**AI Roadside Vendors & Illegal Parking**

**Detection System**

**(Artificial Intelligence Project)**



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# Abstract

Illegal parking and roadside vendors significantly contribute to traffic congestion and urban disruption, especially in densely populated areas. To address this, our project leverages AI to develop a detection system that identifies illegally parked vehicles and roadside vendors using real-time camera feeds. The system utilizes an image dataset that was preprocessed and cleaned before being used to train a YOLOv8 object detection model. This trained model is integrated into a user-friendly website, enabling seamless monitoring and violation detection. By automating these processes, the project reduces the reliance on manual surveillance, ensuring quicker and more accurate identification. This initiative aligns with Pakistan’s Sustainable Development Goals (SDGs), particularly SDG 11, by enhancing urban planning and promoting sustainable traffic management.

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# Introduction:

Roadside vendors have long been a part of Pakistan's urban environment, offering essential goods and providing livelihoods to many. However, their unregulated presence on roadsides has become a major urban management issue. Vendors often set up stalls in unauthorized areas, leading to traffic congestion, blocked pedestrian walkways, and safety hazards. In cities like Karachi, Lahore, and Rawalpindi, the rapid increase in roadside vendors and illegal parking of vehicles has worsened these problems.

With Pakistan’s focus on achieving the Sustainable Development Goals (SDGs), especially SDG 11 on sustainable cities, the need for effective solutions is crucial. Illegal parking and carts on busy roads disrupt traffic, impede emergency services, and increase pollution due to congestion. Authorities struggle to manage these challenges efficiently due to the lack of real-time monitoring.

To tackle these issues, this project proposes using artificial intelligence (AI) to detect roadside vendors and illegal parking. Through real-time camera feeds and pre-recorded videos, the AI system will automatically detect and highlight unauthorized vendors, carts, and vehicles, using object detection algorithm YOLOv8. The system will provide actionable data to municipal authorities, helping them take swift corrective measures.

## Scope:

This project includes developing an AI system that uses real-time camera feeds to identify unauthorized roadside vendors and illegally parked vehicles. It involves collection and training of data for accurate detection. This system can be used by city officials to improve traffic management and make cities safer and more organized.

## Definitions, Acronyms, and Abbreviations:

* **Real-Time Monitoring:** Delivery of continuously updated data about systems, processes or events
* **API:** Application Programming Interface
* **UI:** User Interface

## References:

* Allgo Vision. (n.d.). AI powered illegal parking detection. Retrieved from <https://www.allgovision.com/admin/uploads/datasheets/V4.3_AllGoVision_Datasheet_Illegal_Parking.pdf>
* Universiti Tun Hussein Onn Malaysia. (2023). AI-based analytics for hawkers identification in video surveillance for smart community. Journal of Technology and Science. <https://publisher.uthm.edu.my/ojs/index.php/JTS/article/view/16265>

# Product Perspective:

The product is designed as an independent solution that utilizes artificial intelligence and real-time camera feeds to detect unauthorized roadside vendors and illegally parked vehicles. Relevant projects have also been implemented before like **“AI powered Illegal Parking”** by **“Algo Vision”.** It detects vehicles parking/stopping spots beyond a specified. It monitors, detects and alerts against parking violation by generating alarms in real time. Our project is also similar to this project as that project detects vehicles parked illegally and then it triggers the alarm and our project detects the illegally parked vehicles and then report it to the city officials. The difference between their project and our project is that their project covers the parking area and our project covers the roadside area.

## Product Functions:

The system can perform the following functionalities:

### Real-Time Detection:

The system will utilize AI algorithms to analyze live camera feeds and pre-recorded videos and identify unauthorized roadside vendors and illegally parked vehicles instantly.

### Data Processing:

The system will process video data to extract relevant features and classify objects, ensuring accurate detection.

### User Alerts and Notifications:

The system will generate alerts for city officials when illegal vendors or parking violations are detected, enabling quick response and enforcement actions.

### Managing History:

The system will maintain the history of previously detected violations, including timestamps, locations and images.

### User-Friendly Interface:

The system will provide an intuitive web-based dashboard for city officials to access detection results, view live camera feeds, upload videos and manage previous data.

### User Management:

The system will allow for role-based access control, enabling different levels of access for city officials and administrators based on their responsibilities.

## User Characteristics:

This subsection describes the general characteristics of the intended users of the AI Roadside Vendors and Illegal Trafficking Detection system.

### Education Level:

Users typically possess at least a bachelor’s degree, often in fields related to urban planning, public administration, or law enforcement. This educational background provides them with a foundational understanding of urban management.

### Experience:

Users are generally experienced city officials or traffic management authorities with several years of experience in their respective fields. The need of specific training in AI or machine learning is not required.

### Technical Expertise:

Users are expected to have a basic understanding of computer systems and applications and also familiarity with standard office software like spreadsheets, databases etc., but may not have extensive technical skills in programming or data science.

# Proposed Solution:

Our project solves the problem of illegal parking and roadside vendors by using an AI system connected to a website. The system works with live camera feeds to find illegally parked vehicles and roadside vendors using a trained YOLOv8 model.

## Data Collection:

We collected images dataset from **Roboflow**, cleaned them, and labeled them to make the dataset ready for training.

## Model Training:

The YOLOv8 model was trained on this dataset to detect objects quickly and accurately.

## Model Integration with the System:

The trained model is added to a website where it processes live and pre-recorded videos, detects violations, and shows the results.

## Alerts:

The system shows notifications when it finds a violation, helping authorities take action.

# Implementation:

To build this project, we used several tools and technologies to make sure the system can accurately detect illegal parking and roadside vendors.

## Tools and Technologies:

* We used Python as the main programming language for building and running the model.
* YOLOv8 was used to create and run the object detection model.
* OpenCV helped with image processing and handling live video feeds.
* We created a simple and easy-to-use website where users can see the results of the detection.

## AI model:

* **Data Collection:** We collected a dataset of images from **Roboflow** that show illegal parking and roadside vendors, then cleaned and labeled the images to prepare them for training
* **Model Training:** We used YOLOv8 to train the model on this dataset. The model was able to detect the objects accurately and quickly.

## Website:

* We created a simple website where users can view live camera feeds and also upload the videos and see the results of the detection.
* The website allows users to check certain areas for violations and receive notifications when something is detected.
* The AI model is connected to the website so that it can work in real-time, providing quick results.

# External Interfaces:

This section provides a detailed description of the inputs into and outputs from the AI Roadside Vendors and Illegal Trafficking Detection system.

### Live Camera Feed:

* **Description:** Captures real-time video footage for processing to detect unauthorized vendors and illegally parked vehicles.
* **Source of Input:** Installed surveillance cameras at strategic locations.
* **Relationships to Other Inputs/Outputs:** Feeds into the AI detection algorithm for analysis.

### User Inputs:

* **Description of Purpose:** Allows users to interact with the system, such as reviewing, deleting or changing status
* **Source of Input:** User interactions through the web interface.
* **Relationships to Other Inputs/Outputs:** Affects how data is displayed and processed.

### Alert Notifications:

* **Description:** Notifies users of detected violations in real-time.
* **Source of Input:** Triggered by the AI detection system upon identifying a violation.
* **Relationships to Other Inputs/Outputs:** Related to camera input; requires accurate processing of live feeds.



# Conclusion:

This project successfully developed an AI-based system to detect illegal parking and roadside vendors, which is an important issue in many urban areas. Using the YOLOv8 model, the system was able to accurately identify vehicles and vendors in real-time from live camera feeds and also from pre-recorded videos by uploading them. By integrating this detection system with a user-friendly website, we made it easier for authorities and the public to monitor and address these violations. The project demonstrates the potential of AI to solve real-world problems like traffic management and public space regulation. With further improvements, such as better dataset training and mobile app integration, this system could become a valuable tool for cities looking to improve urban planning and maintain public order. Overall, the AI-based detection system provides an innovative solution to the problems of illegal parking and roadside vending, contributing to better traffic management and urban development.