IIT Tirupati Navavishkar I-Hub Foundation Coding Challenge – 2

Title: Develop a Parking Slots Identification and Tracking Model

Background: In urban areas, particularly in commercial zones like shopping malls, multiplexes, hospitals, and business complexes, the increasing number of vehicles has made parking space management a critical challenge. Traditional parking systems often rely on manual supervision, which leads to inefficiencies such as prolonged vehicle queuing, underutilized slots, and a poor user experience. This Task involves the development of an automated parking slots identification and tracking model becomes which can detect and monitor the occupancy status of individual parking spots using real-time video feeds or images from overhead cameras. Furthermore, integration with digital displays and mobile applications can streamline the parking experience, reduce traffic congestion within the premises, and enhance overall operational efficiency. Automated monitoring also supports data analytics for demand forecasting and future infrastructure planning.

Description of Challenge: The main aim of this task is to detect the parking slots automatically to help the parking owners to know about the status of parking area. This task involves the following sub-tasks but not limited to:

1. Preprocessing of the parking area image
2. Parking Slot Detection
3. Occupancy Status Classification
4. Output Visualization (Count the number of occupied and available slots)

Input Data: the input data is given in the image format; sample image is shown in Figure.1;

Output Data:

An excel sheet or CSV sheet which includes all the extracted characters and numbers as follows;

Total Number of Slots	Occupied Slots	Available Slots
135	39	96

Figure.1 Image of a parking zone

Hints for better Performance:

1. Preprocessing the image for color and contrast enhancement and noise removal.
2. AI / ML algorithms for cars detection and slots identification.
3. Apply image conversion methods at the pre-processing level to extract better features.

Deliverables:

A. **Output Files:** A CSV or Excel sheet with information about total number of slots, occupied slots and available slots.

B. **Code Repository:** A complete code repository which consists of entire system which includes preprocessing, parking slot detection, occupancy classification and Output Visualization. (Preferred format is .zip)

C. **Report:** A summarized report which explain the complete details about the methods, tools and performance analysis. (Preferred format is .pdf)