Architecture Design

Vehicle Number Plate Detection

Index

Abstract

The Vehicle Number Plate Detection Using Deep Learning project aims to develop an efficient and accurate system for automatic number plate recognition (ANPR) using state-of-the-art deep learning techniques. The project leverages a diverse dataset of vehicle images with labeled number plate regions to train and fine-tune a deep learning model. The proposed system goes through data preprocessing, model training, validation, and testing phases, ensuring high accuracy and robustness. The project's successful implementation will contribute to enhancing law enforcement, traffic management, and other transportation-related applications, promising safer and more streamlined roadways.

1. Introduction

1.1 What is Architecture Design?

The goal of Architecture Design (AD) or a low-level design document is to give the internal design of the actual program code for the `Campus placement prediction`. AD describes the class diagrams with the methods and relation between classes and program specification. It describes the modules so that the programmer can directly code the program from the document.

1.2 Scope

Architecture Design(AD) is a component-level design process that follows a step-by-step refinement process. This process can be used for designing data structures, required software, architecture, source code, and ultimately, performance algorithms. Overall, the data organization may be defined during

requirement analysis and then refined during data design work. And the complete workflow.

1.3 Constraints

We only predict the expected number plates status based on the unstructured data with annotation files.

2. Technical Specification

2.1 Dataset

We got the data from kaggle. The data consists of images and annotation files.

```
In [10]: df = pd.DataFrame(label_dict)
         df.to_csv('labels.csv', index= False)
         df.head()
```

Out[10]:

	filepath	xmin	xmax	ymin	ymax
0	C:\Users\admin\Documents\ML\project\Automatic_...	1093	1396	645	727
1	C:\Users\admin\Documents\ML\project\Automatic_...	134	301	312	350
2	C:\Users\admin\Documents\ML\project\Automatic_...	31	139	128	161
3	C:\Users\admin\Documents\ML\project\Automatic_...	164	316	216	243
4	C:\Users\admin\Documents\ML\project\Automatic_...	813	1067	665	724

:

2.2 Logging

We should be able to log every activity done by the user

- The system identifies at which step logging is required.
- The system should be able to log each and every system flow.
- Developers can choose logging methods. Also can choose database logging.
- The system should be not be hung even after using so much logging. Logging just because we can easily debug issuing so logging is mandatory to do.

2.3 DataBase

The system needs to store every request into the database and we need to store it in such a way that it is easy to retain and look into the records.

The system should capture every data that any user gave and the prediction that has been made by that input.

2.4 Deployment

For the hosting of the project, we will use AWS

3. Technology Stack

Front End	HTML,CSS,JS
Backend	Python

Deployment	AWS

4. Proposed Solution

Proposed Solution for Vehicle Number Plate Detection Using Deep Learning:

The proposed solution for vehicle number plate detection using deep learning involves the following steps:

Data Collection: Gather a diverse dataset of vehicle images with annotated number plate regions.

Data Preprocessing: Resize and normalize the images, and extract the number plate regions to create input samples.

Transfer Learning: Fine-tune the pre-trained deep learning model on the collected dataset to improve detection accuracy.

Validation: Evaluate the trained model on a separate validation dataset to measure its performance.

Real-Time Application: Deploy the trained model to perform real-time number plate detection in video streams or images.

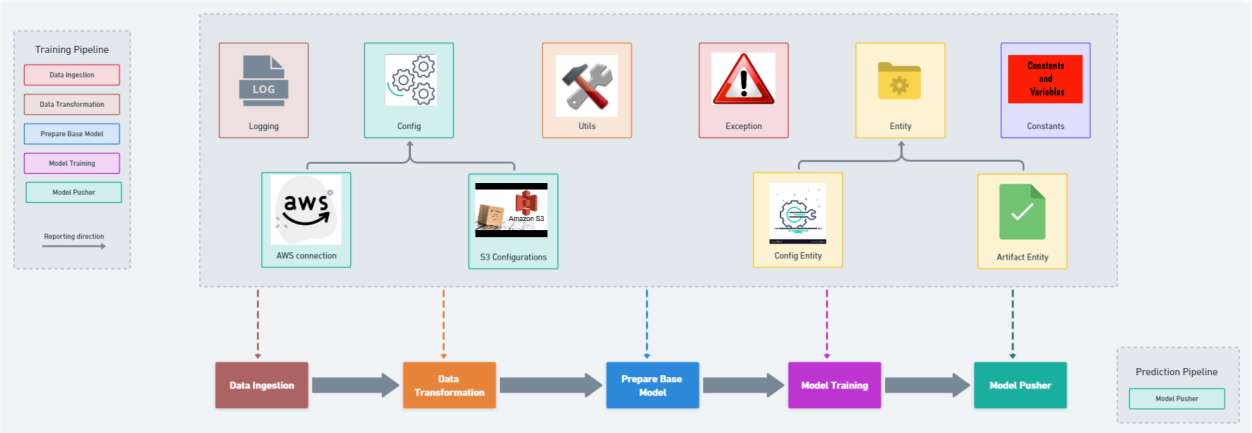
Performance Optimization: Optimize the model for faster inference on resource-constrained devices, ensuring real-world efficiency.

Testing and Validation: Test the system on various scenarios and validate its accuracy and robustness.

Integration: Integrate the vehicle number plate detection system into the desired applications, such as traffic monitoring, law enforcement, or toll collection.

By following this proposed solution, we aim to develop a reliable and efficient deep learning-based vehicle number plate detection system, contributing to improved road safety and transportation management.

5 Architecture detail



5.1 Data Gathering

Data source:
https://www.kaggle.com/datasets/aslanahmedov/number-plate-detection

6. User Input / Output Workflow.