN MAY VIRGINIA 07
```

# Appendix

# Automatic Vehicle License Plate Detection

| Action Items | Status |
|---|---|
| **Research**-on Existing AVLPD Solutions and image processing packages such as open cv, keras and tensorflow | Completed |
| **Data Manipulation:** To build test train DataSets using Image Processing Techniques | Completed |
| ***Model Building**- 3 models built<br>1) **Tuned CNN**<br>2) **Non Tuned VGG16 model**<br>3) **Tuned VGG16 Model**<br>4) **Inception ResNet** | Completed |
| **To try other options to increase prediction validation accuracy and minimise loss**<br>**Image PreProcessing-** To test image pre-processing techniques such as image blurring prior to the introduction<br>**Image Augmentation:-** To increase the training sample size | Completed |
| **Model Finalization-** To compare models and choose the best one based on accuracy and latency tradeoffs | Completed |
| **OCR-** To pickout the license plate digits from the recognised license plate | Completed |
| **Real time Video Integration-** Not part of MVP. If Time permits | Left out of scope |