UTC Project Information	
Project Title	Efficient and Data-Driven Pavement Management System using Artificial Intelligence
University	University of Idaho University of Alaska Fairbanks
Principal Investigator	Emad Kassem Billy Connor
PI Contact Information	ekassem@ui.edu
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Brief Description of Research Project	Pavement management systems are used by transportation agencies to assist pavement engineers to determine cost-effective strategies for pavement preservation and maintenance at the network level. A large amount of data is collected every year as part of the pavement management program. Such data include road location, geometry, roughness, cracking, rutting, texture, skid resistance, traffic level, pavement structure, material properties, and others. This information is processed using traditional analytical-based methods to predict future pavement conditions and program pavement preservation and rehabilitation treatments at the network level. The traditional analytical-based tools used in the pavement management systems do not use the complete information instead they focus on one aspect of the data (e.g., surface distresses or skid condition). Nevertheless, due to the increasing complexity and scale level of collected data, the current methods may not be able to provide an accurate pavement condition assessment and optimal preservation/rehabilitation treatments. Recently, Artificial Intelligence (AI) has been used, as a powerful tool, to examine large data sets that often very challenging to be analyzed by traditional methods and derive helpful correlations and models. Such models can be used to assist scientists and engineers in making informed decisions.

Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	This study aimed to develop artificial intelligence models to predict pavement performance indicators using material properties, layer thickness, and traffic data. Several artificial intelligence models were investigated to determine the best method with the data. Through this investigation, random forests regression models had the highest correlation between predicted and theoretical performance measures, and the predictions produced the most accurate performance decay curves out of all tested models. The models developed using the field dataset were able to achieve strong correlations between the predicted and measured performance indicators for some of the indicators. The models developed to predict IRI, total deformation (rutting), fatigue cracking, transverse cracking, non-wheel path longitudinal cracking, and wheel path longitudinal cracking had respective r-squared values of 0.81, 0.68, 0.58, 0.69, 0.54, and 0.48. Additional field pavement sections can be added to the dataset in order to increase the accuracy and further validate the models.
Impacts/Benefits of Implementation (actual, or anticipated)	The performance decay models can be used in pavement management systems to program pavement preservation and rehabilitation treatments to extend the service life and improve the performance of flexible pavements. The developed models use several parameters that affect pavement performance including material properties and thickness of each layer, applied traffic, and environmental conditions. The proposed models can be used to forecast the future conditions of pavements at the network level.
Web Links • Reports • Project Website	