

---

# Using Big Data to Support Asset Management Decision Making

---

**Kevin Heaslip, Ph.D., PE**

**Sue McNeil, Ph.D. (University of Delaware)**

**Jie Gong (Rutgers University)**

# Acknowledgements

## ➤ Work Funded by

- Center for Advanced Infrastructure and Transportation at Rutgers
- Mountain Plains Consortium at North Dakota State University
- Utah Department of Transportation
- USDOT - Office of the Assistant Secretary for Research and Technology

# Why conduct transportation asset management (TAM)?

- Greater accountability in the effective use of federal funds
- An increased relationship between performance and funding
- More sustainable transportation solutions



Via, Jr.

# Asset Management

## ➤ Categories of Asset Management

- Bridges
- Barriers/Delineators
- Culverts
- Pavements
- Pavement Markings
- Signs
- Other



A. Bending Damage



B. Peeling Damage



C. Vandalism



D. Cracking Damage



E. Other Damage Types

# AASHTO's TAM Process

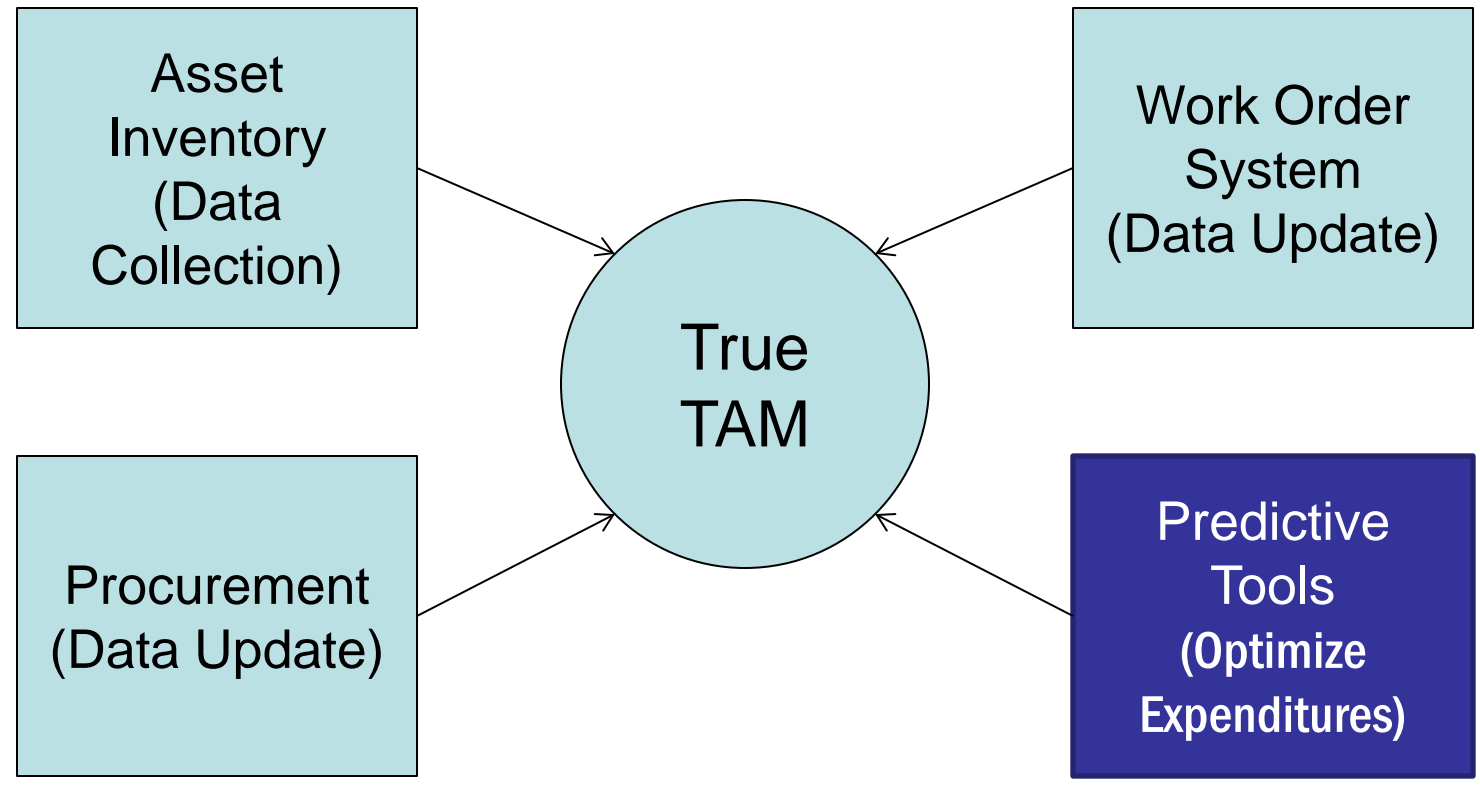
## ➤ The 14 steps to TAM implementation:

1. Set agency goals and objectives.
2. Conduct self-assessment and TAM gap analysis.
3. Define the scope of TAM.
4. Develop the change strategy.
5. Integrate TAM into the organizational culture.
6. Integrate TAM into business processes.
7. Establish asset management roles.
8. Establish performance management standards.
9. Develop a TAM plan.
10. Strengthen enabling processes-service planning.
11. Strengthen enabling processes-life-cycle management.
12. Strengthen enabling processes-TAM integration.
13. Strengthen information systems.
14. Strengthen data

# A Practical Implementation of a TAM

- **The process of TAM can have the following aspects:**
  - **A baseline of existing assets**
    - Installation Date
    - Condition
  - **A process to update records that account for:**
    - New infrastructure
    - Infrastructure replacement

# Linking Databases



# Data Collection

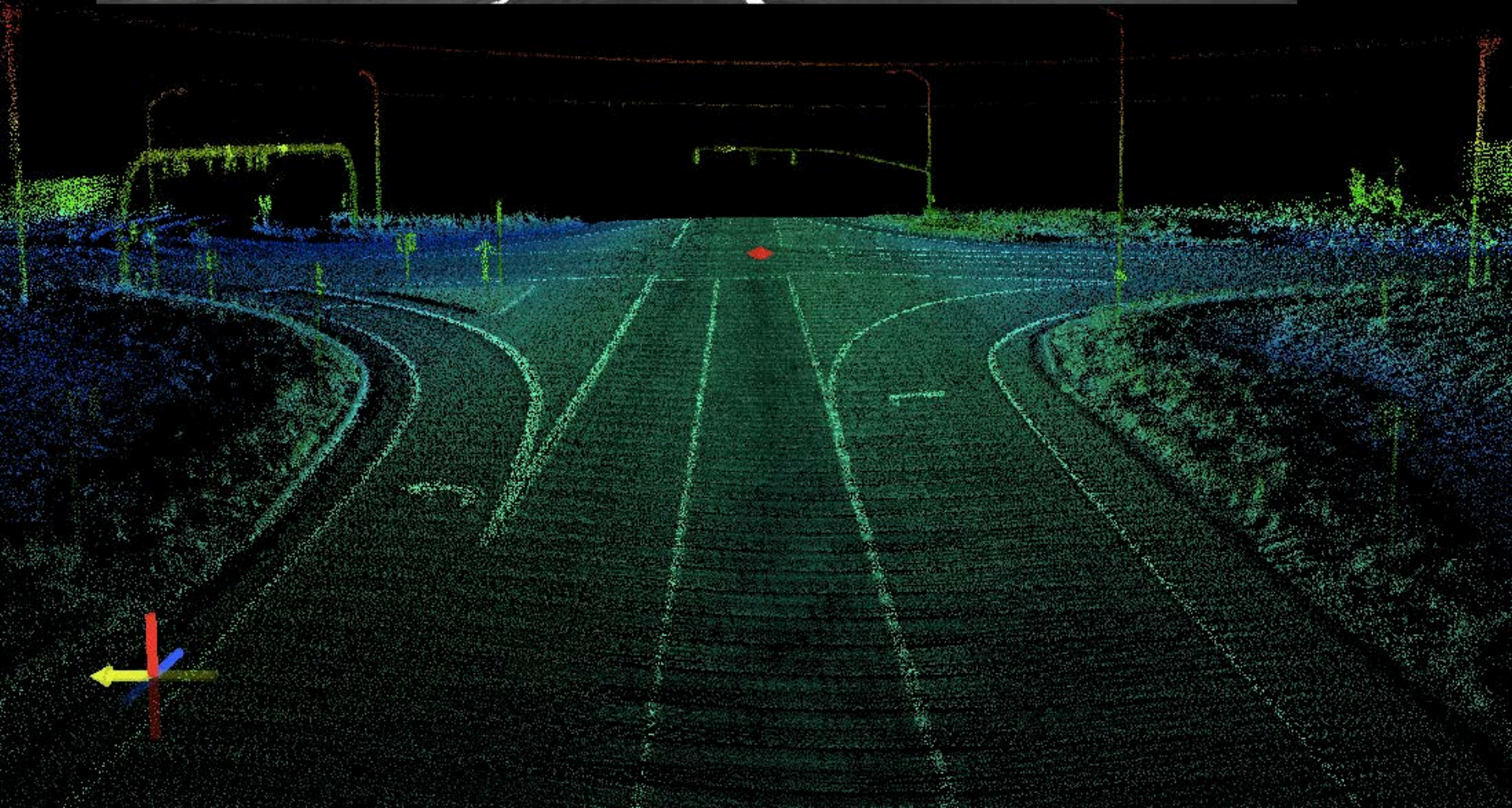
## ➤ Mobile LiDAR

- 1.4 million points of data per second
- State of Utah had 27 TB of points for its roadway system
- 5,860 centerline miles



Charles Edward Via, Jr.  
Department of Civil &  
Environmental Engineering

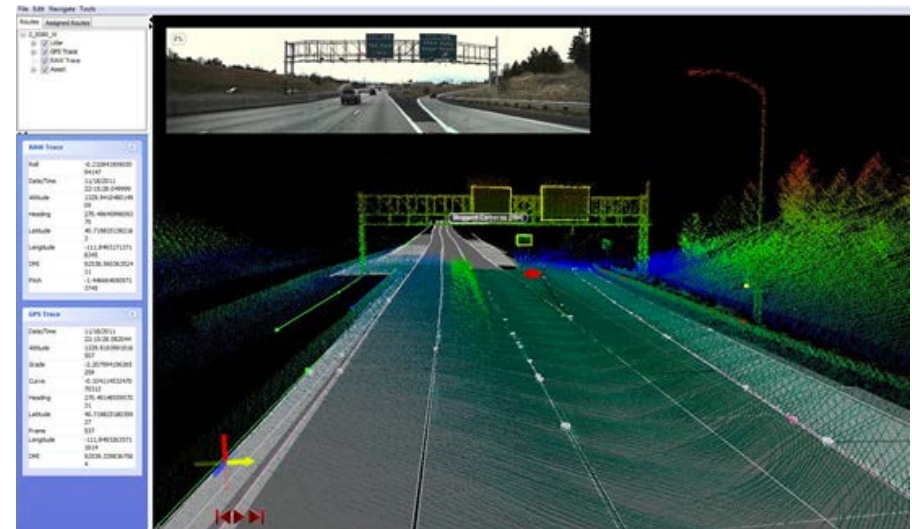




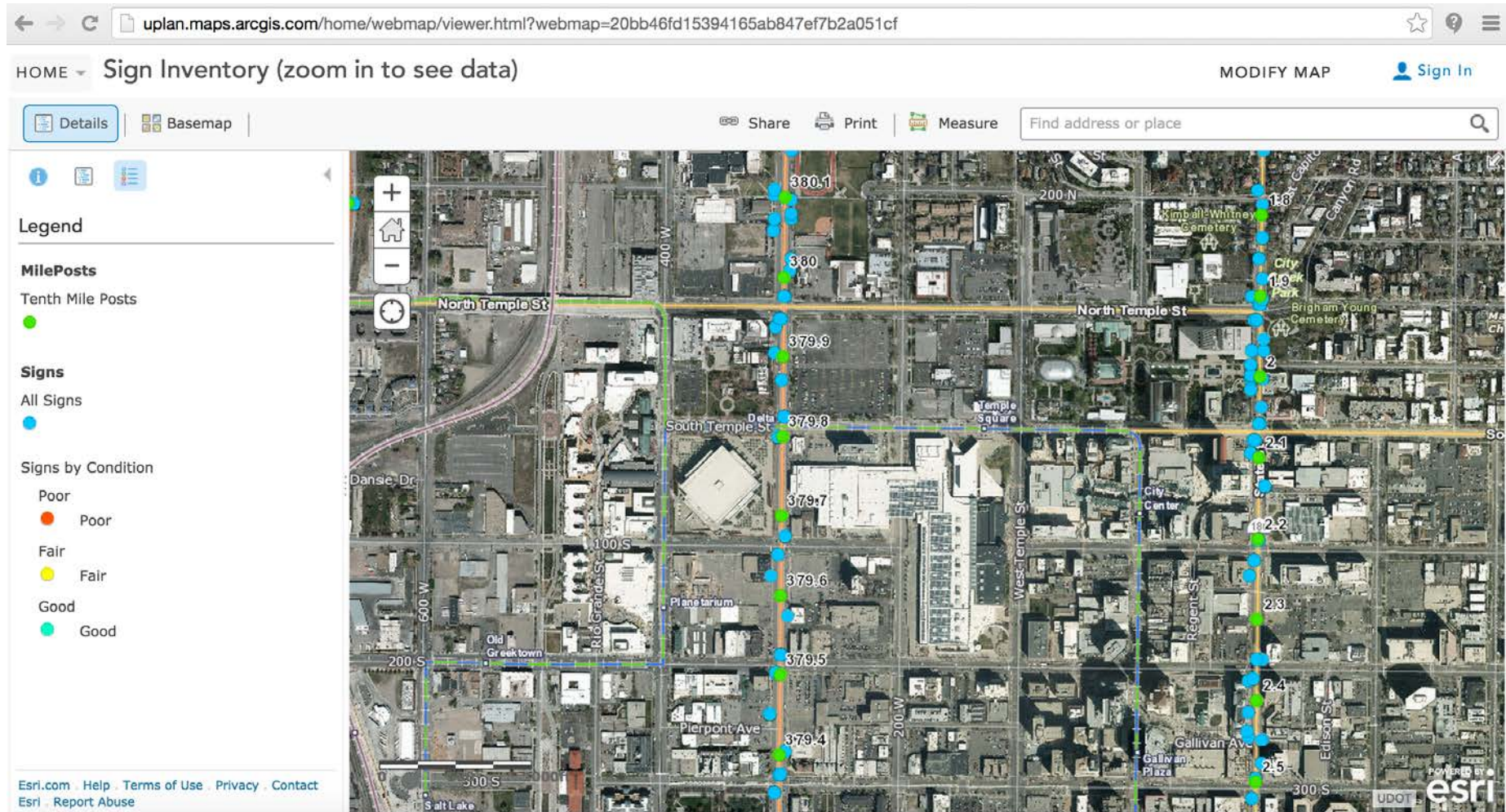


# Output Data

- **Pavement**
  - Cracks, rutting, and roughness
  - Pavement markings
- **Signs**
  - Type, condition, and size
- **Bridges**
  - Deflection and Cracking
- **Other Assets**
  - Reflectors
  - Guardrail
  - Medians
  - Rumble Strips



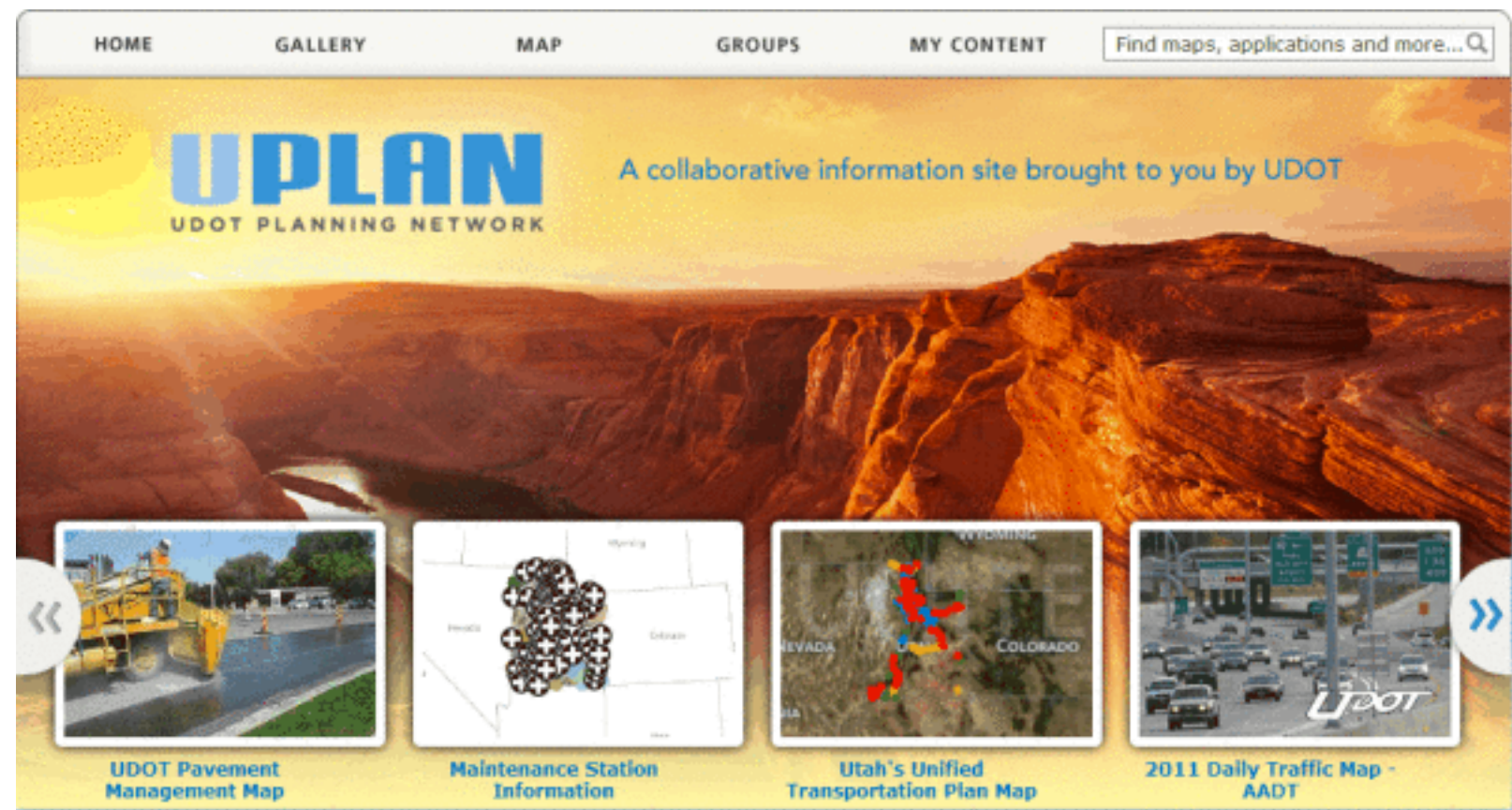
# GIS Integration



Charles Edward Via, Jr.  
 Department of Civil &  
 Environmental Engineering



# UPLAN



The screenshot shows the UPLAN website interface. At the top, there is a navigation menu with links for HOME, GALLERY, MAP, GROUPS, and MY CONTENT. A search bar on the right contains the text "Find maps, applications and more...". The main header features the UPLAN logo (UDOT PLANNING NETWORK) and the tagline "A collaborative information site brought to you by UDOT". Below the header is a carousel of four featured maps:

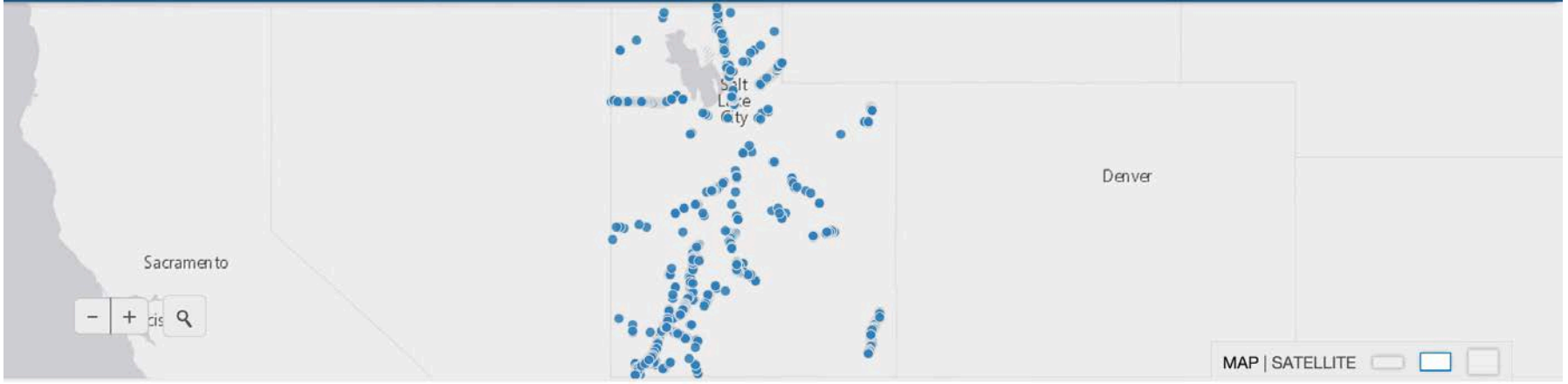
- UDOT Pavement Management Map**: A photograph of a yellow paving machine on a road.
- Maintenance Station Information**: A map of Utah with black and white symbols indicating station locations.
- Utah's Unified Transportation Plan Map**: A map of Utah with colored regions (red, blue, yellow) representing different transportation planning areas.
- 2011 Daily Traffic Map - AADT**: A photograph of a busy highway interchange with traffic.

# UDOT Open Data

udot.uplan.opendata.arcgis.com/datasets/2c718a780caf47279fbc23c3401af4d7\_0?geometry=-124.692%2C36.957%2C-97.358%2C42.039&mapSiz...



asset  SEARCH WITHIN MAP My Activity



## < Sign Faces

[OPEN IN ARCGIS](#) [SHARE](#) [SUBSCRIBE](#) [Download Dataset](#)

[Details](#) [Table](#) [Charts](#)

### DESCRIPTION

This dataset contains sign faces located along Utah state highways. Descriptive information

[more](#)

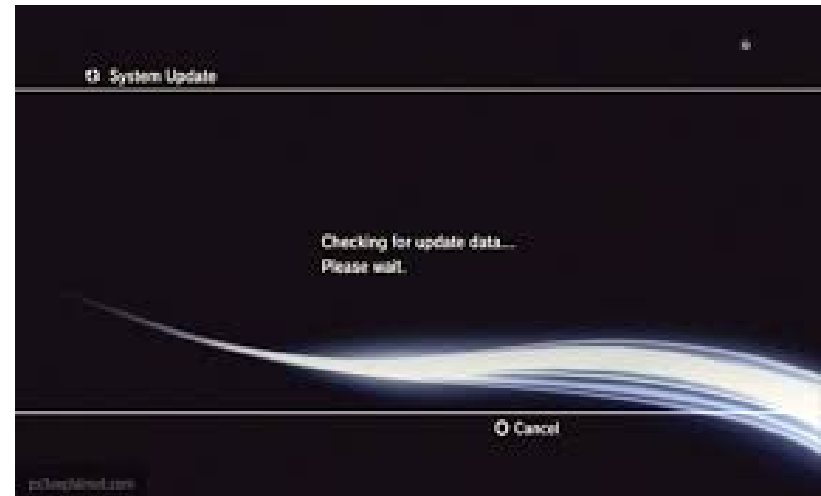
### ABOUT

UDOT Open Data

Charles Edward Via, Jr.  
Department of Civil &  
Environmental Engineering

# Challenges

- **Post processing of data**
- **Keeping maps up to date**
- **“Snapshot in time”**
- **Updating data**
- **Predictive analysis**



# Taking the Next Step

- **Optimizing asset management investment**
  - Understanding degradation of infrastructure
  - Forecasting the useful life of the infrastructure
  - Avoiding blanket replacement and replacement during large projects

# Conclusions

- Era of big data is upon us in transportation
- Data analytics can help
- Collection, maintenance, and analytics are important
- Innovation is possible
- “Real-time” analytics





# Thank you!

- **Kevin Heaslip**  
**Associate Professor**
  
- **900 North Glebe Road**  
**Arlington, VA 22203**  
**kheaslip@vt.edu**  
**571-858-3070**