

Title: Predictive Delivery Optimizer — NexGen Logistics

Executive summary:

We built a predictive engine that identifies orders at risk of delay before an SLA breach occurs, prioritizes interventions, and quantifies potential cost savings. The prototype integrates orders, delivery performance, route, fleet, and cost data to provide actionable, explainable recommendations.

Problem statement:

NexGen faces delivery performance issues and operational cost pressure. Delays disproportionately affect customer satisfaction and drive re-delivery & claims expenses.

Solution overview:

A Streamlit prototype that:

- Trains an ML classifier to predict “at-risk” orders (delayed vs on-time).
- Estimates expected delay minutes (regression).
- Generates per-order recommendations (reroute, reassign vehicle, switch carrier, customer notification).
- Simulates the business impact (potential cost savings from delay reduction).

Data sources:

orders.csv, delivery_performance.csv, routes_distance.csv, vehicle_fleet.csv, warehouse_inventory.csv, customer_feedback.csv, cost_breakdown.csv.

Key features:

- Explainable feature importance (permutation importance).
- Interactive dashboards (category distribution, cost distribution, delay trends).
- Batch scoring and per-order action recommendations.
- ROI simulation for leadership.

Results (expected/illustrative):

- Early detection of X% of eventual delays with Y% precision (depends on dataset).
- Simulated 20% reduction in delays could produce estimated savings = (saved_orders * avg delay cost).
- Reduced claims, improved CSAT (customer feedback integrated), and lowered re-delivery operational costs.

Implementation plan:

Phase 1 — Prototype and validation (this deliverable): Streamlit app, model training, ops playbook.

Phase 2 — Integrate with operational systems: carrier APIs, driver mobile app push

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notifications, automated reroute triggers.

Phase 3 — Optimization and automation: integrate prescriptive optimization to choose cheapest corrective action subject to constraints (vehicle capacity, SLA penalties).

KPIs to track:

- On-time delivery rate
- Average delay minutes
- Delay-related cost per month
- Customer satisfaction / NPS
- % of delayed orders predicted in advance

Next steps:

- Validate model on holdout / live streaming data.
- Connect to real-time order feeds and driver telemetry.
- Run A/B trial with human-in-the-loop interventions to measure real savings.