# Data-Driven Safety Dashboard Assessing Maryland Statewide Density Exposure of Pedestrians, Bicycles, and E-Scooters

## BRTB Bicycle & Pedestrian Advisory Group

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CATS Division Chief, Office of Transportation Mobility & Operations


MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

MARYLAND TRANSPORTATION INSTITUTE

MARYLAND DEPARTMENT OF TRANSPORTATION
MOTOR VEHICLE ADMINISTRATION

R ADAMS COWLEY SHOCK TRAUMA CENTER
UNIVERSITY OF MARYLAND

# PROJECT TEAM

## MDOT SHA

- **Carole Delion,** Division Chief & CAV Program Manager, Project Lead and Manager
- **Jay Zheng,** Transportation Manager, Safety Data Technical Lead on Dashboard Deployment

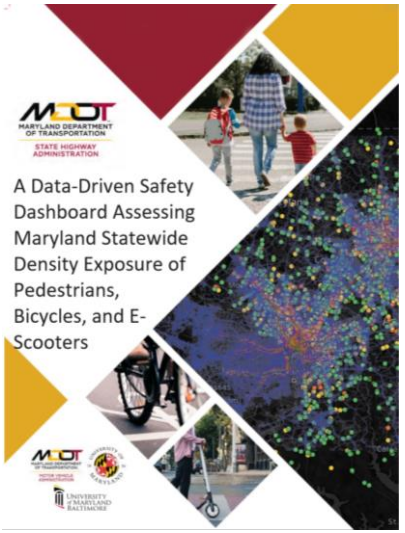
## University of Maryland, College Park & Baltimore

- **Chenfeng Xiong,** Assistant Director, MTI, and Assistant Research Professor, MTI and UMB. UMD PI
- **Michael Pack,** Director, CATT Lab. Project visualization and deployment support
- **Kartik Kaushik,** Assistant Director and Assistant Professor, Shock Trauma Anesthesiology Research Center, Safety and health data and integration support

## U.S. Department of Transportation

- **Office of the Secretary & supporting departments**

# PROJECT INCEPTION


**USDOT awards grant to MDOT SHA/UMD team**

| 2018-2019 | Fall 2019 | Spring 2020 | September 1, 2020 |
|---|---|---|---|

**MDOT SHA & UMD pilot a ped/bike safety dashboard**

**Submission of application to USDOT Safety Data Initiative**

**Cooperative Agreement Signed**

# TASK BREAKDOWN

**Task 1.** Project Management and Collaboration

**Task 2.** Analytical Design, Data Assembly and Integration

- Analytical tools
- Data sources and integration
- Analysis of pedestrian, bicycle, and e-scooter exposure

**Task 3.** Data Analysis and Visualization

Visualization Platform

Exposure and safety risks ranking at intersection and segment levels and other analytics

**Task 4.** Safety Tool Testing, Refinement, and Implementation

- Multi-agency involvement

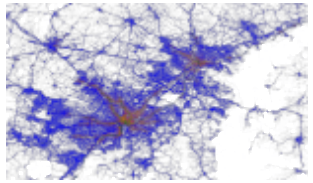
**Task 5.** Technology Transfer

- Peer-exchange events
- Webinar for technology transfer

**Task 6.** Final Report, Deliverables, and Safety Tool Product

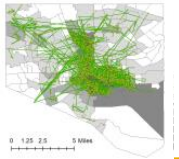
# DELIVERABLE

**Mobile Device Location Data Analytics Suite**

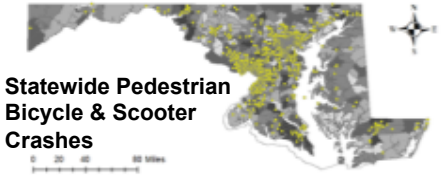


**Pedestrian/Bicycle and Vehicle Movements**

**Baltimore E-Scooter Trips**



**Statewide Pedestrian Bicycle & Scooter Crashes**



integration

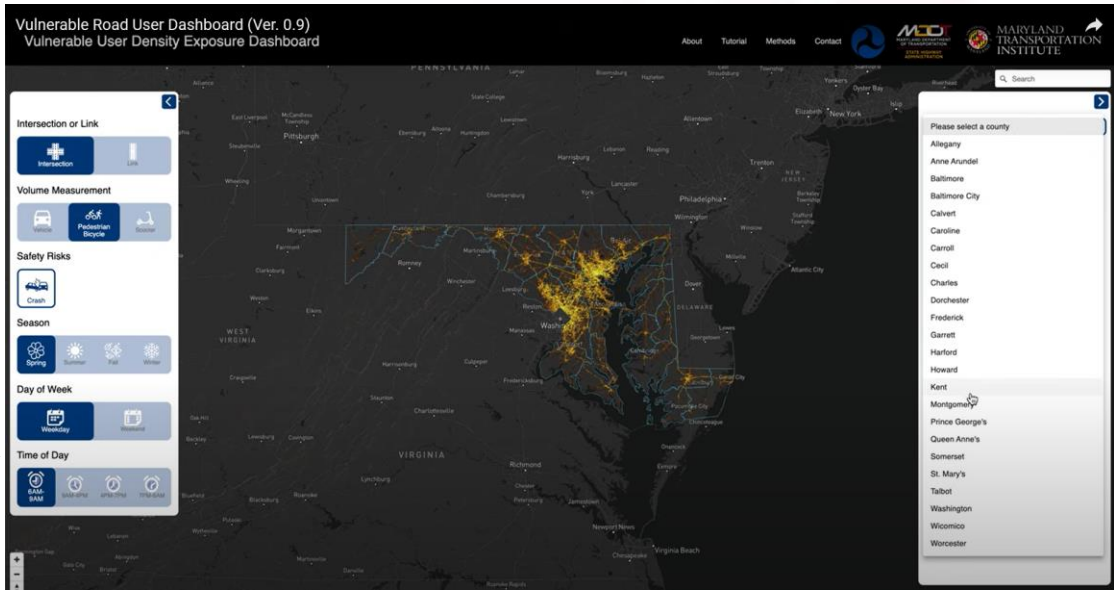



Step 1

**Safety Data Tool Development, Testing, Refinement, and Implementation**

RITIS CATT LABORATORY

Step 2



# MOBILE DEVICE LOCATION DATA SOURCES

**Cell Phone**

- Call Detail Record (CDR)
- Triangulation positioning

**GPS**

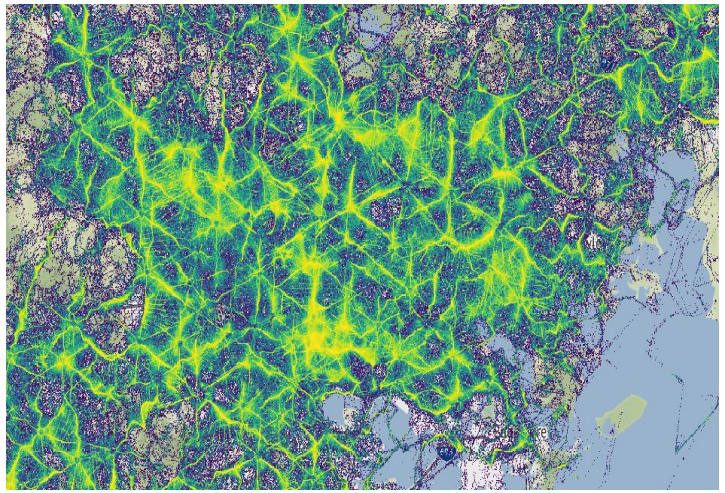
- In-vehicle (driving trips only)
- In-Phone Embedded GPS and accelerometer

**Location-based Services (LBS)**

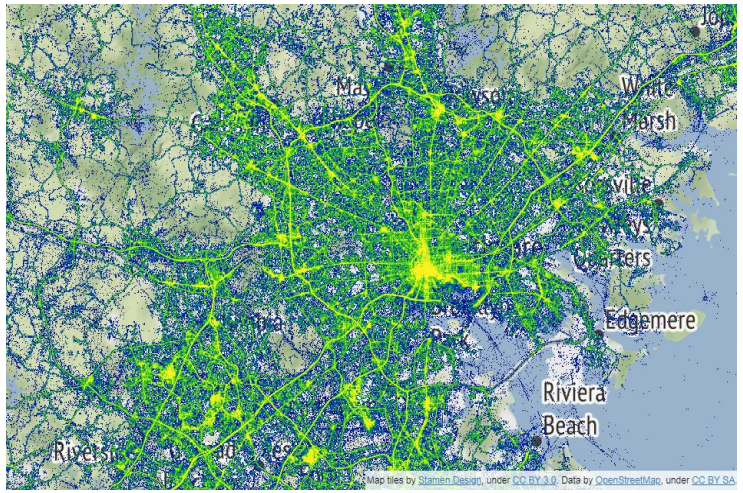
- From smartphone apps that use location-based services

**For situational awareness**: the Maryland Transportation Institute at the University of Maryland leads the Federal Highway Administration's mobile device location data pilot project.

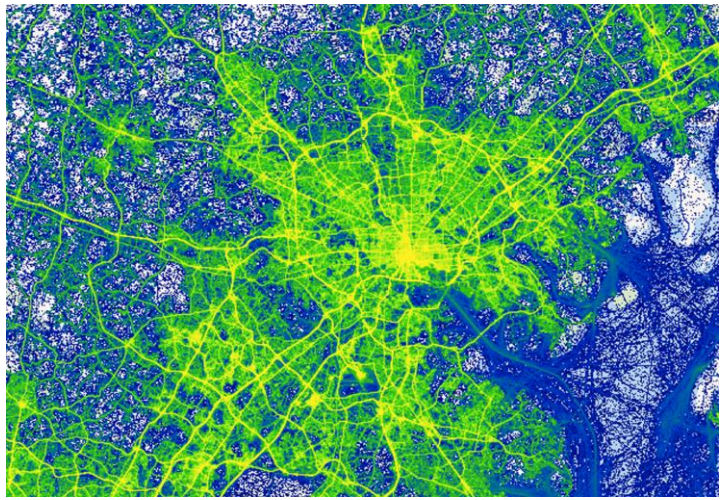
# SAMPLE MOBILE DEVICE LOCATION DATASETS



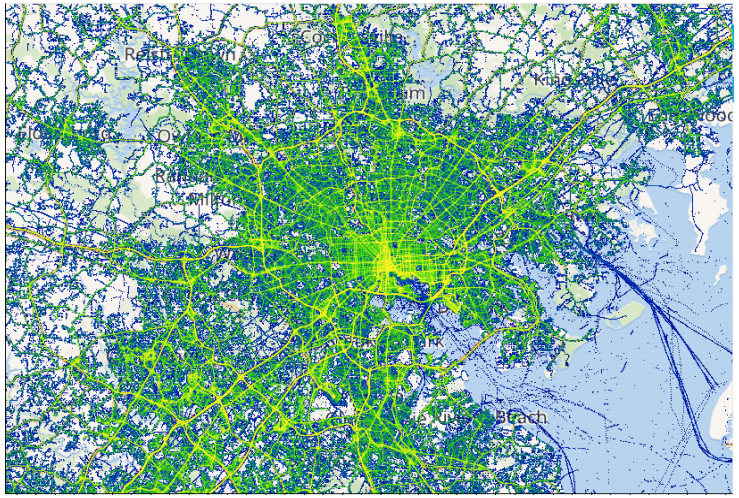
Cell Phone




SDK GPS



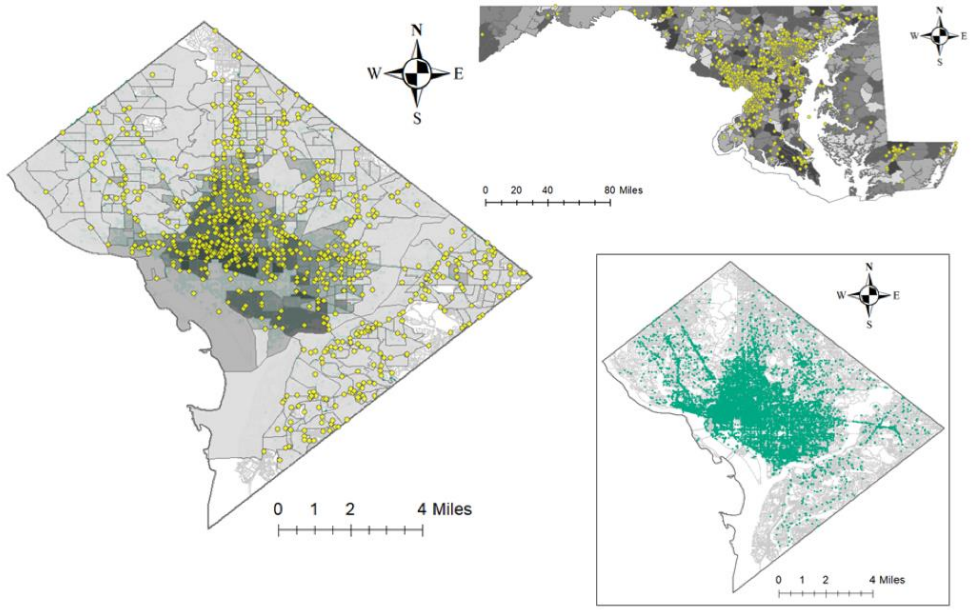
LBS (September 2017)



In-Vehicle GPS

- National data coverage
- 40 percent national coverage for 2017 in LBS alone, continuously increasing
- Continuous observations
- High location accuracy
- High sighting frequency

# DATA BIAS & PRIVACY MANAGEMENT




## Limitations

- LBS data does have **equity bias** to those who have devices, which could exclude certain communities (e.g., aging or low income).
- E-scooter travel patterns and crash data are **difficult to capture**.

## Management of Data Privacy

- Only aggregated information will be shared via the dashboard.
- Raw data, such as the crash records and the individual trajectories in the mobile device location dataset will remain internal.
- No individual-level data will be exchanged to avoid any perception or mishandling of Personally Identifiable Information (PII).

# LEVEL OF TRAFFIC STRESS

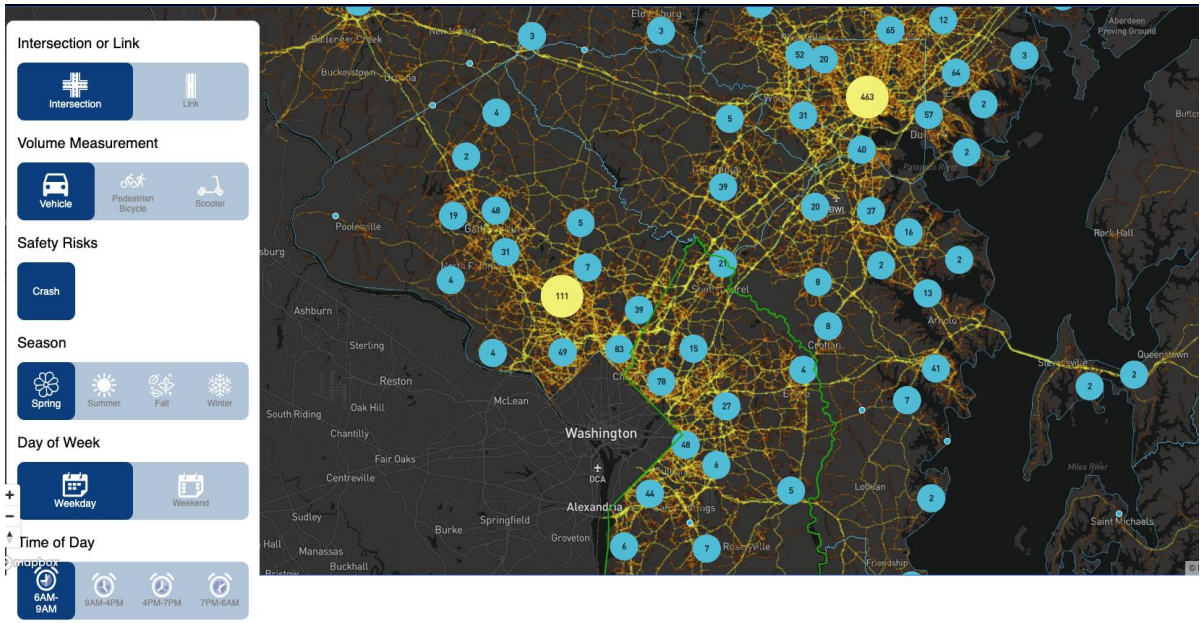
The Level of Traffic Stress (LTS) statistics are derived with the OpenStreetMap (OSM), following the definition as shown below:

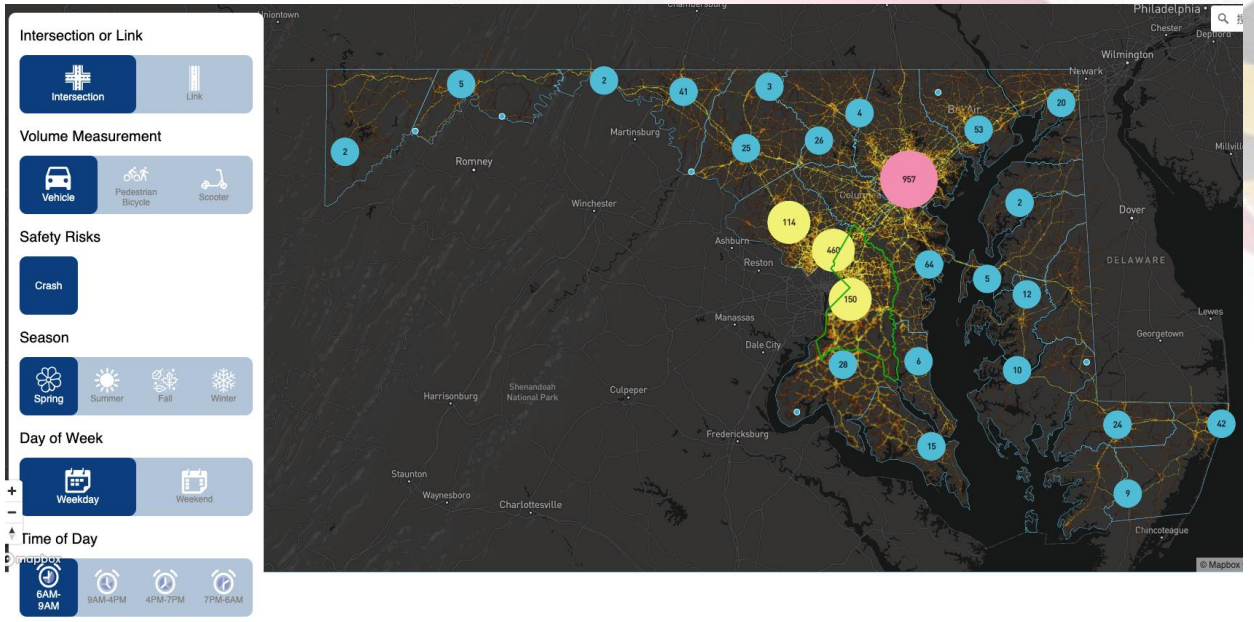
- LTS 1: **Strong separation** from all except **low speed, low volume traffic**.
- LTS 2: Cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings. **Physical separation from higher speed and multilane traffic**.
- LTS 3: Involves interaction with **moderate speed or multilane traffic**, **or close proximity to higher speed traffic**.
- LTS 4: Involves interaction with **higher speed traffic or close proximity to high-speed traffic**.




Source: http://www.northeastern.edu/peter.furth/research/level-of-traffic-stress

# INCORPORATING CRASH RECORDS




- Ped/bike crash records (2019) for Maryland were added as a layer
- MSCAN records received and are being merged to the system

# VOLUME VALIDATION/CALIBRATION

**Validation dataset: vehicle and pedestrian/bicycle counts**

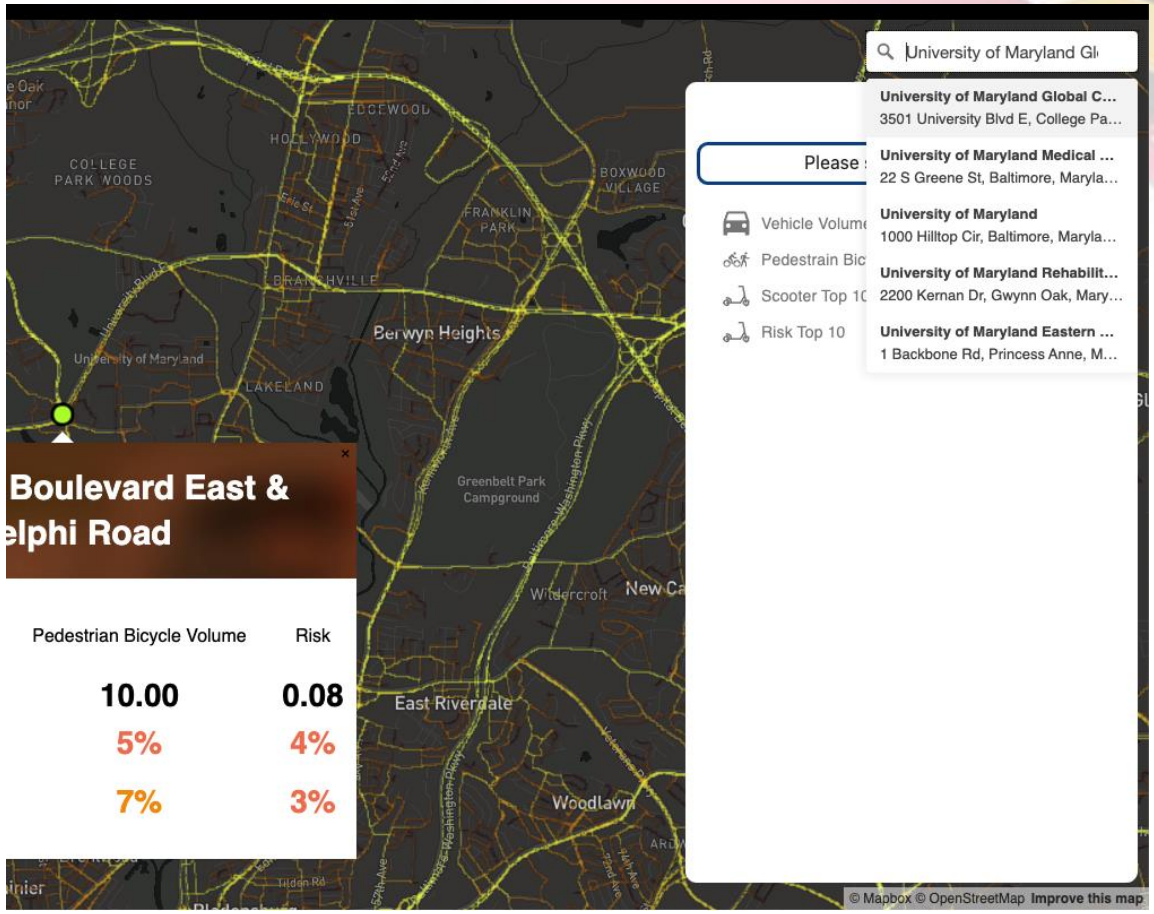
- Data received and has been geocoded to match our network (nodes, links)

**Validation/Calibration (on-going)**

- Massive data production for the entire year of 2019
- Generation of validation dataset
- Multimodal weighting
- Spatial-temporal calibration
- Validation of volume estimates as the final QAQC of the dashboard

# MEASURING RISKS

- Build a model at the link and intersection levels for ped/bike-involved crashes
- Pedestrian bicycle volumes, vehicle volumes at link and intersection levels
- Level of Traffic Stress (LTS) for ped/bicyclist
- Intersection/link geometry
- Land use and built environment variables, etc.




**Risk = Predicted Frequency of Ped/Bike-Involved Crashes in a Year**

# PROJECT TIMELINE

- Refining hiccups/data processing - Winter 2020-2021
- Internal US DOT & stakeholder reviews - Spring 2021
- Final product - Summer 2021 (required)

# THANKYOU!

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

MARYLAND TRANSPORTATION INSTITUTE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