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# Pothole Detection in Asphalt Roads: A Comprehensive Approach for Enhanced Road Maintenance and Safety with AlexNet Model

**Publisher:** IEEE [Cite This](#)  PDF

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#### Document Sections

- I. Introduction
- II. Related Works
- III. Dataset
- IV. Software Component
- V. Hardware Component

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##### Abstract:

The research article described in this paper puts forward a novel method of using an integrated software approach and high-end hardware devices for adaptive and intelligent detection of potholes on asphalt roads. The Pothole Detection Dataset is used for the dataset analysis, and we put VGG19Net, ResNet-50, GoogLeNet, and AlexNet among the computer vision models to analyze the applicability of these models. Different types of networks were compared, and AlexNet showed the best results as it achieved 92.15% accuracy, 91.38 % sensitivity (TPR), and a surprisingly high F-score, which reached 96.52%. Furthermore, by using its time of 279.35 seconds, which might be considered very fast, AlexNet shows many strengths in helping to do this, as well as identifying road anomalies, making it a perfect candidate for real-world utilization. This research demonstrates the emergence of sophisticated integrated pothole repair solutions, emphasizing the importance of both software and hardware in developing sophisticated pothole detection. Practices and this research could be an example for further surveying road inspection technologies.

**Published in:** 2024 International Telecommunications Conference (ITC-Egypt)

**Date of Conference:** 22-25 July 2024

**DOI:** 10.1109/ITC-Egypt61547.2024.10620566



Date Added to IEEE Xplore: 14 August 2024

Publisher: IEEE

► ISBN Information:

Conference Location: Cairo, Egypt

☰ Contents

**I. Introduction**

Concerning the modern world of road management and safe transport systems, the role of the operation that eliminates potholes is undeniably fundamental because the complexity of the road system is gaining the upper hand [1]. Potholes and general road deformations are problems beyond road integrity. They also incur high economic costs, revamping works, and present dangers to motorists [2]. However, forcing road maintenance activities beyond the existing standard to classify road structures along the way as smooth, safe, good, fair, or rough is the caveat for screening the road maintenance activities, which remains the most crucial task for leading road maintenance activities and retain the high level of safety in all sectors. This paper aims to identify various aspects of efficiently solving pothole-related issues in the broader context of road infrastructure management [3].

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