iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 Issue: VII Month of publication: July 2025

DOI: https://doi.org/10.22214/ijraset.2025.73328

Automated Dress Code Detection System for Construction Site Safety

Samitha T[1], Shareen Fathima S[2], Praveen K V[3]
St.Peter's College of Engineering and Technology, Avadi, Chennai.

Abstract: The project presents an innovative approach to construction safety and hazard detection by integrating the YOLOv8 object detection model with the Django web framework. By leveraging the advanced capabilities of YOLOv8, known for its high accuracy and real-time detection performance, the system identifies potential safety hazards on construction sites such as unauthorized personnel, unsafe equipment usage and hazardous materials. The Django framework facilitates seamless integration, allowing for efficient data management, real-time alerts and user-friendly interfaces for monitoring and reporting. The proposed solution enhances proactive safety measures, reducing the risk of accidents and improving overall site safety. Experimental results demonstrate the system's effectiveness in detecting a wide range of hazards, showcasing its potential as a critical tool for ensuring safer construction environments.
Keywords: Construction safety, Hazard detection, YOLOv8, Object Detection, Django Web Framework, Real-Time Detection

I. INTRODUCTION

Safety in construction environments is critical as workers are exposed to hazardous conditions. According to global studies, many accidents are caused due to the absence of safety gear. Traditional monitoring methods are manual and error-prone. The project integrates You Only Look Once version 8 (YOLOv8) with the Django framework to develop a comprehensive safety monitoring system. YOLOv8 ensures fast and accurate object detection while Django handles data management, alert systems and a user-friendly dashboard interface. With advancements in AI and computer vision, it is now possible to automate this process. This project aims to develop a system that detects if a person on a construction site is wearing a hardhat, mask and vest using real-time camera input.

II. LITERATURE REVIEW

Several studies have been conducted in the domain of PPE (Personal Protective Equipment) detection using machine learning. Previous works using YOLOv4 and YOLOv5 have shown success in object detection. However, few have integrated web frameworks like Django for real-time deployment. Jyothika et al. proposed a YOLOv3 based detection system that used a buzzer and SMS alerts to notify safety violations. Though effective, its accuracy was limited to below 90%. Ruksin Kamal and Ajai John Chemmanam tested different classifiers including MobileNet SSD and Haar features, concluding that MobileNet SSD offered better real-time performance on edge devices. Vanita Buradkar and Shejal Potuwar designed a CNN-based system using OpenCV for real-time helmet detection. Our system builds upon these existing models using the advanced YOLOv8 architecture, which offers faster and more accurate detection.

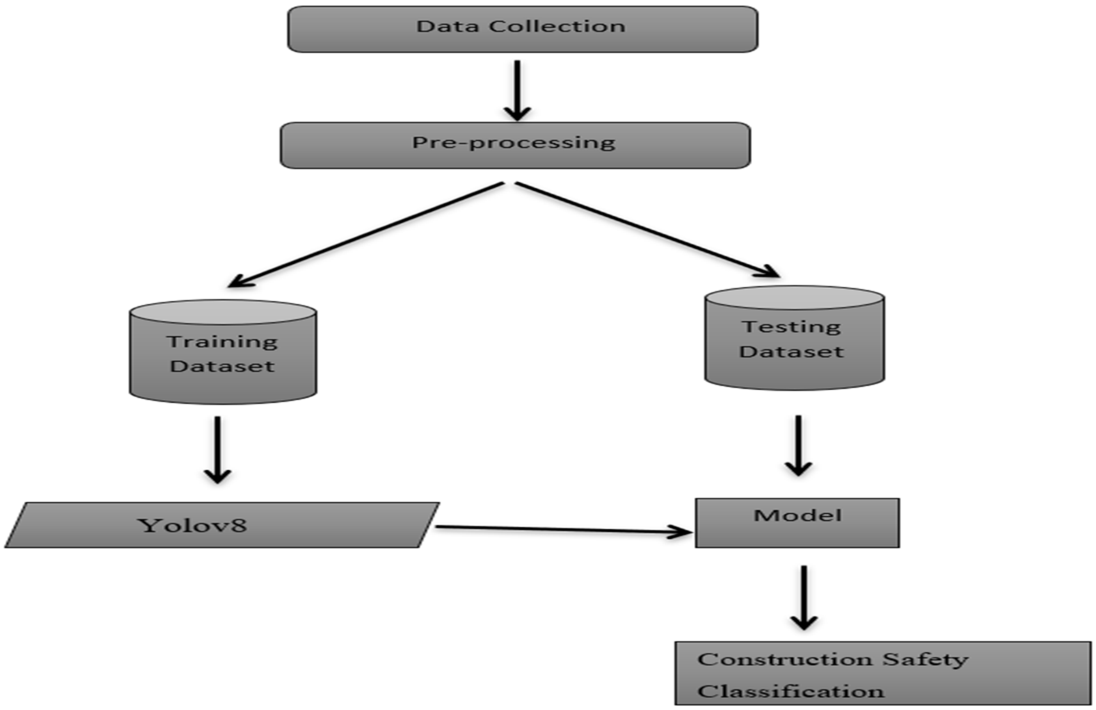
III. PROPOSED SYSTEM

The proposed model uses YOLOv8 trained on a dataset containing images of construction workers with and without safety gear. The dataset was annotated manually using tools like Roboflow. The model was integrated with Django to create a web application that streams camera input and detects safety violations in real time. If any required gear is missing, an alarm is activated through the backend.

IV. METHODOLOGY

The methodology includes data preparation with annotated construction site images, training the YOLOv8 model on PPE classes and deploying the model on cloud infrastructure. The Django application handles user registration, detection visualization and alert management. The SafeBot module, built with Dialogflow, provides health-related assistance on minor injuries and medical issues.

A. Dataflow Diagram



B. Technologies Used

Python, OpenCV, Django, YOLOv8, Roboflow

V. SYSTEM DESIGN & IMPLEMENTATION

The system comprises four modules : DataPrep AI, SafeBot, YOLOv8 Detection and Deployment via Django. DataPrep AI handles preprocessing and dataset standardization. YOLOv8 is trained to identify safety equipment and violations. SafeBot is a chatbot integrated into the web application to provide health assistance. The application is deployed using Django, Docker and cloud platforms like AWS or Azure. Real-time object detection is performed on live video feeds using OpenCV and alerts are triggered when violations are detected.

VI. RESULTS & DISCUSSION

The trained YOLOv8 model achieved an accuracy of 92% in detecting safety helmets, vests, and other PPEs under varying conditions. The system was tested in different lighting and camera conditions and consistently detected missing safety gear. The alarm system was effective in notifying real-time violations. YOLOv8's rapid inference time ensures that alerts are generated within milliseconds. Integration with Django allows for scalable monitoring and logging. SafeBot efficiently delivers health tips and alerts the supervisor when necessary. Below are sample results:

EQUIPMENT DETECTED	ACCURACY (%)
Helmet	94%
Vest	91%
Mask	92%

VII. CONCLUSION

The integration of YOLOv8 with Django enhances construction site safety by enabling real-time hazard detection and management. YOLOv8's robust object detection capabilities allow for accurate identification of potential risks, while Django provides a user-friendly web interface for monitoring safety alerts. The proposed system provides a smart and effective way to monitor construction safety in real time. By using YOLOv8 for object detection and Django for deployment, we ensure fast and accurate responses.

REFERENCES

[1] Z. Chen and Z. Chen, "RBNet: A deep neural network for unified road and road boundary detection," in Proc. Int. Conf. Neural Inf. Process., 2017 , pp. 677–687.

[2] J. Munoz-Bulnes, C. Fernandez, I. Parra, D. Fernández-Llorca, and M. A. Sotelo, "Deep fully convolutional networks with random data augmentation for enhanced generalization in road detection," in Proc. IEEE Int. Conf. Intell. Transp. Syst., 2017, pp. 366–371.

[3] R. Liu, Z. Yuan, T. Liu, and Z. Xiong, "End-to-end lane shape prediction with transformers," in Proc. IEEE Winter Conf. Appl. Comput. Vis., 2021 , pp. 3694–3702.

[4] Z. Qin, H. Wang, and X. Li, "Ultra fast structure-aware deep lane detection," in Proc. Eur. Conf. Comput. Vis., 2020, pp. 276–291.

[5] S. Ren, K. He, R. Girshick, and J. Sun, "Faster R-CNN: Towards real-time object detection with region proposal networks," in Proc. Int. Conf. Neural Inf. Process. Syst., 2015, pp. 91–99.

[6] P. Dollár, C. Wojek, B. Schiele, and P. Perona, "Pedestrian detection: An evaluation of the state of the art," IEEE Trans. Pattern Anal. Mach. Intell., vol. 34, no. 4, pp. 743–761, Apr. 2012.

[7] F. Chabot, M. Chaouch, J. Rabarisoa, C. Teuliere, and T. Chateau, "Deep MANTA: A coarse-to-fine many-task network for joint 2D and 3D vehicle analysisfrommonocularimage,"inProc.IEEEConf.Comput.Vis.Pattern Recognit., 2017, pp. 1827–1836.

[8] H. Zhao, J. Shi, X. Qi, X. Wang, and J. Jia, "Pyramid scene parsing network," in Proc. IEEE Conf. Comput. Vis. Pattern Recognit., 2017 , pp. 6230–6239.

[9] L.-C. Chen, G. Papandreou, F. Schroff, and H. Adam, "Rethinking atrous convolution for semantic image segmentation," 2017, arXiv: 1706.05587.

[10] E. Romera, J. M. Alvarez, L. M. Bergasa, and R. Arroyo, "ERFNet: Efficient residual factorized ConvNet for real-time semantic segmentation," IEEE Trans. Intell. Transp. Syst., vol. 19, no. 1, pp. 263 272, Jan. 2018.