Blog Post 3: From Data to Decisions – AI and Simulation

Once data is ingested, PANTHEON employs advanced analytics to convert raw information into actionable intelligence for disaster response operators.

Machine Learning (ML) Integration

PANTHEON leverages various ML models managed within its dedicated architecture layer. These include supervised models for classification and regression, and unsupervised models for clustering data anomalies. The platform uses specific data stores optimized for different model types—GraphDB for relationship data, InfluxDB for time-series, and PostgreSQL with PostGIS for geospatial data.

The Simulation Engine & What-If Analysis

At the heart of PANTHEON is the transportation-sector based SCDT. It uses graph network builders (utilizing Neo4J) to model road networks where nodes represent junctions and edges represent roads with associated traffic flows.

Operators can run **What-If Analyses** to explore potential outcomes by altering input variables—such as simulating the failure of a specific bridge during a flood. The system calculates risk based on:

- **Threat Likelihood:** Derived from historical data (e.g., seismic activity).
- **Vulnerability:** Based on infrastructure age, building codes, or proximity to hazards (e.g., vegetation density for wildfires).
- **Impact:** Measuring potential population affected or critical infrastructure service loss.

This allows decision-makers to compare alternative solutions and understand trade-offs in conflicting performance indicators before committing real-world resources.