AI – Powered Supply Chain Resilience Index (SCRI)

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Introduction

Modern supply chains are highly interconnected and vulnerable to disruptions like extreme weather, pandemics, and global conflicts. Traditional systems lack the ability to assess risk in real time, often reacting too late to avoid delays or losses.

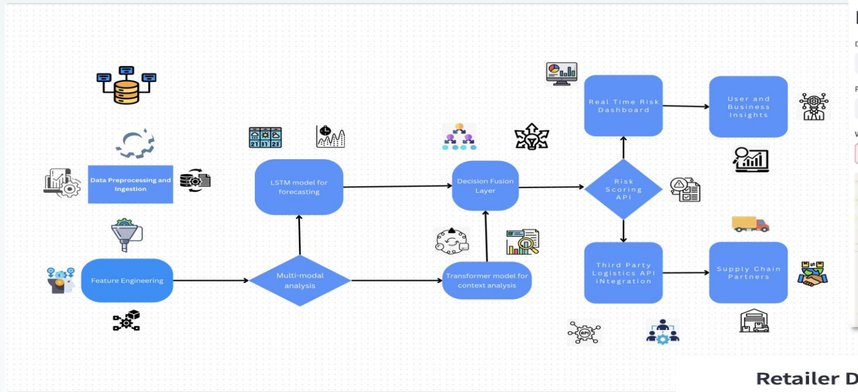
Companies lose billions annually due to poor visibility, planning gaps, and shipment failures. To address this, we introduce the Supply Chain Resilience Index (SCRI) — an AI-driven metric that predicts delivery risk proactively. It combines live weather data, logistics inputs, and shipping conditions to assess risks across the supply chain.

SCRI helps businesses make informed decisions, issue early warnings, and ensure continuous service delivery. This transforms supply chains from reactive to resilient systems.

Objective

Our project aims to build a real-time AI-powered system that evaluates and predicts supply chain delivery risks. By combining customer, retailer, and logistics data with live weather inputs, we compute a unified metric called the Supply Chain Resilience Index (SCRI).This index guides proactive decisions to mitigate disruptions. The goal is to enhance transparency and enable better planning across the supply chain. It empowers both retailers and consumers to respond to risks more effectively and in real time.

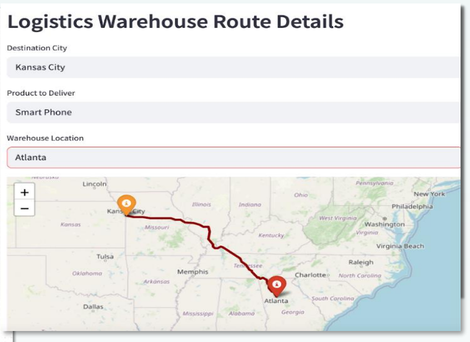
System Architecture

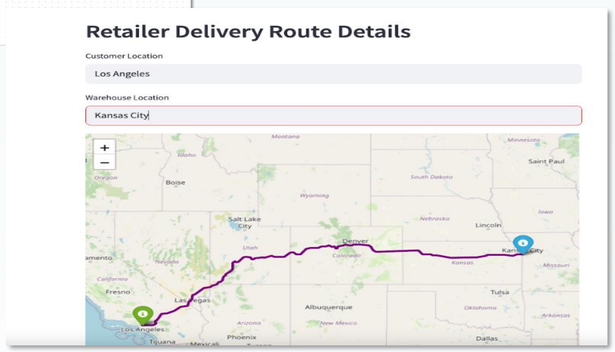


Methodology

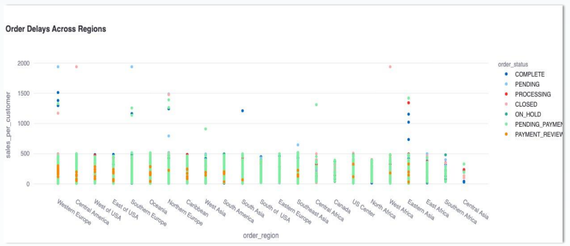
- Integrated real-time weather data via **OpenWeather** API and route data via **OpenRouteService**.
- Applied asynchronous ingestion, imputation for missing values, and statistical noise filtering.
- Performed dynamic feature selection on temporal and categorical risk indicators (e.g., wind speed, shipping type).
- Deployed **LSTM** for sequence modeling (weather), and **MLP**s for tabular retail and logistics data.
- Risk outputs rendered with Folium map layers; backend hosted in a Streamlit-based interactive UI.
- Fine-tuned models using **Low-Rank Adaptation (LoRA)** and validated performance with cross-entropy loss.

Results





- **AI Insight for Order** is displayed based on the city and product entered.
- Achieved AI generated insight for risk prediction text generation.
- Deployed an interactive **real-time risk dashboard** for visualization and monitoring.
- This graph displaying actual vs. predicted risk scores over time



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Conclusion

- The **AI-powered SCRI** enhances predictive accuracy and decision-making.
- **Transformer models and LSTMs** provide complementary strengths for risk prediction.
- Future improvements will focus on integrating **federated learning** and **multi-modal AI** for adaptive risk modeling.

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