# Vehicle number plate detection

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*Abstract*—

One of the most significant parts of integrating computer technologies into intelligent transportation systems (ITS) is vehicle license plate recognition (VLPR). In most cases, however, to recognize a license plate successfully, the location of the license plate is to be determined first. Vehicle License Plate Recognition systems are used by law enforcement agencies, traffic management agencies, control agencies, and various government and non-government agencies. VLPR is used in various commercial applications, including electronic toll collecting, personal security, visitor management systems, parking management, and other corporate applications. As a result, calculating the correct positioning of a license plate from a vehicle image is an essential stage of a VLPR system, which substantially impacts the recognition rate and speed of the entire system. In the fields of intelligent transportation systems and image recognition, VLPR is a popular topic. In this research paper, we address the problem of license plate detection using a You Only Look Once (YOLO)-PyTorch deep learning architecture. In this research, we use YOLO version 5 to recognize a single class in an image dataset.

## I. Introduction

Vehicle License Plate Recognition aims to detect the presence of a license plate on a vehicle in a concise amount of time and with high accuracy. The license plate of a vehicle is usually referred to as a "number plate." It's a metal plate fitted to a car that carries its official registration number imprinted on it. The vehicle can be identified using the number plate placed on both front and rear sides. Over the last few decades, License Plate Recognition (LPR) has been a methodology utilized in various Intelligent Transportation Systems (ITS). It replaces the efforts of humans in recognizing the license plate. This proposed LPR system is primarily used in a car park with a static camera rather than a high-speed vehicle plate recognition setting. In a traditional LPR system, the initial step is to collect a vehicle image with the license plate using a camera. After that, several image processing techniques are used to convert the digital image into usable information. License Plate (LP) detection, character segmentation [9], and character recognition are the three steps of most LPR systems. Because non-observance of LP would lead to failure in the subsequent phases., the early steps require better accuracy or near-perfection, and this paper focuses on the detection part only.

To reduce processing time and prevent false positives, many approaches scan the car

## II. Why is it necessary to register?

A LEGALLY PURCHASED MOTOR VEHICLE MUST BE REGISTERED WITH THE LOCAL AUTHORITY OR THE GOVERNMENT. THIS HELPS PREVENT THEFT OF THAT VEHICLE AND IDENTIFY THE CRIMES COMMITTED USING THAT VEHICLE. BY REGISTERING THE VEHICLE, A RECORD IS CREATED, WHICH GIVES THE VEHICLE ITS UNIQUE IDENTITY

### Contents of Number Plate:

Number plate comes in various colors and numeric or alphanumeric characters. These colors signify the authority of the owner of that vehicle. The numeric or alphanumeric character combination varies from country to country, and it is the record that gives the vehicle its unique identity.

### Proposed Solution:

The issue at hand can be resolved by utilizing various object detection methods, where we must train our model using photos of cars and other vehicles with license plates but in this research work, we are focused on using YOLO v5s[1]. YOLO v5s is used to detect the presence of a number plate in a given image along with its location and confidence of being a number plate in the detected location[1]. We used Google Colab for this experiment because of the free availability of GPUs. The proposed solution, along with character recognition, is likely to be integrated with a web application. The backend will display the contents to the user after the camera takes the image of the vehicle

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To avoid confusion, the family name must be written as the last part of each author name (e.g. John A.K. Smith).

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Email address is compulsory for the corresponding author.

Future Work:

This work can further be extended to recognize the characters of the detected number plate by the proposed solution and implementation in a web app connected to a database of car owners to make it more versatile and beneficial for the country's judicial system. An increase in the number of images in the dataset can result in better detection accuracy. Furthermore, if the number plates of a particular country are used, the model will work better. Dataset can be changed to video format further to test the detection rate and accuracy of the model. Hyperparameter tuning can be done with more precision to generate better results. YOLO v5 also gives the option of custom architectures and anchors, which can be explored moreCONCLUSIONS

This research work will significantly benefit the future of object detection, especially in vehicle detection. It uses the latest version of YOLO, i.e., version 5, and the miniature version for number plate detection. YOLO v5, in a traditional sense, does not bring any novel architectures or losses, or techniques to the table. However, it vastly improves the speed with which individuals may integrate YOLO into their existing pipelines. It is written in PyTorch (python), while the older version was in C, making it more friendly to people and companies. It includes a simple approach to defining experiments utilizing modular config files, quick inference, mixed-precision training, improved data augmentation approaches, etc. There is yet to be a research paper released for YOLO v5. The outcome of this research work was pretty good with the mAP@0.5 values of 0.984 on the dataset of 800 images split into 70:20:10 ratio for train, test, and validation. ACKNOWLEDGMENT

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