

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

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

Wastage Control

- Reduced **Cleaning Frequency**
- No **Excessive Refillment Needs**

Optimization

- Dispenser Allocation
- Customer Satisfaction

Analysis Process

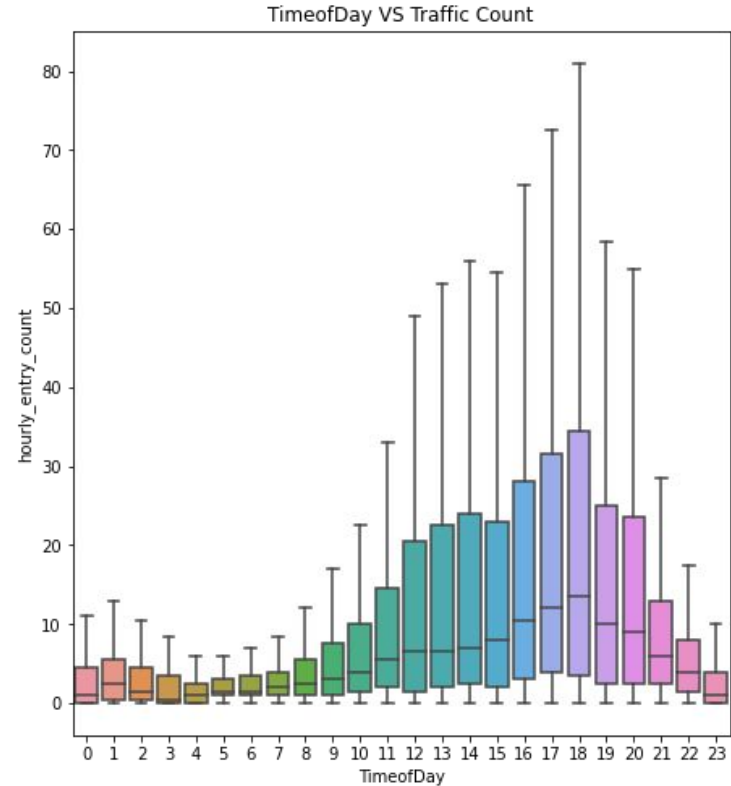
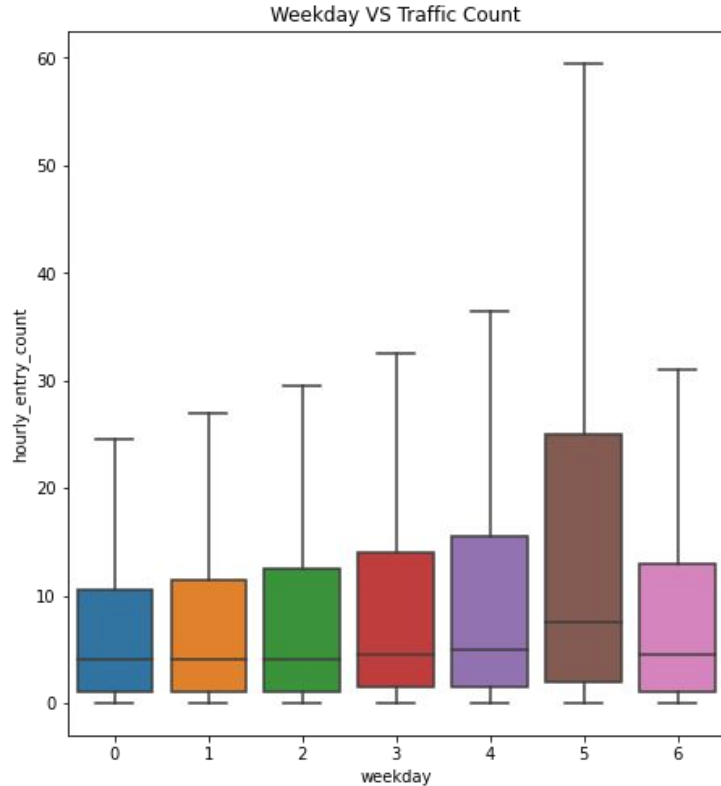




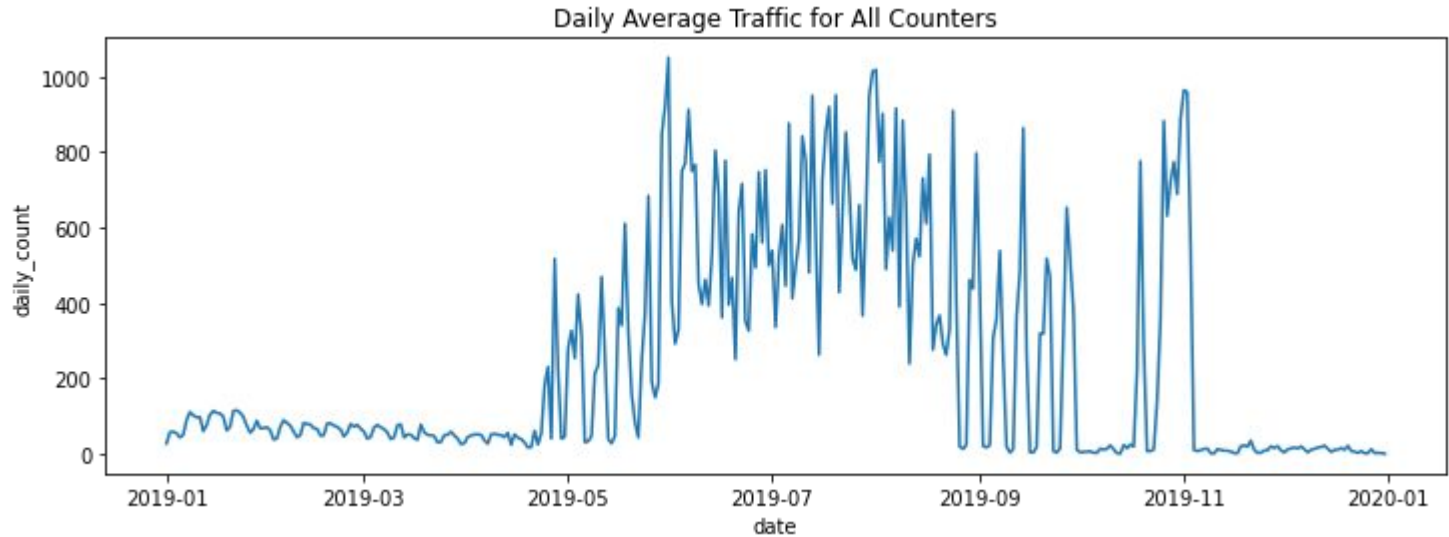
Exploratory Data Analysis

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

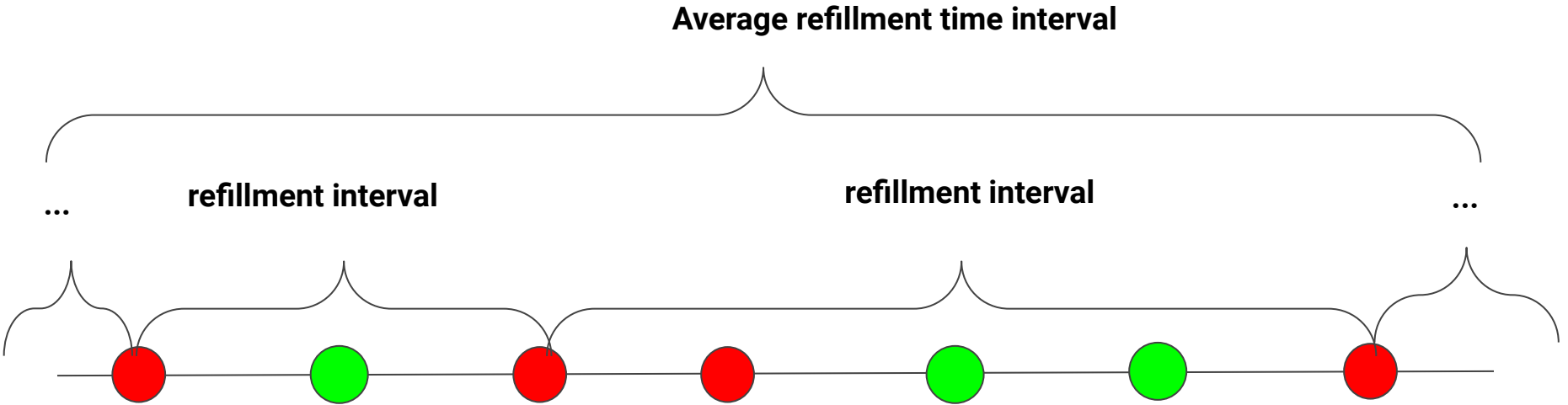
Daily and Weekly Traffic Flow



Annual Traffic Flow

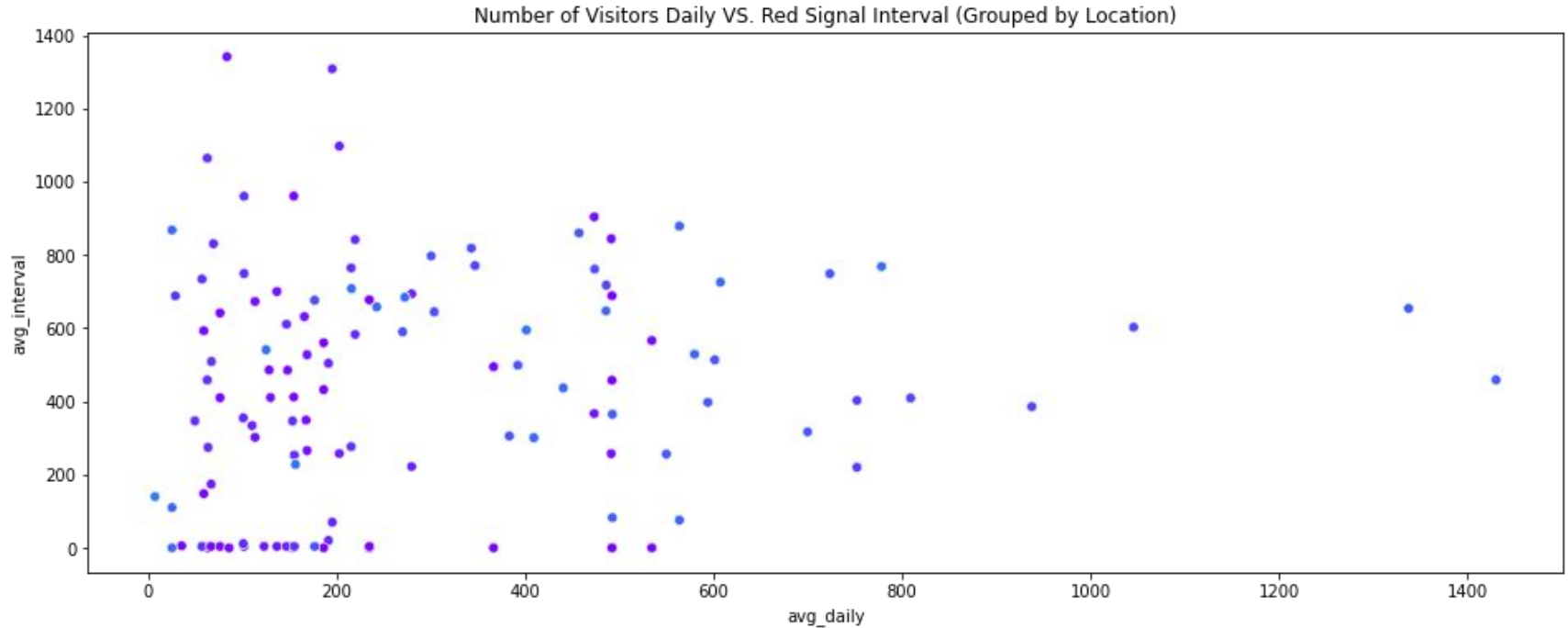


Refill Alert (Red) Signal Interval

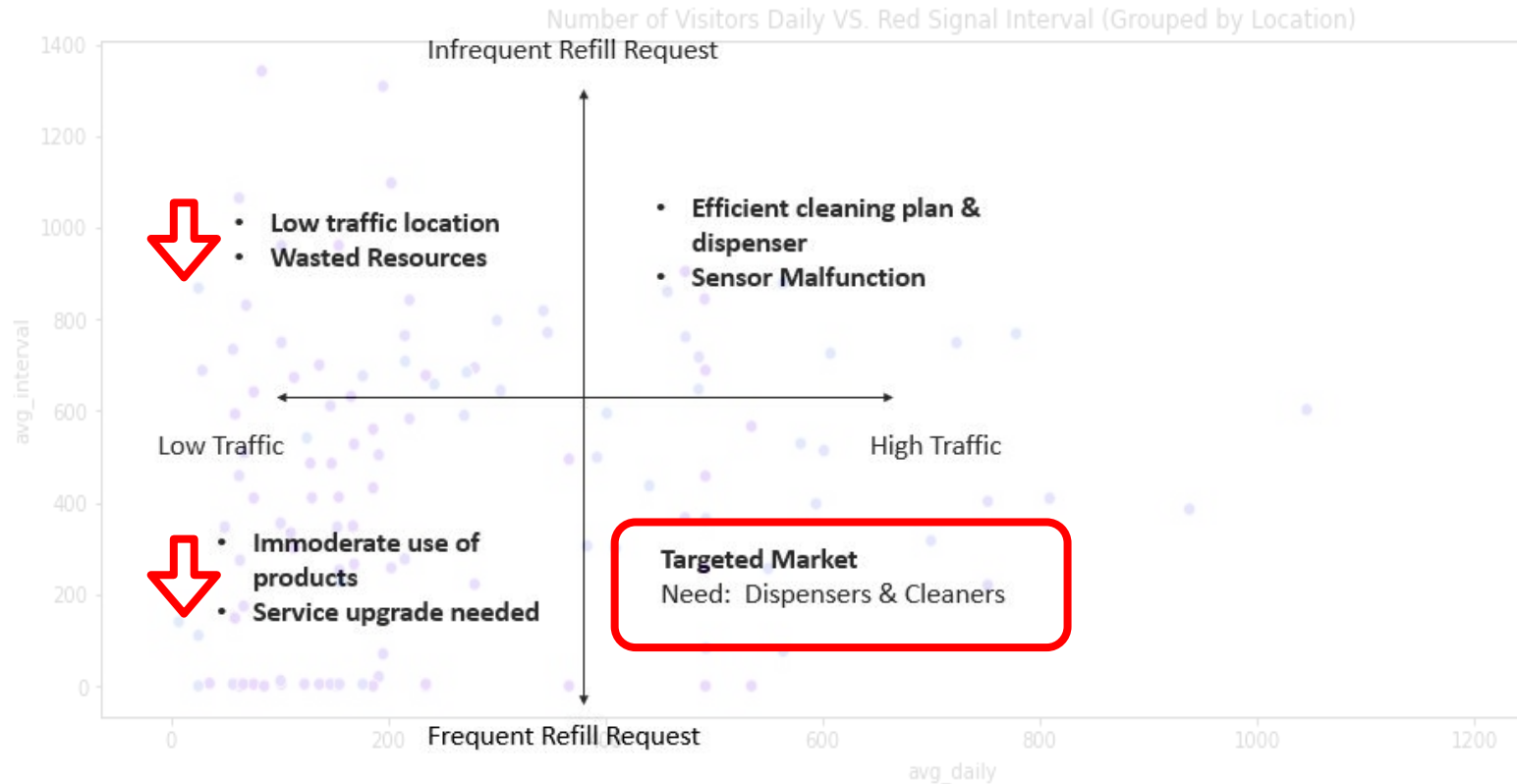


Avg_refillment_interval = Average number of minutes between first red alert occurrence and first red alert occurrence after green signal occurrence

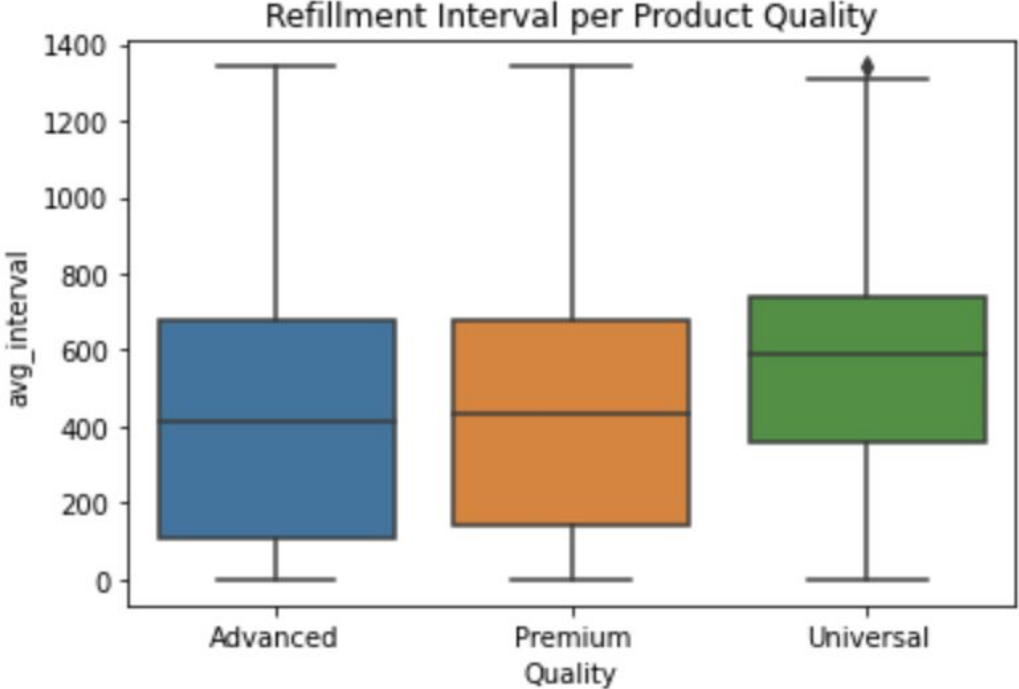
Refill Alert (Red) Signal Interval



Value Matrix upon Red Signal



Product Quality





Modeling & Interpretation

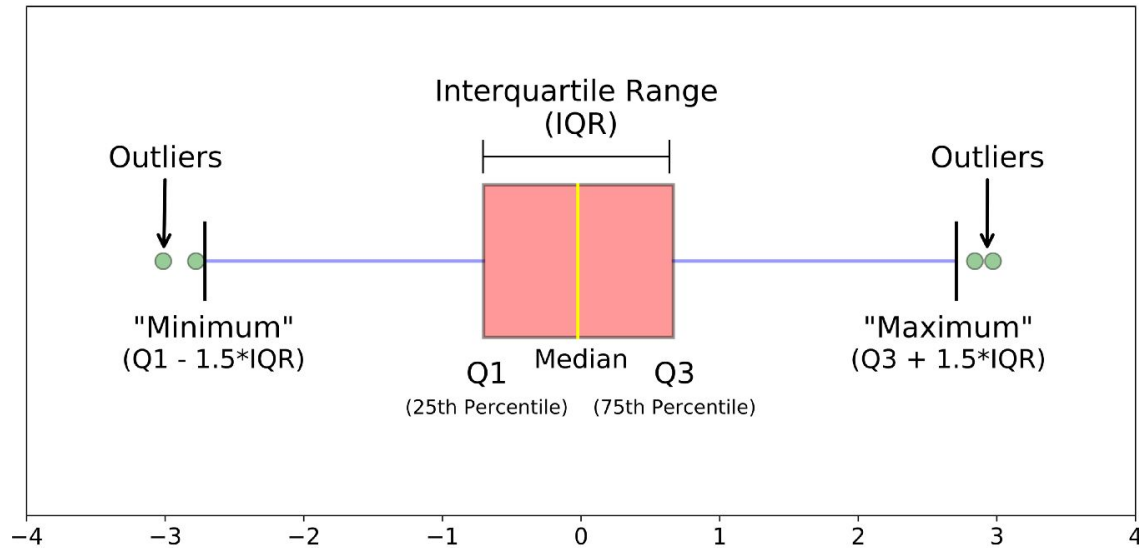


Method





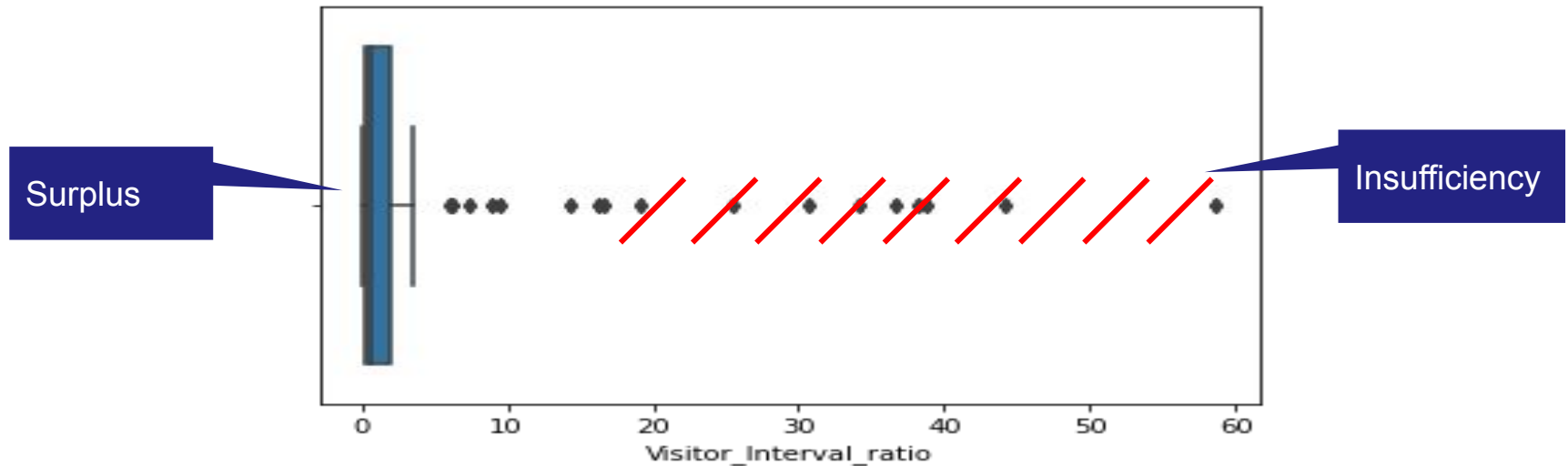
Outlier Detection - IQR





Define Metrics - Refillment Frequency

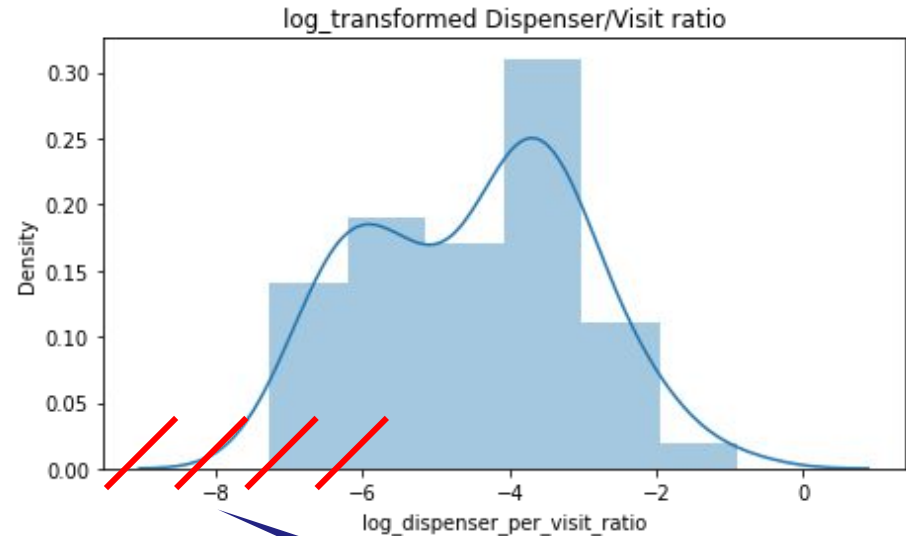
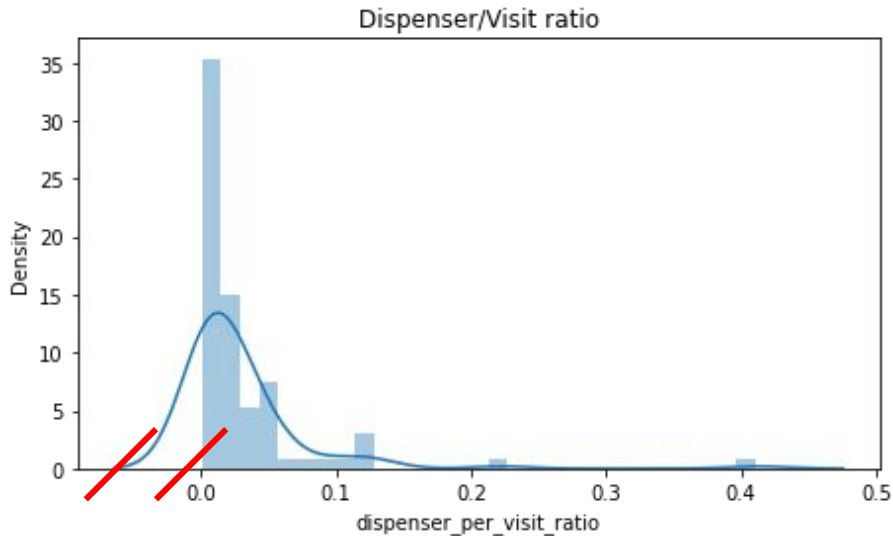
Dispenser Suffice Index = Average Daily Visitor / Average Refillment Interval





Define Metrics - Traffic Data

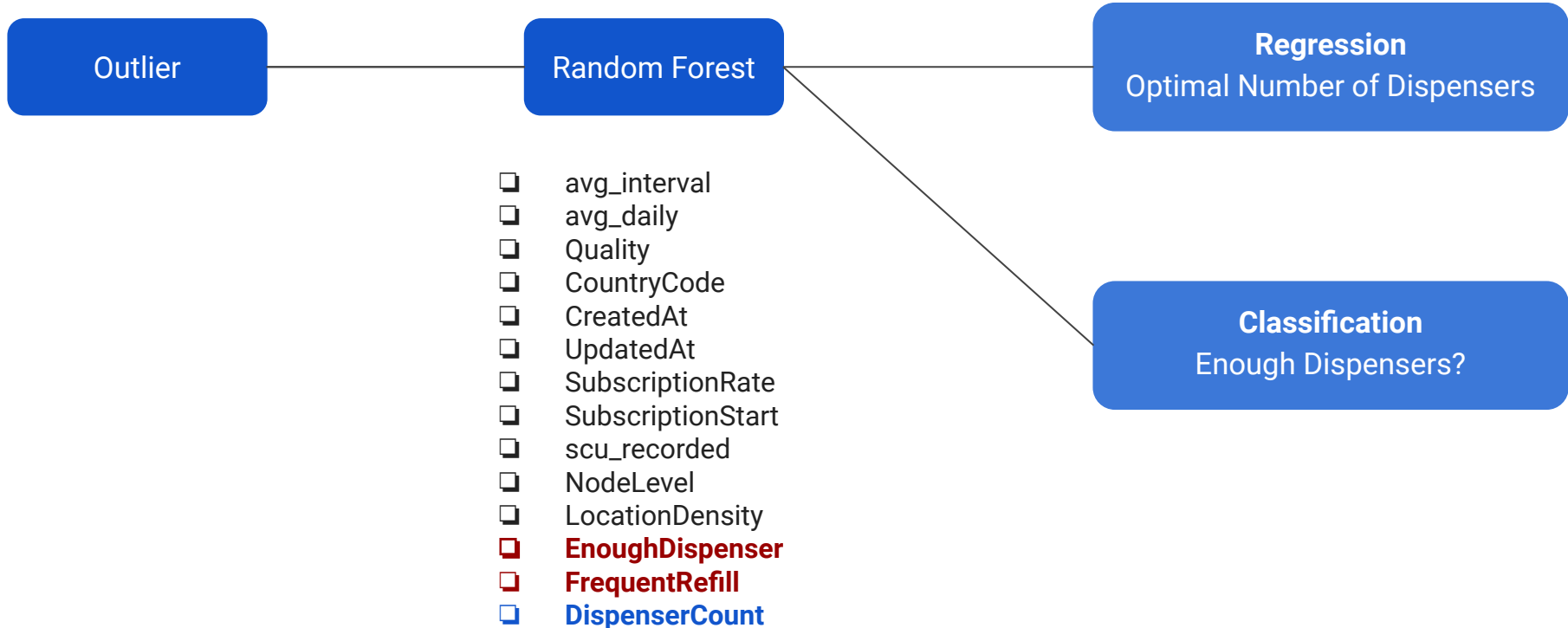
Dispenser Visit Ratio = Number of Dispensers / Average Daily Visitor



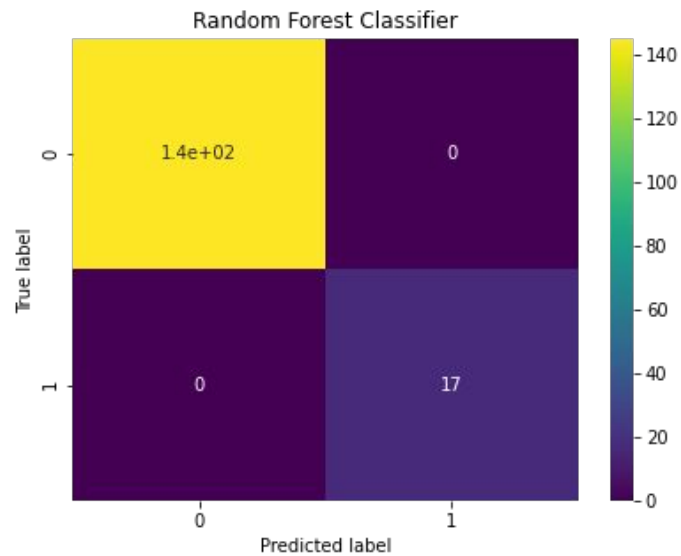
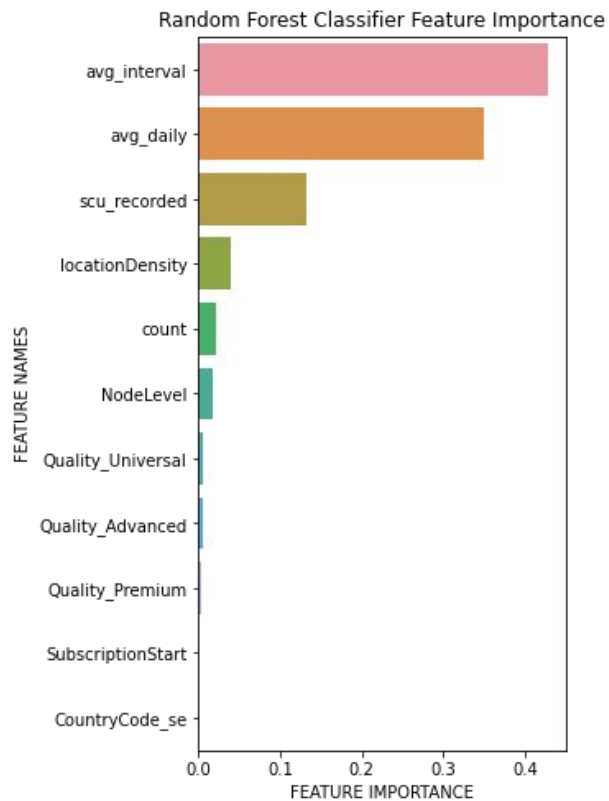
Insufficiency



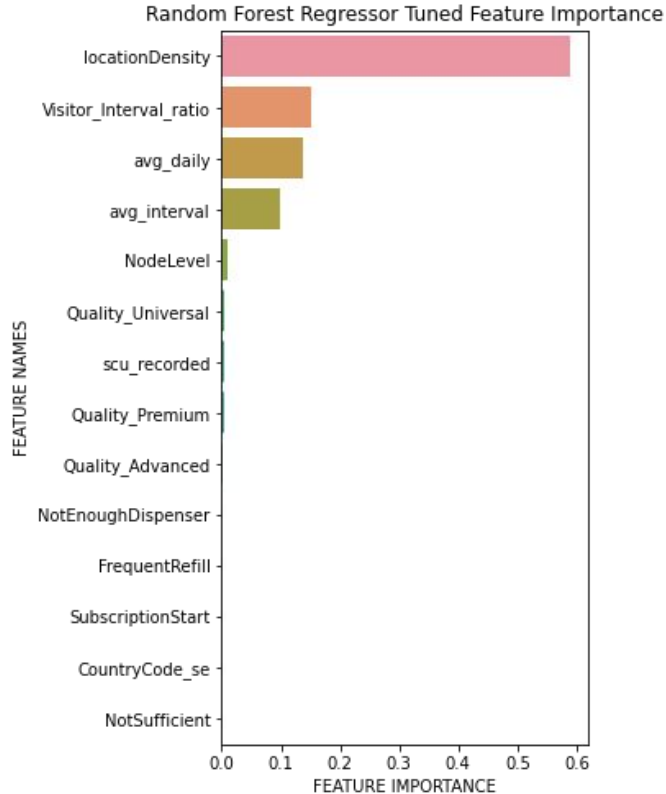
Modeling



Classification



Regression



- ☐ 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...

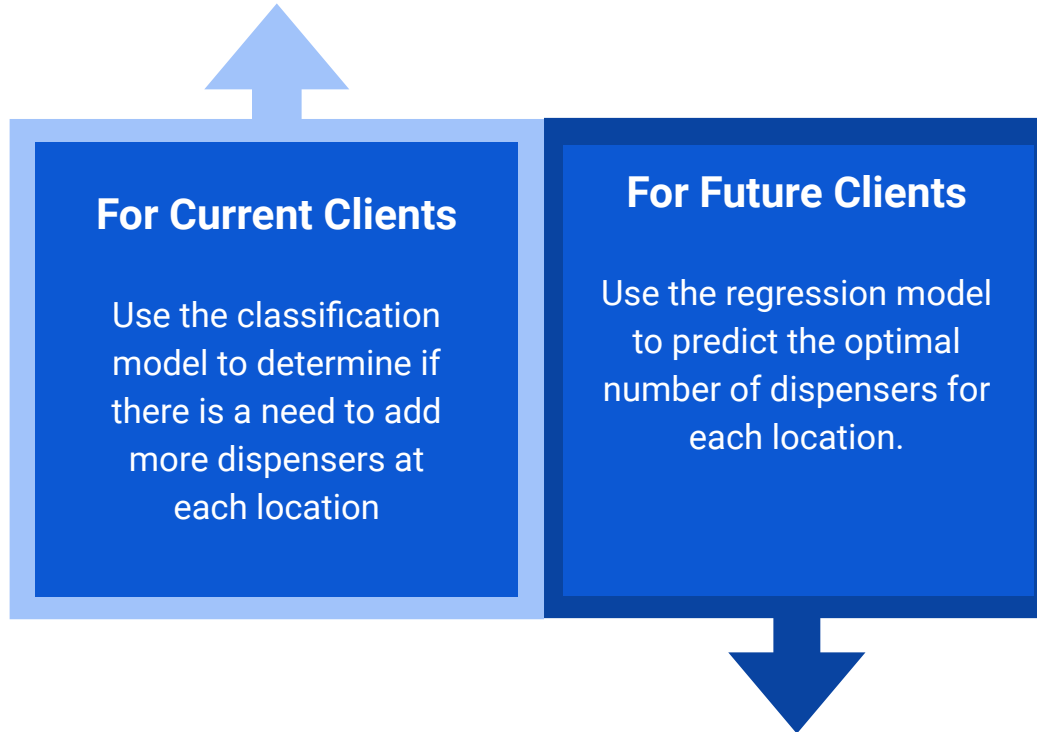
Incomprehensive Features

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

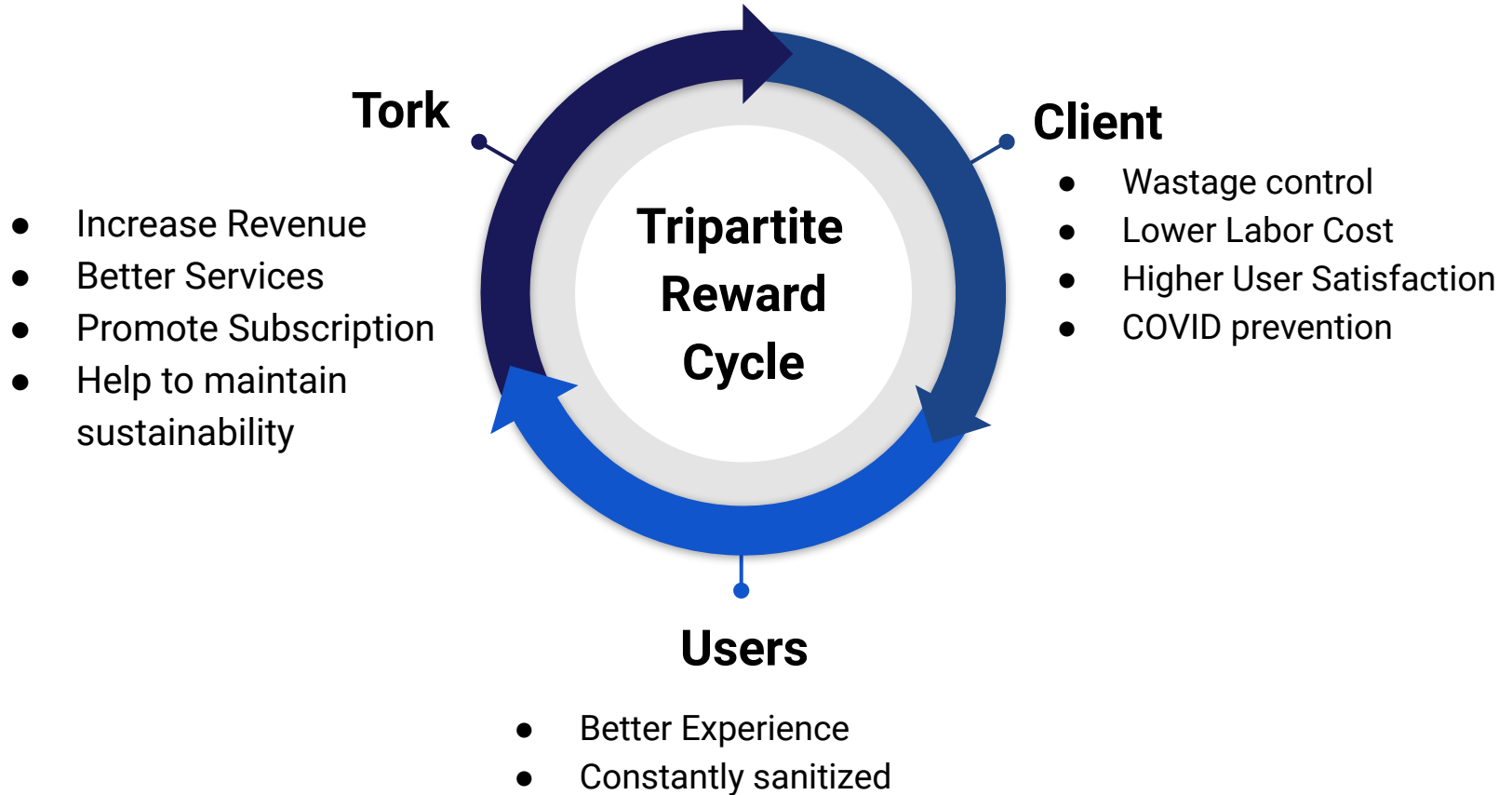
Conclusion



Major Takeaways



Significance



Next Steps

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

Q&A

