Off-Street Car Detection Algorithm for Smart Parking

Team Member and Student ID:

Kunal Sanghvi – 011809708

Abstract:

The idea of smart cities is gaining popularity and becoming more feasible due to rapid technological advancements. However, with the increasing number of vehicles and poor parking management, congestion is becoming a common problem, leading to wasted time and unnecessary pollution. Developing an efficient smart parking system that can help individuals locate available parking spaces is crucial. While extensive research is underway for such systems, many still need to rely on outdated sensor-based methods. This idea introduces an off-street car detection algorithm development, which can ease the process of intelligent parking solutions.

Introduction:

The overarching goal of the smart city concept is to create a self-reliant system by automating various tasks, including monitoring, access, and usage of smart facilities. This allows citizens to embrace new technologies and streamline their daily activities. In India, the average monthly income for an individual is approximately 39,100 rupees. With an increasing standard of living, people are inclined to purchase cars, leading to a yearly increase in car sales. Unfortunately, this surge in vehicles often results in road congestion due to the mismanagement of parking spaces. Consequently, the time spent searching for parking spaces, both on-street and off-street, has steadily risen. In India, areas with high population density offer paid parking options, but individuals must manually oversee the collection of fees and manage available parking spaces. Larger venues like malls follow a similar system, but the challenge lies in handling the increased number of people and parking levels. This necessitates additional manpower, and sometimes, it becomes challenging to determine the availability of parking slots for a specific group, resulting in inefficient parking management. Numerous smart parking systems exist, employing two main approaches: sensor-based and vision-based methods. Therefore, this idea introduces an off-street car detection algorithm that helps in vision-based smart parking solutions.

Technical Plan

Start

|-- Month 1: Preparation and Data Setup

| |-- Define Project Scope and Goals

| |-- Data Collection and Preprocessing

| | |-- Identify Suitable Dataset

| | |-- Data Cleaning and Formatting

| |-- Data Exploration and Analysis

| | |-- Explore Dataset Characteristics

| | |-- Visualize Data

| |-- Model Selection

| |-- Research and Choose Model

|-- Month 2: Model Development and Evaluation

| |-- Model Development

| | |-- Set Up Development Environment

| | |-- Implement Chosen Model Architecture

| | |-- Split Dataset into Training and Validation

| |-- Training the Model

| | |-- Train Model with Training Dataset

| | |-- Monitor Training Progress

| | |-- Implement Data Augmentation

| |-- Hyperparameter Tuning

| | |-- Fine-Tune Hyperparameters

| |-- Model Evaluation and Testing

| | |-- Evaluate Model with Validation Dataset

| | |-- Calculate Metrics (Accuracy, Precision, etc.)

| |-- Testing and Validation

| | |-- Test Model with Separate Testing Dataset

| | |-- Assess Real-World Performance

| |-- Documentation and Reporting

| | |-- Document the Project

| | |-- Create Final Report

| | |-- Prepare Presentation

| |-- Fine-Tuning and Optimization (If needed)

| | |-- Improve Model Performance

|-- Week 10: Final Report and Presentation

| |-- Final Report Preparation

| |-- Presentation Creation

|-- Week 11-12: Buffer Time

| |-- Address Unexpected Issues and Improvements

End