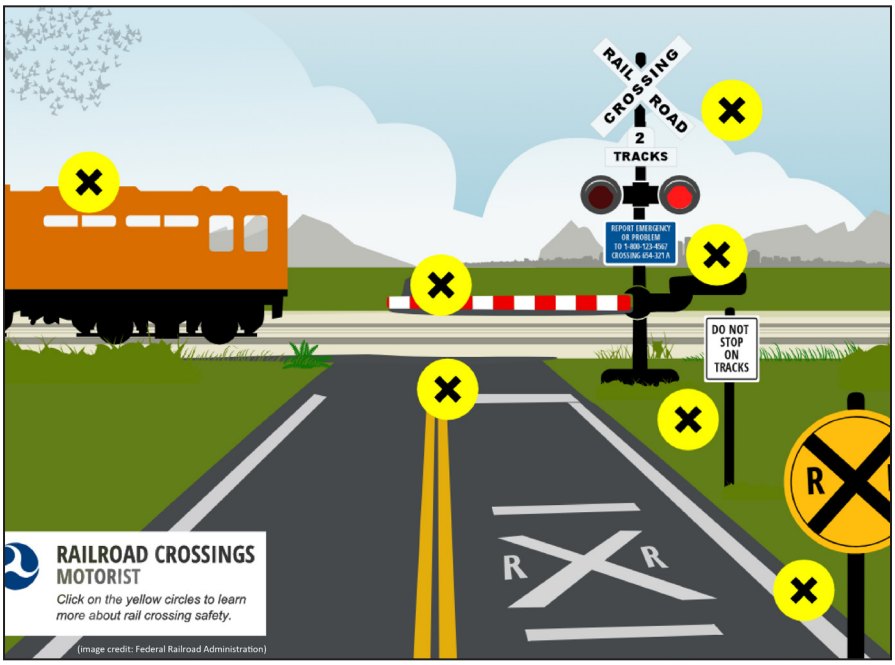
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 18-354 (project 476) | July 2018

Highway-Rail Grade Crossing Traffic Hazard Forecasting Model



the ISSUE

The need to improve traffic safety has been a major concern in the Untied Stated for decades. Transportation agencies must accurately identify the factors that contribute to accident likelihood to better predict crash probability and provide direction for ighway-rail grade crossing designs and policies that will reduce crash numbers.

the RESEARCH

This research will explore potential eneralized linear model options to handle under-dispersed HRGC crash data, including 1) Poisson model 2) Negative Binomial Model 3) the Gamma Model 4) the Conway-Maxwell-Poisson model 5) the Bernoulli model 6) the hurdle Poisson model and 7) zero-inflated Poisson model. The research also uses a data mining algorithm analysis to explore the non-linear relationship and forecasting power with the 1) decision tree model 2) neural network model and 3) gradient boosting model.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

Lead Investigator(s)

Dr. Pan Lu
pan.lu@ndsu.edu
North Dakota State University

Co-Investigator(s)

Dr. Denver Tolliver
North Dakota State University

Project Title

Highway-Rail Grade Crossing Traffic Hazard Forecasting Model

Research Assistant(s)

Zijian Zheng , GRA, PhD

Sponsors | Partners

Upper Great Plains Transportation Institute, North Dakota State University

USDOT, Research and Innovative Technology Administration

the **FINDINGS**

In summary, data mining models can perform crash forecasting with relatively accurate forecasting power and a strong ability to model non-linear relationships between contributors and crash likelihood. All the models will provide different sets of contributors. However, the decision tree model may be hard to apply because of the large tree structure. Since generalized linear models are parametric, they tend to identify a limited number of explanatory variables; data mining algorithms, also considered as non-parametric algorithms, tend to select more contributor variables. However, the same top contributors are identified by all the methods and include traffic exposure variables such as highway traffic volume, rail traffic volumes, and travel speed, and some crossing characteristics such as warning devices.

the **IMPACT**

Data mining models can serve as alternative tools for performing crash forecasting and do so with relatively accurate forecasting power and a strong ability to model non-linear relationships. This research is a first step toward developing an agency-friendly user tool that will allow agencies to conduct analyses of highway-rail grade crossings so that they can allocate limited safety improvement resources to improvements that will have the greatest potential for reducing crashes.

For more information on this project, download the entire report at http://www.ugpti.org/resources/reports/details.php?id=914

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.