JP INFOTECH

OUR PROPOSED PROJECT TITLE:

Road Pothole Detection using Deep Learning

IEEE BASE PAPER TITLE:

Road Pothole Detection Based on Crowdsourced Data and Extended Mask R-CNN

IEEE BASE PAPER ABSTRACT:

Road pothole detection is significant for road maintenance which has been widely solved based on computer vision models in recent years. However, the accuracy of the pothole detection is still far from satisfactory and has the potential to be increased. One of the challenges is the diversity of the training samples. Another challenge is the extension of mature computer vision models. Therefore, in this paper, we created a pothole dataset with multiple road conditions and environments via samples of previous studies and developed an extended mask R-CNN model. Based on the created dataset, we compared the proposed model with the traditional model using the ResNet- 50 and ResNet-101 networks. The experimental results show a mAP0.5 of 92.1% on the test dataset, surpassing the traditional backbone networks ResNet-50 and ResNet-101 by 3.6% and 4.5%, respectively. Furthermore, we compared the details of the different models. The experimental results show that the total area prediction error is only 3.19% on the test dataset. It suggests that our model can precisely extract geometric features and the area information of detected potholes.

OUR PROPOSED PROJECT ABSTRACT:

Road maintenance is a critical aspect of urban infrastructure management, with potholes posing significant hazards to vehicle safety and driver comfort. Traditional methods of pothole detection are often labor-intensive, time-consuming, and prone to human error. To address these challenges, we present a novel solution for road pothole detection leveraging deep learning techniques. This project employs the YOLOv8 architecture, a state-of-the-art object detection model known for its high speed and accuracy.

Our system is developed using Python, with a frontend composed of HTML, CSS, and JavaScript, and is deployed using the Flask web framework. The detection algorithm was trained on a dataset of 780 images, achieving an overall accuracy of 71%. The detection system is versatile, offering three modes of operation: image-based detection, video-based detection, and real-time detection using a webcam.

The image-based mode allows users to upload static images, which are then analyzed for pothole presence. The video-based mode processes video files, enabling continuous monitoring of road conditions. The webcam mode provides real-time detection, making it suitable for integration into vehicle systems or roadside monitoring stations. Each mode leverages the YOLOv8 model to quickly and accurately identify potholes, providing valuable data for timely road maintenance interventions.

This project demonstrates the feasibility of deploying deep learning models for infrastructure monitoring, showcasing significant potential for improving road safety and maintenance efficiency.

In Summary, this project addresses the critical issue of road pothole detection using a deep learning approach. Developed with Python and a frontend comprising

HTML, CSS, and JavaScript, the system is deployed via the Flask web framework. It employs the YOLOv8 architecture for object detection, trained on a dataset of 780 images, achieving an accuracy of 71%. The detection system operates in three modes: analyzing images, processing videos, and real-time detection using a webcam. These capabilities make it suitable for various applications, including vehicle systems and roadside monitoring. The project demonstrates significant potential for enhancing road safety and maintenance efficiency through advanced deep learning techniques.

SYSTEM REQUIREMENTS:

HARDWARE REQUIREMENTS:

- System : Pentium i3 Processor.
- Hard Disk : 500 GB.
- Monitor : 15'' LED.
- Input Devices : Keyboard, Mouse.
- Ram : 8 GB.

SOFTWARE REQUIREMENTS:

- Operating System : Windows 10 / 11.
- Coding Language : Python 3.12.0
- Web Framework : Flask.
- Frontend : HTML, CSS, JavaScript.

REFERENCE:

Linchao Li, Jiazhen Liu, Jiabao Xing, Zhiyang Liu, Kai Lin, and Bowen Du, “Road Pothole Detection Based on Crowdsourced Data and Extended Mask R-CNN”, IEEE Transactions on Intelligent Transportation Systems (Early Access), 2024.