# AI-Powered Mill Contract Evaluation Tool

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## Project Overview

The current mill contract evaluation process at American Lumber is largely manual and reactive. Supply chain managers must review shipment delays, fluctuating margins, and inconsistent mill performance without automated tools. This makes contract evaluation slow, error-prone, and limited in scope.

This project aims to develop an AI-powered decision support tool that integrates contract data from American Lumber and freight shipment data from Lane One Transport. The tool will compute KPIs such as shipment times, gross margins, and carrier efficiency, and apply machine learning to:

- Predict profitability,
- Recommend contract renewals,
- Segment mills by performance,
- Forecast margins, and
- Detect anomalies.

The results will be presented in an interactive Streamlit dashboard for supply chain managers to make transparent, data-driven decisions.

## Data Sources

The tool integrates two structured datasets in Excel format enabling a 360° view of financial and operational performance:

- **American Lumber Contract Data:** Purchase orders, mill details, material, grade, purchase/sales prices, freight factors, costs, and margins.

- **Lane One Dispatch Data:** Shipment type, carriers, miles, revenue, expenses, profit %, and operational dates.

## Ethical Considerations

We will ensure the tool is not only accurate but also responsible and trustworthy by following these principles:

- **Transparency:** Provide explanations of predictions and renewal recommendations through feature importance and KPI drivers.
- **Fairness:** Apply consistent evaluation criteria across mills and carriers, monitoring for bias.
- **Privacy:** Keep shipment and financial data secure and confidential.
- **Human Oversight:** The tool supports decision-making; managers retain final responsibility.

# High-Level Methodology



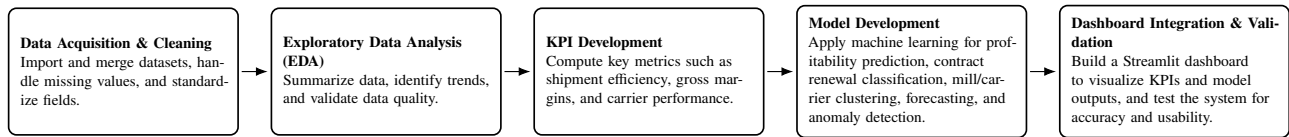| Data Acquisition & Cleaning — Import and merge datasets, handle missing values, and standardize fields. | Exploratory Data Analysis (EDA) — Summarize data, identify trends, and validate data quality. | KPI Development — Compute key metrics such as shipment efficiency, gross margins, and carrier performance. | Model Development — Apply machine learning for profitability prediction, contract renewal classification, mill/carrier clustering, forecasting, and anomaly detection. | Dashboard Integration & Validation — Build a Streamlit dashboard to visualize KPIs and model outputs, and test the system for accuracy and usability. |

Figure 1: High-Level Methodology

# Planned Machine Learning Models

- **Regression/Classification (PyTorch):** Predict gross profit and renewal likelihood.
- **Clustering (K-means):** Segment mills/carriers by performance.
- **Forecasting (ARIMA):** Predict margins and expenses.
- **Anomaly Detection (Z-score):** Identify irregular shipment costs and delays.

# Project Timeline



Phase 1 – Setup & Proposal (Weeks 1–2)

Phase 2 – Data Access & EDA (Weeks 3–4)

Phase 3 – Modeling & KPI Development (Weeks 5–7)

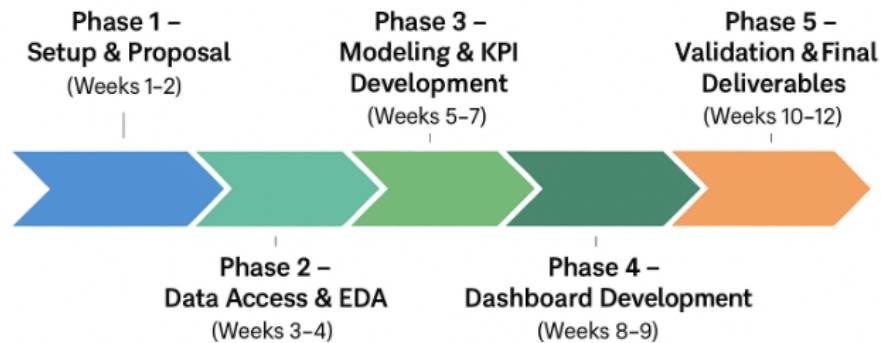Phase 4 – Dashboard Development (Weeks 8–9)

Phase 5 – Validation & Final Deliverables (Weeks 10–12)

Figure 2: Project Timeline