ABSTRACT

The emergence of time-dependent data provides the researchers with great opportunity to investigate disaggregated level's safety performance of the roadway infrastructures. This advancement of data invokes the idea of a risk-based safety management, which uses time-dependent data, like hourly traffic dynamics, weather conditions and signal controls to estimate hourly probability of crash. The signalized intersections are under investigated compared with roadway segments due to their diversity and complexity of crashes. This study establishes a comprehensive analysis framework of crash risk for signalized intersections. The crashes are decomposed into three types, same-direction, opposite-direction and right-angle, according to different crash generating scenarios. The fixed geometry and hourly level time-dependent risk factors are collected separately for the three types of crashes. Three different non-crash sampling strategies are adopted for three statistical models, Conditional Logit, Firth Logit and Mixed Logit, and two machine learning models, Random Forest, Penalized Support Vector Machine. Important risk factors, like presence of light rain, logarithm of volume, speed standard deviation, and coordination plans, are identified. The model with the most robust out-of-sample prediction performance, Firth Logit, is selected for implementation examples, which show promising potential of exhibiting crash risk profiles and simulating safety benefits for operational safety countermeasures.