UTC Project Information	
Project Title	Machine Learning-Based High-Fidelity Mesoscopic Modeling Tool for Traffic Network Optimization
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Funding Source(s) and Amounts Provided (by each agency or organization)	University of Washington PacTrans $40,000 University of Idaho $ 40,000
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Brief Description of Research Project	Traffic optimization is a complex system without reliable and situation specific closed form formulas for optimization. This means an effective and sound simulation model plays a critical roll in any advancement in traffic optimization. With the advent of specialized hardware and high performance bus and memory architectures, machine learning has shown near magical improvement in the last 10 years. Evidence of this is plainly visible on the cell phones we use everyday such as speech recognition and classification of your picture library by subject. We will apply this technology to learning and predicating the behavior of traffic on individual road segments allowing us to quickly assess the arrival times and create a fast simulator suitable for traffic optimization.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	Traffic signal control of the future will adapt in real-time to traffic, driving, and environmental conditions. The adaptation will have to do real-time optimization based on traffic monitoring. However, for optimization to work it requires that it be able to predict what traffic will do in response to changes in signal timing. Furthermore, it must do this prediction very efficiently in a short time horizon so that the optimization can evaluate many alternative signal timing parameters. Instead of using a "one size fits all" legacy functions for prediction of traffic flow, this project hopes to pioneer the use of Machine Learning techniques to learn how traffic behaves on segments of street in response to traffic and driving conditions and use that to build a high-speed simulator based on predicting arrival times of cars at intersections.

Impacts/Benefits of Implementation (actual, or anticipated)	In this project, We proposed a mesoscopic simulator which has a predictor for each road segment. The predictor of a road segment predicts the travel time distribution for the particular traffic conditions. The mesoscopic simulator selects a random sample of the predicted distribution as travel time. We compared the performance of our simulator with VISSIM which stands in for real time traffic data. We demonstrated through our experiments that the travel time distributions predicted by our simulator is similar to that of VISSIM for various scenarios. We also conducted experiments to test the running time of simulations using our simulator and VISSIM, and found that our simulator runs 10.02 to 21.45 times faster than VISSIM. The developed model should provide system operators with reliable and effective microscopic simulation model that models the operations of complex transportation networks with mixed use traffic allowing them to assess the expected benefits of alternative network control.
Web Links • Reports • Project Website	