Forecasting Aggressive Driving at Intersections in a Connected Vehicle Environment

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In this paper we propose a general framework to identify and forecast aggressive driving at intersections in a connected vehicle environment. The proposed framework uses time series k-means to categorize multi-dimensional time series trajectories into several context-aware driving patterns. Dynamic time Warping (DTW) is implemented within the time series k-means algorithm for measuring the similarity between trajectories. DTW is adopted to make the framework resilient to temporal distortions and missing data. We train an isolation forest model on the trajectory dataset to identify anomalous trajectories and apply this model to clusters to provide aggressiveness scores for each driving pattern. We provide a real-time online assessment approach to output the probability of aggressiveness for driving trajectories that approach a subject intersection.

We use real-world connected vehicle trajectories obtained from the Ann Arbor Safety Pilot project to implement our framework and discuss how safety-focused warning systems at the individual vehicle- and system-level can be developed using this framework.