Project Design Phase-I
Proposed Solution Template

Date	19 September 2022
Team ID	PNT2022TMID592328
Project Name	Project - AI-Enabled Car Parking Using OpenCV
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	In busy urban areas, finding available parking spaces during peak hours is a common challenge that leads to frustration and delays for drivers. The overcrowding of parking lots, especially at locations like shopping malls, creates a stressful and inefficient experience for motorists. To address this issue, there is a need for an AI-enabled car parking solution that utilizes OpenCV to automate the process of identifying and counting empty parking spaces in real-time, thus enhancing the convenience and efficiency of urban parking for drivers.
2.	Idea / Solution description	This solution utilizes Open CV for an AI-enabled parking system. It monitors the availability of parking space in real time using CCTV camera footage and counts available spaces by using a counting meter which will be available on the screen The system displays the parking lot with marked spaces (occupied or available) and provides a real-time count of open parking spots. The free space will be marked with green rectangle and the occupied space will be marked with red rectangle. This innovative approach streamlines the parking process, enhances convenience for drivers, and helps reduce congestion and frustration in busy urban areas. Fine-tuning and optimizations can further improve accuracy and effectiveness.
3.	Novelty / Uniqueness	**Real-Time Object Detection and Tracking:** The system's ability to perform real-time object detection and tracking using OpenCV distinguishes it from conventional parking systems. This feature enhances security, minimizes the risk of unauthorized access, and ensures efficient utilization of parking spaces. **Optimized Space Allocation:** The AI-driven approach can intelligently allocate parking spaces, considering factors such as vehicle size and available space. This optimization reduces congestion, improves traffic flow, and enhances the overall parking experience for users. **AI-Based Traffic Flow Analysis:** By analyzing the parking lot's traffic flow, the system can provide insights to optimize parking lot layout, reduce bottlenecks, and improve traffic management.
4.	Social Impact / Customer Satisfaction	**Reduced Traffic Congestion:** By optimizing parking space allocation and traffic flow, the AI-powered system helps reduce traffic congestion, making urban areas more efficient and less stressful for commuters. **Safety and Security:** Real-time object detection and tracking enhance parking lot security, reducing the risk of vehicle theft,

		vandalism, and unauthorized access. **Enhanced Accessibility:** Implementing designated accessible parking spots and providing automated assistance for individuals with disabilities makes parking facilities more inclusive and accessible for all members of the community.
5.	Business Model (Revenue Model)	In our business model, we will introduce a parking tag system. Initially, users must register for parking tags, ensuring they maintain a minimum balance in the tag to use it for parking. When a car is parked, the required parking fee will be deducted automatically from the parking tag, calculated based on the duration of time the car remains in the parking lot. Essentially, the parking tag functions as a user's digital wallet for paying parking fees, with charges proportional to the parking duration.
6.	Scalability of the Solution	**Advanced Machine Learning Models:** Fine-tuning and optimizing the machine learning models used by OpenCV enhance the system's accuracy and effectiveness. As the system scales, continuous refinement of these models ensures that the parking occupancy detection remains precise, providing reliable real-time information to drivers. **User-Friendly Interface:** The scalability of the solution is not limited to its backend architecture. The user interface, displaying parking lot availability with color-coded rectangles (green for available spaces, red for occupied spaces), is intuitive and easy to comprehend. Regardless of the parking lot's size, users can quickly interpret the information, promoting seamless scalability without compromising user experience. **Adaptive Hardware Infrastructure:** The system's architecture is designed to work seamlessly with varying hardware setups. This flexibility allows parking facility operators to scale the solution according to their needs, whether it's a small parking lot or a large urban parking complex. It can run on different hardware configurations, from basic cameras to high-end cameras and servers, depending on the scale of the operation.