



UNIVERSITY TRANSPORTATION CENTER RESEARCH BRIEF

Efficient and Data-Driven Pavement Management System using Artificial Intelligence

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Background

Pavement management systems (PMSs) are used by transportation agencies to determine cost-effective strategies for pavement preservation and maintenance at the network level. A large amount of data is collected as part of this process, including road location, climate, geometry, surface/structural characteristics, material properties, traffic level, and others. This information is processed using analytical-based methods to predict future pavement conditions and program treatments. However, this approach does not make complete use of the available information while focusing on a single aspect (e.g., roughness). Moreover, due to the increasing complexity and scale level of collected data, the current methods are unable to provide accurate pavement assessment and optimal intervention strategies. Recently, Artificial Intelligence (AI) has been used, as a powerful tool, to examine large datasets that are often very challenging to be analyzed by conventional methods and derive helpful correlations and models. These can be used to assist scientists and engineers in the decisional process.

Research Project

AI is underutilized in the current PMSs; therefore, this study aims to provide State DOTs in the Pacific Northwest with advanced AI-data-driven solutions to make informed decisions for pavement preservation and rehabilitation



strategies. To achieve the main goal of this study, the following tasks are sought:

- Conduct a comprehensive review of the state of the practice on the use of AI in PMSs.
- Collect pavement management data currently available at State DOTs in the Pacific Northwest as well as at the Long-Term Pavement Performance (LTPP) database for pavement conditions at the national level.
- Evaluate the most promising AI approaches based on the findings of the literature search to process the collected data and to be next incorporated into the PMS.
- Develop an AI-based pavement management tool that incorporates engineering, economy, environment/climate, policy, and other information and provide data-driven solutions for optimal, cost-effective, and efficient pavement preservation and rehabilitation strategies.
- Prepare guidelines on the proposed AI-based PMS to facilitate its implementation at the DOT level.

The proposed research is expected to lead to the implementation of an innovative PMS that provides precise and effective selection of intervention strategies ultimately resulting in more sustainable and resilient road infrastructures.

ABOUT THE AUTHORS

The research team consisted of Billy Connor of the University of Alaska Fairbanks, and Emad Kassem of the University of Idaho.

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EXPECTED DATE OF COMPLETION

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FOR MORE INFORMATION

<https://depts.washington.edu/pactrans/research/projects/efficient-and-data-driven-pavement-management-system-using-artificial-intelligence/>