

Introduction and Project Flow

Vehicle Number Plate Detector can detect the license number of Car from the images obtained from surveillance camera . It can be used at tolls for recording the license number and finding the stolen cars etc . Below is the flow of project which contain 3 major steps :



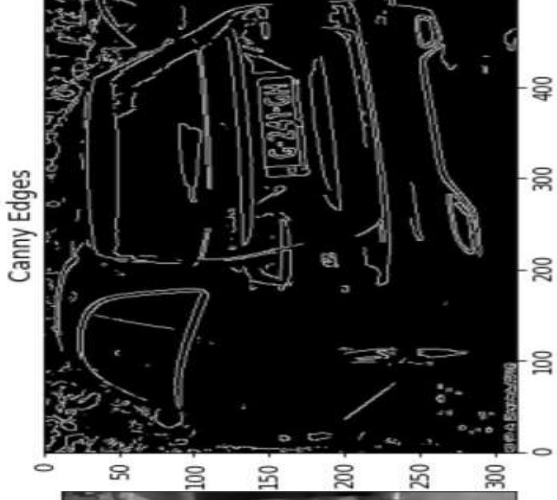
Object detection using finding contours(Preprocessing)

Input image

Gray scale image

Noise
elimination

Canny edge detection



- Each contours are approximated to form a Polygon .
- Contours with favourable condition are detected using cv2 library

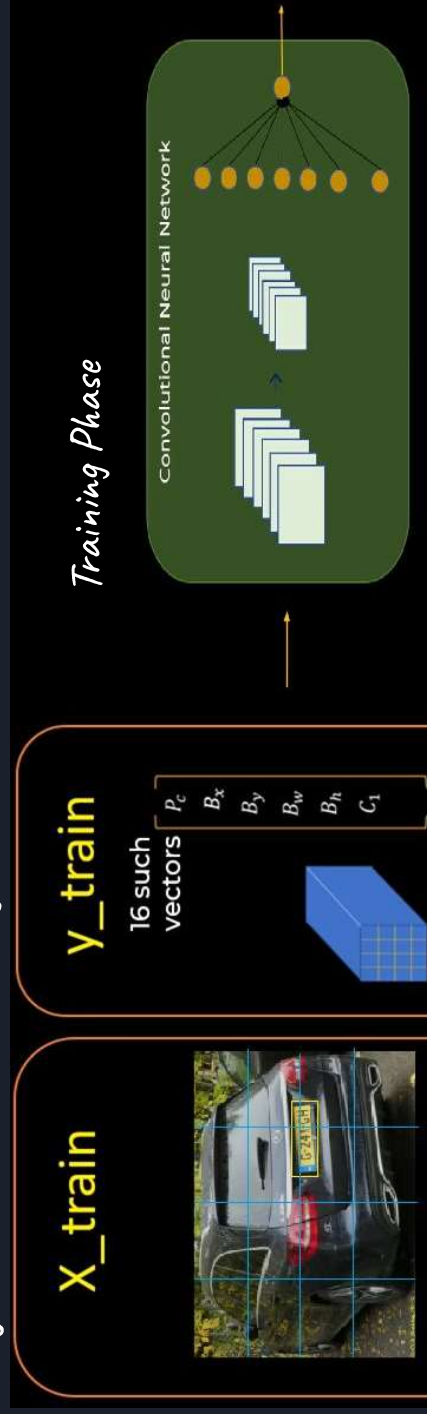
Conditions:

1. Area>30
2. Quadrilateral in shape

- Rotation(if needed)



Object Detection Using YOLOv3

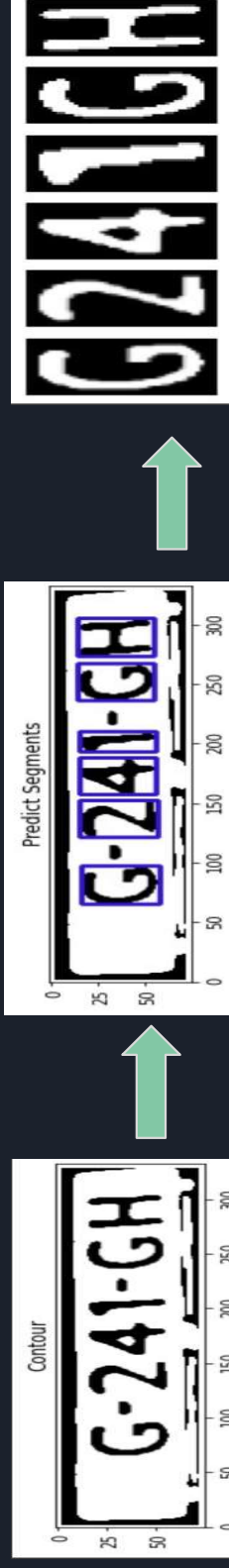


- We will use Pre-Trained Model with YOLOv3 weights for vehicle plate detection . We have got this from Kaggle .
- Final Result :



Character Segmentation

- Pre Processing - Resizing, Grayscale conversion, Binarization, Eroding, Dilate
- Contour detection
- Finding bounding rectangle of each character by dimension comparison.



Character Recognition using CNN

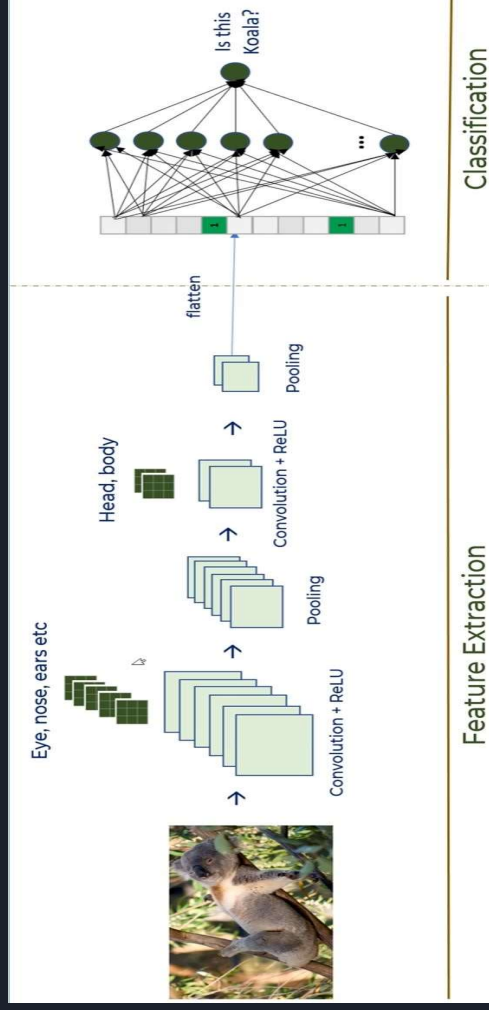
CNN Model Summary that we use for Character Recognition:

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 28, 28, 16)	23248
conv2d_1 (Conv2D)	(None, 28, 28, 32)	131104
conv2d_2 (Conv2D)	(None, 28, 28, 64)	131136
conv2d_3 (Conv2D)	(None, 28, 28, 64)	65600
max_pooling2d (MaxPooling2D)	(None, 7, 7, 64)	0
dropout (Dropout)	(None, 7, 7, 64)	0
flatten (Flatten)	(None, 3136)	0
dense (Dense)	(None, 128)	401336
dense_1 (Dense)	(None, 36)	4644

Total params: 757,268
Trainable params: 757,268
Non-trainable params: 0

Working of CNN



Hyper Parameter Tuning :

For dropout rate = 0.2

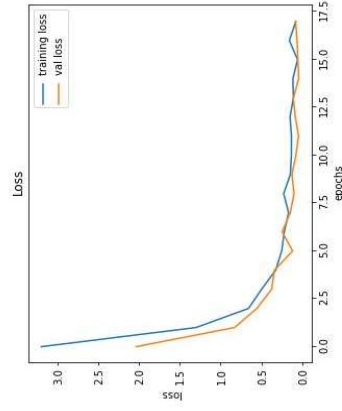
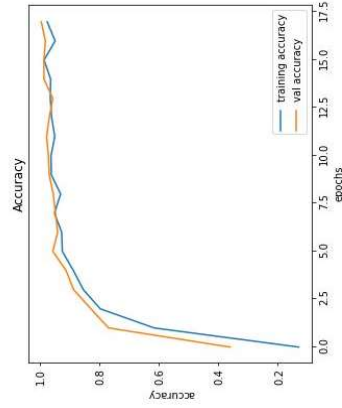
	adam	sgd	rmsprop
Lr=0.001	0.8925	0.9743	0.9285
Lr=0.0005	0.9506	0.9754	0.9598
Lr=0.0001	0.9726	0.8321	0.9794

For dropout rate = 0.4

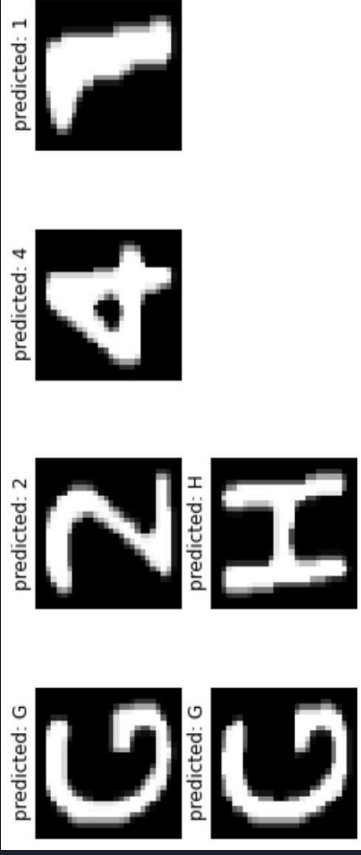
	adam	sgd	rmsprop
Lr=0.001	0.2944	0.9656	0.8888
Lr=0.0005	0.9441	0.9479	0.9322
Lr=0.0001	0.9812	0.6574	0.9618

Loss function : sparse_categorical_crossentropy and optimal dropout rate = 0.4 , optimal learning rate = 0.0001 , and optimizer = adam

Training Accuracy and Loss vs Epochs :



Predicting the Characters :-





Conclusions:

- 1) Accuracy for Number Plate Detection using Finding Contour comes out to be around 63 % .
- 2) Accuracy for Number Plate Detection using YOLOv3 comes out to be around 72 % .
- 3) Contour Method may return any rectangular objects found in an image , hence its accuracy is less compared to YOLO v3
- 4) It's important to do preprocessing before every step in order to get better results .
- 5) Hyper parameter tuning in CNN helps us to get the optimal parameter and thus increase model efficiency .