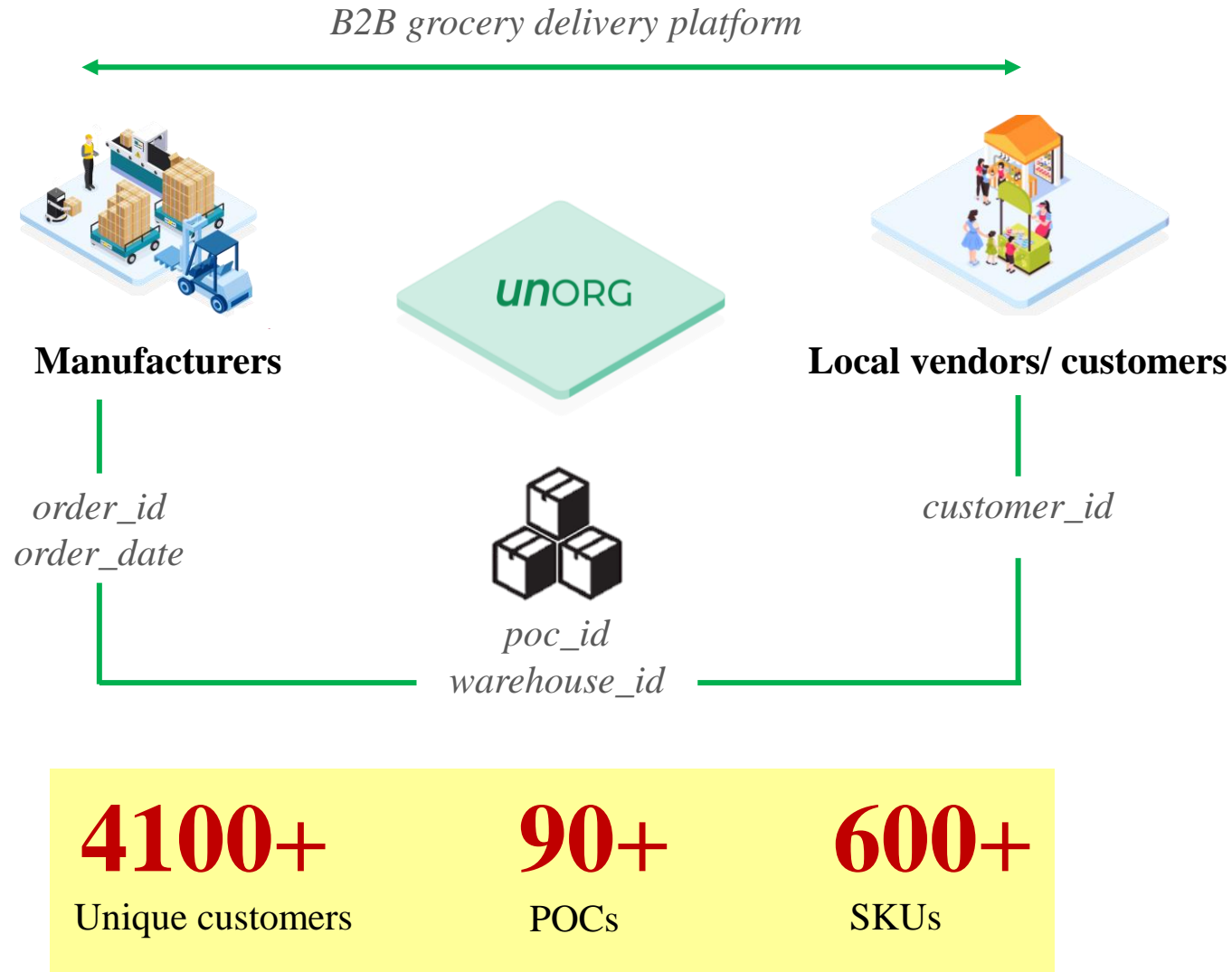# UNORG

Supply Chain + Data Science

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Team – Hyperion

Understanding the Demand Forecasting Challenge

B2B grocery delivery platform

Manufacturers

UNORG

Local vendors/ customers

order_id
order_date

poc_id
warehouse_id

customer_id

4100+
Unique customers

90+
POCs

600+
SKUs

Objectives

1 Daily Order Prediction

Likelihood of placing order for each of **14 days**.

2 SKU Forecast

Which SKU and What Quantity?

3 Inventory Planning

Better inventory management

Expected Outcomes:

1 Enhanced Order Predictability

2 Order Composition & Quantity

3 Strong Inventory Planning

EDA

Engineered 20+ features across the dataset

order.csv & item_order.csv

Total_order :The total number of orders placed by the customer across the observed time period.

Average Order Gap Days The average no. of days between two consecutive orders placed by the customer.

Total_order The total number of orders placed by the customer indicates their overall purchase activity.

Order Consistency Score measures how regularly and predictably a customer places orders over time.
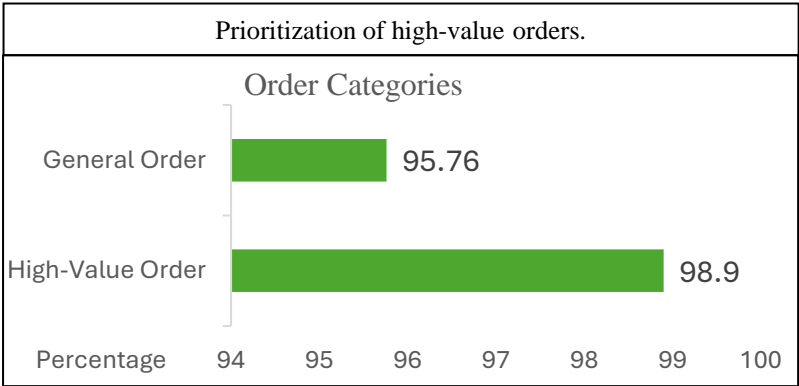
Major problems faced:

1 Same customers with multiple IDs:
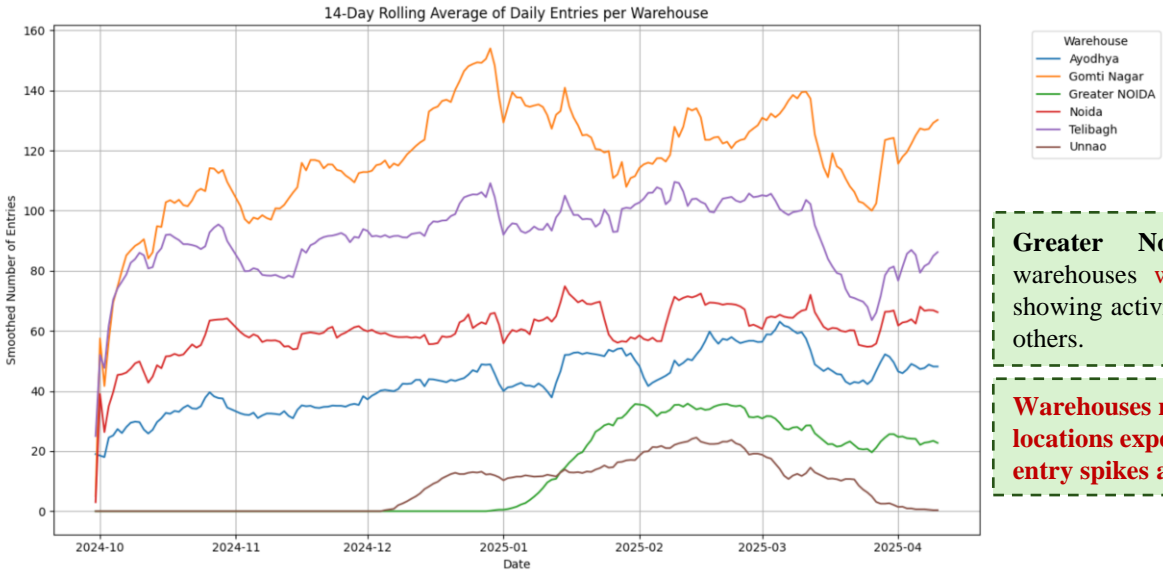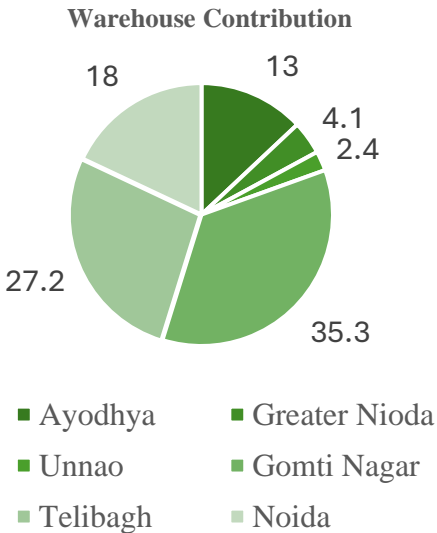89 customers appeared with multiple IDs.

Generate a **primary ID** by replacing each customer ID with the one having the most orders.

2 Same POC with multiple IDs:
2 POCs appeared with multiple IDs.

Generate a primary POC ID by replacing each POC ID with the one having the most orders.

14-Day Rolling Average of Daily Entries per Warehouse

Warehouse
- Ayodhya
- Gomti Nagar
- Greater NOIDA
- Noida
- Telibagh
- Unnao

Greater Noida and **Unnao** warehouses were launched later, showing activity starting well after others.

Warehouses near religious locations experienced noticeable entry spikes after the New Year.

Prioritization of high-value orders.

Order Categories

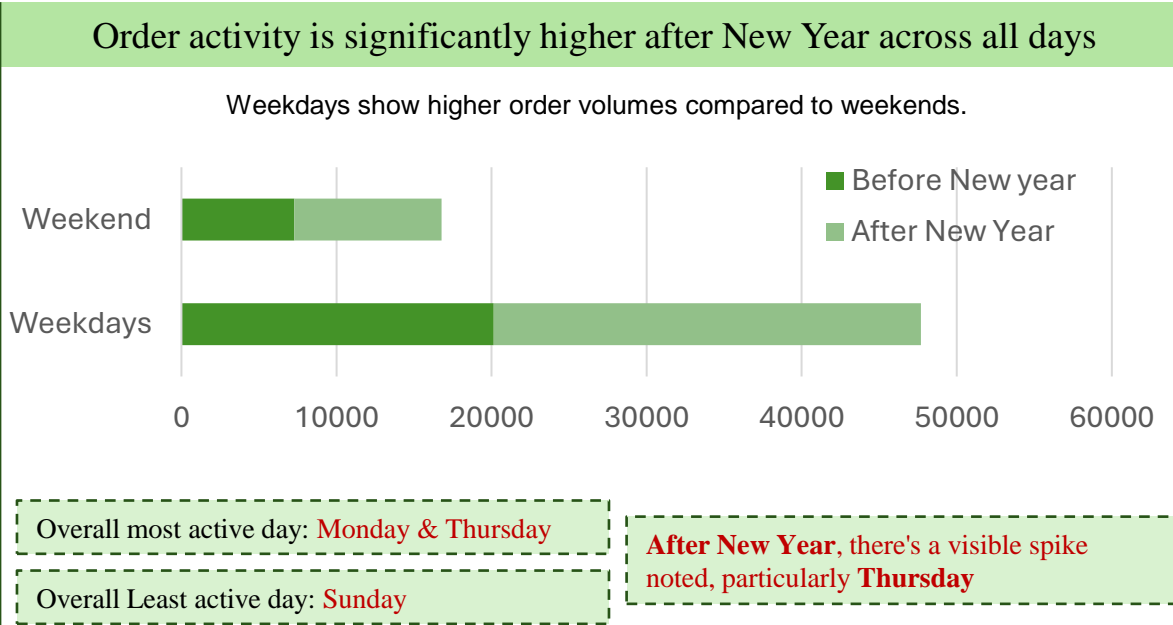| Category	Percentage
General Order	95.76
High-Value Order	98.9

Percentage axis: 94 95 96 97 98 99 100

High-value orders show exceptional fulfillment (98.9%), while general orders also perform well (95.76%), indicating possible **prioritization of high-value orders**.

Warehouse Contribution

Values: 13, 4.1, 2.4, 35.3, 27.2, 18

- ■ Ayodhya
- ■ Greater Nioda
- ■ Unnao
- ■ Gomti Nagar
- ■ Telibagh
- ■ Noida

Order activity is significantly higher after New Year across all days

Weekdays show higher order volumes compared to weekends.

- ■ Before New year
- ■ After New Year

Weekend / Weekdays

Axis: 0 10000 20000 30000 40000 50000 60000

Overall most active day: Monday & Thursday

Overall Least active day: Sunday

After New Year, there's a visible spike noted, particularly **Thursday**

PS1 – LSTM based Daily Order Prediction Model

Order.csv dataset

Feature engineering

- Average order Gap
- Total order

→ *Clustering* →

Cluster_0

Cluster_1

Cluster_2

Total Orders =< 4 ──────→ Probability: 0

('Total Orders' <=25)
&
('Total Orders' > 4)
&
('Average Order Gap Days' >= 14)

data['customer_id'][~data['customer_id'].isin(cluster_1_people)
&
~data['customer_id'].isin(cluster_1_people)]
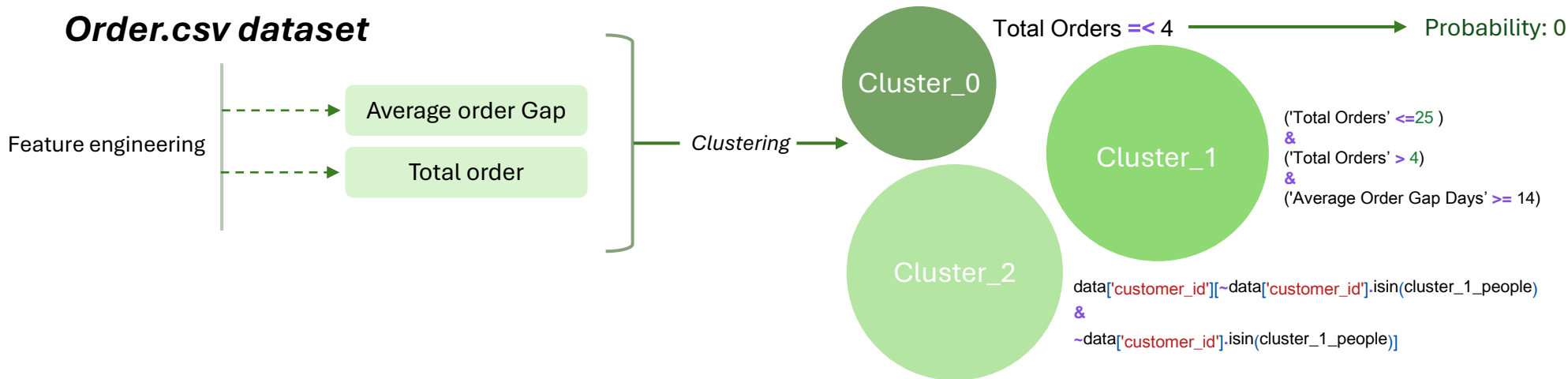
LSTM model Implementation

cluster_x → Feature engineering → *Preprocessing for LSTM* →

customer_	0	1	2	10	11	12	13
1	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0

. . . .
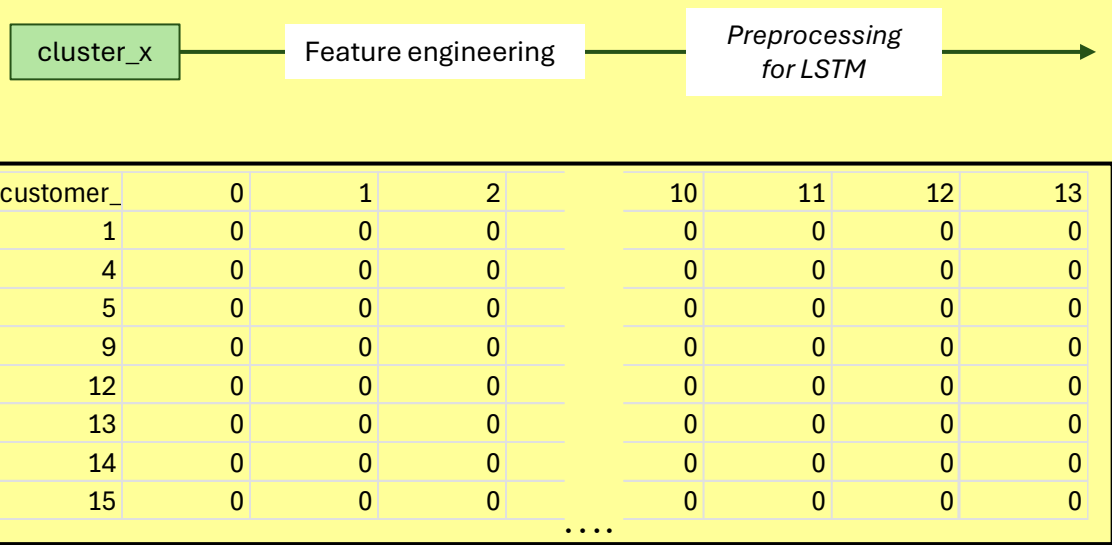
TRAIN

Layer (type)	Output Shape	Param #
lstm (LSTM)	(None, 30, 128)	74,240
dropout (Dropout)	(None, 30, 128)	0
lstm_1 (LSTM)	(None, 64)	49,408
dropout_1 (Dropout)	(None, 64)	0
dense (Dense)	(None, 32)	2,080
dropout_2 (Dropout)	(None, 32)	0
dense_1 (Dense)	(None, 14)	462

Cluster_1
- Accuracy: 0.5192
- Precision: 0
- Recall: 0
- F1 Score: 0

Cluster_2
- Accuracy is 0.144
- Precision is 0.867
- Recall is 0.0434
- F1 Score is 0.0826

VALIDATION

Cluster_1
- Accuracy: 0.5150
- Precision: 0
- Recall: 0
- F1 Score: 0

Cluster_2
- Accuracy: 0.140
- Precision: 0.855
- Recall: 0.0470
- F1 Score: 0.0891

TEST

Cluster_1
- Accuracy: 0.5185
- Precision 0
- Recall: 0
- F1 Score: 0

Cluster_2
- Accuracy: 0.1424
- Precision: 0.8608
- Recall: 0.0435
- F1 Score: 0.0827
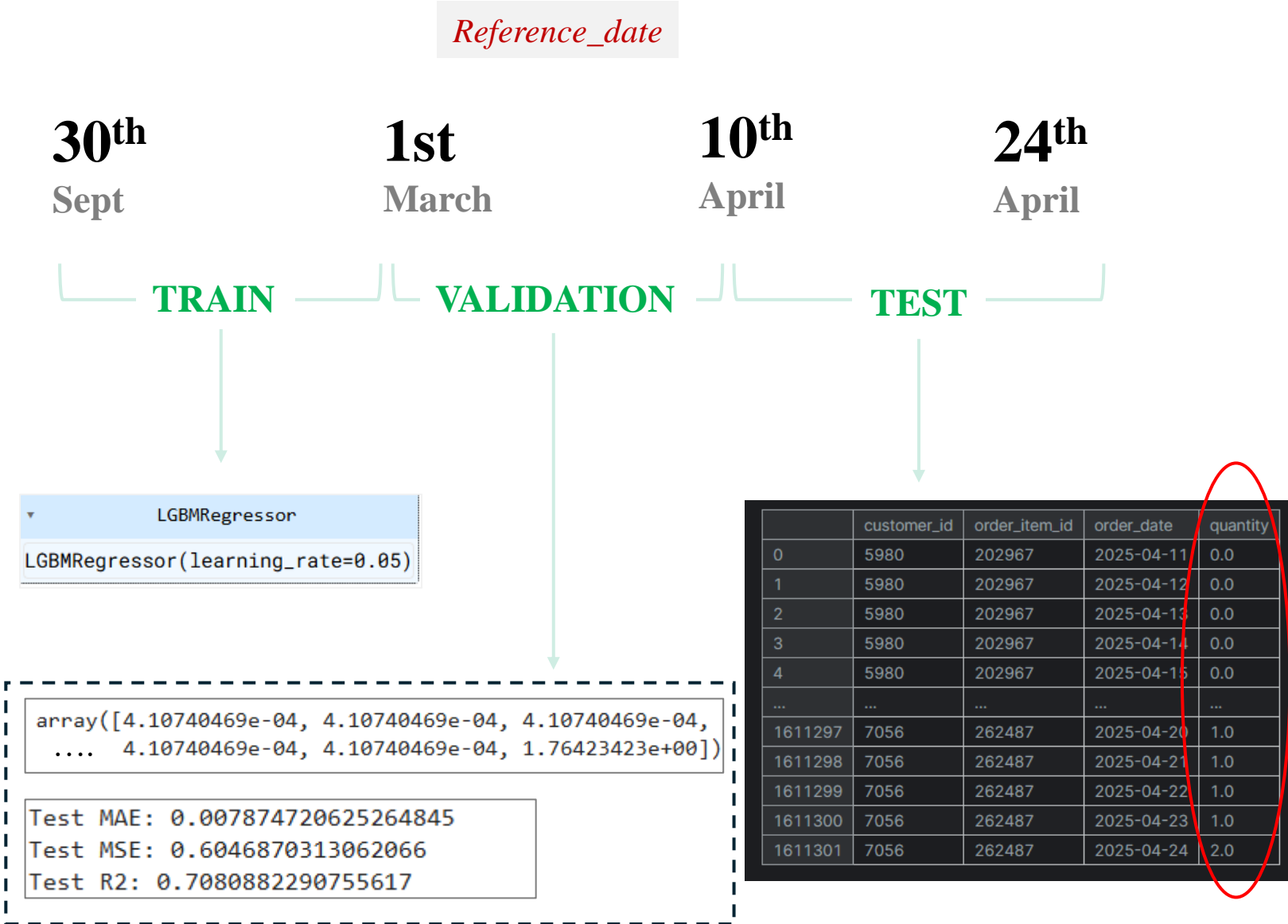
PS3 – Inventory Model

Implemented a Periodic Review (P-System) for each customer-product-warehouse combination

Inventory Plan for 7 Star Rice at Warehouse 1
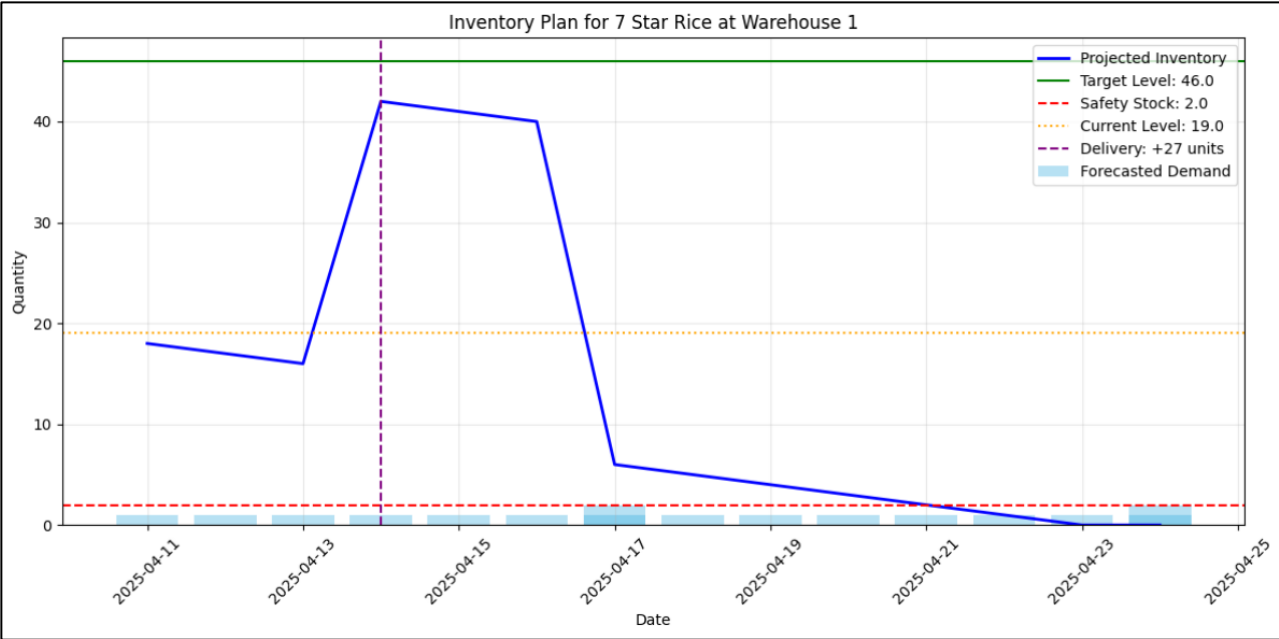
7 days	**3 days**	
Review Interval	Lead Time	

```
Running periodic review on 2025-04-11

Orders to place on 2025-04-11:
     warehouse_id                       item_name  current_inventory  \
0               1                    7 Star Rice               19.0
1               1      ASHOK BIRYANI MASALA (50 GM)             2.0
2               1    ASHOK KALI MIRCH POWDER (100g)            4.0
3               1      ASHOK SONTH MASALA (100gm)              2.0
4               1                Adani Mota Besan              30.0
..            ...                            ...                ...
986             6                 Tata Salt Pkt(1Kg)           32.0
987             6                     Tibaar Rice               6.0
988             6               Tuta Basmati Rice               1.0
989             6                  Urad Sabut Dal              14.0
990             6            Vibhor Soya Pouch(1L)            117.0

     target_inventory  order_quantity
0                46.0              27
1                 3.0               1
2                 7.0               3
3                 4.0               2
4               105.0              75
..                ...             ...
986              53.0              21
987              15.0               9
988               5.0               4
989              21.0               7
990             173.0              56

[991 rows x 5 columns]

Next review scheduled for: 2025-04-18
```

Thankyou