unORG

Supply Chain + Data Science

Team Hyperion

Krish Sharma | Rajan Verma | Rajarshi Verma | Rujhaan Taneja

Introduction

B2B grocery delivery platform

Manufacturers

order_id
order_date

unORG

poc_id
warehouse_id

Local vendors/ customers

customer_id

4100+
Unique customers

90+
POCs

600+
SKUs

Deliverables

1 Daily Order Prediction

c_id: 1837

D1	*D2*	*D3*	*D14*
0.28	**0.14**	**0.80**	**0.21**

2 SKU Forecast

c_id: 1837 | *SKU_id* | *order_date*

14-day aggregated quantity forecast: **40**

3 Inventory Planning

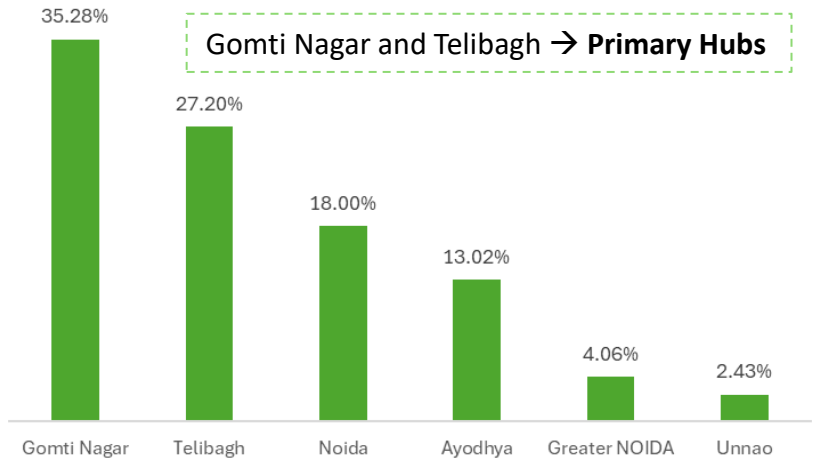
*Periodic review date**

warehouse_id | *SKU_id* | *Current_inventory* | *Target inventory*

Quantity: **25**

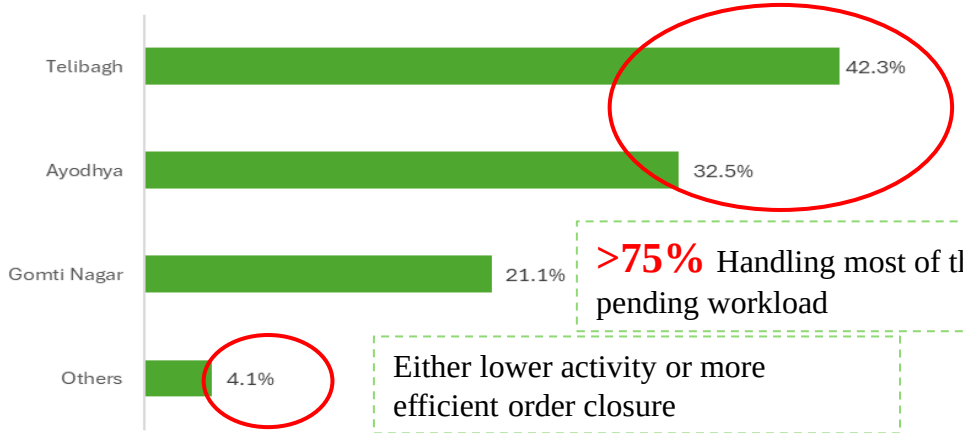
EDA

Order Distribution by Warehouse



Gomti Nagar and Telibagh → **Primary Hubs**

Distribution of OPEN Orders by Warehouse



>75% Handling most of the pending workload

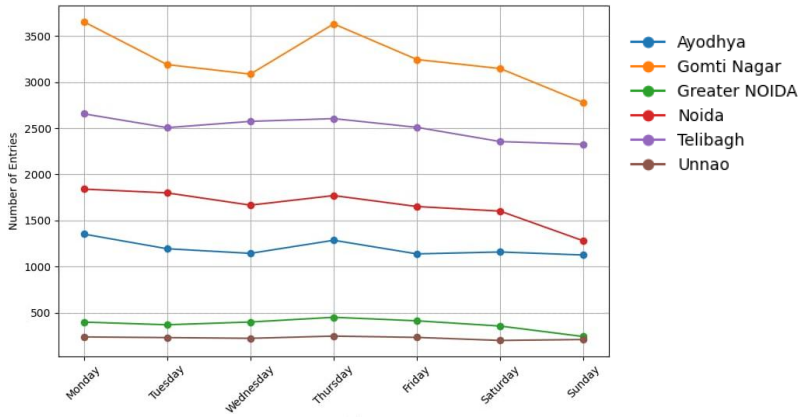
Either lower activity or more efficient order closure

General Observations

- Most open orders are from the Most Recent Date (10th April), sharp drop off for previous days (<1% before 8th April) → **System actively processing orders**
- High-value orders show exceptional fulfillment (98.9%), while general orders also perform well (95.76%), indicating possible **prioritization of high-value orders**

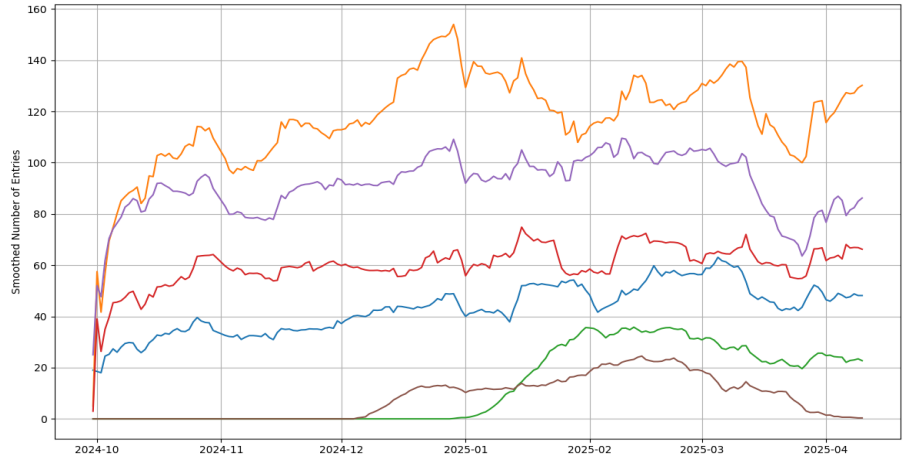
Number of Entries per day for each Warehouse

- Gomti Nagar → **Busiest** warehouse throughout the week
- Monday, Thursdays → **Peak** Days
- Sundays → **Lowest**

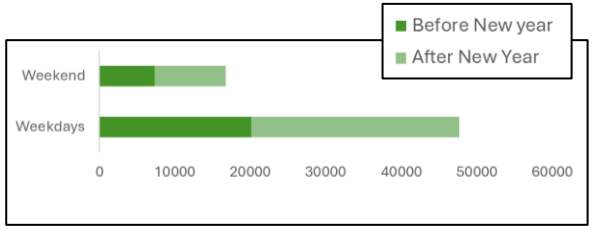


14-Day Rolling Average of Daily Entries per Warehouse

- Most warehouses show stable or growing trends, with no drastic drops except for **Unnao**, which tapers off sharply in early 2025



Weekdays show higher order volumes compared to weekends



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

PS1 – Customer order Prediction

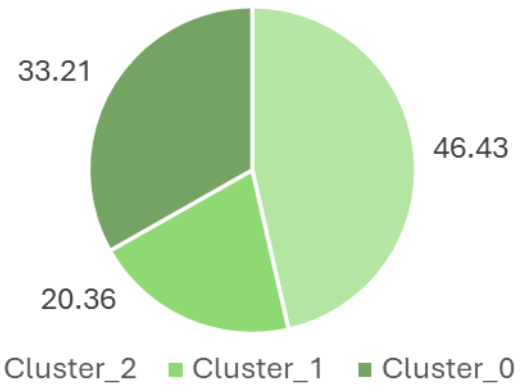
Features engineering

- *average_order_gap* — Average time between orders
- *average_order_value* — (Total order value) / (No. of orders)
- *total_order_value*
- …
- *Order Consistency Score* — *1/ (SD of order Gaps)*

Clustered into 3 customer categories

- Cluster_1 → total_orders <=4
- Cluster_0 → 4 < total_orders <= 25
- Cluster_2 → *average_order_gap >= 14*
- *else if not satisfied*

% customers



Feature engineering

VALIDATION

Cluster_1: Perfect
- Accuracy: 51.50
- Precision: 0
- Recall: 0
- F1 Score: 0

Cluster_2: Perfect
- Accuracy: 14.03
- Precision: 83.53
- Recall: 4.25
- F1 Score:8.09

TEST

Cluster_1: Perfect
- Accuracy: 51.93
- Precision0
- Recall: 0.0
- F1 Score: 0.0

Cluster_1
- Accuracy: 95.86
- Precision 47.95
- Recall: 50.0
- F1 Score: 48.95

Cluster_2: Perfect
- Accuracy: 14.24
- Precision: 86.08
- Recall: 4.35
- F1 Score: 8.27

Cluster_2:
- Accuracy: 82.13
- Precision: 84.048
- Recall: 51.91
- F1 Score: 48.85

Cluster_1: Perfect
- Accuracy: 51.93
- Precision: 7.14
- Recall: 0.01
- F1 Score: 0.02

Cluster_2: Perfect
- Accuracy: 14.4
- Precision: 0.867
- Recall: 4.34
- F1 Score 0.826

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

LSTM Model

PS2 – SKU Quantity Prediction

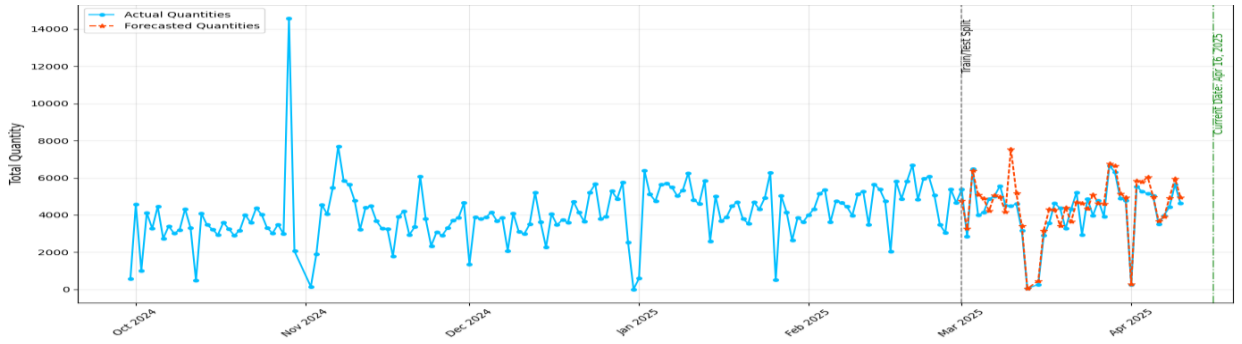
Orders.csv

order_id	customer_id	order_date
.....	poc_id	warehouse_id

Items.csv

order_id	quantity
.....	order_item_id

Merged per customer per SKU basis



Daily Order Quantities

Engineered 10+ features to capture Time trends, Calendar features, and discounts

- *lag_1_day* — SKUs purchased in the prev. order
- *rolling_mean_7d* — Avg. qty across 7 most recent orders
- *discount_percentage* — Discount amount/ price per unit
- *is_holiday* *day_of_week* .....

Reference_date

30th Sept | **1st March** | **10th April** | **24th April**

TRAIN | VALIDATION | TEST

```
LGBMRegressor
LGBMRegressor(learning_rate=0.05)
```

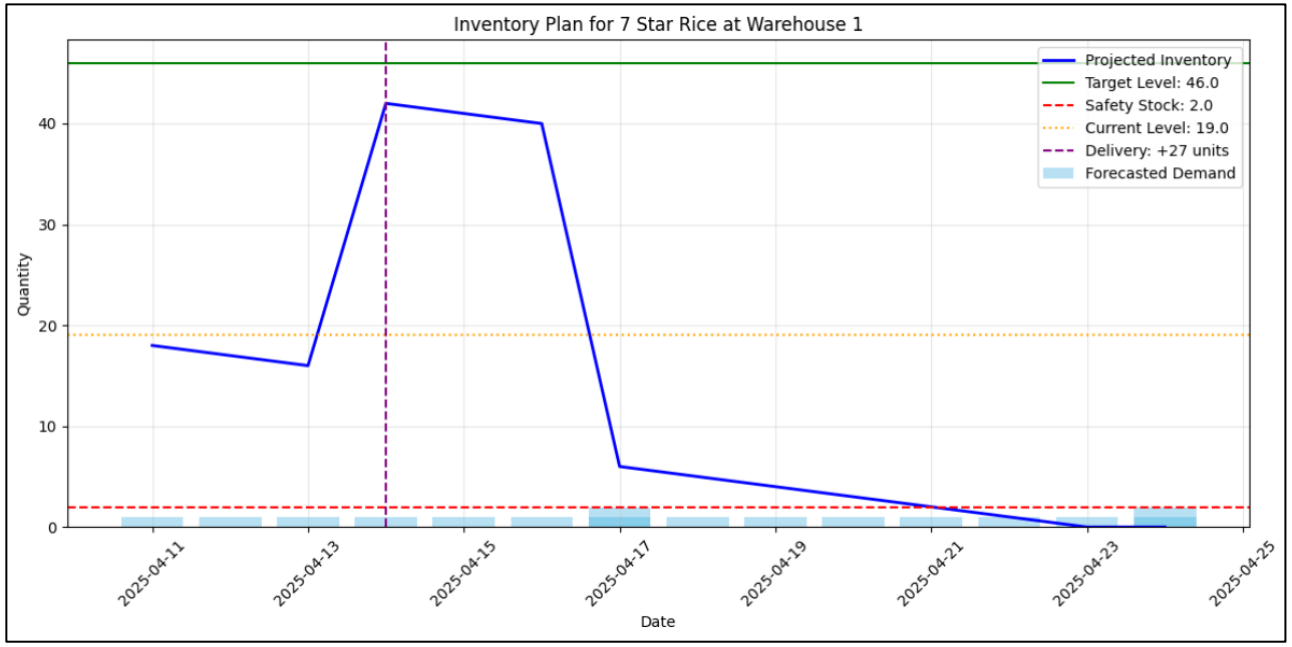
```
array([4.10740469e-04, 4.10740469e-04, 4.10740469e-04,
  ....  4.10740469e-04, 4.10740469e-04, 1.76423423e+00])
```

```
Test MAE: 0.007874720625264845
Test MSE: 0.6046870313062066
Test R2: 0.7080882290755617
```

	customer_id	order_item_id	order_date	quantity
0	5980	202967	2025-04-11	0.0
1	5980	202967	2025-04-12	0.0
2	5980	202967	2025-04-13	0.0
3	5980	202967	2025-04-14	0.0
4	5980	202967	2025-04-15	0.0
...	...	...	...	...
1611297	7056	262487	2025-04-20	1.0
1611298	7056	262487	2025-04-21	1.0
1611299	7056	262487	2025-04-22	1.0
1611300	7056	262487	2025-04-23	1.0
1611301	7056	262487	2025-04-24	2.0

PS3 – Inventory Model

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



7 days
Review Interval

3 days
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

EDA

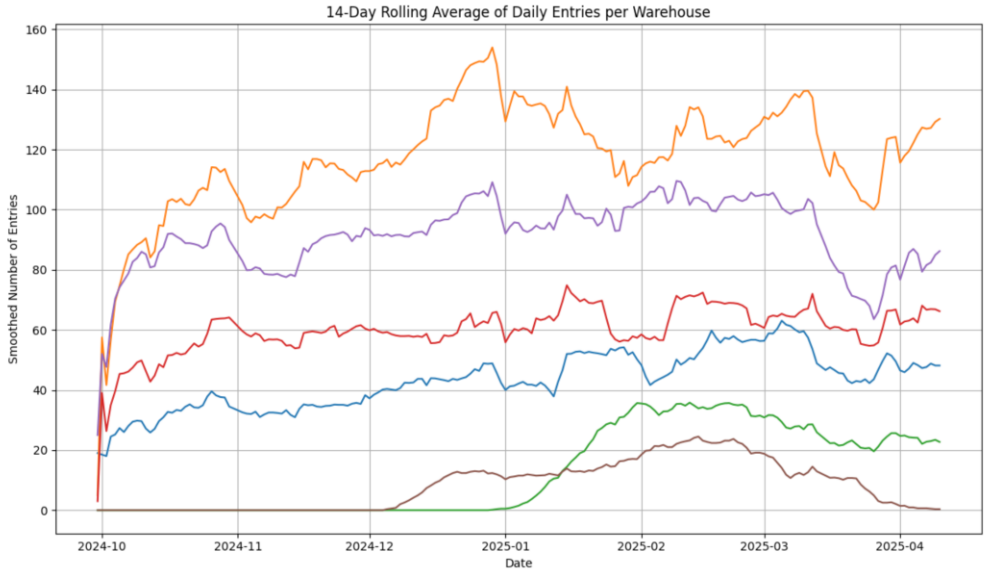
Engineered 20+ features across the dataset ← *order.csv & item_order.csv*

- *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:

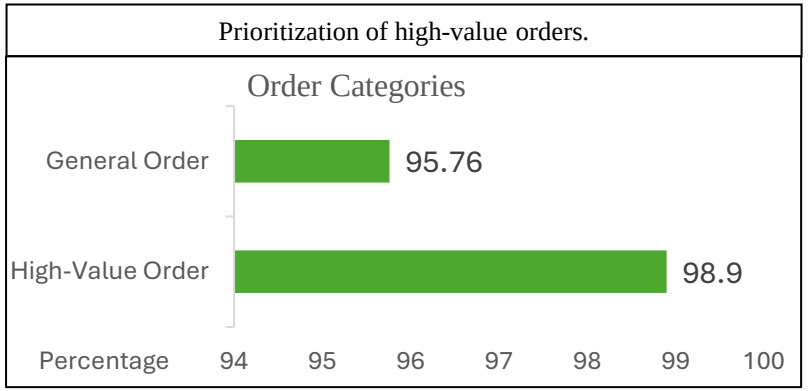
1. Same customers with multiple IDs:
   89 customers appeared with multiple IDs.
   Generate a **primary ID** by replacing each customer ID with the one having the most orders.

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.

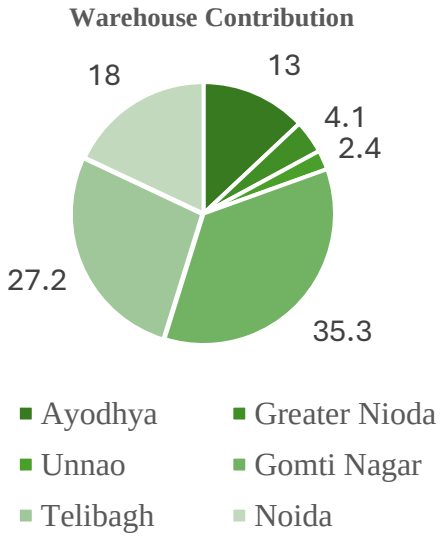


Greater Noida and **Unnao** warehouses were launched later, showing activity starting well after others.

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

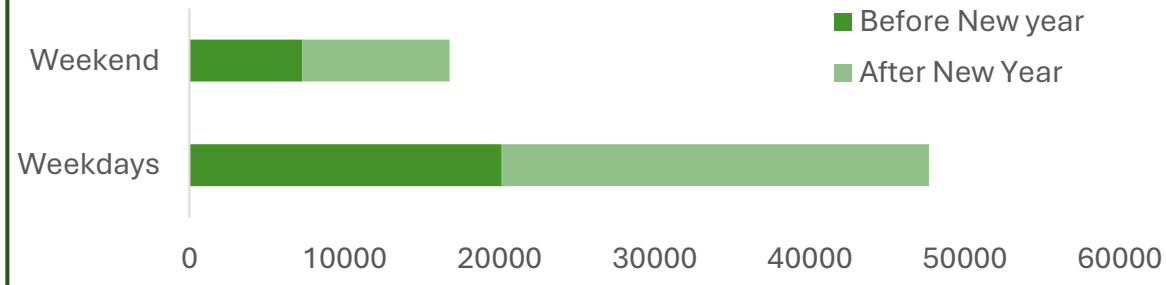


High-value orders show exceptional fulfillment (98.9%), while general orders also perform well (95.76%), indicating possible **prioritization of high-value orders**.



Order activity is significantly higher after New Year across all days

Weekdays show higher order volumes compared to weekends.



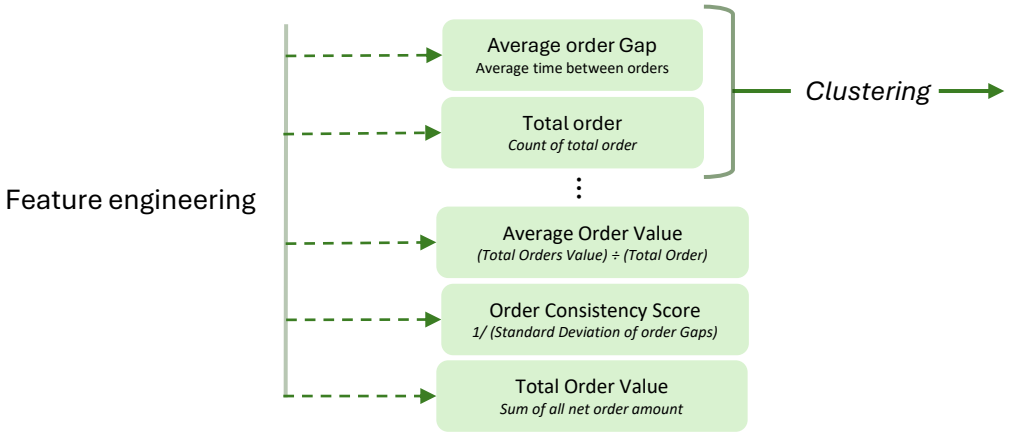
Overall most active day: Monday & Thursday

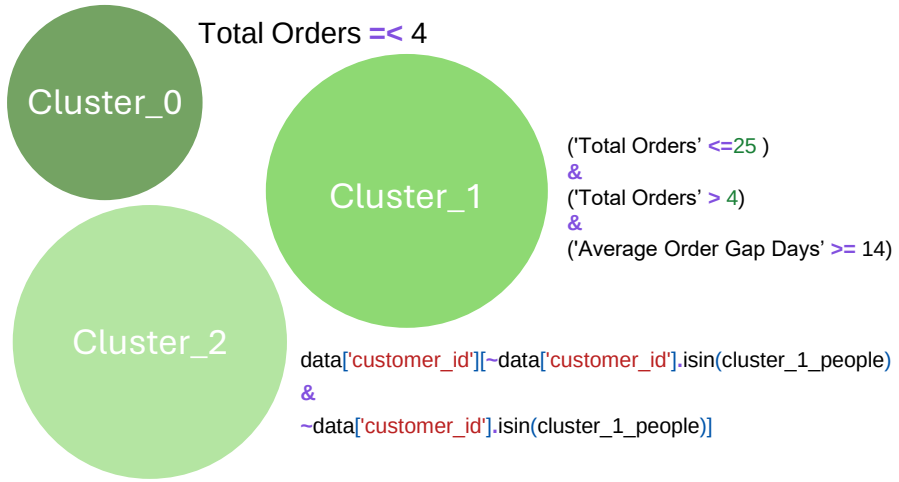
Overall Least active day: Sunday

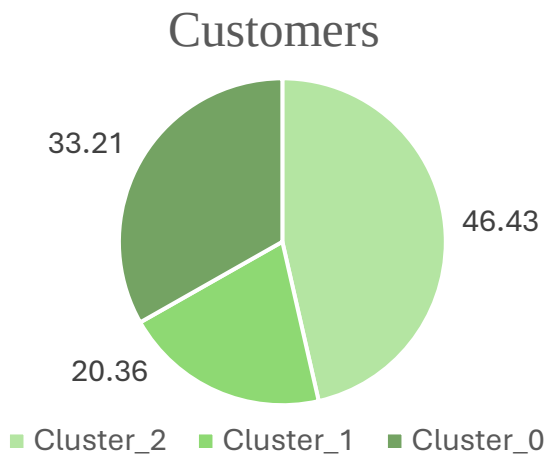
After New Year, there's a visible spike noted, particularly **Thursday**

PS1 – LSTM based Daily Order Prediction Model

Order.csv dataset







LSTM model Implementation

cluster_x — Feature engineering — *Preprocessing for LSTM* →

customer_id	0	1	2	...	11	12	13
1	0.29416	0.30853	0.31522	...	0.31571	0.31441	0.31520
4	0.00000	0.00000	0.00000	...	0.00000	0.00000	0.00000
5	0.22865	0.23321	0.23301	...	0.24403	0.24347	0.25080
9	0.00000	0.00000	0.00000	...	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	...	0.00000	0.00000	0.00000
13	0.26654	0.30609	0.30896	...	0.32041	0.31685	0.32203
14	0.23439	0.23842	0.23755	...	0.24574	0.24513	0.25224
15	0.00000	0.00000	0.00000	...	0.00000	0.00000	0.00000
18	0.20650	0.21019	0.21010	....	0.22965	0.22955	0.23857

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: 14.4
- Precision: 0.867
- Recall: 4.34
- F1 Score 0.826

VALIDATION

Cluster_1
- Accuracy: 51.50
- Precision: 0
- Recall: 0
- F1 Score: 0

Cluster_2
- Accuracy: 14.03
- Precision: 83.53
- Recall: 4.25
- F1 Score:8.09

TEST

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

Cluster_2: Perfect
- Accuracy: 82.13
- Precision: 84.048
- Recall: 51.91
- F1 Score: 48.85

Cluster_2
- Accuracy: 14.24
- Precision: 86.08
- Recall: 4.35
- F1 Score: 8.27