High-Level Design

Vehicle Number Plate Detection

The project is about building a system that can detect the vehicle number plate. We have collected the data from kaggle and bring this data to our model for training DL model.

1. Introduction

1.1 Why these High-Level Design Documents?

The purpose of this High-Level Design (HLD) Documents is to add necessary details to the current project description to represent a suitable for coding. This document is also intended to help detect contradictions before coding. And can be used as a reference manual for how the modules interact at a high level.

The HLD will be :

- · Present all of the design aspects and define them in detail.
- · Describe the user interface being implemented.
- · Describe the needed Python libraries for the coding.
- · Describe the performance requirements.
- · Include design features and the architecture of the project.
- · List and describe the non-functional attributes like:
  - o Security
  - o Reliability
  - o Maintainability
  - o Portability
  - o Reusability
  - o Application Compatibility
  - o Resource Utilization
  - o Serviceability

1.2 Scope

The HLD documentation presents the structure of the system, such as the database architecture, application architecture(layers), application flow (Navigation), and technology architecture, The HLD uses non-technical and mildly-technical terms which should be understandable to the administrators of the system

1.3 Definition

TERM	Description
DB	A database is **information that is set up for easy acce** **management and updating**. Computer databases typically st aggregations of data records or files that contain information, such as sales transactions, custom data, financials and product information.
DL	Deep Learning
API or APIs	APIs are mechanisms that enable two software components communicate with each other using a set of definitions a protocols.

2. General Description

2.1 Product Perspective

The Vehicle Number Plate Detection is an DL-based Web Application that Is able to detect number plates based on given images as a input. It will detect correct any license plate number.

2.2 Problem Statement

Automatic vehicle license plate detection and recognition is a key technique in most

traffic-related applications and is an active research topic in the image processing domain.

As a result, different methods, techniques and algorithms have been developed for

license plate detection and recognition.

2.3 Proposed Solution

We used InceptionResNetV2 architecture with Relu activation function in the hidden layer and Sigmoid activation in output layer. And compile the model as MSE loss function. And fit the model.

2.5 Data Requirements

They had not been given on the dashboard so we collected the data from kaggle. The data consist of images with annotation files.

2.6 Tool Used

The programming language is Python that is used here, also we will use some other python-based libraries like for DL we will use Tensorflow library, for data manipulation we will use pandas, for custom APIs creation we use frameworks.

2.7 Constraints

The System should be user-friendly, the user should get all proper messages while using the web app. He/she also should get a proper error message if he/she has done something wrong On the web-app page. All the errors and results should be delivered

in the easiest possible way and all the buttons are going to insert on the webpage should be labeled properly, so the user did not get confused to use the system.
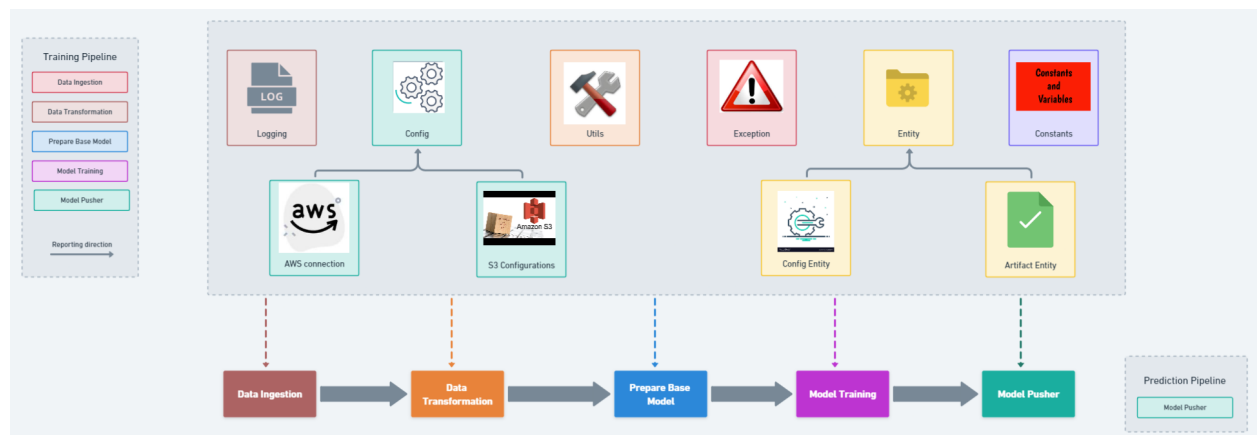
2.8 Assumptions

The main objective is to implement a system that will detect the license plate to help the cops or some organization if any wrong act is detected.
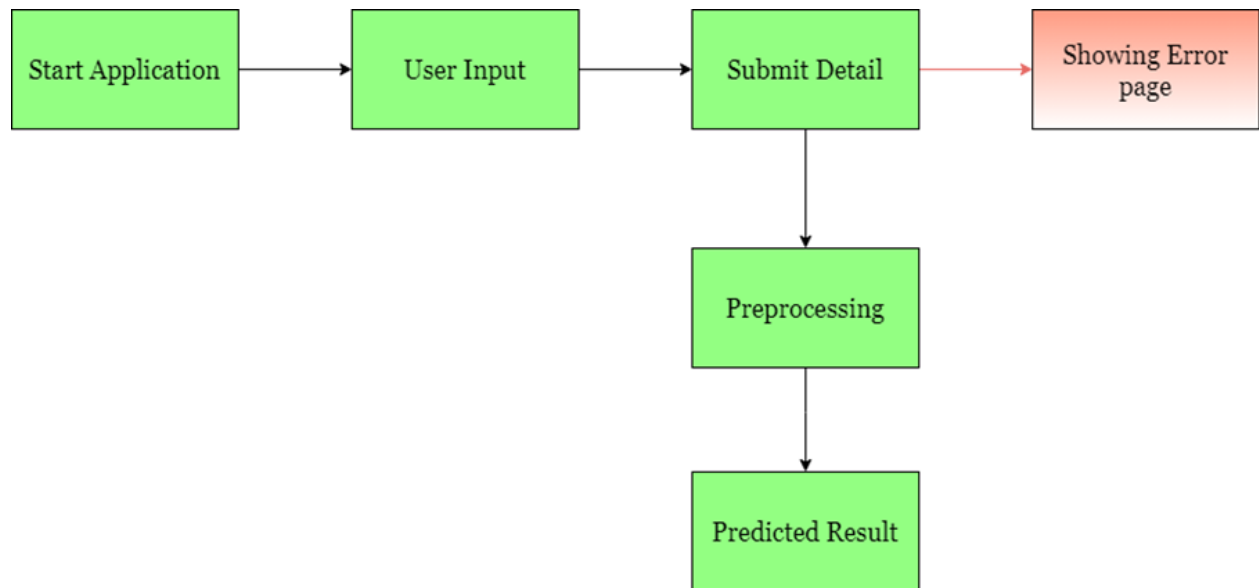
3. Design Details

3.1 Process Flow

We will be using following process flow for this project. The process will be based on modular coding i.e. use of oops concepts to build the entire project from start to end.

3.2 Deployment Process

3.3 Error Handling

If any error occurred in the processing way then the error message should be shown to the user in a completely non-technical way that can be understandable by any person.

4. Performance

The Vehicle Number Plate Detection is base on Convolutional Neaural Networks. InceptionResNetV2 architecture with Relu activation function in the hidden layer and Sigmoid activation in output layer. And compile the model as MSE loss function. And fit the model. And it gave very good accuracy.

4.1Reusability

The **code** written **and** the components **used** should have the **ability** to be **reused with** no **problems**.

4.2 Application Compatibity

The different **components for this project** will be **using** Python as an interface between **them**. Each **component will** have **its** own **task** to perform, and it **is** the job **of the** Python to ensure proper transfer of information.

4.3 Resource Utilization

Our application should utilize the given resource properly and it should use a minimal amount of internet to work and call the APIs on the Web page.

5. Deployment

The cloud environment was set up and the project was deployed from AWS cloud platform.

6. Conclusion

Vehicle number plate detection is a crucial technology that has numerous practical applications, such as enhancing law enforcement, automating toll systems, and improving traffic management. Through the use of advanced computer vision techniques and machine learning algorithms, accurate and efficient number plate detection systems can be developed to ensure safer roads and streamline various transportation-related processes.