

# Performance Measurement & Management using Connected & Automated Vehicle Data

(STRIDE Project C)

## PROJECT OVERVIEW

Estimating performance measurements of a transportation system is a key component in congestion management. The currently used measures include travel time, travel time reliability, volume, density/occupancy, vehicle classification, incident occurrence, queue length, back of queue, and emissions. These measures are currently estimated from data gathered using existing technologies such as point detectors, vehicle matching technologies, and probe vehicles.

Data from connected vehicles (CV) can also be used to estimate these performance measurements while also providing additional measures that cannot be estimated based on existing technologies such as stops, accelerations, and decelerations, shockwave speed, traffic flow disturbance measures, detailed signalized intersection movement-level measures, potential for crashes, weather impacts, and emissions.

## GOAL

The goal of this study was to identify how data collected from connected vehicles (CV) can be used alone or in combination with data from other sources to support transportation system performance measurement for transportation planning and operation purposes.

## FINDINGS

The study found that even at lower market penetrations, CV data can be sufficient to support some critical transportation performance measurement and management functions. Other measures will require high market penetrations to produce accurate results.

The study developed a framework, methods, and algorithms for using CV data to measure mobility, safety, reliability, and environmental impacts.

## PRODUCTS

Three products were developed to use CV data for estimating performance measurements.

1. Framework to estimate mobility, reliability, and environmental metrics
2. Methods to estimate new mobility and safety metrics
3. Method to estimate pollutant emission

## IMPACTS

The products support enhanced traffic management strategies to improve safety, mobility, and environmental impacts while also reducing the costs associated with collecting data.

## CLIMATE CHANGE IMPACTS

The performance measurements according to the study findings will provide support for implementing and activating strategies to reduce emissions.

## WHO BENEFITS?

- Transportation system management and operations (TSM&O) programs
- Traffic management centers (TMCs)
- Planning organizations
- Transportation system decision makers

## RESEARCH TEAM

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## PRODUCTS

### 1) Framework to estimate mobility, reliability, and environmental metrics using connected vehicle (CV) data

The framework is for the use of connected vehicle data to estimate mobility, reliability, and environmental metrics that are currently being estimated using traditional (existing) sources. The estimated performance measures can be used by a system operator, planner, or an automated system to support their decisions. The measurements can be also used to derive information for dissemination to travelers, third-party data aggregators, traveler information service providers, and other agencies.

### 2) Methods to estimate new mobility and safety metrics

The methods estimate new mobility and safety metrics that cannot be estimated based on existing sources of data. The methods can be used in real-time operations by traffic management centers (TMCs) to determine the traffic conditions on the freeway segments. In addition, machine learning models were developed that can be used by TMCs for short-term prediction of traffic conditions that can be used to proactively activate operational plans to mitigate potential deterioration in mobility and safety performance.

### 3) Method to estimate pollutant emission

The method estimates pollutant emissions based on a limited number of connected vehicles. This method can be used in off-line and real-time analysis of traffic conditions to determine the pollutant emission levels under different traffic conditions. The method can be used in making decisions regarding strategies and plans to reduce pollution.

For more information on Project C (Performance Measurement & Management using Connected & Automated Vehicle Data), visit the [STRIDE Project page](https://stride.ce.ufl.edu/project-c/) (<https://stride.ce.ufl.edu/project-c/>).

## About STRIDE

The Southeastern Transportation Research, Innovation, Development & Education Center (STRIDE) is the 2016 Region 4 (Southeast) U.S. Department of Transportation University Transportation Center headquartered at the University of Florida Transportation Institute (UFTI).

