Intel Unnati Industrial Training Program

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Problem Statement

Managing vehicle movement and parking in a college campus can be a challenging task. An intelligent system that can analyse vehicle movement, monitor parking occupancy, and match vehicles to an approved database can significantly improve campus security and management. Your task is to develop an Edge AI-based solution that can analyse vehicle movement using data from cameras capturing vehicle photos and license plates.

Solution

The solution involves deploying high-resolution cameras and edge devices at campus entrances, exits, and parking lots to capture and process vehicle images and license plates in real-time. Utilizing computer vision and machine learning, the system analyzes vehicle movement patterns, monitors parking occupancy, and matches vehicles to an approved database. An intuitive dashboard provides real-time insights and alerts, enhancing campus security and operational efficiency. This scalable and efficient Edge AI-based system ensures better traffic and parking management.

Features Offered

1.**Parking Occupancy Detection**:-Use image processing techniques to monitor parking lot occupancy, identifying vacant and occupied spots in real-time.

2.**Utilizations Insights**:- Analyze parking lot usage trends to determine the most and least occupied times, helping in effective space management

3.**Approved Vehicle Database**:- Maintain a database of authorized vehicles, including license plate numbers and vehicle details

4.**Data Preprocessing**:- Implement algorithms to enhance image quality, normalize data, and filter out irrelevant information before analysis.

Process Flow

1.**Data collection**:-Begin continuous capture of vehicle images and license plates along with timestamps

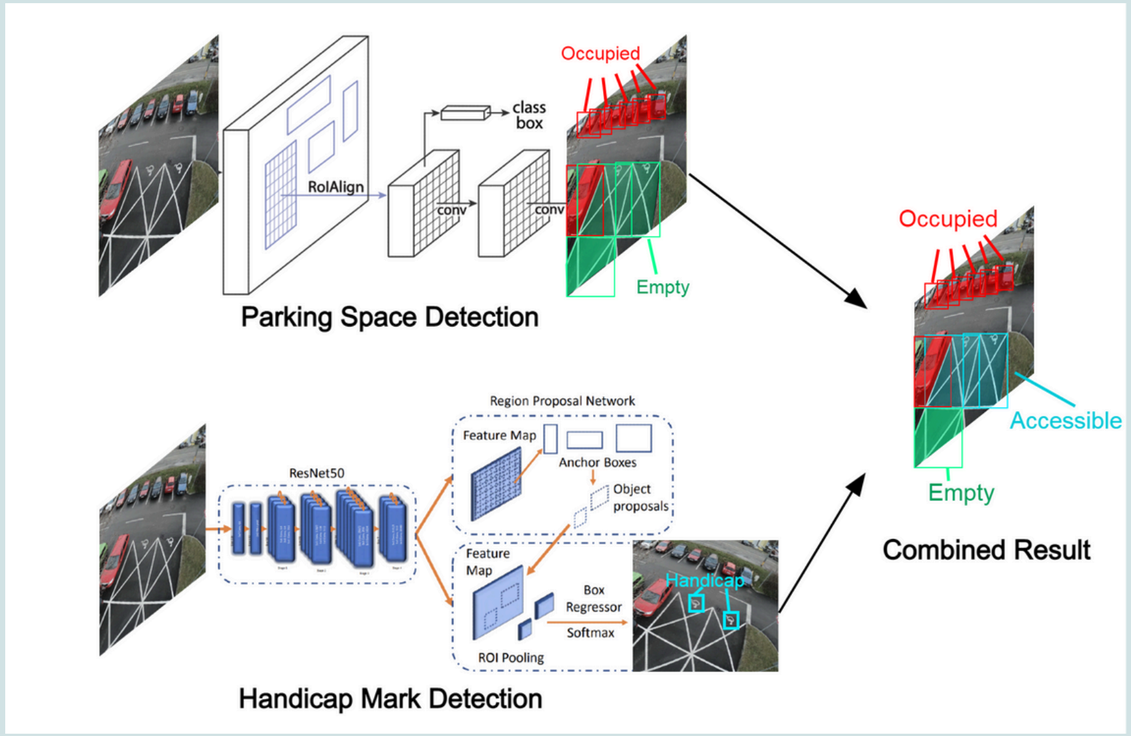
2.**Image Enhancemen**t:- Apply algorithms to enhance image quality

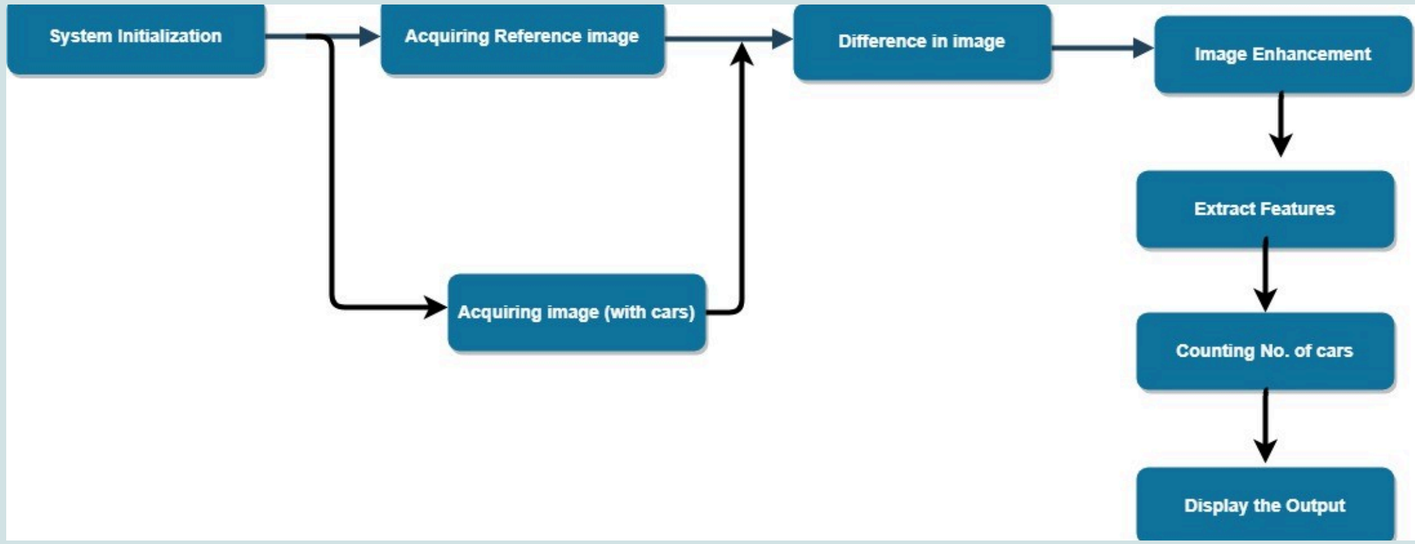
3. **Movement Analysis**:- Use convolutional neural networks (CNNs) and models like YOLO to detect vehicles and recognize license plates

4. **Occupancy Detection**:- Analyze images of parking lots to detect occupied and vacant spots and Use image segmentation and classification algorithms for accurate monitoring

5. **Vehicle Matching**:- Compare detected license plates against the approved vehicle database

Architecture Diagram





TECHNOLOGIES USED

1.Python
2.OpenCv
3.YOLO
4.PyTorch
5.Pandas
6.Matplotlib
7.Sci-kit Learn
8.Kaggle
9.Google Colab

Conclusion

The Edge AI-based Vehicle Movement and Parking Management System enhances campus security and operational efficiency by leveraging real-time vehicle detection, movement pattern analysis, and parking occupancy monitoring. This project showcases the practical application of AI, computer vision, and edge computing, providing valuable insights for better traffic and parking management. Its scalable architecture ensures adaptability to future needs, making it an innovative solution for improved campus management. This project highlights the potential of advanced technologies in creating smarter, safer environments.