JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# PEDESTRIAN DETECTION ON INDIAN ROADS

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## Abstract:

The pedestrian application mostly uses cameras mounted on vehicles to watch pedestrian movements when they are traveling on busy roads and highways or when reversing a vehicle and generate notifications in a way that enables the camera to extract more features and supports future applications. This study includes a detection of pedestrian on Indian roads by using Yolov8, Robo flow, Computer Vision methods. Additionally, contrast the performance metrics like detection rate, false alarm rate, accuracy, and sensitivity. These experimental findings surpass the approach and set a new standard for modern technology. YOLOv8 is particularly suited for applications requiring real-time processing, such as autonomous vehicles, security surveillance, and advanced driver- assistance systems.

**Keywords:** Pedestrian detection, Yolov8, Dataset, Real Time Detection, Computer Vision, Robo Flow.

## Introduction:

We introduce a novel method for detecting pedestrians by utilizing the state-of-the-art features of YOLOv8, the most recent model in the “You Only Look Once” family of object identification models. YOLOv8, which is well-known for its remarkable speed and accuracy, is especially well-suited for real-time processing applications including enhanced driver assistance systems, security surveillance, and driverless cars. As part of our technique, YOLOv8 is strategically fine-tuned on a large and varied dataset that has been carefully selected to span a wide range of pedestrian appearances, actions, and ambient conditions. This guarantees the durability and adaptability of the model, allowing it to function consistently in a range of real-world settings.

The CCTV Live Feed application, coupled with advanced vehicle, signal, and pedestrian detection capabilities, serves as a comprehensive solution for real-time monitoring of road activities. By leveraging state-of-the-art technology, this system enhances safety and efficiency on roadways. With the ability to process live video feeds and detect various elements such as vehicles, signals, and pedestrians, it provides valuable insights for traffic management and public safety.

## Literature Survey on Pedestrian Detection on Road with different Modules:

This study is based on different modules such as:

**Real time detection:** YOLO is an advanced, real-time object detection system. In this implementation, it is specifically adapted for the detection of pedestrians. The YOLO model has been trained with a proprietary dataset to specialize in pedestrian recognition, enhancing its efficacy in this specific domain.

**Visual Processing:** Serves as a comprehensive library for computer vision tasks, essential for image and video manipulation. Used for pre-processing the input to the YOLO model and postprocessing the output, including rendering of bounding boxes and annotations on detected objects. Crucial for managing real-time video data, including frame capture, processing, and display functionalities.

**Scripting and Integration:** Python is the backbone scripting language that orchestrates the interaction between different modules, given its widespread adoption in data science and machine learning. Responsible for scripting the operational flow, including loading the model, executing detection tasks, and handling input/output operations.

**Data Manipulation:** A key Python library for numerical operations, predominantly used for array manipulation. Facilitates the handling of images and video frames, which are inherently array-based data structures, ensuring efficient processing in both the pre- and post-detection phases.

**Optimized Visual Representation** Provides additional image processing capabilities that may complement those offered by OpenCV.

## Literature Study:

### 1) Vehicle Detection:

1. **Development of Vision-based Systems:** Vision-based vehicle-pedestrian detection systems have been extensively reviewed, highlighting the evolution from traditional image processing to advanced deep learning techniques. These systems aim at enhancing road safety by accurately detecting vehicles and pedestrians under various conditions.

2. **Integration with Autonomous Vehicles:** Research on integrating detection systems into autonomous vehicles emphasizes the need for robust detection and tracking of other vehicles and obstacles to ensure safe navigation. This includes advancements in sensor technologies and algorithms for effective environment perception.

**2) Pedestrian Detection:**

1. **Advancements in Pedestrian and Cyclist Safety:** A significant focus has been on developing methods for detecting and estimating the intentions of pedestrians and cyclists, crucial for the safety of vulnerable road users in the vicinity of autonomous vehicles. Deep learning approaches have shown promising results in accurately predicting pedestrian and cyclist behavior.
2. **Pedestrian Protection Systems:** Comprehensive reviews of pedestrian protection systems discuss various approaches to enhance pedestrian safety, including infrastructure improvements, passive and active safety features in vehicles, and advanced detection systems using sensors and video analytics.

## Cases used in the Detection of Pedestrian using Yolov8:

**Traffic Management Control**: By using the dataset to monitor real-time street scenes, one can gain a better understanding of how traffic moves through the area. Differentiating between classes may be useful when monitoring and controlling traffic jams or creating new routes. **Autonomous Driving Systems:** The dataset may be utilized to teach autonomous automobiles to identify and discriminate between various road user types, including people, animals, cars, and buses. In the long run, this might improve the efficiency and safety of driverless cars.

**Law enforcement:** Using this dataset, authorities can train algorithms to detect vehicles, persons, or animals that have broken the law. They can also keep an eye on the quantity, kind, and compliance of vehicles with traffic laws.

**Urban Planning:** Decisions on road construction, safety precautions, and infrastructure improvements can be made by planners and city officials using the analyses obtained from this dataset. It might be applied to planning that is hospitable to pedestrians, identifying highdensity regions, calculating peak hours for car traffic, etc.

**Road Safety assessments:** By identifying the most prevalent vehicle and pedestrian types on different types of roads at different times, the dataset can be used to train algorithms that may help with accident risk assessments. In order to take preventative measures, it can assist in spotting trends and dangerous behaviors

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## Review of a Literature:

Several research papers and publications offer insightful information on this topic that can be used to conduct a literature review on pedestrian detection on the road. The research use cutting-edge technologies and approaches to focus on different areas of pedestrian detection.

**Research Focus**: The literature review highlights the application of Yolov8, robo flow, Computer Vision and OpenCV technologies for car and pedestrian tracking systems. vital pedestrian detection algorithms are being explored in the vital field of vision-based pedestrian identification for driving assistance. A study that highlights limitations and the requirement for higher detection rates for real-time applications examines pedestrian detection and tracking research approaches. Another review addresses issues in this subject by exploring the detection and behaviour analysis of pedestrian crossings in intelligent transportation systems. A review of the literature focuses on the prediction of pedestrian intent, which is important for intelligent systems and road safety.

**Technological Approaches:** For pedestrian detection, a variety of technologies are used, including Yolov8, robo flow, Computer Vision and OpenCV models. To improve precision and effectiveness, the application of multi-cue pedestrian detection systems from moving vehicles is being investigated.

**Difficulties and Suggestions:** The performance of current methods for real-time applications can be enhanced in terms of detection rates, accuracy, sensitivity, recall, and overall performance. Inaccurate detections with poor accuracy rates are one of the present models' limitations, pointing to the necessity for sophisticated techniques or learning models to improve performance.

The literature review on pedestrian detection on the road concludes by highlighting the significance of cutting-edge technology like Yolov8, robo flow, Computer Vision and OpenCV models in enhancing pedestrian safety through precise detection systems. For practical applications, researchers are always trying to solve problems and improve pedestrian detection techniques.

Numerous studies concentrating on enhancing car and pedestrian detection for traffic management in smart cities are highlighted in the literature analysis of pedestrian detection on Indian roadways using YOLOv8. The PVswin-YOLOv8s model is presented in one paper, which enhances YOLOv8s with a CBAM module and Swin Transformer block to increase detection accuracy, particularly in occlusion scenarios. With a recall of 26.4% and a mean Average Precision (mAP) of 43.3%, this model performed well. Furthermore, when contrasting the suggested model with alternative YOLOv8 versions, the study showed increased detection accuracy.

The significance of identifying road hazards for road safety and infrastructure maintenance is emphasized in a different study work that examines the YOLOv8-based visual identification of road hazards such potholes, sewer covers, and manholes. The research assesses how well YOLOv8 detects these threats under various settings and contrasts its results with those of earlier versions, such as YOLOv5 and YOLOv7. According to the study's findings, YOLOv8, especially the micro version, exhibits potential in precisely identifying traffic risks while juggling speed and resource efficiency.

In addition, BL-YOLOv8, an enhanced road defect identification model, is presented to guarantee road safety and upkeep by quickly identifying road defects .By combining the LSKattention mechanism, SimSPPF module, and BiFPN concept, this model optimizes YOLOv8s in order to decrease computational burden and increase accuracy. In addition to decreases in parameter volume and computational effort, the experimental findings demonstrate a 3.3% improvement in average precision mAP@0.5 when compared to the original model.

## Conclusion:

The conclusion on pedestrian detection on Indian roadways utilizing YOLOv8, Robo flow, and computer vision may be summed up as follows based on the data from the sources provided: The YOLOv8 model was put to the test to see how well it could identify pedestrians in various traffic situations, especially on Indian highways. The goal of the study was to determine YOLOv8's advantages and disadvantages in driverless vehicles. When detecting pedestrians in daylight photos, the model obtained a mean Average Precision 50 (mAP50) of 0.874 with a Frames per second (FPS) of 67. Nevertheless, the model performed poorly in lower light, suggesting that night time accuracy may decline. This implies that additional testing using diverse datasets is required to completely comprehend the potential and constraints of YOLOv8 for pedestrian identification in diverse circumstances. The experiment dataset was processed and stored using Robo flow, a crucial tool in this case. The dataset included traffic photos from North American inner cities that had been classified with 11 distinct classes to help identify things in the photos. Additionally, the images were enhanced using Robo flow, and they were exported in YOLOv8 format for testing and training. The study concluded by highlighting the effectiveness of YOLOv8 in detecting pedestrians on Indian roadways, highlighting its advantages during the day and highlighting the need for additional research, particularly in low-light settings. In order to train and evaluate the YOLOv8 model for pedestrian recognition in real-world traffic scenarios, Robo flow integration made dataset administration and preprocessing easier.

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