# *Research Summary*

TITAN – An Interactive, Web-based Framework for Transportation Data Integration and Analytics – Phase 2

Departments of Transportation (DOTs) are increasingly inundated with vast amounts of data flowing in at high speeds from various sources, including traffic sensors, incident reports, weather stations, and probe vehicles. While these datasets are critical for monitoring and managing transportation systems, the sheer size and velocity of the data can be overwhelming. Transportation agencies are expected to process this information rapidly to make actionable decisions in real-time, but the existing infrastructure for storing and visualizing these datasets often falls short. Where infrastructure exists, it typically lacks the scalability required to handle the growing data demands effectively.

The goal of the TITAN (In**T**eract**I**ve, Web-based Framework for **T**ransportation Data Integration and **An**alytics) project is to overcome these challenges by leveraging the power of cloud computing and big data technologies to develop a web-based platform. Through a robust data storage and visualization framework, TITAN empowers transportation agencies to derive actionable insights quickly and efficiently, even as data volumes continue to grow. The TITAN platform effectively fulfills two key roles in the realm of transportation management: data
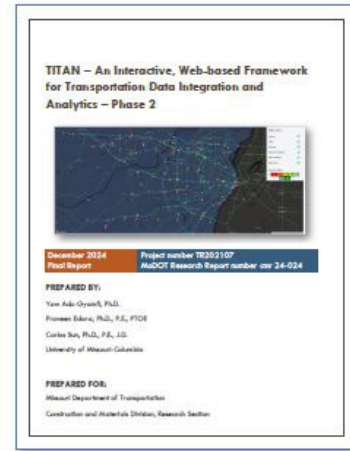
warehousing, data integration and visualization, and predictive analytics (as shown in Figure 1).
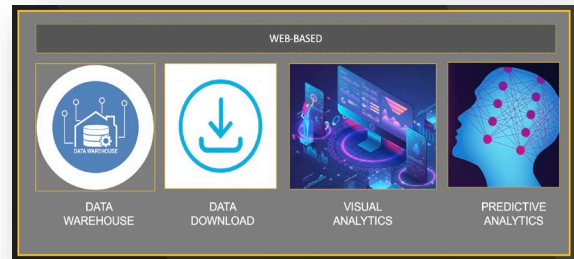

Figure 1: Key Components of TITAN

First, as a data warehousing solution, TITAN provides a robust, scalable infrastructure capable of archiving and managing vast amounts of transportation data from diverse sources, including traffic sensors, crash reports, weather systems, and crowd-sourced data. The platform ensures that this data is readily available for both real-time and historical analysis, offering the Missouri Department of Transportation (MoDOT) and other stakeholders a reliable repository of transportation insights.

At its core, TITAN is used for data integration and visualization, seamlessly connecting datasets from various sources and presenting them in user-friendly, interactive dashboards (as shown in Figure 2). This functionality enables the DOT

to visualize and cross-analyze complex datasets, such as crash statistics, traffic patterns, and weather conditions, all in one unified platform. The ability to visualize large datasets and perform real-time analytics across them allows transportation professionals to make informed decisions quickly, significantly improving traffic management, safety operations, and infrastructure planning.

> *"TITAN empowers DOTs with real-time insights through scalable data integration and predictive analytics."*

TITAN's future development will focus on enhancing its predictive analytics capabilities to address emerging transportation challenges. By integrating advanced machine learning algorithms with historical and real-time data, the platform will enable predictive modeling of traffic patterns, crash probabilities, and potential roadway disruptions. This capability will allow MoDOT to proactively manage issues such as traffic congestion, road safety, and maintenance planning, ultimately improving operational efficiency and ensuring safer, more reliable transportation infrastructure.
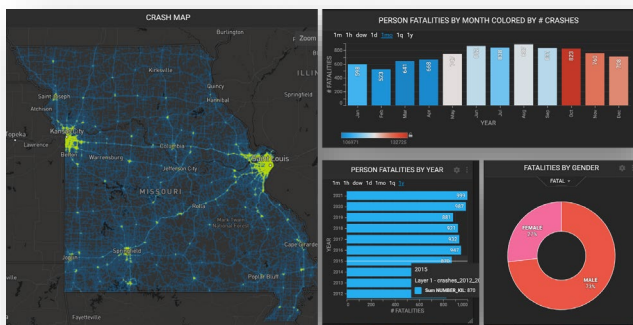

Figure 2: Example Visual Analytics Dashboard for Traffic Safety

Project Information

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