UTC Project Information	
Project Title	Developing a Proactive Fuzzy-Logic Model for Optimizing Winter Road Maintenance Measures in Cold Urban Areas Using Real-time Data
University	Washington State University
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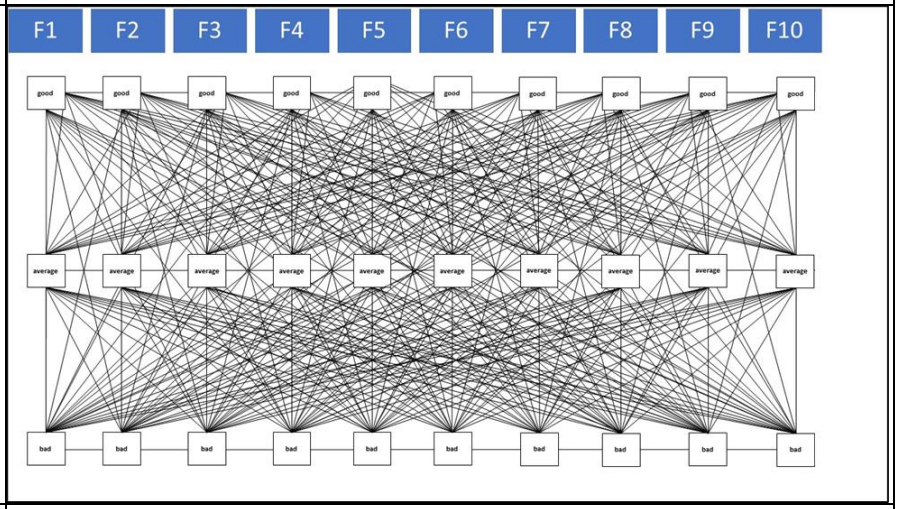
Funding Source(s) and Amounts Provided (by each agency or organization)	University of Washington PacTrans $40,000 Washington State University $ 40,000
Total Project Cost	$ 80,000
Agency ID or Contract Number	69A3551747110
Start and End Dates	August 16, 2020-August 15, 2022
Brief Description of Research Project	This research will introduce a method to comprehensively optimize winter road maintenance in urban areas where transportation quality can significantly be impacted by adverse climatic conditions. The research is expected to have the following benefits: 1) detecting the exiting gaps in winter road maintenance 2) maximizing the efficiency of the investments in maintaining the quality of transportation during the cold season 3) contributing to the safety, comfort, and economy of the residents of the affected areas. This research is focused on enhancing the quality of road maintenance through a proactive, rather than reactive, approach that can monitor road conditions, evaluate maintenance options using a fuzzy logic model, and prioritize preventive or maintenance measures to retain the safety and serviceability of urban roads during the cold season.

Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The research has the potential to be implemented in the cold regions where prioritizing winter road maintenance for multiple spots with limited resources is a challenge. the model introduced in this study can use the characteristics of the target spots based on 10 following factors: 1. Snowfall intensity, 2. Other weather factors (wind, visibility, etc.), 3. Pavement condition, 4. Existing level of service for the traffic, 5. Type of vehicles on the road (heavy vehicles), 6. Number of vehicles on road (density of cars), 7. Quality of road signing, 8. Quality of road lighting 9. Road slope, and 10. other geometric features of the road. Depending on these criteria (F1 to F10 as shown in the picture below) and considering the relative importance of the factors, the model can use descriptive terms to evaluate the severity of they need to winter road maintenance For each location by creating a score. the higher is the score, the more severe is the need to winter road maintenance for the location. Therefore the model can decide which spot has a higher score to receive winter road maintenance services before other locations.
	
Impacts/Benefits of Implementation (actual, or anticipated)	It is anticipated that the model would maximize the efficiency with which resources are distributed for the provision of winter road maintenance services. As a result of the fact that fast action can play a key role in maintaining public safety on roads during winter events, the method that was developed in this study is anticipated to contribute to the improvement of road safety in colder regions throughout the winter season. In addition, it is anticipated that the model will contribute to cost savings by optimizing the measures for winter road maintenance. This will be accomplished by allocating resources to the locations where services are highly demanded.
Web Links • Reports • Project Website	