Pedestrians and cyclists are regarded as vulnerable road users (VRUs). Each year, thousands of pedestrians' deaths are caused by traffic crashes, which take up 16% of the total road fatalities and injuries in the U.S. (FHWA, 2018). Crashes could happen if there are interactions between VRUs and motorized transportations. And pedestrians' unexpected crossings, such as red-light violations at signalized intersections, will expose them to motorized transportations and cause potential collisions.

This study is intended to predict the pedestrians' red-light violation behaviors at the signalized crosswalks based on an LSTM (Long Short-term Memory) neural network. With video data collected from real traffic scenes, it was found that pedestrians that crossed during the red-light periods were more in danger of being struck by vehicles, from the perspective of Surrogate Safety Measures (SSMs). Pedestrians' characteristics were generated using computer vision techniques. And LSTM model was used to predict pedestrians' red-light violations using these pedestrians' characteristics. The experiment results at a signalized intersection showed that the LSTM model achieves an accuracy of 91.6%. Drivers can get more prepared for these unexpected crossing pedestrians if the model is to be implemented in the vehicle-to-infrastructure (V2I) communication system.