Seattle Department of Transportation Advances Vision Zero with AI-Driven Safety Insights

Value-Driven Benefits

90%+
reduction in collision analysis time

250,000+
collisions analyzed

4,000
miles of roadway unified for citywide safety insights

Introduction

Seattle Department of Transportation (SDOT) manages and maintains more than 4,000 miles of roadway and 7,800 intersections across a growing metropolitan area. Increasing travel demand from vehicles, pedestrians, and cyclists has placed significant strain on the city's transportation network. Despite ongoing safety programs, the city continues to experience more than 6,000 collisions and nearly 30 fatal crashes each year. In response, the city launched a comprehensive Vision Zero initiative to eliminate traffic deaths and serious injuries on city streets by 2030.

Challenges

SDOT faced several challenges in advancing its Vision Zero goals and improving intersection safety across the city. Collision analysis and safety evaluations relied on manual, repetitive methods that limited the department's ability to identify high-risk intersections and understand the underlying causes of severe collisions. Analysts often had to reconcile data from multiple disconnected systems, which made it difficult to achieve systemwide visibility into roadway safety. The department also lacked sufficient staffing and in-house expertise to analyze growing volumes of collision, traffic, and roadway data available to them.

Evaluating the effectiveness of past safety projects was equally challenging. Intersection upgrades were not consistently tracked or linked to outcome data, leaving decision-makers without clear understanding of which design treatments or mitigation strategies most effectively reduced fatalities and serious injuries.

For a data-driven initiative like Vision Zero, these limitations created barriers to timely, evidence-based decision-making. Without integrated analytics and consistent data governance, the department risked overlooking emerging collision patterns, duplicating efforts across teams, and missing opportunities for proactive safety interventions.

Solution

SDOT implemented C3 AI Safety Analysis to establish a proactive, data-driven framework to improving roadway safety. Within three months, the C3 AI team unified historical collision and speed data into a centralized view, providing engineers and planners with citywide visibility across 7,800+ intersections. C3 AI Safety Analysis applies machine learning-based collision severity factor analysis to uncover root causes, identify high-risk corridors, and support data-driven prioritization of safety investments.

Results

C3 AI Safety Analysis enhanced SDOT's ability to monitor, analyze, and respond to safety risks across the city's intersections. By replacing manual, siloed workflows with AI-driven insights and interactive dashboards, the application reduced collision analysis time by more than 90%, allowing near real time identification of safety hotspots.

With a unified view of collision and roadway data, engineers and safety planners can now evaluate the effectiveness of mitigation measures, track performance across corridors, and plan future improvements with greater precision. This capability allows SDOT to respond to emerging risks more efficiently, allocate resources on the highest-impact safety projects, and accelerate progress toward its Vision Zero goal of eliminating traffic fatalities and serious injuries.

Approach

C3 AI configured and deployed C3 AI Safety Analysis to help SDOT enhance traffic safety analysis through use of advanced machine learning and centralized data workflows in support of the city's Vision Zero initiative.

The team began by integrating, cleansing, and consolidating five years of historical collision and speed data, comprising tens of thousands of collision records and traffic observations across the city's 7,800+ intersections. These datasets captured critical attributes, including crash type, severity, contributing factors, roadway characteristics, and observed vehicle speeds, to create a unified data foundation for safety analysis.

C3 AI Safety Analysis combines interactive dashboards and interpretable machine learning models into a single workflow that enables engineers and planners to visualize collision trends, understand risk factors, and evaluate the effectiveness of mitigation strategies. The application aggregates safety indicators such as collision frequency and severity trends to highlight emerging hotspots while allowing users to drill into intersection-level details, review historical interventions, and track ongoing safety projects.

The C3 AI team also configured tree-based machine learning models with explainability to quantify the factors most strongly associated with collision severity. The models revealed top severity contributors, including excessive speed and motorcycle involvement, and severity reducers, such as functioning traffic signals and protected turning movements. Intersection-level analyses uncovered actionable insights for targeted mitigations, such as speed reduction, signal upgrades, and lane control enhancements.

With C3 AI Safety Analysis, SDOT now has real-time, citywide visibility into roadway safety performance and the tools to prioritize high-impact projects with confidence. This unified approach empowers engineers to identify safety hotspots, measure the effectiveness of past interventions, and target design treatments that most effectively reduce severe collisions and fatalities.

Continued Engagement

Building on the success of the initial deployment, SDOT and C3 AI continue to collaborate to expand the use of C3 AI Safety Analysis across additional datasets and capabilities. The application was designed with extensibility and interoperability in mind, allowing integration of new data sources such as weather, lighting, traffic conditions, and intersection geometry to further enhance analytical precision and insight.

C3 AI remains a strategic partner in supporting the city's Vision Zero initiative, helping SDOT scale data-driven safety practices, improve cross-department collaboration, and prioritize projects that deliver the greatest impact on community safety.

About SDOT

- Oversees $28 billion in city transportation assets and infrastructure
- Manages 4,000 miles of roadways and 7,800 intersections
- Supports a population of more than 760,000 residents
- Leads the city's Vision Zero program to eliminate traffic deaths and serious injuries by 2030

Project Highlights

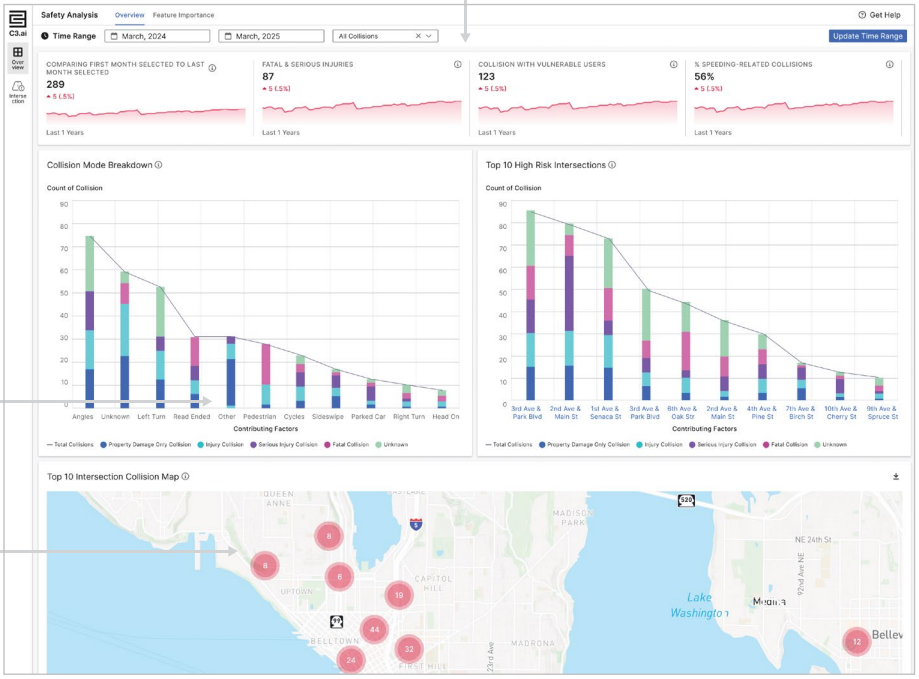
- 12 weeks from project kickoff to production-ready application
- 5 years of historical collision, traffic, and roadway data integrated across 7,800+ intersections
- 5 user interface screens configured
- 11 users trained and onboarded
- Achieved 90%+ reduction in collision analysis time

Solution Architecture

C3 AI Safety Analysis

- Collision Data
- Speed Data
- Roadway Information
- Geospatial Data (GIS)
- Records Management System (RMS)
- Weather

KPIs



Machine Learning analysis of top collision severity factors

Interactive map view of intersection collisions

Proven Results in Initial Production Deployment

Visit C3.ai/get-started