Dispenser Distribution Optimization

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What does an empty dispenser imply?

Do we really need a call to refill dispensers?

What is the number of optimal dispensers?

Motivations

Boost Bottomline

Wastage Control

Optimization

Number of Locations * Dispenser/Locations* RefillmentFrequency * Refillment Amount * Price/quality

Reduced Cleaning Frequency

□ No Excessive Refiliment Needs

Dispenser Allocation

Customer Satisfaction

Analysis Process

Exploratory Analysis

Model Training

Conclusion

Exploratory Data Analysis

G Frequency

- Number of dispensers per location
- Price for different quality products

Daily and Weekly Traffic Flow



Annual Traffic Flow



Refill Alert (Red) Signal Interval



Avg_refillment_interval = Average number of minutes between first red alert occurrence and first red alert occurrence after green signal occurrence

Refill Alert (Red) Signal Interval



Number of Visitors Daily VS. Red Signal Interval (Grouped by Location)

Value Matrix upon Red Signal



Product Quality



Modeling & Interpretation

Method



Cleaning ∞ Data Retrieve

Outlier Detection - IQR



Define Metrics - Refillment Frequency

Dispenser Suffice Index = Average Daily Visitor / Average Refillment Interval



Define Metrics - Traffic Data

Dispenser Visit Ratio = Number of Dispensers / Average Daily Visitor



Modeling



Classification









Tuned via Grid Search

□ Testing MSE: 0.0176

□ How many additional dispensers ?

On average, 1 additional dispenser needed in every 5 locations.

Limitations



Insufficient Data

More data entries boost model generalizability and robustness.

Inadequate Information

Additional qualitative information may generate a more comprehensive model: customer experience, business types...

Incomprehensive Features

More categorical and numerical information regarding dispenser like mount location and accessibility will increase prediction accuracy. Conclusion

Major Takeaways

For Current Clients

Use the classification model to determine if there is a need to add more dispensers at each location

For Future Clients

Use the regression model to predict the optimal number of dispensers for each location.

Significance



- Increase Revenue
- Better Services
- Promote Subscription
- Help to maintain sustainability

- Better Experience
- Constantly sanitized

Client

- Wastage control
- Lower Labor Cost
- Higher User Satisfaction
- COVID prevention

Next Steps

 Imbalanced data handling
Implement additional machine learning models (XGBoost, Long-Short Term Memory...)
Train independent models for different site based on types

Thank you for listening!

Q&A

