In the context of pro-active traffic management, real-time safety evaluation is one of the most important components. Previous studies on real-time safety analysis mainly focused on freeways, seldom on arterials. With the advance of sensing technologies and smart city initiative, more and more real-time traffic data sources are available on arterials, which enables us to evaluate the real-time crash risk on arterials. However, there exist substantial differences between arterials and freeways in terms of traffic flow characteristics, data availability, and even crash mechanism. Therefore, this study aims to deeply evaluate the real-time crash risk on arterials from multiple aspects by integrating all kinds of available data sources. First, Bayesian conditional logistic models (BCL) were developed to examine the relationship between crash occurrence on arterial segments and real-time traffic and signal timing characteristics by incorporating the Bluetooth, adaptive signal control, and weather data, which were extracted on four urban arterials in Central Florida. Second, real-time intersection approach-level crash risk was investigated by considering the effects of real-time traffic, signal timing, and weather characteristics based on 23 signalized intersections in Orange County. Third, a deep learning algorithm for real-time crash risk prediction at signalized intersections was proposed based on Long Short-Term Memory (LSTM) and Synthetic Minority Over-Sampling Technique (SMOTE). Moreover, in-depth cycle-level real-time crash risk at signalized intersections was explored based on high-resolution event-based data (i.e., Automated Traffic Signal Performance Measures (ATSPM)). All the possible real-time cycle-level factors were considered, including traffic volume, signal timing, headway and occupancy, traffic variation between upstream and downstream detectors, shockwave characteristics, and weather conditions. Above all, comprehensive real-time safety evaluation algorithms were developed for arterials, which would be key components for future real-time safety applications (e.g., real-time crash risk prediction and visualization system) in the context of Integrated Active Traffic Management.

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The public is welcome to attend.