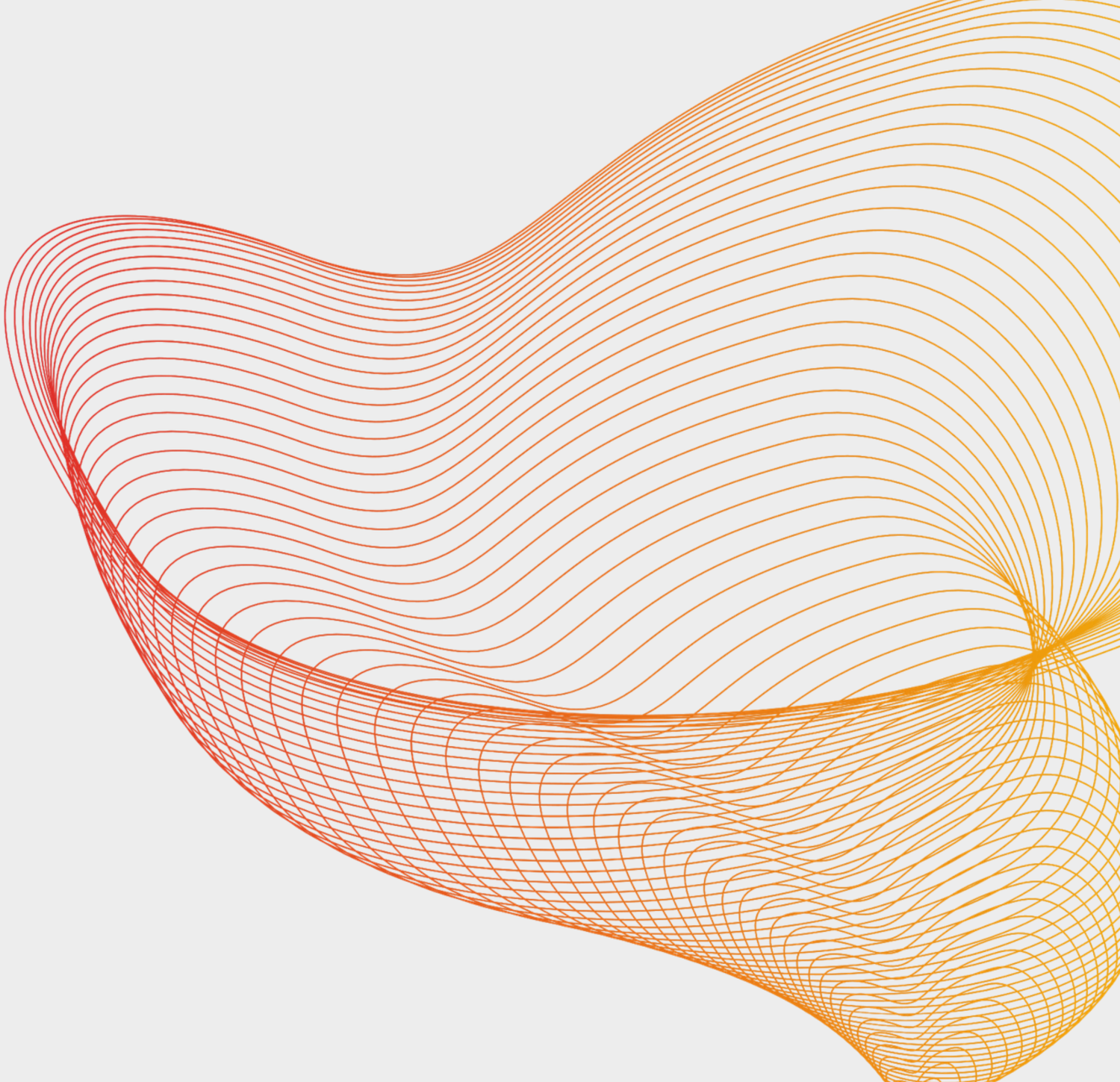
Miracle Electronics

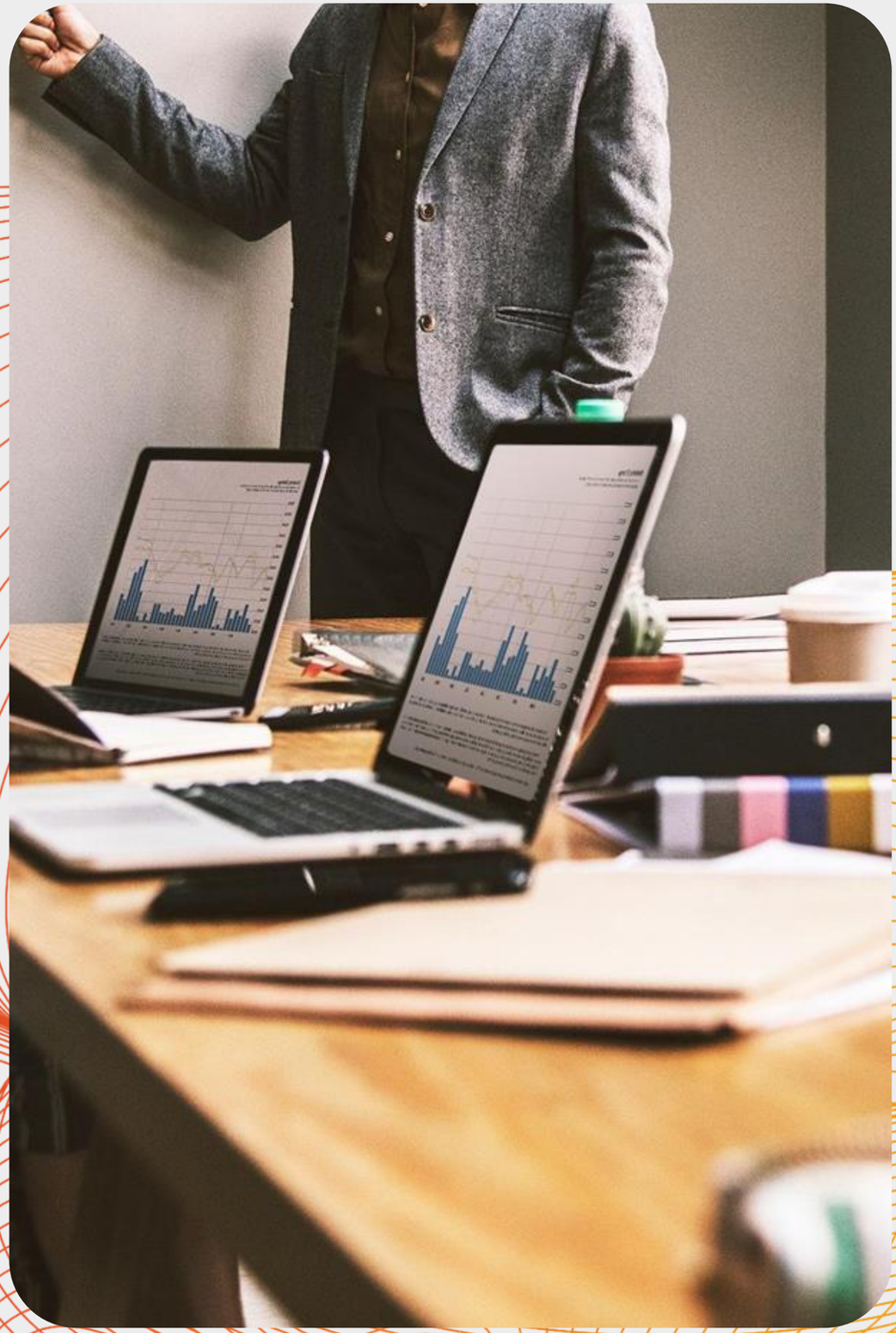
Created by

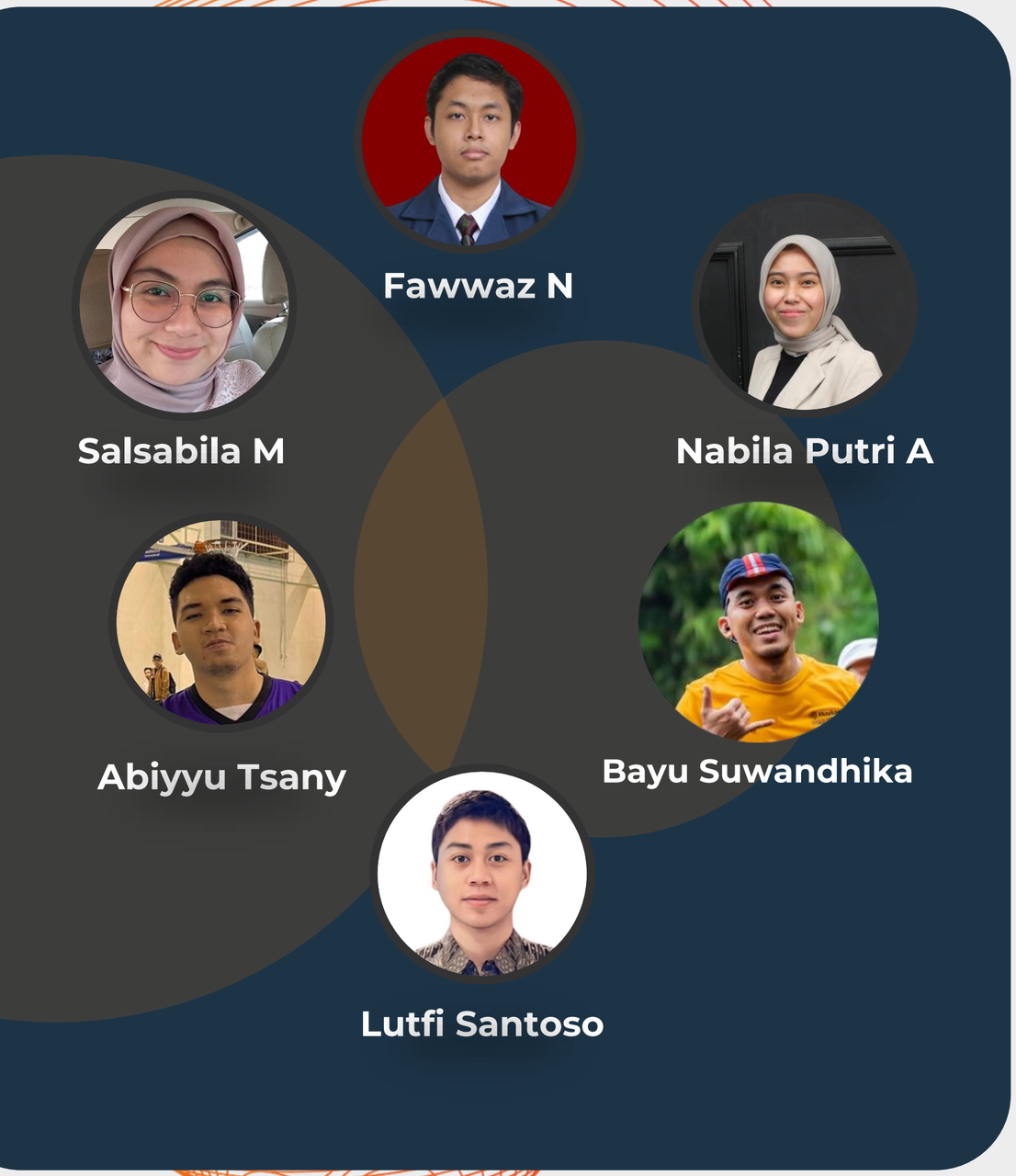
Miracle7



About Us

Miracle Electronics is an e-commerce that sells electronic goods in Indonesia and also provides its own shipping service for the delivery.





Our Team

Miracle7 is a group of highly skilled professional consist of data scientist and business analyst at Miracle Electronics

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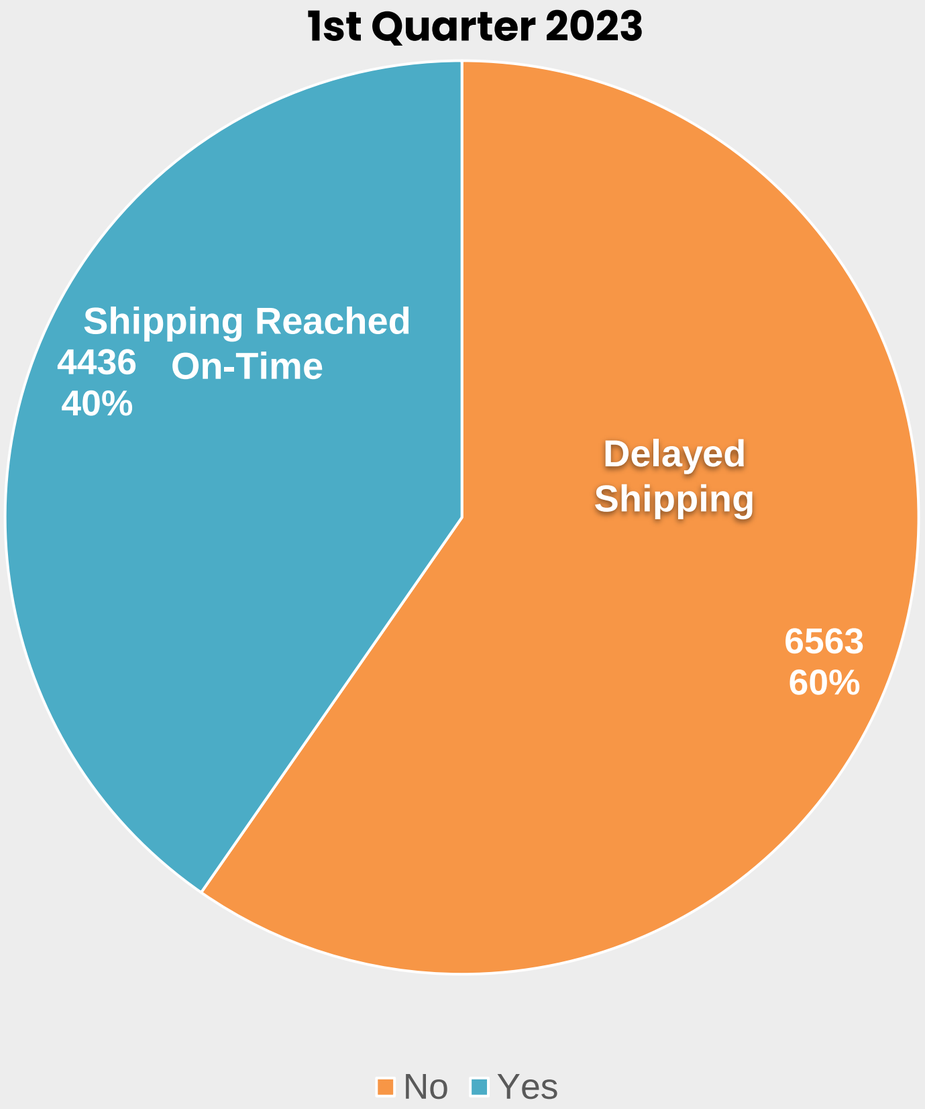
Problem Statement



Standard on-time delivery rate: 90%.

Consequences

- Negative Reviews that Lead to a Bad Reputation
- Increased Promotional Expenses
- Potential Revenue Loss

Research

Amazon

90%

set an on-time delivery rate for international and national delivery services.

Metapack

96%

from 3.597 respondents said that late delivery will make customers not buy again at the e-commerce anymore.

Harvard Business Review

Cost 5 - 25 times more

on acquiring a new customer than retaining an existing customer.

Goals and Objectives

Objectives

- Identify the causes of late delivery
- Create a machine learning model to predict whether or not goods will be delivered on time
- Provide business recommendations to improve the on-time delivery rate and increase customer satisfaction ratings

Goals

Increase on-time delivery rate of electronic shipping to 90% for 5 quarters

Business Metrics

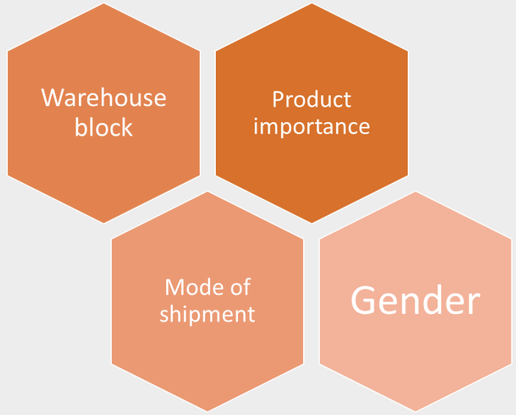
On-time Delivery Rate

Exploratory Data Analysis

12 Data Features (10,999 Rows)

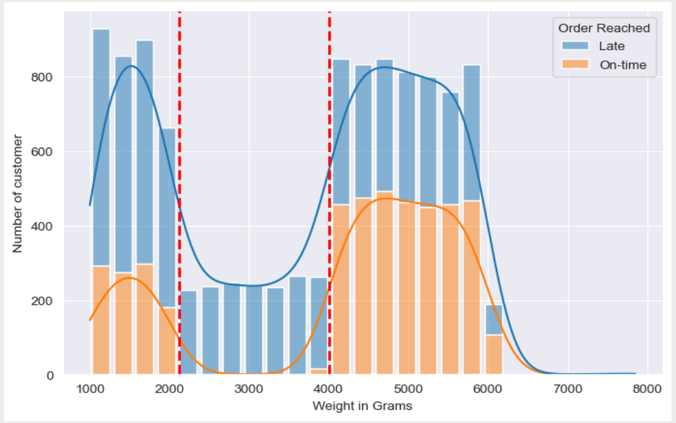
ID	Warehouse block	Mode of shipment
Customer care calls	Customer rating	Cost of the product
Prior purchase	Product importance	Gender
Discount offered	Weight in grams	Reached on time

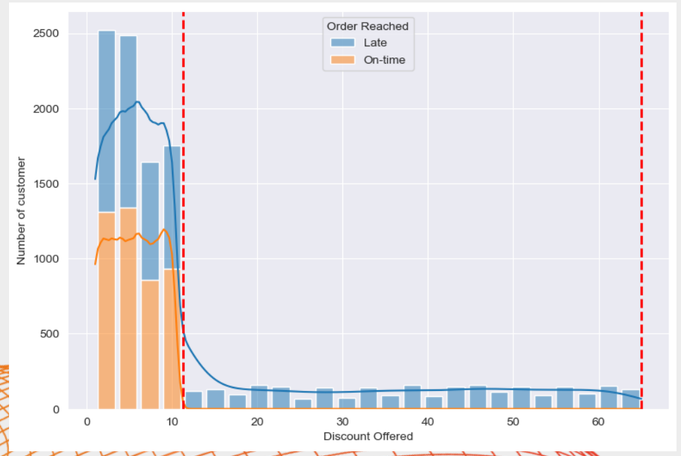
4 Categorical Variables

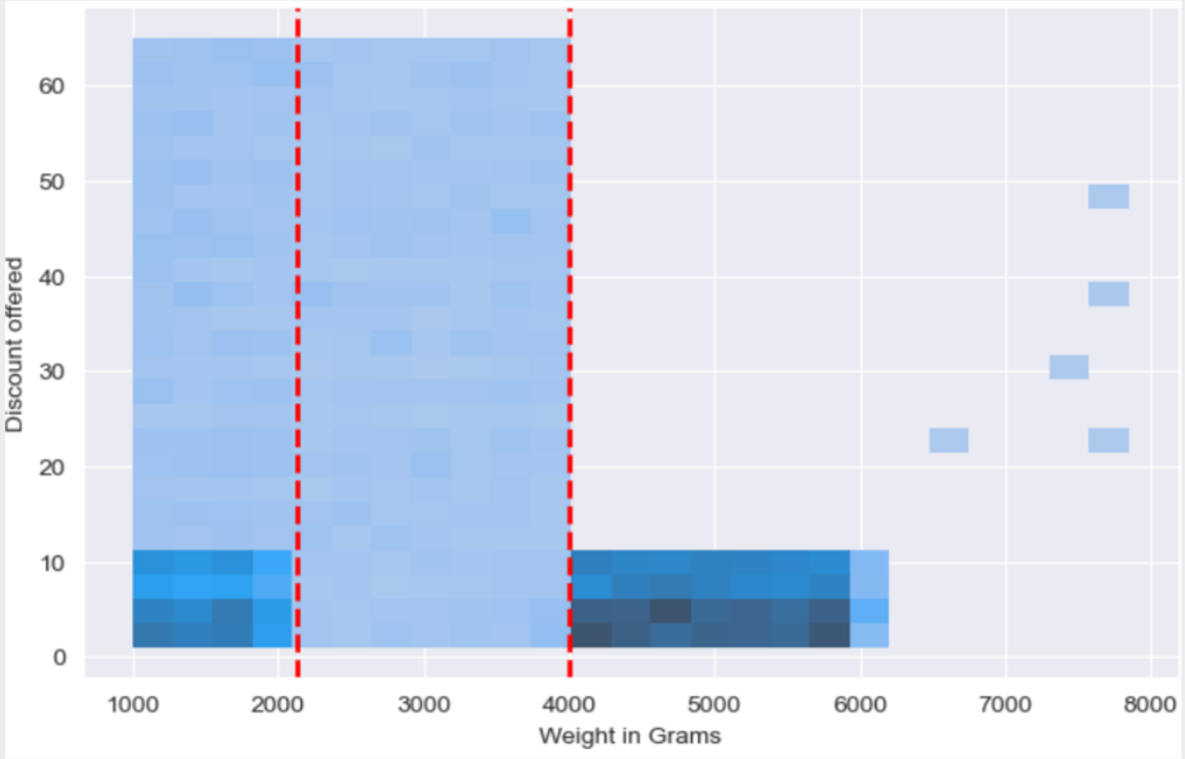


8 Numerical Variables

Exploratory Data Analysis



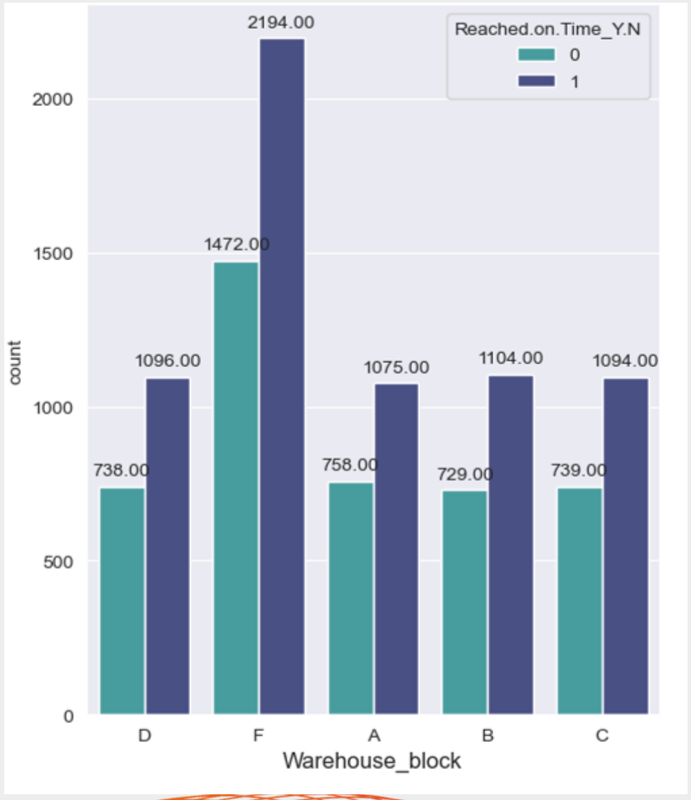


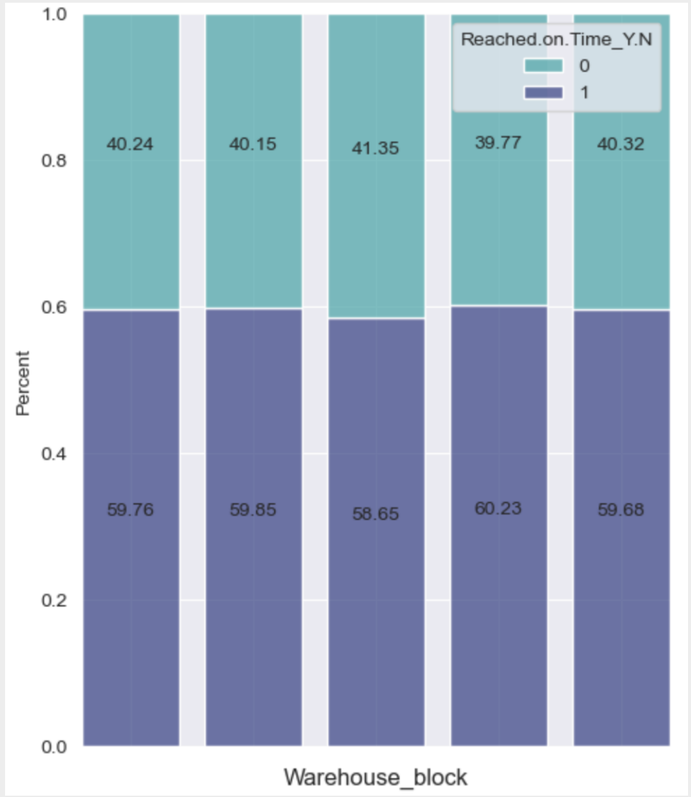


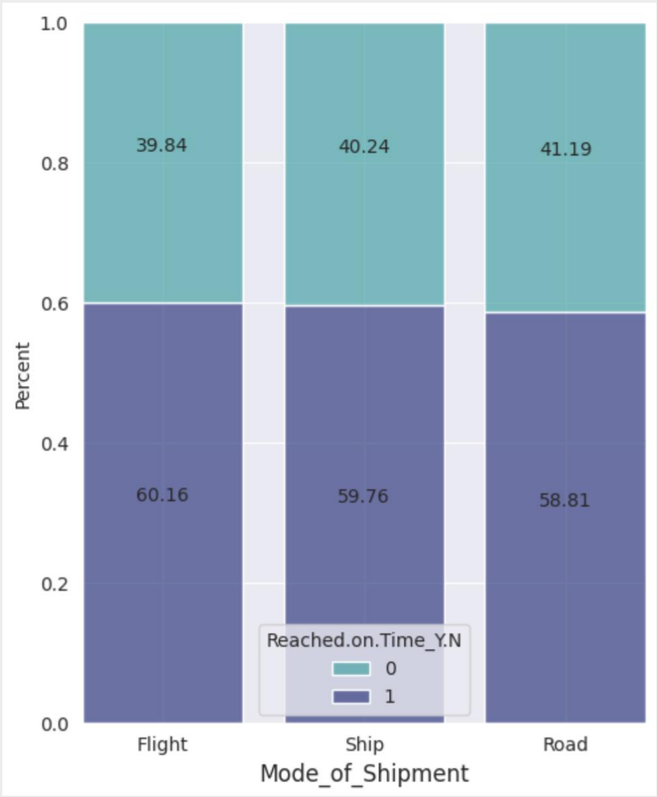
Discount Offered & Weight in gms Analysis

Most of late products is a combination of high discount and light weighted goods (under 4 kgs)

Exploratory Data Analysis



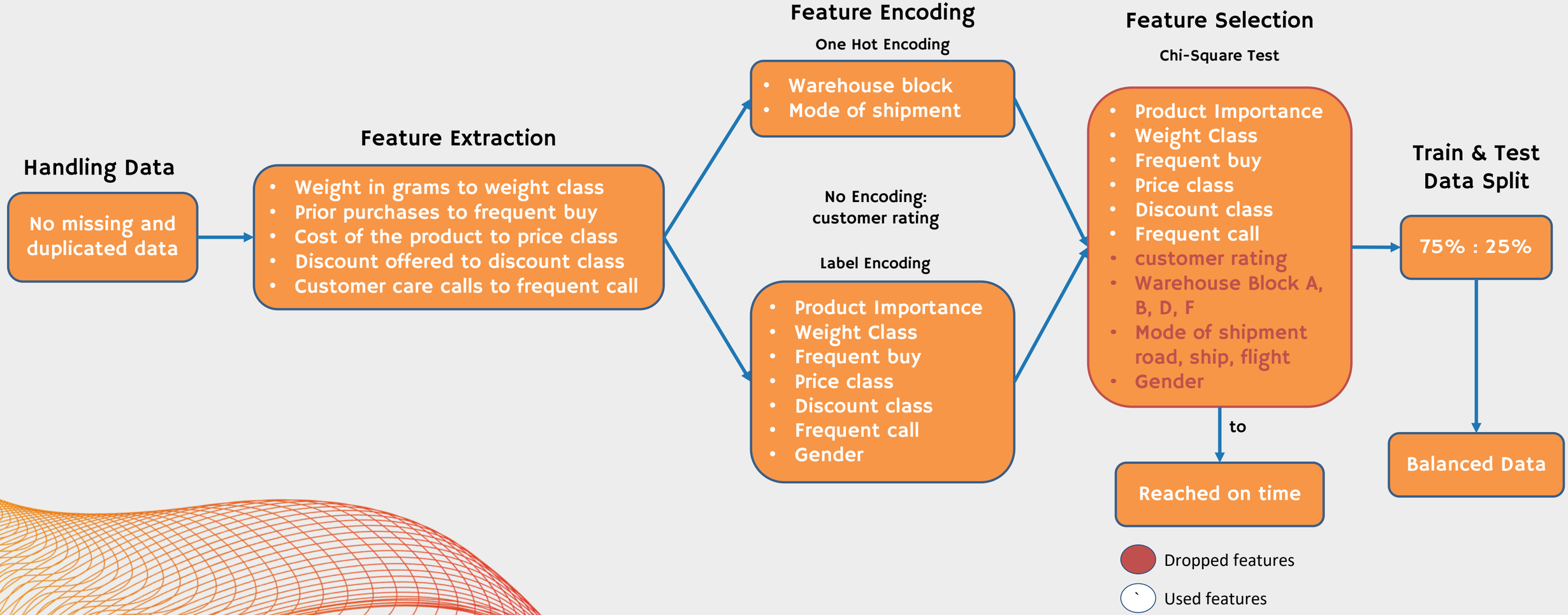




Warehouse and Shipment Distribution

Warehouses with both high and low capacity have the same percentage of delays.

Data Preprocessing



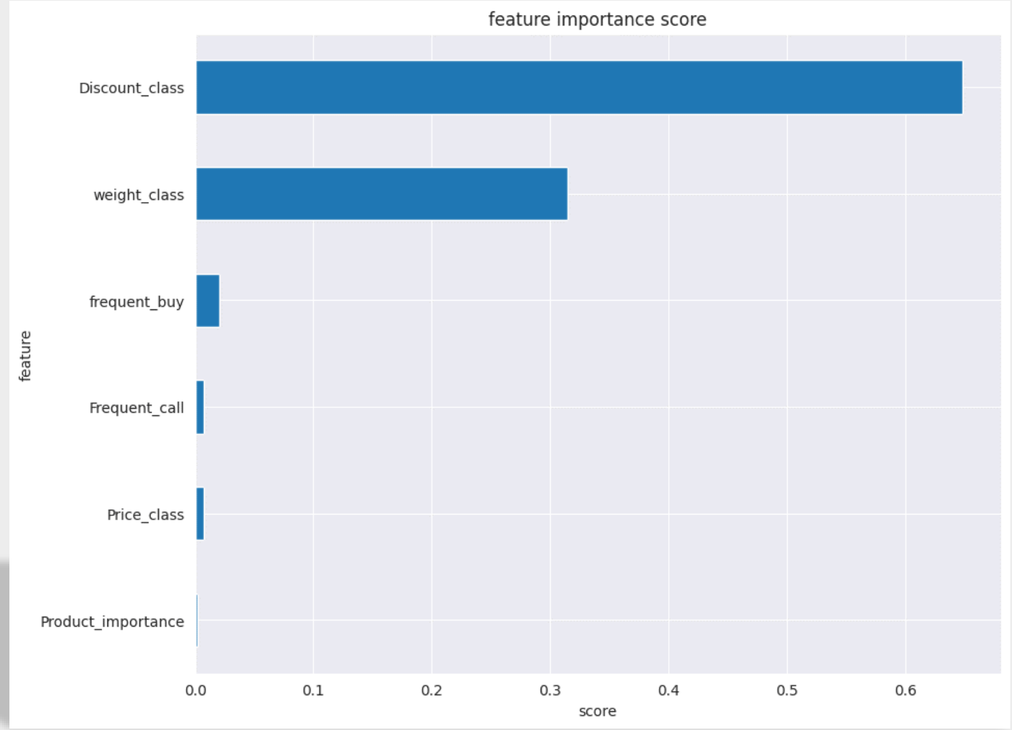
Machine Learning Model Evaluation

Without Hyperparameter Tuning						
Model Evaluation	Decision Tree	KNN	Adaboost	XGBoost	Random Forest	CATBoost
Recall	0,52	0,7	1	0,52	0,53	0,98
Recall (crossval train)	0,52	0,63	0,61	0,52	0,53	0,52
Recall (crossval test)	0,51	0,62	0,61	0,51	0,52	0,51

Hyperparameter Tuning						
Model Evaluation	Decision Tree	KNN	Adaboost	XGBoost	Random Forest	CATBoost
Recall	1	0,66	1	0,98	1	1
Recall (crossval train)	0,60	0,64	0,61	0,97	1	1
Recall (crossval test)	0,60	0,63	0,61	0,97	1	1

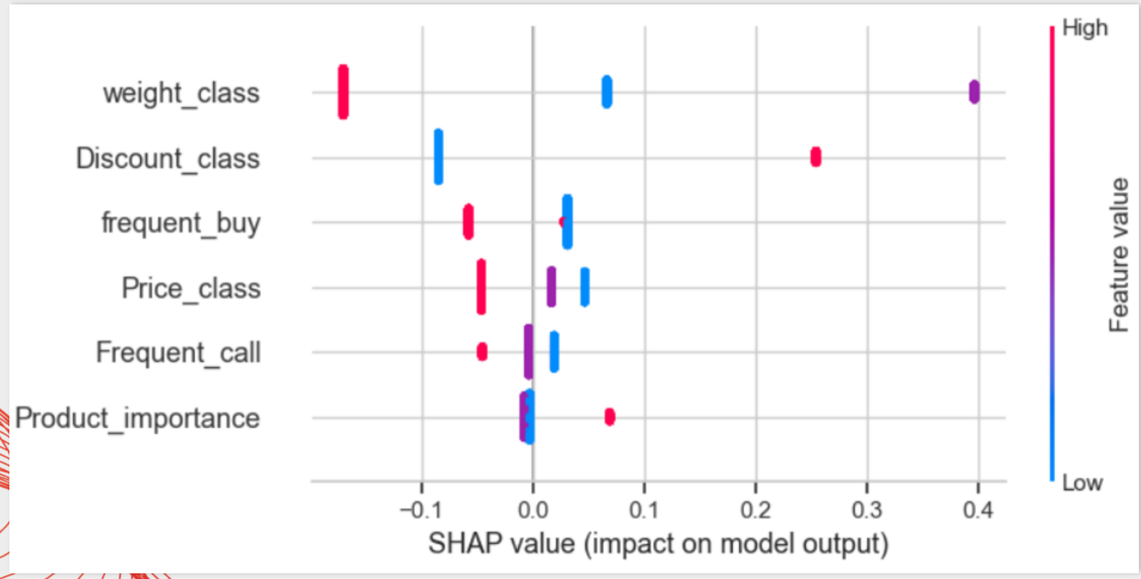
Best Fit Model:
XGBoost
Recall 98%

Feature Importance



Most Important Features:

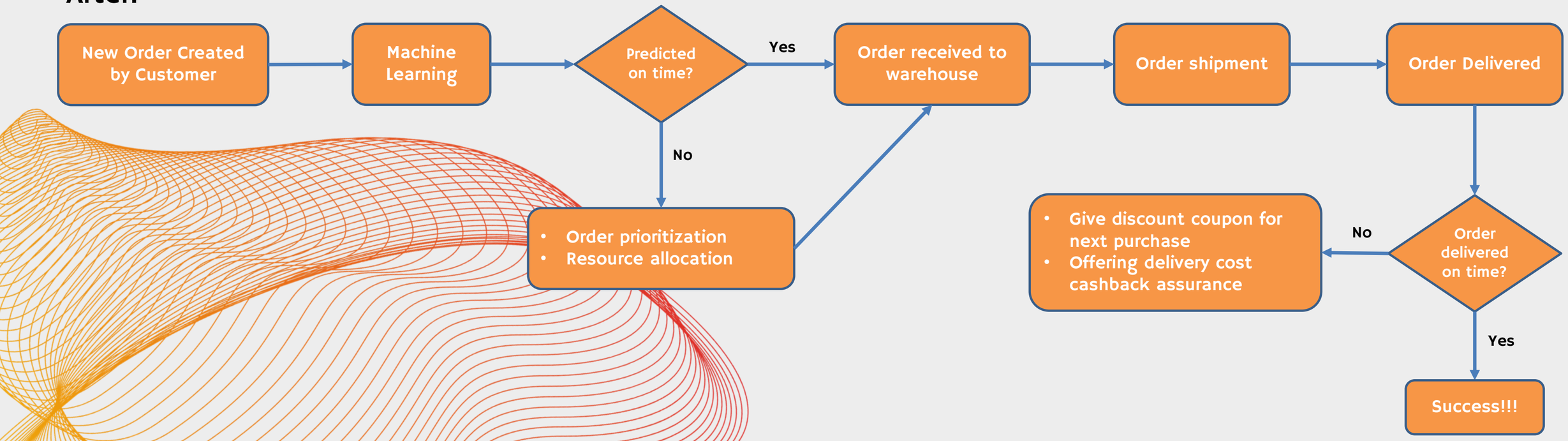
1. Discount_class
2. weight_class



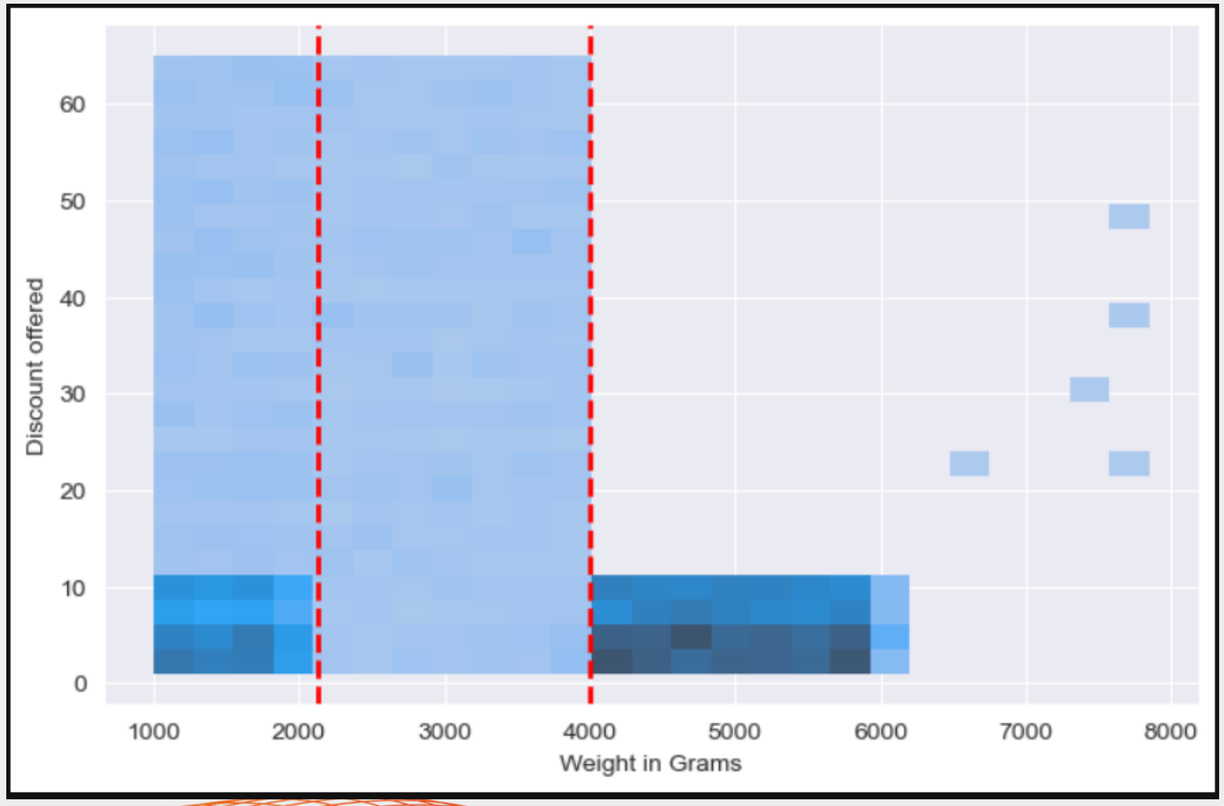
Order Processing Flow
Before & After Machine Learning Implementation

Before:

After:



Business Insights (Discount Offered & Weight in gms)



Most of late products is a **combination of high discount and light weighted goods** (under 4 kgs). Assuming orders created on the same period, we can conclude that the goods were ordered during the ‘high discounts’ period.

Insights:

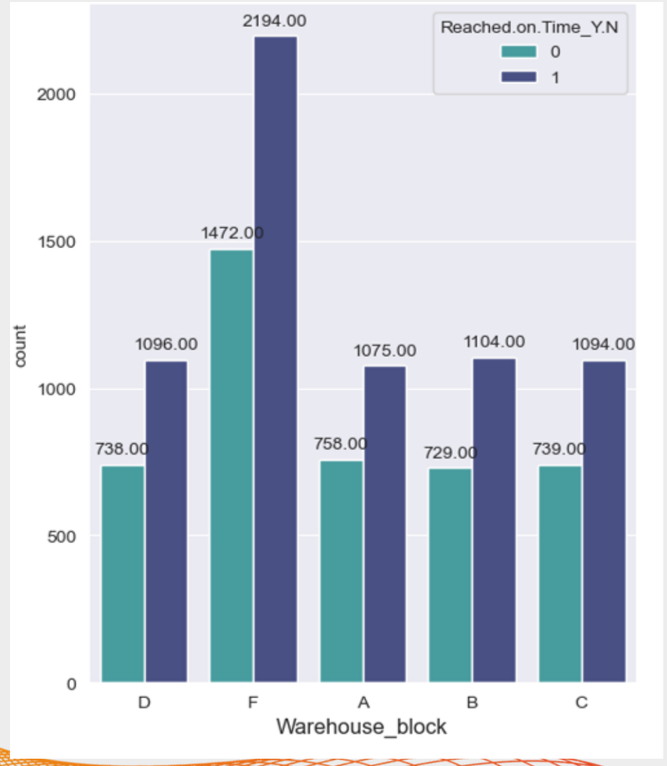
- Increase the number of resource available during 'high discount'
- Plan better for the next ‘high discount’ season by managing project collaboration with 3PL

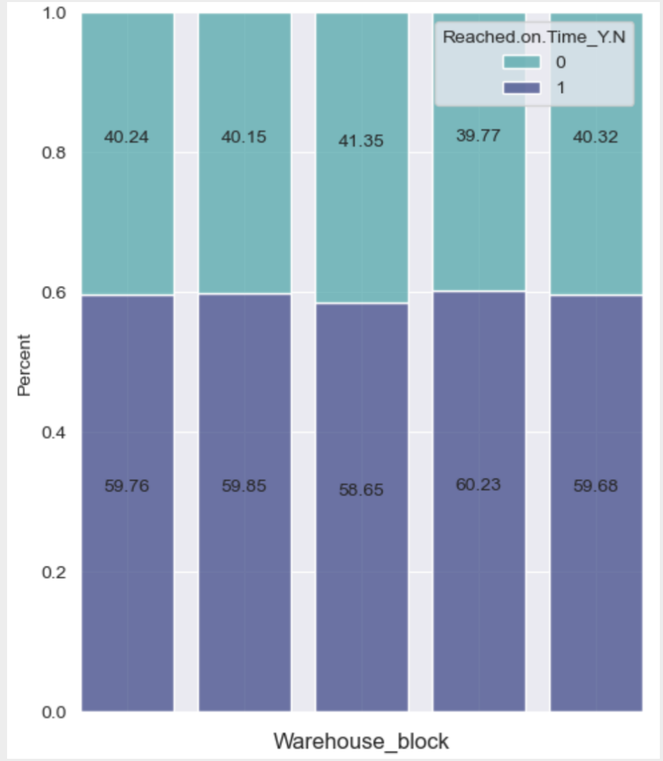
Pros:

- Prevent bottlenecks, reduce delays, and ensure timely order processing and delivery during "high discount" season
- Collaboration with 3PL provides flexibility without the need for significant investments in resources.

Cons:
-Higher cost
-Dependency on third-party performance

Business Insights (Distribution of Warehouse)



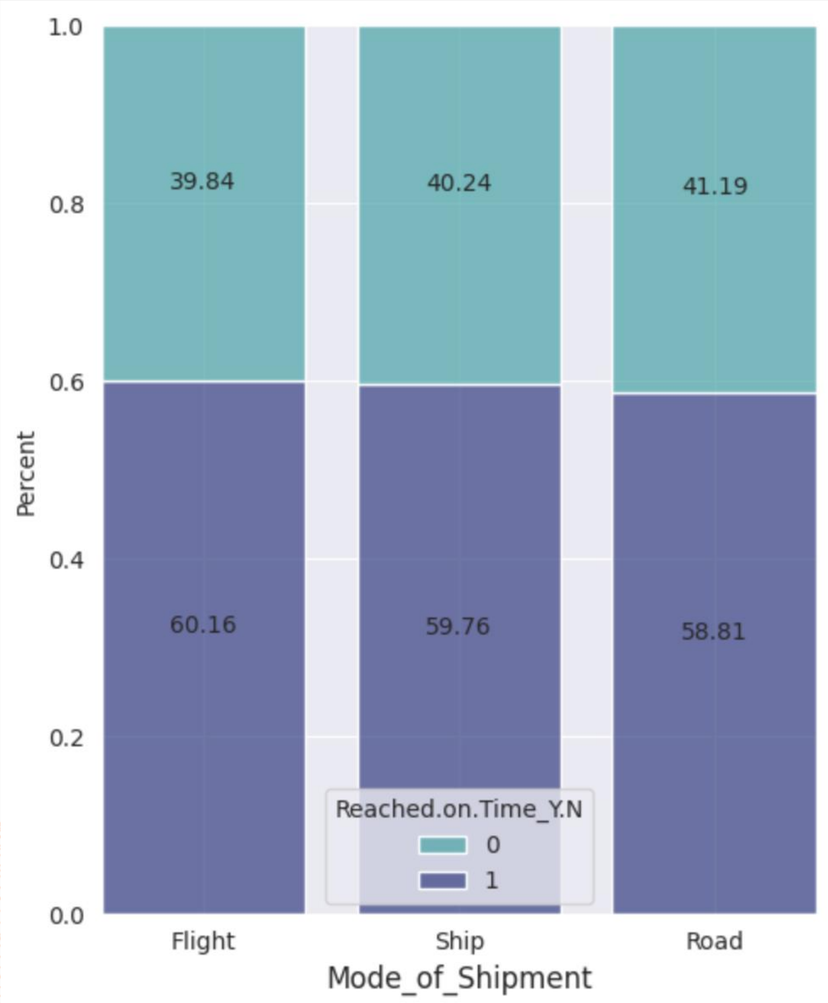


Warehouses with both high and low order volume **have the same percentage of delays**. Assuming all warehouses have the same order processing system, it can be concluded that all warehouses have inefficient order processing, inventory management issues or have exceeded their maximum capacity.

Insights:

- identify the specific causes by conducting a thorough analysis of each warehouse's operations

Business Insights (Distribution of Shipment)

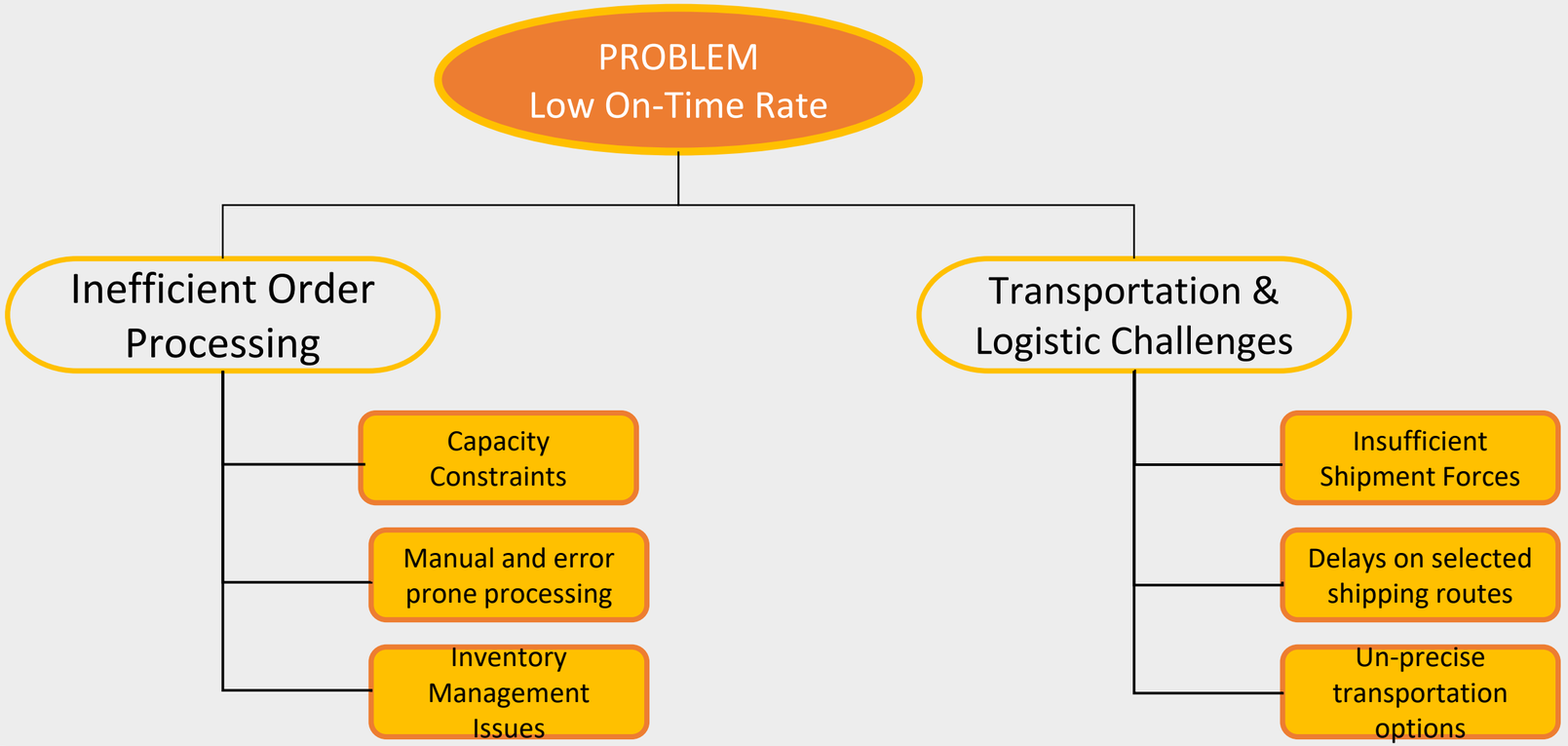


All of the shipment modes **have the same percentage of delays**. Considering all of the shipment modes have the same order processing system, it can be concluded that all shipment modes have inefficient transit order and unreliable shipping methods.

Insights:

- Identify the specific causes by conducting a thorough analysis of each shipment mode's process.

Root Cause Analysis



Root Cause Analysis

Main Root Cause	Root Cause	Recommendation	How-to-do	Pros	Cons
Inefficient Order Processing	Manual and error prone processing	Use Automation and Technology	• Adopt warehouse management systems (WMS) and order management systems (OMS) to automate order processing, inventory tracking, and documentation, reducing manual tasks and potential errors.	• Better for long-term investments	• High initial cost • Depends in a model
	Inventory Management Issues	Optimize Inventory Management	• Regularly update inventory records • Employ real-time inventory tracking systems	• Reduce unnecessary spending • Better decision making	• High initial cost • Depends in a model (real-time inventory tracking systems)
	Capacity Constraints	Assess warehouses capacity regularly	• Regularly assess space, equipment, and manpower at available warehouses	• Reduced travel times, touchpoints, and bottlenecks in the operations	• Time-consuming • Overcapacity or under-capacity if capacity utilization fluctuates

Root Cause Analysis

Main Root Cause	Root Cause	Recommendation	How-to-do	Pros	Cons
Transportation & Logistic Challenges	Insufficient Shipment Forces	Collaborate with Reliable Carriers or Logistics Providers	• Establish clear communication channels and work closely with them to ensure smooth coordination and efficient transportation	• Expertise and specialization • Improved service levels	• Dependency on third parties • Communication and coordination challenges • Limited customization • Potential risk of service disruptions
	Delays on selected shipping routes	Optimize Shipping Routes	• Analyze shipping routes to identify opportunities for optimization • Look for ways to minimize distance traveled, reduce congestion, and avoid potential delays • Consider utilizing technology solutions	• Improved delivery speed • Enhanced delivery efficiency	• Higher cost for utilizing technology solutions • More data to optimizing shipping routes
	Un-precise transportation options	Evaluate Transportation Options	• Assess different transportation modes (such as air, sea, or road) and carriers to determine the most efficient and reliable options for your shipments • Consider factors such as transit times, frequency of service, and reliability.	• Improved delivery speed • Enhanced delivery efficiency	• Need geolocation data for delivery optimization model

Business Metrics Analysis

↑10%
On-Time Delivery Rate

before → after
40% → 50%

Assumptions:
- 50% of predicted late deliveries will be on-time after addressing root causes

↓15%
Churn Rate

before → after
58% → 43%

Assumptions:
- 96% of customers with late deliveries will be churned
- Neglecting number of new customers acquired

↓25%
Potential Revenue Loss

before → after
$372k → $279k

Assumptions:
- Gross Profit Margin: 28%
- Average Potential Revenue: $59
- Repressive Measures Effectiveness: 10%

*Potential Revenue Loss = Number of Churned Customer * Average Potential Revenue

Recommendation

1. Recommendation of important attributes to gather in order to have a better understanding of the existing data and enhance the machine learning model.
    - Order, shipping, and arrival date
    - Type of the products
    - Distance (geolocation)
2. Periodically evaluate machine learning model and order processing flow from order entry until it arrives at the customer to produce new, more specific solutions until standard on-time delivery of 90% is reached.

Qualitative Impacts

Improve Customer Shopping Experience

Increased Customer Loyalty

Positive Reputation and Company Image

Increased Profit

Conclusion

Exploratory Data Analysis

- Add more resources and collaborating with 3PL during ‘high discount’ season and conducting thorough analysis of each shipment mode and warehouse’s operation

Root Cause Analysis

- Recommend to collaborate with fulfillment center or third party logistics because can solve on-time delivery rate and low-cost compare to other recommendation

Business Impacts

- Implementing preventive measures of order prioritization on predicted late deliveries could boost on-time delivery rates by 10%, and by also applying repressive measures to customers who might leave could reduce churn rates by 15% and reduce potential revenue loss by 25%.

Thank You

Miracle7 Team