Measuring freeway safety performance: The Freeway Accident Risk Analysis (ARA) Tool

Problem Statement:
- Collisions have many causes and contributing factors
- Need for research to develop and comprehensively assess collision prediction models

Research Performed:
- Development of a tool for measuring freeway safety performance based on raw loop detector data
- Conducted a limited deployment of the models for Caltrans use
- Validated prediction models against actual collisions
- Models used 2007 data and were validated with 2008 data

Research Results:
- Final product is a freeway safety performance measurement tool called Accident Risk Analysis (ARA)
- Analyzes collision risks for urban freeway mainlines with 3+ directional lines
- ARA links traffic dynamics with relative safety of a roadway
- ARA evaluates and quantifies freeway safety performance based on dynamic driver behavior in time and space

Applications:
- Operations can use ARA to measure the collision risk impacts of traffic flow changes
- Planning can use ARA to identify areas that would benefit from improvements

Research Conclusions:
- ARA tool well suited to examine and quantify changes in the relative safety characteristics of an urban freeway section
- Tool is being used by Caltrans District 12 Southern California engineers for feedback and user interface enhancements

Research Benefits:
- ARA allows Caltrans to evaluate safety impacts of roadway changes over time
- Models indicate when propensity for collisions inches up or down and why

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