

Machine Learning Methods for Assisting Drivers Change Lanes

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Over 500,000 lane change crashes occur every year in the United States. These crashes often result in injuries, property damage, and congestion delays. A lane changing assistance system that advises drivers of safe gaps for making mandatory lane changes is developed in this paper. Two machine learning methods - Bayes Classifier and Decision-Tree were applied to model lane changes. Detailed vehicle trajectory data from U.S. Highway 101 and Interstate 80 in California were used for model development and validation. The model predicts driver decisions on whether to merge or not as a function of traffic and geometric variables.



The best results were obtained when both Bayes and decision-tree classifiers were combined into a single classifier using a majority voting principle. The prediction accuracy was 94% for nonmerge decisions and 79% for merge decisions. In a lane change assistance system, the accuracy of nonmerge (when not to merge) decisions is more critical than merge decisions. Misclassifying a nonmerge decision as a merge decision could result in a traffic crash, whereas misclassifying a merge decision as a nonmerge decision would only result in a lost opportunity to merge. Sensitivity analysis performed by assigning higher misclassification cost for nonmerge decisions resulted in even higher accuracy for nonmerge decisions.

Dr. Praveen Edara is an Associate Professor in the Civil and Environmental Engineering Department at the University of Missouri-Columbia (MU). He teaches and conducts research in the areas of alternative intersection designs, intelligent transportation systems (ITS), and traffic operations. His research has been sponsored by Missouri DOT, Virginia DOT, and Federal Highway Administration. He teaches a wide range of undergraduate and graduate courses at MU including Traffic Simulation, Transportation Planning, and Research Methods in Transportation. He has published over 30 journal articles, 34 conference proceedings, and 23 sponsored research reports.

Prior to joining MU, Dr. Edara worked as a Research Scientist for the Virginia Transportation Research Council conducting research for the Virginia Department of Transportation in ITS and traffic engineering. Before that he worked as a Research Contractor at the Turner Fairbanks Highway Research Center (TFHRC) performing research in alternative intersection designs. His graduate degrees are from Virginia Tech and undergraduate degree is from Indian Institute of Technology – Madras. He is a registered Professional Engineer (P.E.) in Missouri and a certified Professional Traffic Operations Engineer (PTOE).