**Exploratory Data Analysis (EDA) Report**

**Objective**: This section focuses on uncovering key patterns and trends related to ETA variation, delivery efficiency, driver behavior, traffic, inventory levels, and other logistics KPIs from the cleaned supply chain dataset. Each chart is supported with analytical commentary to guide decision-making.

**ETA Variation Overview**

A graph with numbers and a red line

AI-generated content may be incorrect.

Insight: The distribution of ETA variation shows the right skew, indicating most deliveries were close to on-time, but a smaller subset experienced significant delays.

**Monthly Delay Patterns**

A graph of orange bars

AI-generated content may be incorrect.

Insight: A clear seasonal trend is visible, with delays peaking in certain months (e.g., December due to holidays).

**Traffic Congestion & Weather Impact**

A graph showing a number of red and blue dots

AI-generated content may be incorrect.

Insight: High traffic congestion correlates with longer ETA delays, especially when weather severity is also high.

**Customs Clearance Time Effect**

A graph with blue dots and a red line

AI-generated content may be incorrect.

Insight: Positive linear trend indicates longer customs clearance processes consistently delay shipments.

**Driver Behavior & Delivery Efficiency**

A graph of a driver behavior score

AI-generated content may be incorrect.

Insight: Strong positive correlation: better driver behavior scores lead to higher delivery efficiency.

**Fuel Consumption Distribution**

A graph of fuel consumption

AI-generated content may be incorrect.

Insight: Most vehicles operate within a consistent range, but outliers may point to inefficient driving or maintenance issues.

**Fatigue Monitoring vs ETA Variation**

A graph with blue dots

AI-generated content may be incorrect.

Insight: As fatigue score worsens, ETA delays increase. This validates fatigue as a critical risk factor.

**Inventory Bins vs Order Fulfillment**

A bar graph with numbers and a bar chart

AI-generated content may be incorrect.

Insight: Moderate inventory levels are linked to higher fulfillment success.

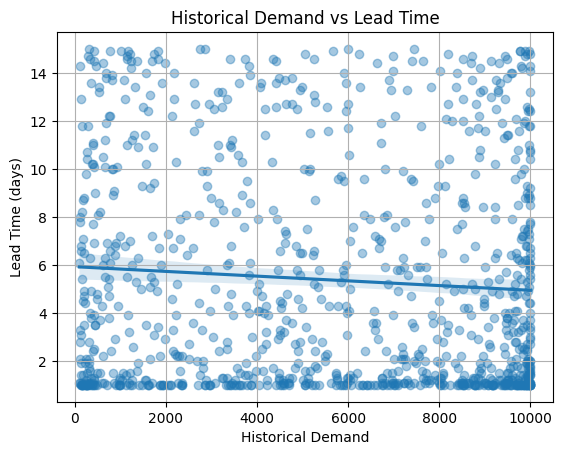
**Hourly Delay Trends**

*A graph of blue and white vertical lines

AI-generated content may be incorrect.*

Insight: Peak delays occur during rush hours (e.g., 8–10 AM, 4–6 PM).

**Historical Demand vs Lead Time**



Insight: Lead times increase slightly with higher historical demand.

**Delay Category Frequency**

A graph with green squares

AI-generated content may be incorrect.

Insight: The majority of delays fall under one or two categories — e.g., 'Traffic' or 'Customs'.

**Temperature Bands vs Cargo Condition**

A graph of a diagram

AI-generated content may be incorrect.

Insight: Higher temperatures correspond with worse cargo condition scores.

**Day of Week vs Delivery Efficiency**

*A graph of blue and black bars

AI-generated content may be incorrect.*

Insight: Certain days (e.g., Mondays or Fridays) show lower efficiency.

**Risk Score Distribution**

*A graph with purple bars

AI-generated content may be incorrect.*

Insight: The risk score clusters around a mid-range, with few extreme values.

**Disruption Likelihood vs Delay Probability**

*A graph of blue dots

AI-generated content may be incorrect.*

Insight: Strong relationship confirms that delay risks can be predicted and managed using disruption signals.