# Exploring Data Fusion's Applications to Nonmotorized Safety Analysis

SAFE-D SAFETY THROUGH DISRUPTION

*The Safe-D UTC conducts innovative research, education and technology transfer guided by a vision of systemically safe transportation.*

Texas A&M Transportation Institute

**SAFETY THROUGH DISRUPTION (SAFE-D)** NATIONAL UNIVERSITY TRANSPORTATION CENTER

**NONMOTORIZED TRANSPORTATION** makes up a large share of fatal and serious injury crashes in the United States, an alarming trend to safety advocates. However, a single model or data source is often unable to provide enough coverage and reliability to help with crash analyses as an exposure measure.

***Nonmotorized transportation***
(also known as active transportation) refers to pedestrians or bicyclists.

Funded by the Safety through Disruption (Safe-D) University Transportation Center (UTC), the Data Fusion for Nonmotorized Safety Analysis study ventured into an emerging research territory — a data-fusion–based technique combining multiple nonmotorized data sources for a robust exposure estimate. The research team selected the City of Austin as the study area, gathered five bike data sources (using both traditional and crowdsourced data sources), developed bike demand models, and employed decision fusion mechanisms.

***Decision fusion***
pulls a decision from each data source to come to a unified decision.


***Data fusion***
combines or integrates multiple data sources to present comprehensive information.


***Decision fusion mechanisms***
developed as part of this study support the utilization of local knowledge and the data to either use the individual estimates or opt for the fusion approach to obtain a better estimate with increased confidence.


The analysis of actual and simulated data illustrated that the fusion methods outperformed the individual estimates in most cases. Using the fused exposure measure, the team's crash models of the City of Austin offer insights into:

- hot spots for nonmotorized crashes, such as in the city's central downtown region, and
- the influence of neighborhood features on people's reasons for not biking more, such as heavy traffic near street crossings or the poor condition of sidewalks.

Demonstrating data fusion's applications through studies like this one can help analysts act based on knowledge and local context identified by the technique. The findings from the demand and crash models empower safety advocates to design and implement effective strategies, training, and educational programs. The proposed fusion framework promotes data-driven safety analysis and informed planning while enhancing the strategic use of available information.

**For more information:**

**Ipek N. Sener, Ph.D.**
Research Scientist
(512) 407-1119 or
i-sener@tti.tamu.edu

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## Consortium Members

San Diego State University
Texas A&M Transportation Institute
Virginia Tech Transportation Institute