

# Logistics and Stock Optimization:

## A Comprehensive Capstone Analysis of DataCo Global's Smart Supply Chain

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[Constante, F., Silva, F., & Pereira, A. \(2010\). DataCo SMART Supply Chain for Big Data Analysis \(Version 5\) \[Dataset\]. Mendeley Data.](#)

# BIO



## PORNNAPAS ROONGSUK

**Education**  
*Master of Business Administration  
In Industrial Management*

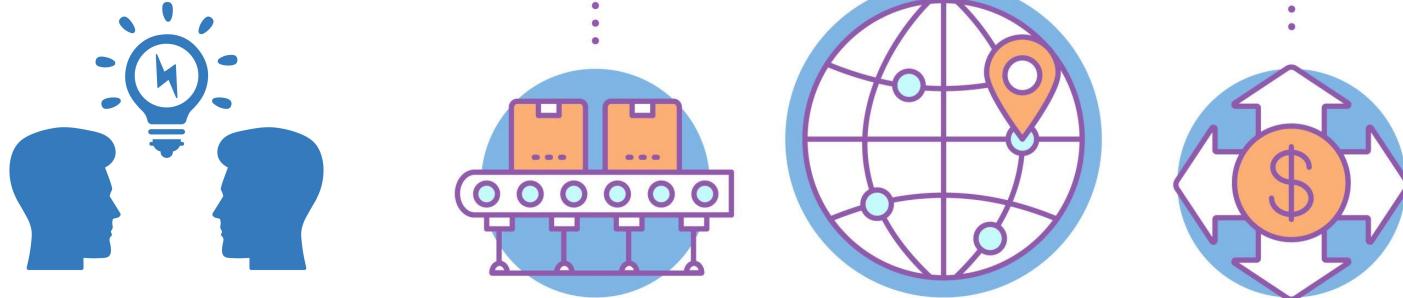
**Experience**  
*Inventory Planner (from 2023)*

**Skills**  
*Data Analysis  
Visualisation  
Machine Learning*

**Relevance to the project**  
*Stock optimisation  
cost modelling  
End-to-end supply chain*

# BUSINESS ASPECT

WHO	WHAT	WHEN	WHERE	WHY
<p><b>Industry</b> - Supply Chain related; <b>Manufacturer, Distributer, Retailer</b>, etc</p> <p><b>Internal</b> - Supply Chain, Logistics, Finance, Sales, and Executive teams</p> <p><b>External</b> - Supplier, Carriers and distribution partners</p>	<p>Identifying patterns causing transportation <b>delays, high freight cost, and negative margin</b></p> <p>Analysing <b>profit ratios, product trends</b></p> <p>Highlighting inefficient route</p>	<p>Based on <b>historical</b> order, freight, and sales data across all available years</p> <p><b>Issues occur</b> during order fulfilment, shipping, and delivery cycle</p> <p>New product or DC <b>implementation</b></p>	<p>Across all distribution <b>routes, customer segments, and product categories</b></p> <p>Focus on high-<b>cost</b> lanes and low-<b>margin</b> product flow</p>	<p><b>Margin Improvement</b></p> <p><b>Reliable On-Time Delivery</b></p> <p><b>Stable &amp; Predictable Freight Cost</b></p>

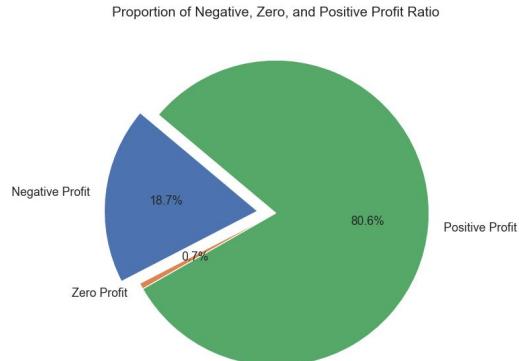


# BUSINESS PROBLEM

How can we reduce transportation delays and cost-to-serve while improving delivery reliability and customer satisfaction?

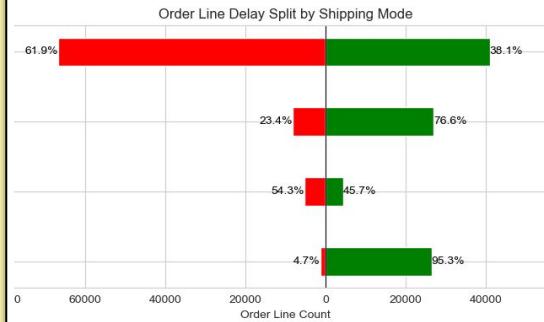
## Negative Profitability Margin

19% of total order showing Negative on profit Margin indicates cost-to-serve inefficiencies



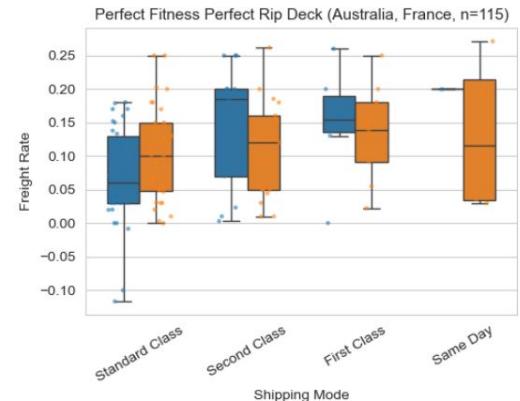
## Delivery Delays

Unpredictable lead times  
Route-level variability  
Shipping Class inconsistency

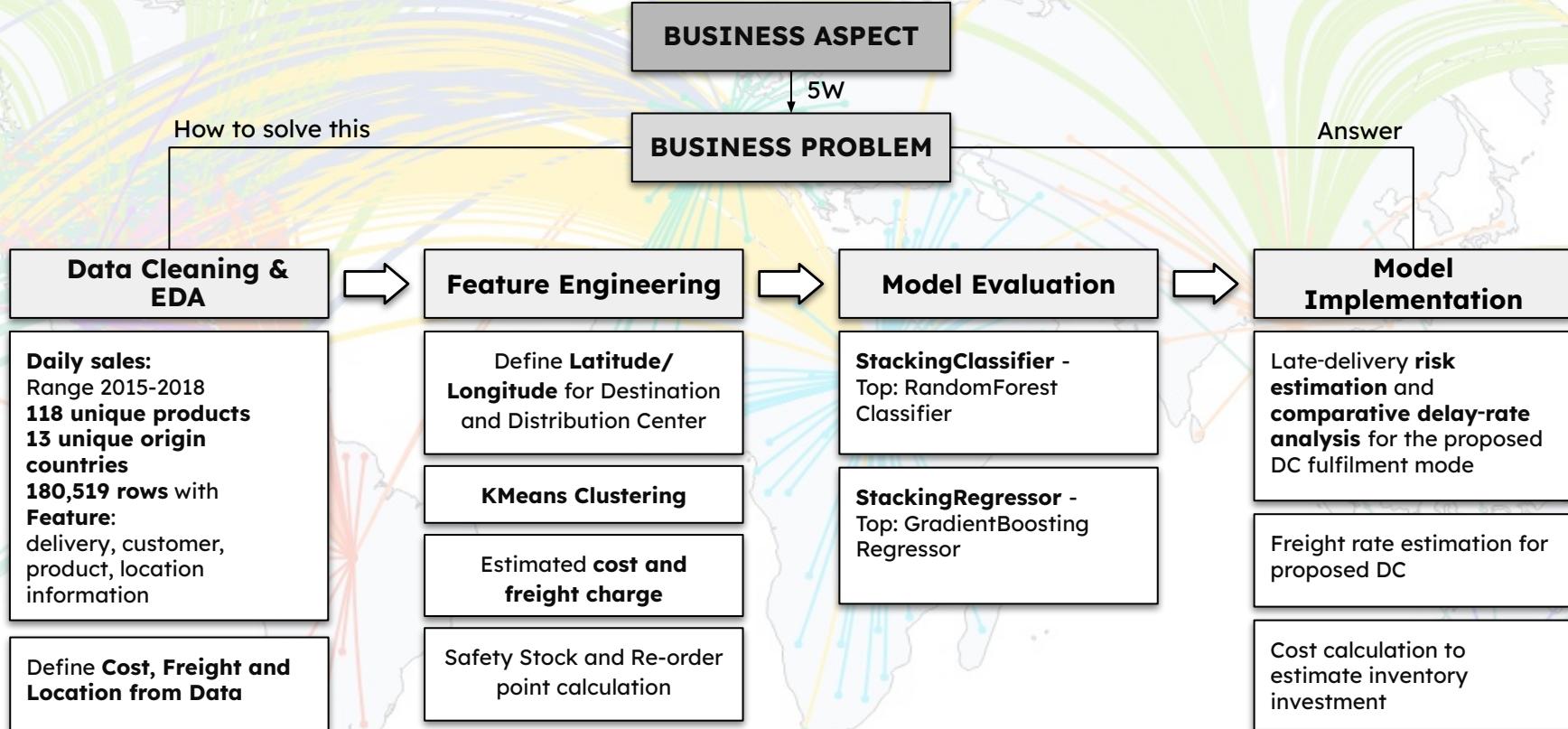


## Unstable Freight Cost

Inconsistency across different shipping routes and shipping modes causing difficulties to predict true cost-to-serve

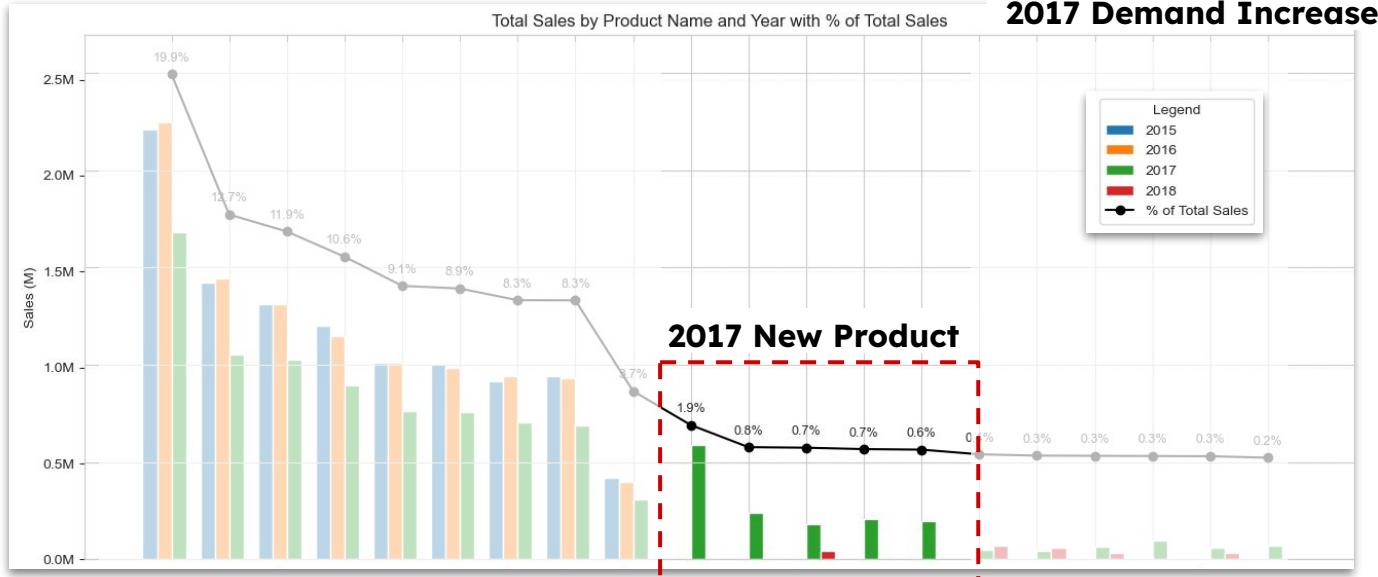
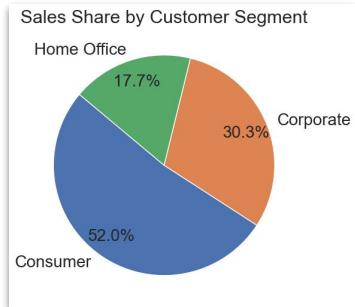


# PROJECT DATA PIPELINE



# EXPLORING DATA ANALYSIS

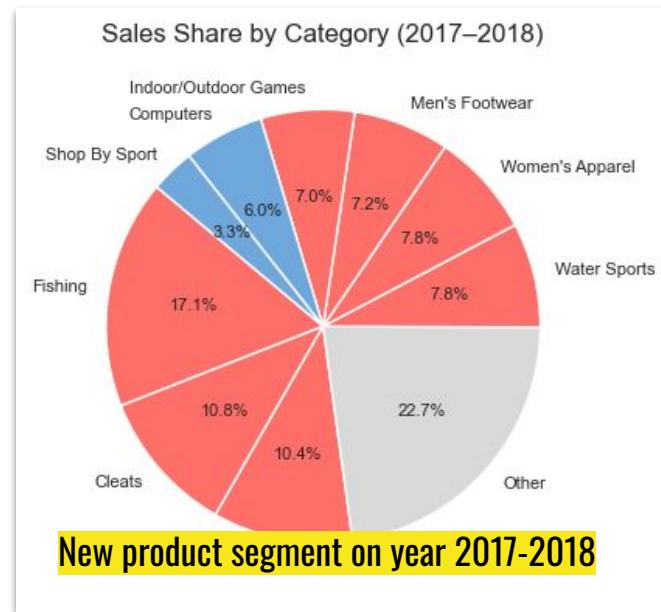
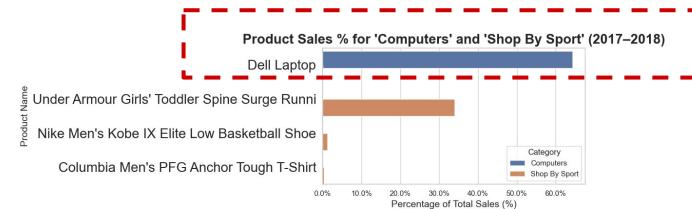
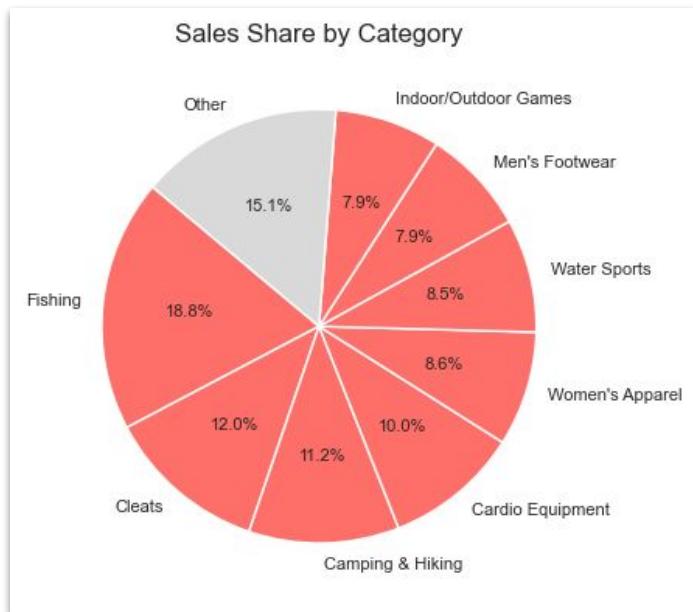
## Sales Data History: Determine product trend with time series data



# EXPLORING DATA ANALYSIS

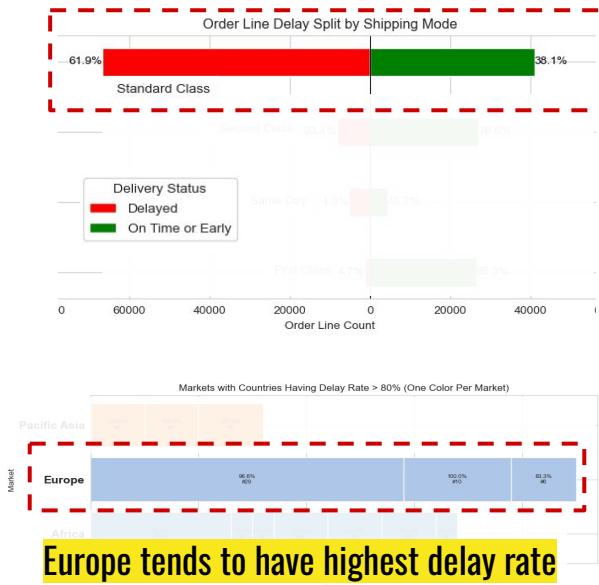
## Sales Data History:

Determine product ratio and life cycle  
where top segment drive 80% of total sale

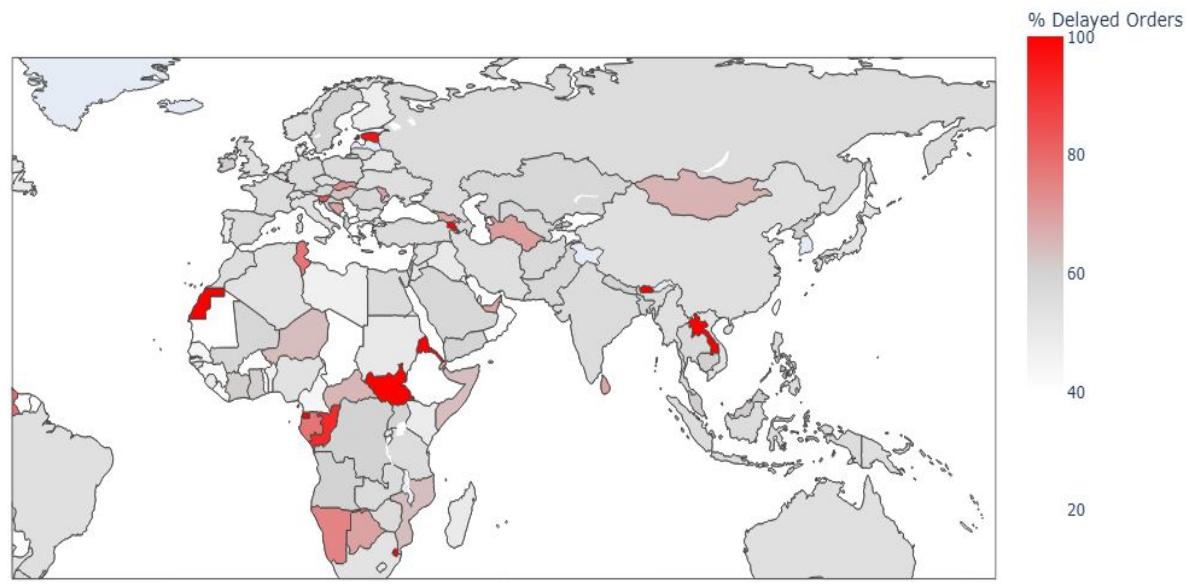


# EXPLORING DATA ANALYSIS

## Regional Delays: High in Europe & Africa markets



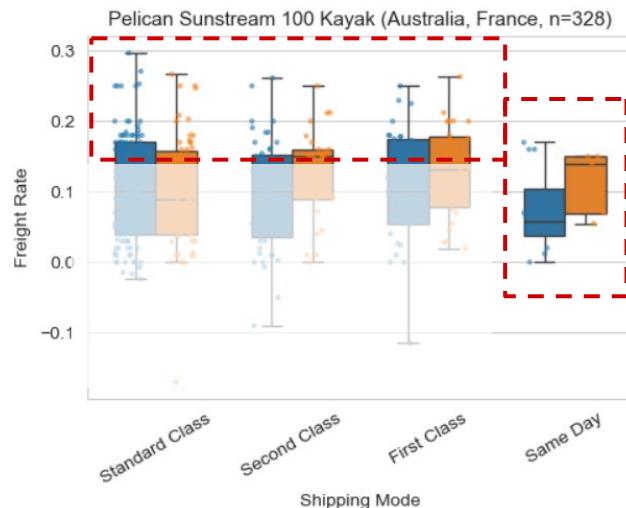
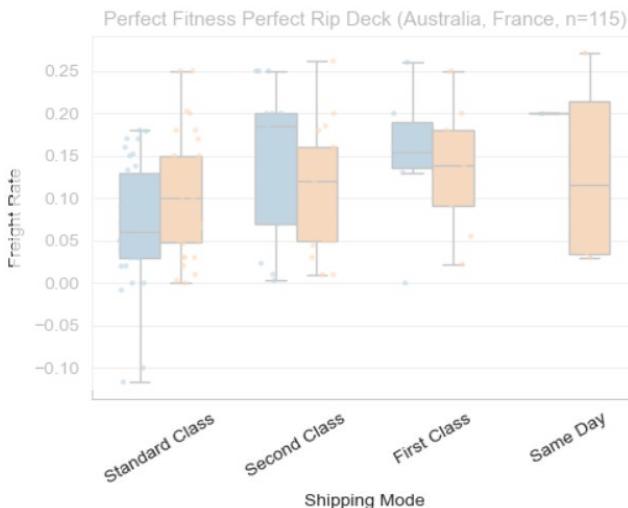
Normalized Rate of Delayed Orders by Country



# EXPLORING DATA ANALYSIS

## Cost Inconsistency:

Indicates route- and mode-specific cost volatility for this product

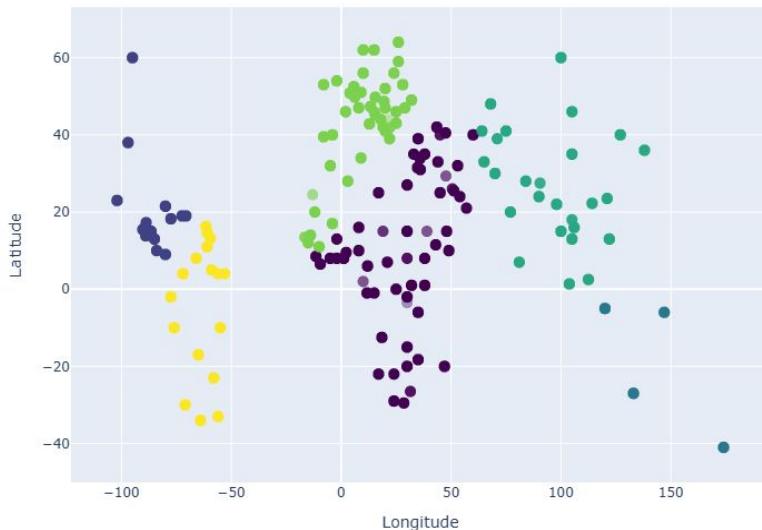


- **Freight rates vary widely** across shipping modes.
- **Same Day shows the highest cost** and largest spread, meaning unstable and unpredictable freight charges.
- Standard / Second / First Class are more stable but still show noticeable differences between countries.

# FEATURE ENGINEERING

## KMeans:

Define cluster of Destination



## SafetyStock & Reorder Point Calculation:

Estimated Stocking Quantity and value

$$\text{Safety stock} = Z \times \sigma_{LT} \times D_{avg}$$

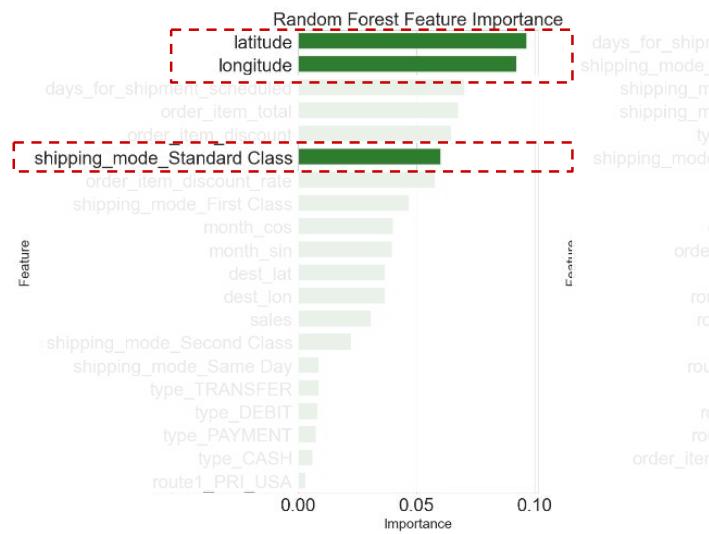
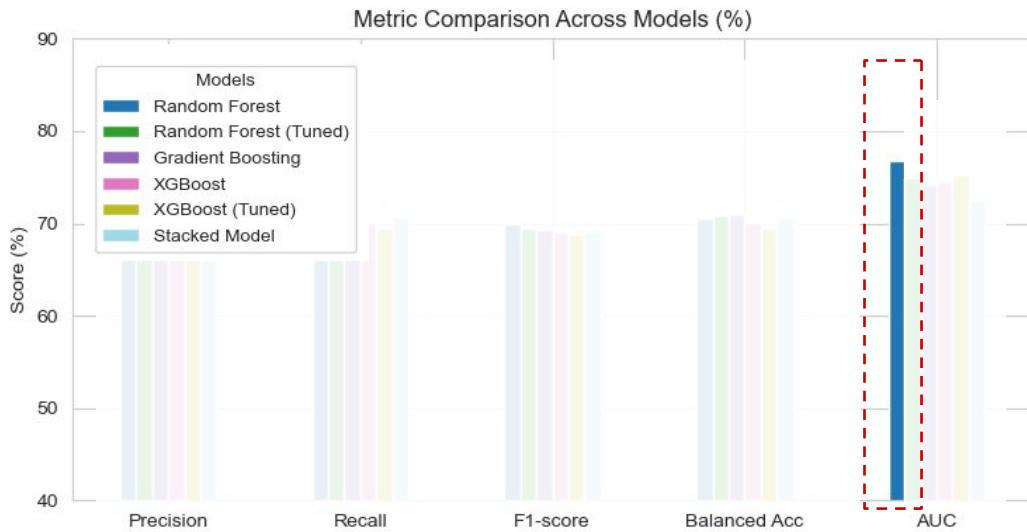
Desired cycle service level	Z-score
84	1
85	1.04
90	1.28
95	1.65
97	1.88
98	2.05
99	2.33
99.9	3.09



# MODEL EVALUATION

## MODEL 1: Late Delivery Risk prediction:

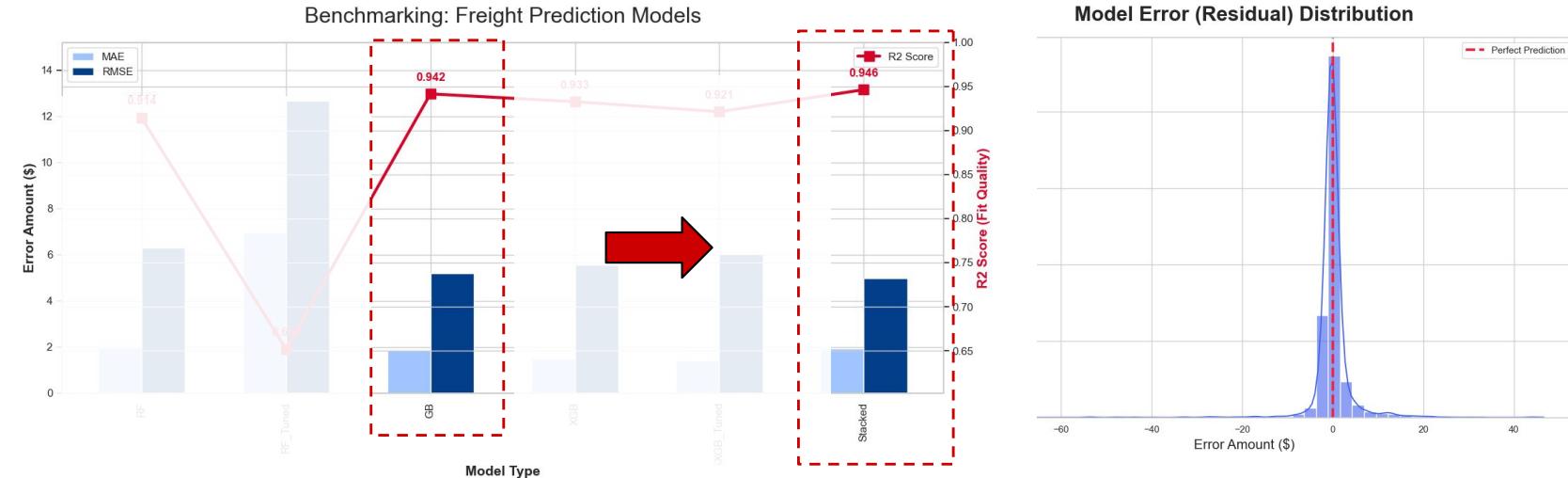
Location is the main feature impact on the delay



# MODEL EVALUATION

## MODEL 2: Freight Charge Prediction

Predict freight charge for estimating investment on DC implementation



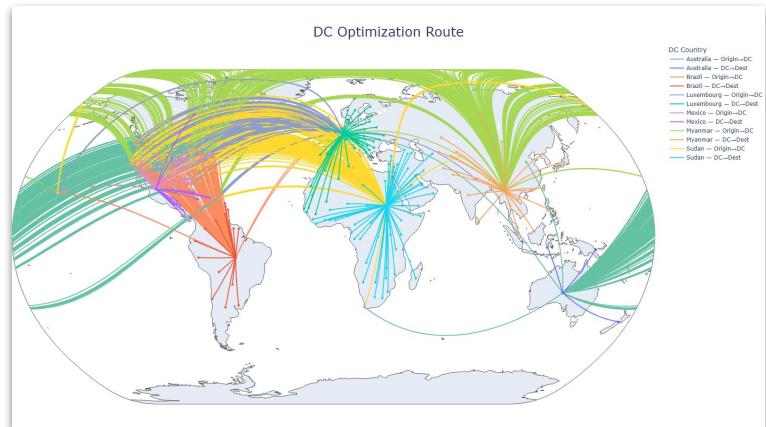
Residuals are narrowly distributed around zero, indicating high predictive accuracy and minimal systematic bias

# MODEL IMPLEMENTATION

## MODEL 1: Late Delivery Risk prediction: Location Clustering (KMeans) to Determine DC



Current Setting

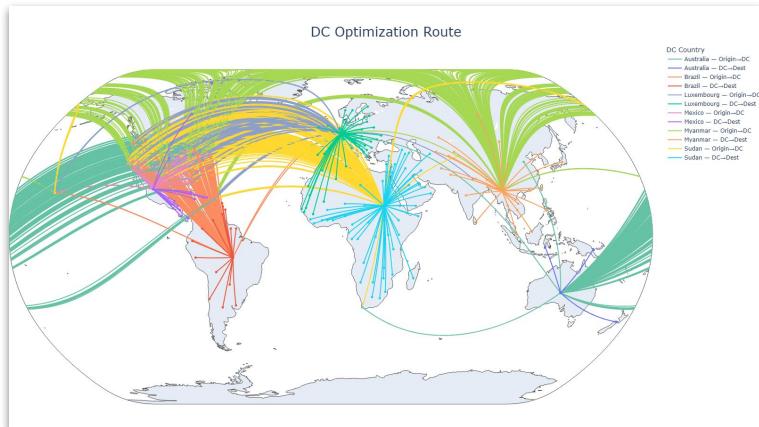


Distribution Center implementation

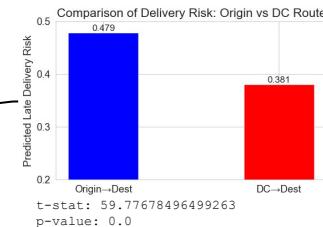
# MODEL IMPLEMENTATION

## MODEL 1: Late Delivery Risk prediction:

Location Clustering (KMeans) to Determine DC



Distribution Center implementation



Prediction result after apply Machine Learning Model

The difference between the two groups is statistically significant

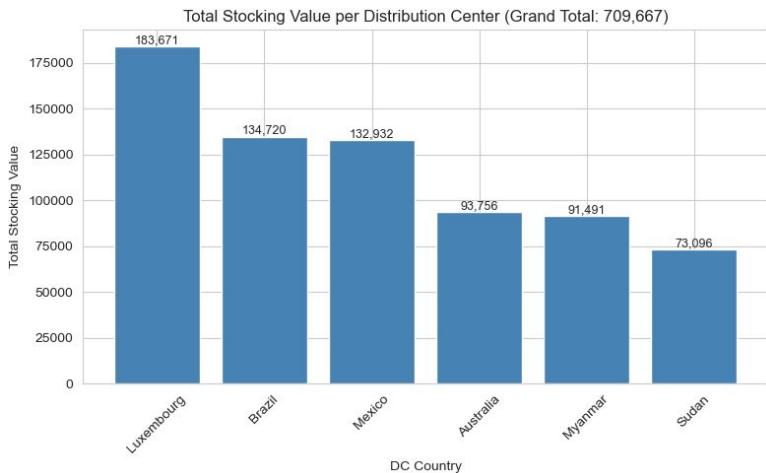
Reduce Late delivery risk

Better route management and Tracking

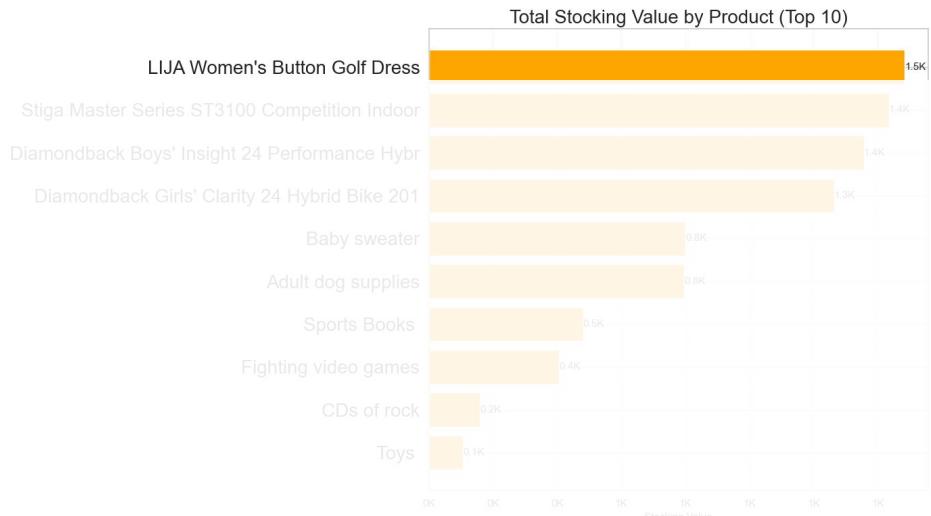
Ease and Simplify operations progress at Origin

# MODEL IMPLEMENTATION

## MODEL 1: Late Delivery Risk prediction: DC Stocking Investment estimation by utilizing reorder point calculation



Total suggested stocking value USD \$709 across all new DC

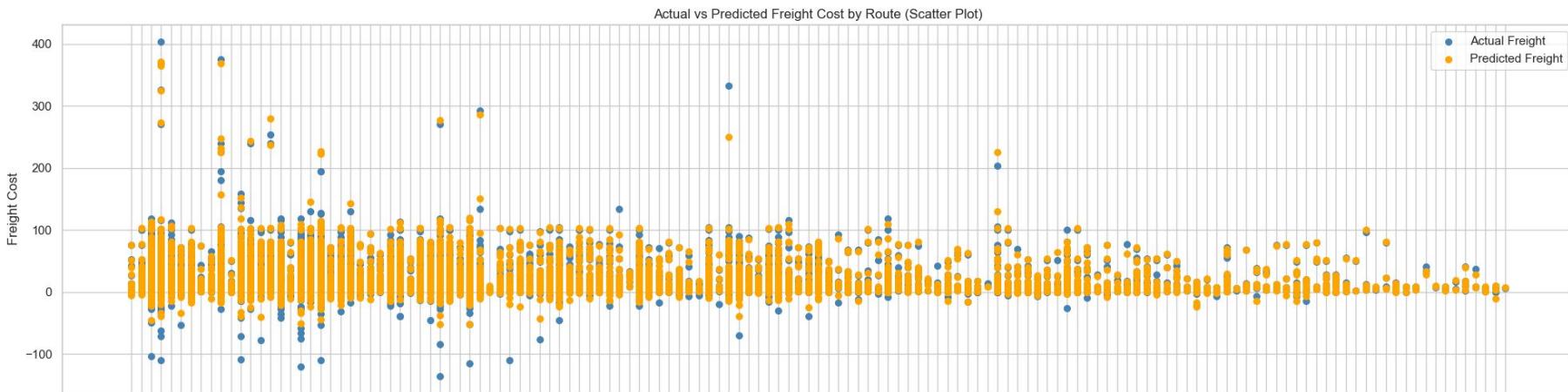


Top product stocking by Value

# MODEL IMPLEMENTATION

## MODEL 2: Freight Charge Prediction:

Apply freight cost prediction model to estimate selling price to improve sale margin



# SUMMARY AND CONCLUSION

## SOLUTIONS

### Negative Profitability Margin

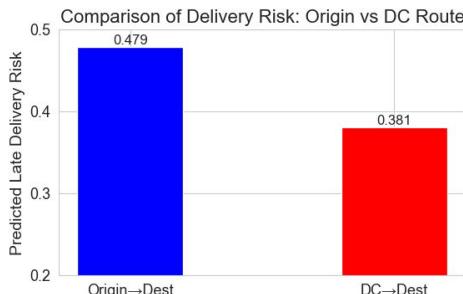
### Unstable Freight Cost

### Delivery Delays

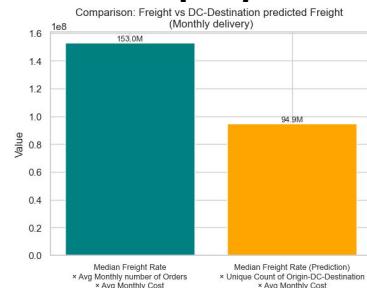
#### MODEL 1: Implement DC and Inventory Optimization Operations, Supply Chain

#### MODEL 2: Product Sales Driven Sales, Pricing, Marketing

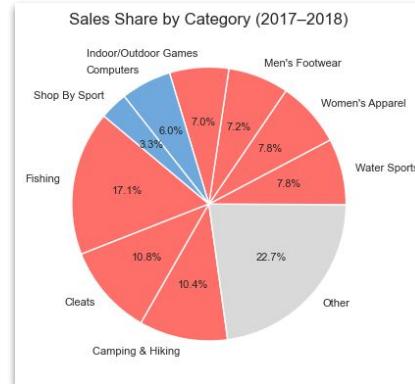
**Reduce 20% of Delayed risk**  
by Implement DC fulfilment



Implementing the predictive model  
to **improve freight cost by approximately 37%** and help pricing team for **selling price**



Focusing on sale strategy by Top sale product which cover approx 80% sales and implement Product Life Cycle



**Next step:**  
Working on Domestic and Regional Logistics for seamless operation

# THANK YOU

## CONTACT

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[https://github.com/rphornnapas/  
DataCo-SupplyChain-DC](https://github.com/rphornnapas/DataCo-SupplyChain-DC)

