Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	20 May 2023
Team ID	NM2023TMID16858
Project Name	Project – AI Enabled Car Parking Using OpenCV

Technical Architecture:

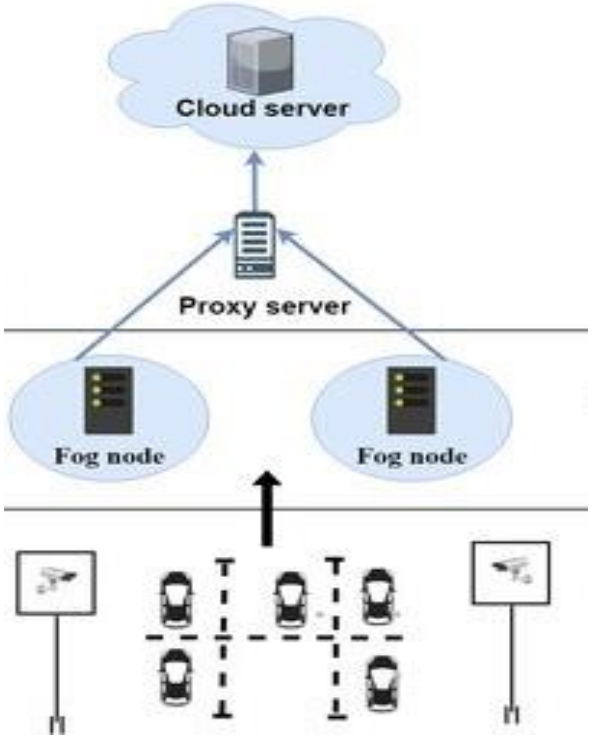

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic	Logic for a process in the application	Java / Python
3.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
4.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
5.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
6.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
7.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.
8.	Camera	The camera captures the live video feed or images of the parking area. It provides visual input to the system for analysis and processing.	USB camera , Raspberry Pi camera

9.	Video Processing	The captured frames are preprocessed	OpenCV
10.	Object Detection	Detects the car which occupied the parking slot	Haar cascades, HOG, SSD, YOLO
11.	Parking Space Detection	Detects the empty slots	OpenCV's contour

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Real-time Object Detection	The system detects cars in real-time, providing live updates on parking space availability.	OpenCV, Object Detection Algorithms (Haar cascades, SSD, YOLO)
2.	Parking Space Segmentation	The system segments the parking area into individual parking spaces for accurate identification and tracking.	OpenCV, Image Processing, Contour Detection
3.	Occupancy Detection	The system determines the occupancy status (vacant or occupied) of each parking space.	OpenCV, Machine Learning, Deep Learning (SVM, CNN)
4.	Accuracy and Reliability	The system achieves high accuracy and reliability in car detection and occupancy classification, minimizing false positives/negatives.	OpenCV, Machine Learning, Deep Learning
5.	Scalability	The system can scale to accommodate parking areas of different sizes and configurations	OpenCV
6.	User-friendly Interface	The system provides a user-friendly interface displaying the parking area and real-time parking space availability.	GUI Frameworks (PyQt, Tkinter)
7.	Adaptability	The system adapts to changing conditions, such as varying lighting or different vehicle types, for robust performance.	OpenCV