

Artificial Intelligence Department Assignment

Project Overview: Building an Intelligent License Plate Recognition System

Imagine a bustling city where vehicles from across the globe traverse highways and urban streets. From law enforcement agencies ensuring public safety to logistics companies tracking fleet operations, identifying and processing license plates accurately is paramount. In this context, our mission is to build a cutting-edge **Automatic License Plate Recognition (ALPR) System** that not only detects license plates but also extracts and interprets the embedded information to deduce their country of origin.

Project Workflow

→ Manual Annotation with LabelImg

The journey begins with precision labeling. By using the **LabelImg tool**, we will manually annotate license plates in our image dataset. These annotations serve as the foundation for training a robust detection model, ensuring high accuracy in real-world scenarios.

→ Deep Learning Model for License Plate Detection

A reliable detection mechanism is the heart of the system. We will implement a deep learning model—such as **YOLO (You Only Look Once)** or **Faster R-CNN**—to automatically identify and mark license plates in the provided images. This model will be trained and validated on the annotated dataset, enabling it to efficiently detect license plates in diverse conditions, such as varying lighting, angles, and backgrounds.

→ Optical Character Recognition (OCR) for Text Extraction

Once license plates are detected, the focus shifts to extracting the text. By applying an OCR engine like **Tesseract**, the system will convert the visual information of the license plate into readable text (e.g., license plate numbers).

- To enhance OCR accuracy, **image preprocessing techniques** like resizing, thresholding, and noise reduction will be utilized. These steps will minimize distortions and improve text recognition under challenging conditions.

→ Identifying the Country of Origin

Decoding the license plate text is just the beginning. Each country has unique license plate formats (e.g., “34ABC123” for Turkey or “BXX 1234” for Germany). The next challenge is to classify the country based on the extracted text.

- Using a combination of **regular expressions** and a comprehensive **lookup table** for various national license plate formats, the system will determine the origin of each plate. This feature adds a layer of intelligence to the recognition process, enabling the system to handle plates from multiple regions seamlessly.

Key Goals

- **Accuracy in Detection:** Achieving a high detection rate for license plates under diverse real-world conditions.
- **High-Quality Text Recognition:** Maximizing OCR accuracy through effective preprocessing techniques.
- **Country Identification:** Implementing a robust methodology for mapping text to country-specific formats using logical rules and data structures.

Bonus Assignment:

- The model to be implemented in the code will provide extra points if it detects license plates in real-time.

Project Requirements and Tools

→ Dataset and Programming Language

- A dataset containing images of vehicles will be provided.
- The project must be implemented using the **Python programming language**.

→ Tools and Resources

- **Labelling**: For manual annotation of license plates.
- **IDE**: Any preferred IDE such as **PyCharm**, **VS Code**, or **Jupyter Notebooks** can be used.

Project Delivery Guidelines

→ Submission Details

- The project must be uploaded to **GitHub**, and notification of the submission should be provided.

→ Optional Enhancements

- Implementing additional methods beyond the given examples (e.g., an **automatic labeling system**) can lead to extra credit and improved evaluation.