



Research Project Statement 20-263 FY 2019 Annual Program

Title:	Exploring the Use of Artificial Intelligence to Leverage TxDOT Data for Enhanced Corridor Management and Operations.
The Problem:	An unprecedented volume of traffic data has become available to TxDOT in recent years. Sources such as traffic monitoring cameras, intelligent transportation systems (ITS) sensors, and weather stations, complemented by probe-based data from vendors, can paint a detailed picture of the use and performance of transportation systems. However, the diversity and volume of available data makes data management and integration challenging. Available data is often used through dashboards that help human operators understand traffic conditions in real-time, or compare them over selected time periods and regions. While ad-hoc data use provides enormous value to network managers and operators, it's limited to relatively small data samples, and can only explore a small set of relationships. TxDOT has made significant progress towards sharing and archiving data through Lonestar, which provides a unique opportunity to explore the use of a systematic data analysis approach to reveal patterns and trends that can support safer, more efficient corridor management. Such analyses can enable more comprehensive evaluations of ITS performance, efficient calibration of real-time simulation models to support incident management, and the identification of safety issues, among others.
Technical Objectives:	<p>This research will focus on the use of machine learning and other artificial intelligence (AI) techniques to derive additional value from traffic-related data currently archived by TxDOT. Given that the AI/data space is fast-moving, researchers will conduct a thorough review of available techniques, tools and success stories, and identify the most promising applications based on existing and prospective TxDOT data availability and interests. A survey of both, data availability and TxDOT-specific use cases will be conducted early on during the project.</p> <p>While a range of applications will be discussed and documented for future reference, the focus of this work will be on applications that can support corridor management, such as quantifying the impact of incident management strategies on the performance of the system, or calibrating and validating predictive models of lane closure impact. Once specific applications are identified, researchers will deploy and test selected methodologies to understand their potential and limitations. Technologies will be evaluated based on pre-specified criteria, which include transferability to multiple locations, seeking to develop methods that will be of value across Texas.</p> <p>The researchers shall perform a literature review of available AI techniques for traffic management, with a focus on corridor management and operations. In addition, the researchers shall provide a synthesis of relevant TxDOT data availability and desirable use cases.</p> <p>The expectation of this project is that the end product will obtain a TRL level 5.</p>
Desired Deliverables:	<ol style="list-style-type: none"> 1. Technical memorandum for each task completed. 2. Monthly progress reports. 3. Value of Research (VoR) that includes both qualitative and economic benefits, to be included in the final research report. 4. Research report documenting the findings of the research, including all conducted testing and corresponding source code; for successful tests, detailed summary of data work flows, metrics of key performance indicators (KPI), service level agreements (SLA), cost benefit analysis, and other recommendations to support implementation 5. Project Summary Report.
Proposal Requirements:	<ol style="list-style-type: none"> 1. Utilize the "Proj/Agre" and "PA_Form" templates located at the TxDOT RTI website. 2. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in RTI's University Handbook, which is also located at the RTI website. 3. Proposals should be submitted in PDF format, 1 PDF file per proposal. File name should include project name and university abbreviation. 4. This project will be tracked during the life of the project using a Technology Readiness Level (TRL) scale. For more information about the use of a TRL, click.