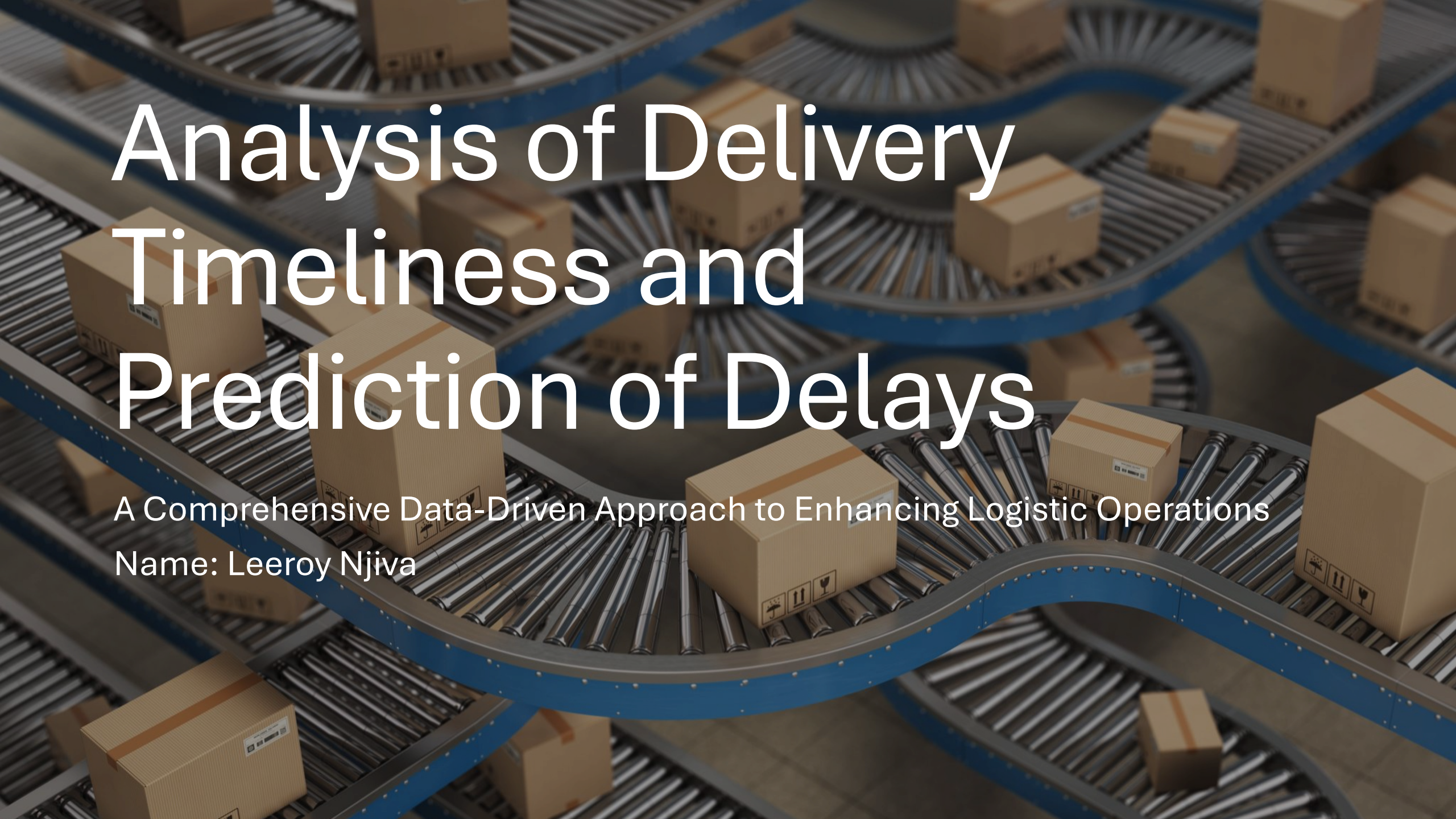


Analysis of Delivery Timeliness and Prediction of Delays

A Comprehensive Data-Driven Approach to Enhancing Logistic Operations

Name: Leeroy Njiva

Introduction

Objective: This presentation aims to provide insights into the timeliness of deliveries within our logistics operations, identify potential delays, and predict future occurrences to improve service reliability.

Scope: Analysis covers data from GPS tracking, shipment bookings, and prospective booking predictions.

Approach: Utilizing advanced data analytics techniques including data merging, datetime parsing, and predictive modeling.

Data Overview

Data Sources:

- GPS Data: Tracks real-time vehicle locations.
- Shipment Bookings: Records details about each shipment.
- New Bookings: Contains future bookings to analyze prospective delays.

Preprocessing Steps:

- Parsing datetime fields with timezone awareness.
- Merging GPS and bookings data for comprehensive analysis.

Analysis of On-Time Deliveries

- Key Findings:
- "75.20% of deliveries met the on-time delivery threshold."
- Visualization: [Include a bar graph of on-time delivery percentage]
- Discussion:
- The high percentage of on-time deliveries indicates effective logistics operations for most shipments.
- Factors influencing timeliness include vehicle type, route chosen, and external conditions such as traffic.

Potential Delays Identification

- Overview of Findings:
- Several potential delays were identified, where shipments exceeded their scheduled delivery windows.
- Data Snippet:

- Note:
- "No potential delays were detected within certain periods, indicating effective adjustments and responses to logistic challenges."

Shipments with potential delays:

	SHIPMENT_NUMBER	SHIPPER_ID	RECORD_TIMESTAMP	\
793	SEZHUK-231211-272127	NaN	2023-12-13 16:32:00+00:00	
794	SEZHUK-231211-272127	NaN	2023-12-13 16:33:00+00:00	
795	SEZHUK-231211-272127	NaN	2023-12-13 16:34:00+00:00	
796	SEZHUK-231211-272127	NaN	2023-12-13 16:42:00+00:00	
797	SEZHUK-231211-272127	NaN	2023-12-13 16:46:00+00:00	
...	...	...	...	
641190	SEZHUK-231014-253126	NaN	2023-10-15 19:19:00+00:00	
641191	SEZHUK-231014-253126	NaN	2023-10-15 19:21:00+00:00	
641192	SEZHUK-231014-253126	NaN	2023-10-15 19:23:00+00:00	
641193	SEZHUK-231014-253126	NaN	2023-10-15 19:24:00+00:00	
641194	SEZHUK-231014-253126	NaN	2023-10-15 19:26:00+00:00	

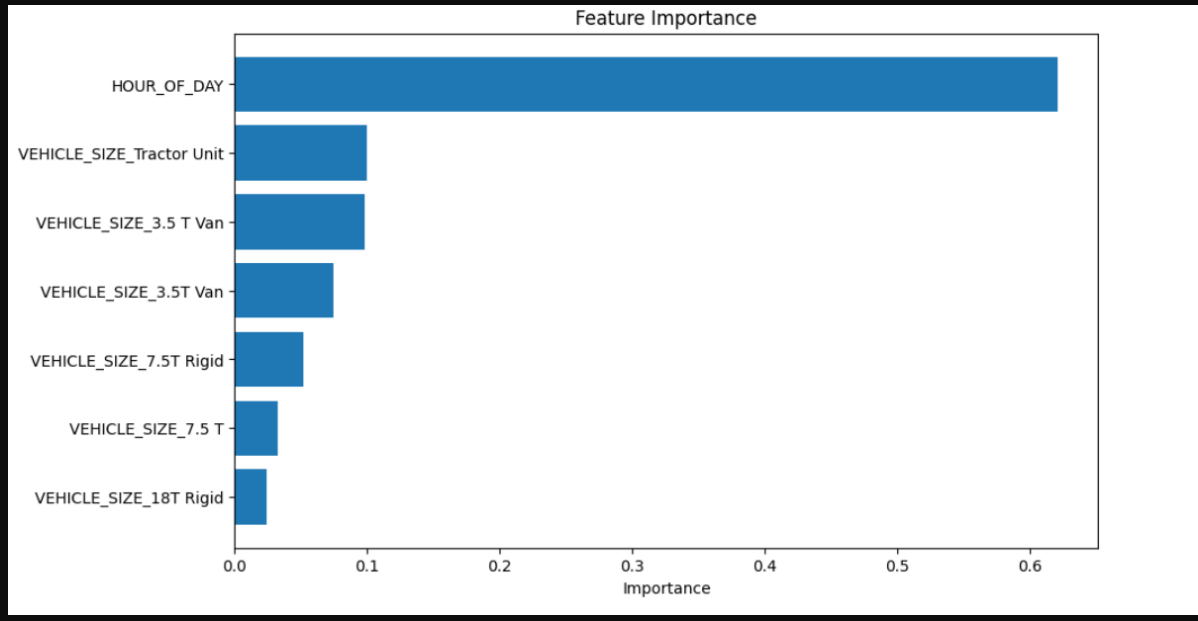
	LAST_DELIVERY_SCHEDULE_LATEST	DELAY_NOTIFICATION
793	2023-12-13 16:00:00+00:00	Notify
794	2023-12-13 16:00:00+00:00	Notify
795	2023-12-13 16:00:00+00:00	Notify
796	2023-12-13 16:00:00+00:00	Notify
797	2023-12-13 16:00:00+00:00	Notify
...	...	...
641190	2023-10-15 17:03:01+00:00	Notify
641191	2023-10-15 17:03:01+00:00	Notify
641192	2023-10-15 17:03:01+00:00	Notify
641193	2023-10-15 17:03:01+00:00	Notify
641194	2023-10-15 17:03:01+00:00	Notify

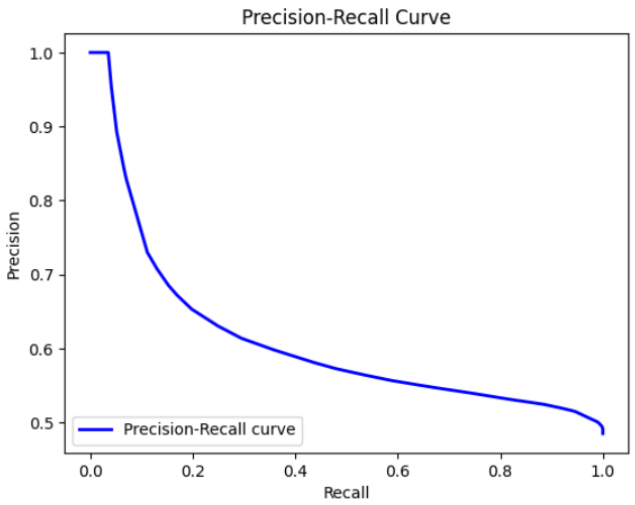
Predicting Future Delays for Shipments

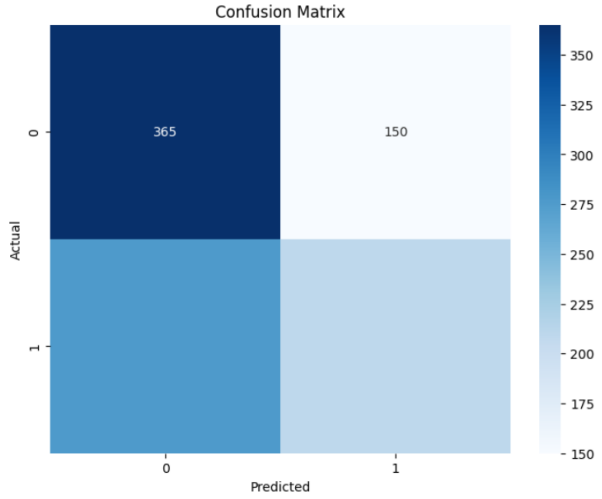
- Model Performance
  - Model Accuracy: 0.497 (Best Model)
  - Best Parameters: Learning Rate: 0.1, Max Depth: 4, Estimators: 200
- Classification Report:
  - Precision, Recall, F1-Score for each class demonstrating moderate predictive accuracy.
- Discussion:
- The model provides a foundational approach to predict delays but indicates potential for further tuning and enhancement.

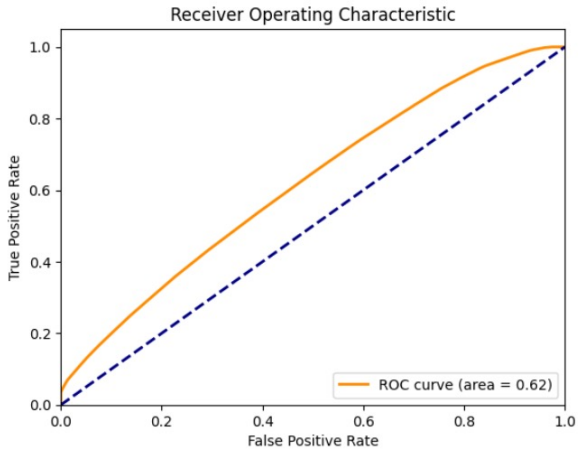
Feature Importance

- Explanation:
  - "Hour of the Day is significantly impactful, suggesting specific times where logistical challenges are heightened."
  - "Vehicle size affects delay likelihood, with larger vehicles like Tractor Units showing different patterns compared to smaller vans."









Model Evaluation Graphs

Conclusion

- Summary:
  - Our analysis demonstrates a strong capacity for on-time deliveries with specific areas identified for improvement in delay prediction.
- Implications:
  - Enhanced predictive capabilities can help allocate resources more effectively during critical periods.
- Recommendations:
  - Continued refinement of predictive models.
  - Increased data collection on external factors affecting delivery times.