ISSN: 2582 - 6379
Orange Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed Journal
2025, Volume 6 Issue 1
www.ijisea.org

Detecting Road Damages: Pothole Detection Using Deep Learning

G. Sreenivasa Reddy[1], S. Umesh Reddy[2], Y. Chandu Bhaskar[3], Y. Ravi Teja[4], Y. Rama Kalyan Reddy[5],P. Keshava Jaganath[6]
[1,2,3,4,5,6]Chaitanya Bharathi Institute of Technology, Proddatur, A.P, India.

sreenivaas.g67@gmail.com[1], umeshreddysirigireddy@gmail.com[2], chandubhaskar691@gmail.com[3], raviteja9014966@gmail.com[4], ramkalyanreddy7@gmail.com[5], keshavacm037@gmail.com[6]

ABSTRACT

The abstract for the project "DETECTING ROAD DAMAGES: POTHOLE DETECTION USING DEEP LEARNING" encapsulates its core essence and objectives. Leveraging deep learning techniques, the project aims to develop and deploy efficient models for automated pothole detection in road images. Two main models are implemented: the first utilizes renowned algorithms like VGG19, ResNet50, and YOLO for image classification, accurately identifying potholes. The second model enables real-time prediction of potholes through webcam-based image processing, facilitating swift action. By enhancing the accuracy and efficiency of pothole detection, the project endeavours to streamline road maintenance efforts, ensuring safer and more sustainable transportation infrastructure. This abstract encapsulates the project's innovative approach, emphasizing its potential to significantly impact road safety and maintenance practices.

Keywords: Pothole Detection, Deep Learning, Image Processing, YOLO Algorithm, Convolutional Neural Networks (CNN), VGG19, ResNet50, Real-Time Monitoring, Road Damage Detection, Road Safety.

I. INTRODUCTION

The project "Pothole detection using deep learning techniques like OpenCV and YOLO" Addresses a critical issue plaguing transportation infrastructure worldwide: road damages, with a specific focus on potholes. Potholes pose significant safety hazards to motorists and pedestrians alike, leading to accidents, vehicle damage, and costly repairs. Traditional methods of identifying and repairing potholes are often time-consuming and resource-intensive, highlighting the need for automated and efficient detection systems.

In response to this challenge, this project leverages the power of deep learning, a subset of artificial intelligence, to develop advanced models capable of automatically detecting and classifying potholes in road images. Deep learning algorithms, including VGG19, ResNet50, and YOLO (You Only Look Once), are employed to analyze images and accurately identify the presence of potholes.

The introduction of deep learning into pothole detection represents a paradigm shift in road maintenance practices. By harnessing the capabilities of convolutional neural networks (CNNs) and object detection algorithms, the project aims to enhance the efficiency and accuracy of pothole detection, enabling timely repairs and maintenance efforts.

The significance of this project extends beyond mere technological innovation; it has tangible implications for road safety, infrastructure sustainability, and economic efficiency. By automating the detection process, transportation agencies can proactively identify and address potholes before they escalate into larger problems, thereby reducing the risk of accidents and minimizing maintenance costs.

ISSN: 2582 - 6379
Orange Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed Journal
2025, Volume 6 Issue 1
www.ijisea.org

Furthermore, the project's focus on real-time prediction using webcam-based image processing adds another dimension to its utility. By integrating this feature into existing infrastructure monitoring systems, authorities can continuously monitor road conditions and prioritize maintenance activities based on realtime data.

II. LITERATURE SURVEY

Year	Author	Title	Summary
2023	C. Koch and I. Brilakis	"Pothole Detection and Classification Using YOLO and Convolutional Neural Networks "	Proposed a hybrid YOLO-CNN system with enhanced detection and classification of potholes.
2022	J. Singh, D. K. Gupta, R. S. Joshi	"YOLO-Based Approach for Automated Pothole Detection and Severity Assessment "	Introduced a YOLO-based approach for accurate pothole detection and severity assessment, improving road safety.

III. EXISTING SYSTEM

The Current methods for pothole detection rely heavily on manual inspection by road maintenance crews or citizen reports, which are often slow, labor-intensive, and prone to errors. Some limited automated systems exist, but they lack the accuracy and efficiency required for widespread adoption. This project aims to overcome these limitations by introducing advanced deep learning models for automated pothole detection.

Disadvantages:

1. Manual Inspection
2. Reliance on Citizen Reports
3. Limited Automation

IV. PROPOSED SYSTEM

The proposed system for "Pothole detection using deep learning techniques like opencv and YOLO" introduces advanced deep learning models to revolutionize pothole detection in transportation infrastructure. Leveraging state-of-the-art algorithms such as VGG19, ResNet50, and YOLO (You Only Look Once), the system aims to automate the detection and classification of potholes in road images with unprecedented accuracy and efficiency.

By harnessing the power of deep learning, the proposed system overcomes the limitations of existing methods, offering a scalable and reliable solution for proactive pothole detection. Real-time prediction capabilities, facilitated by webcam-based image processing, enable continuous monitoring of road conditions, allowing authorities to promptly identify and address potholes before they escalate into safety hazards.

The proposed system represents a significant advancement in road maintenance practices, offering the potential to enhance road safety, reduce maintenance costs, and improve the overall quality of transportation infrastructure. By integrating cutting-edge technology with practical application, the proposed system sets a new standard for automated pothole detection and establishes a foundation for future advancements in infrastructure maintenance and management.

Advantages:

ISSN: 2582 - 6379
Orange Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed Journal
2025, Volume 6 Issue 1
www.ijisea.org

1. Accuracy and Efficiency
2. Real-Time Monitoring
3. Cost-Effectiveness

ARCHITECTURE:

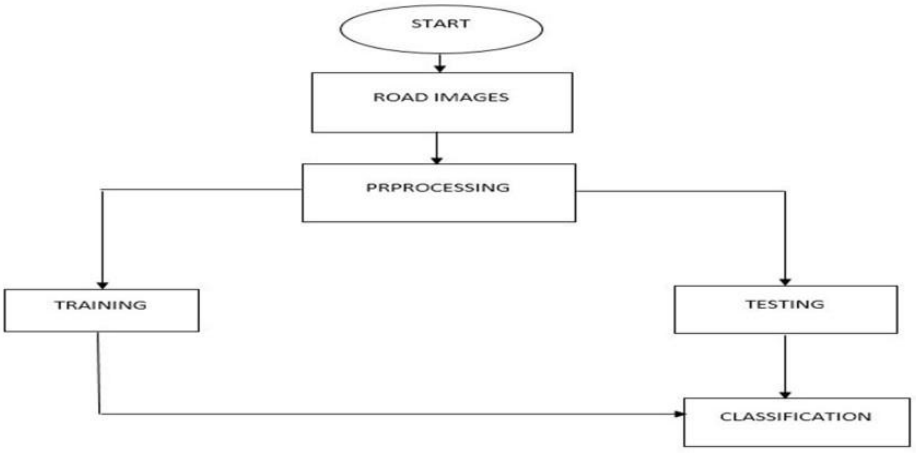


Figure 1 : Shows the Architecture flow

MODULE:

USER:

Input Images:

The user must provide input image for the certain fields in order to get results.

View Results

User view's the generated results from the model and road detection.

SYSTEM:

Working on Plain & Pothole Road Images dataset:

System checks for data whether it is available or not and load the data **Pre-processing:**

Data need to be pre-processed according the models it helps to increase the accuracy of the model and better information about the data.

Training the data:

After pre-processing, the data will spill into two parts as train and test data before training with the given algorithms

Generate Results:

System takes the input data from the users and produce the output

V. CONCLUSION

The pothole detection system revolutionizes road maintenance by providing an automated, AI-driven solution that enhances detection accuracy, streamlines operations, and enables real-time monitoring. By addressing the inefficiencies of manual inspection and inconsistent reporting, our system empowers transportation agencies with proactive maintenance, improved road safety, and cost-effective infrastructure management. With its advanced deep learning models and scalable architecture, the pothole detection system not only simplifies road damage identification but also drives long-term improvements in urban mobility and transportation planning. As road networks continue to expand, our solution ensures adaptability, efficiency, and a data-driven approach, setting a new standard for intelligent road maintenance and infrastructure management.

REFERENCES:

[1] C. Koch and I. Brilakis, Pothole detection in asphalt pavement images, Advanced Engineering Informatics, vol. 25, 2011, 507-515.
[2] T. Kim and S. Ryu, "Review and analysis of pothole detection methods," Journal of Emerging Trends in Computing and Information Sciences, vol. 5, 2014, no. 8, pp. 603–608.
[3] H. Bello-Salau, A. M. Aibinu, E. N. Onwuka, J. J. Dukiya, and A. J. Onumanyi. "Image processing techniques for automated road defect detection: A survey," 11th International Conference on Electronics, Computer and Computation (ICECCO), 2014.
[4] Aparna, Yukti Bhatia, Rachna Rai, Varun Gupta, Naveen Aggarwal, and Aparna Akula. "Convolutional Neural Networks-Based Pothole Detection Using Thermal Imaging," Journal of King Saud University, 2019.
[5] Kwang Eun An, Sung Won Lee, Seung-Ki Ryu, and DongmahnSeo. "Detecting a Pothole Using Deep Convolutional Neural Network Models for an Adaptive Shock Observing in a Vehicle Driving," IEEE International Conference on Consumer Electronics (ICCE), 2018.
[6] Akagić, A., Buza, E., and Omanović, S. "Pothole Detection: An Efficient Vision-Based Method Using RGB Color Space Image Segmentation," 40th International Convention on Information and Communication Technology, Electronics, and Microelectronics (MIPRO), IEEE, 2017, pp. 1104-1109.
[7] Hyunwoo Song, KihoonBaek, and Yungcheol Byun. "Pothole Detection Using Machine Learning," Advanced Science and Technology Letters, vol. 150 (AST 2018), pp. 151-155.
[8] Lim KuoySuong and Kwon Jangwoo. "Detection of Potholes Using Deep Convolutional Neural Network," Journal of Universal Computer Science, vol. 24, no. 9, 2018, pp. 1244-1257.
[9] Ryu S. K., Kim T., and Kim Y. R. "Image-Based Pothole Detection System for ITS Service and Road Management System," Mathematical Problems in Engineering, 2015.
[10] J. Lin and Y. Liu. "Pothole Detection Based on SVM in the Pavement Distress Image," Ninth International Symposium on Distributed Computing and Applications to Business, Engineering, and Science (DCABES), 2010, pp. 544-547.