**Project Design Phase-I**
**Solution Architecture**

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| Date | 27 October 2023 |
| Team ID | Team-593005 |
| Project Name | AI-enabled car parking system using OpenCV |
| Maximum Marks | 4 Marks |

## Solution Architecture:

The AI-powered car parking solution utilizes computer vision and OpenCV to automate the parking process, creating a seamless and efficient experience. It identifies vacant parking spaces and delivers real-time information on spot availability, enhancing user satisfaction and optimizing parking operations. By leveraging computer vision and OpenCV, this advanced parking solution improves overall parking management efficiency, streamlining the parking experience and providing valuable insights for optimizing parking lot operations.

### 1. Data Gathering:

- Places cameras strategically within the parking lot to capture a live video feed.
- Ensures continuous collection of video data for a real-time view of the parking lot.

### 2. Image Preprocessing:

- Preprocesses each frame from the video feed to enhance image quality and extract key features.
- Utilizes techniques like resizing, noise reduction, and contrast adjustment to improve image clarity.

### 3. Model Building:

- Develops a robust machine learning model, potentially employing convolutional neural networks (CNNs), to analyze preprocessed images.
- Trains the model on labeled data to recognize parking spaces and

accurately identify occupied and unoccupied spots.

**4. Empty Parking Space Detection:**

- Systematically processes each frame using the model to identify parking spaces.
- Classifies parking spaces as either 'occupied' or 'empty' based on the presence of vehicles.
- Utilizes object detection algorithms to precisely locate vehicles within parking spots.

**5. Real-Time Analysis:**

- Provides continuous, real-time analysis of the live video feed, actively monitoring parking space status.
- Updates the count of available parking spots in real-time.

**6. User Interface:**

- Offers a user-friendly interface, such as a mobile app or a digital display at the parking lot entrance.
- Provides an up-to-the-minute count of available parking spots, enabling drivers to quickly locate parking spaces.

**7. Alerts and Notifications:**

- Generates alerts or notifications for parking management personnel and drivers based on specific conditions, such as the parking lot reaching a certain capacity or detecting unauthorized parking.

In summary, this AI-enabled car parking solution employs cutting-edge technology to revolutionize the parking experience, ensuring efficiency, user-friendliness, and real-time monitoring for enhanced overall parking management.

**Example - Solution Architecture Diagram:**