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Unveiling Challenges:

Addressing and Analyzing Operational Issues in a Small Business

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Mid-Term Report for the Project on Business Data Management

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Executive Summary

This report includes proof of originality and the dataset used for preliminary analysis. It provides a comprehensive analysis of business data from November to December 2023, covering daily sales, monthly sales and expenditures, and customer demographics.

Initial analysis reveals key insights into customer behavior, business performance, and strategic growth opportunities. Kitchipalayam emerges as a major market hub, with 92% of customers originating from this locality, suggesting a need for focused customer engagement strategies in this area. Conversely, only 8% of customers are from Ammapet, indicating an opportunity for geographical expansion and customer outreach. The analysis of top customers by revenue and onion sales highlights the critical role of restaurants in revenue generation, with 90% of total revenue and 80% of onion sales originating from this sector.

Analysis techniques, including Customer Churn and Geospatial analysis, were used to understand the consumer market, Churn rate, and its distribution. Targeting restaurant-based customers with customized marketing can boost satisfaction, loyalty, and revenue, facilitating market expansion.

In summary, the report shows the importance of customer-centric strategies, geographical diversification, and targeted approaches towards specific segments, particularly restaurants, to optimize customer retention and foster business expansion in the market landscape.

Proof of Originality of Data

- **Data Source Clarification**

- **Daily Sales.xls:** This file contains the daily recorded sales data of XYZ as elaborately explained in the following section.
- **Monthly Sales & Expenditures.xls:** This file contains the monthly sales and expenditure data of the business, explained in detail in the upcoming section.
- **Customer_Data.xls:** This data contains the record of customers.

Metadata and Descriptive Statistics:

Metadata: Daily Sales.xls

Sample Data:

	Date	Customer ID	Onions Sold (in Kg)	Buying Price (per Kg)	Listed price (per Kg)	Total Price	Discount (in Rs.)	Selling Price
0	2023-11-01	209	6.0	70	77	462.0	77.0	385.0
1	2023-11-01	210	12.0	70	77	924.0	154.0	770.0
2	2023-11-02	235	1.5	70	77	115.5	38.5	77.0
3	2023-11-02	236	4.5	70	77	346.5	38.5	308.0
4	2023-11-02	218	6.0	70	77	462.0	77.0	385.0

Shape of the dataset: (50,8) 50 rows and 8 columns.

Description: The dataset contains everyday sales data from November 2023 to December 2023, Each row represents a delivery made by the business, and the data set contains 8 columns as follows:

- **Date:** This column indicates the date of each delivery.
- **Customer ID:** Each customer is assigned a unique identification number.
- **Onions Sold (in Kg):** This column shows the quantity of onions sold to a customer on a specific date.
- **Buying Price (Per Kg):** It represents the price at which the business purchases onions daily.
- **Listed Price (Per Kg):** This is the base selling price of onions.
- **Total Price:** Onions Sold(in Kg) * Listed Price(Per Kg)
- **Discount (in Rs.):** This column indicates the amount reduced from the total price.
- **Selling Price (in Rs.):** It represents the total amount payable by the customer after applying any discounts.

Metadata: Monthly Sales & Expenditures.xls

Sample Data:

	Month(MM YYYY)	Onion Bought (in kg)	Onion Sold (in kg)	Total onion bought (in rupees)	Employee Count	Miscellaneous expenditure	Total Spent (in rupees)	Total onion sold (in rupees)	Discount (in rupees)	Profit (in rupees)	Loss (in rupees)
0	Nov 2023	663.0	663.0	41910	1	1200	43110	45351.0	8235.5	-5994.5	5994.5
1	Dec 2023	700.5	700.5	29664	1	1140	30804	32839.5	6127.5	-4092.0	4092.0

Shape of the dataset: (2, 11) 2 rows and 11 columns.

Description: Each row of the dataset represents a month and it contains monthly expenditure and sales data along with profit and loss information from November 2023 to December 2023, which is important to

understand overall business performance. The dataset consists of 11 columns out of which the following have been used for analysis:

- **Month (MM YYYY):** This column denotes the month and year of the recorded data.
- **Onions Bought (in Kg):** It represents the amount of onions purchased by the business each month.
- **Onions Sold (in Kg):** This column shows the total amount of onions sold per month.
- **Total Onions Bought (in Rupees):** It indicates the cost of buying onions per month.
- **Employee Count:** This column reveals the total number of employees in the business each month.
- **Miscellaneous Expenditure:** It includes additional expenses such as petrol, electricity, posters, and repair costs.
- **Total Spent (in Rs.):** The total amount spent on buying onions and miscellaneous expenditures.
- **Total Onion Sold (in Rs.):** It represents the total value of onions sold each month.
- **Discount (in Rs.):** This column shows the total amount of discount given per month.
- **Profit (in Rupees):** It indicates the total profit generated by the business per month.
- **Loss (in Rs.):** This column shows the total loss incurred by the business per month.

Metadata: Customer Data.xls

Sample Data:

	Customer ID	Business Name	Address	Business Type	Locality
0	220	Yeshodha	Kitchipalayam, Salem	Home	Kitchipalayam
1	221	Asrar Ahamed	Kitchipalayam, Salem	Home	Kitchipalayam
2	222	Vijay Kumar	Kitchipalayam, Salem	Home	Kitchipalayam
3	223	Nirmal	Kitchipalayam, Salem	Home	Kitchipalayam
4	224	Ajith	Kitchipalayam, Salem	Home	Kitchipalayam

The shape of the dataset: : (34, 5) 34 rows and 5 columns.

Description: The dataset contains the customer data from November 2023 to December 2023, each row in the dataset represents a customer. The dataset contains 5 columns as follows:

- **Customer ID:** A unique number for each customer.
- **Business Name:** Business or Consumer name.
- **Address:** Address of the customer.
- **Business Type:** Type of customer establishment.
- **Locality:** The locality of the customer, A locality representation of grouped addresses of those who belong to a particular locality.
- **Miscellaneous Expenditure:** It includes additional expenses such as petrol, electricity, posters, and repair costs.
- **Total Spent (in Rs.):** The total amount spent on buying onions and miscellaneous expenditures.
- **Total Onion Sold (in Rs.):** The total amount of onions sold per month.
- **Discount (in Rs.):** This column shows the total amount of discount given per month.
- **Profit (in Rupees):** It indicates the total profit generated by the business per month.
- **Loss (in Rs.):** This column shows the total loss incurred by the business per month.

Numerical Data Analysis: Daily Sales.xls

	Customer ID	Onions Sold (in Kg)	Buying Price (per Kg)	Listed price (per Kg)	Total Price	Discount (in Rs.)	Selling Price
count	50.000000	50.000000	50.000000	50.000000	50.000000	50.000000	50.000000
mean	203.000000	27.270000	52.120000	58.060000	1563.810000	287.260000	1276.550000
std	44.563644	42.997177	17.156709	17.814704	2572.192962	491.114343	2098.431261
min	20.000000	1.500000	25.000000	30.000000	45.000000	0.000000	30.000000
25%	205.500000	2.500000	34.750000	39.750000	154.000000	32.750000	115.500000
50%	214.000000	6.000000	55.000000	62.000000	363.250000	53.500000	304.000000
75%	227.500000	45.000000	70.000000	77.000000	1500.000000	295.500000	1200.000000
max	237.000000	150.000000	70.000000	77.000000	11250.000000	2250.000000	9000.000000

The data presents information on onion sales for 50 customers, detailing quantities sold, buying and listed prices per kilogram, total prices, discounts, and selling prices. On average, each customer bought approximately 27.27 kilograms of onions at a buying price of Rs. 52.12 per kilogram, with a listed price of Rs. 58.06 per kilogram.

The data shows considerable variability, with standard deviations indicating substantial dispersion from the mean. Sales ranged from as little as 1.5 kilograms to as much as 150 kilograms per customer.

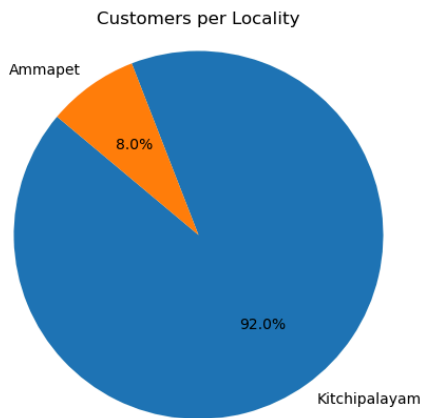
Quartile analysis reveals that 25% of customers spent less than Rs. 154, while 50% spent less than Rs. 363.25, and 75% spent less than Rs. 1500.

Numerical Data Analysis: Monthly Sales & Expenditure.xls

	Onion Bought (in kg)	Onion Sold (in kg)	Total onion bought (in rupees)	Employee Count	Miscellaneous expenditure	Total Spent (in rupees)	Total onion sold (in rupees)	Discount (in rupees)	Profit (in rupees)	Loss (in rupees)
count	2.000000	2.000000	2.000000	2.0	2.000000	2.000000	2.000000	2.000000	2.000000	2.000000
mean	681.750000	681.750000	35787.000000	1.0	1170.000000	36957.000000	39095.250000	7181.500000	-5043.250000	5043.250000
std	26.516504	26.516504	8659.229642	0.0	42.426407	8701.656049	8846.966493	1490.581095	1345.270651	1345.270651
min	663.000000	663.000000	29664.000000	1.0	1140.000000	30804.000000	32839.500000	6127.500000	-5994.500000	4092.000000
25%	672.375000	672.375000	32725.500000	1.0	1155.000000	33880.500000	35967.375000	6654.500000	-5518.875000	4567.625000
50%	681.750000	681.750000	35787.000000	1.0	1170.000000	36957.000000	39095.250000	7181.500000	-5043.250000	5043.250000
75%	691.125000	691.125000	38848.500000	1.0	1185.000000	40033.500000	42223.125000	7708.500000	-4567.625000	5518.875000
max	700.500000	700.500000	41910.000000	1.0	1200.000000	43110.000000	45351.000000	8235.500000	-4092.000000	5994.500000

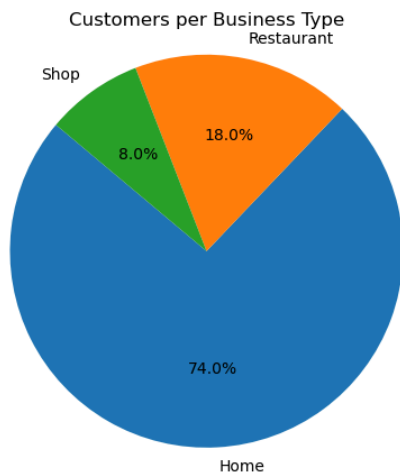
The data summarizes the transaction details for onion buying and selling, along with miscellaneous expenditures, profit, and loss. Two transactions are recorded. On average, 681.75 kilograms of onions were both bought and sold, with a mean miscellaneous expenditure of Rs. 1170. The transactions resulted in an average profit of Rs. -5043.25, indicating a loss. Standard deviations show variability around the means, with profits and losses fluctuating by approximately Rs. 1345.27.

Categorical data analysis: Customers per Locality



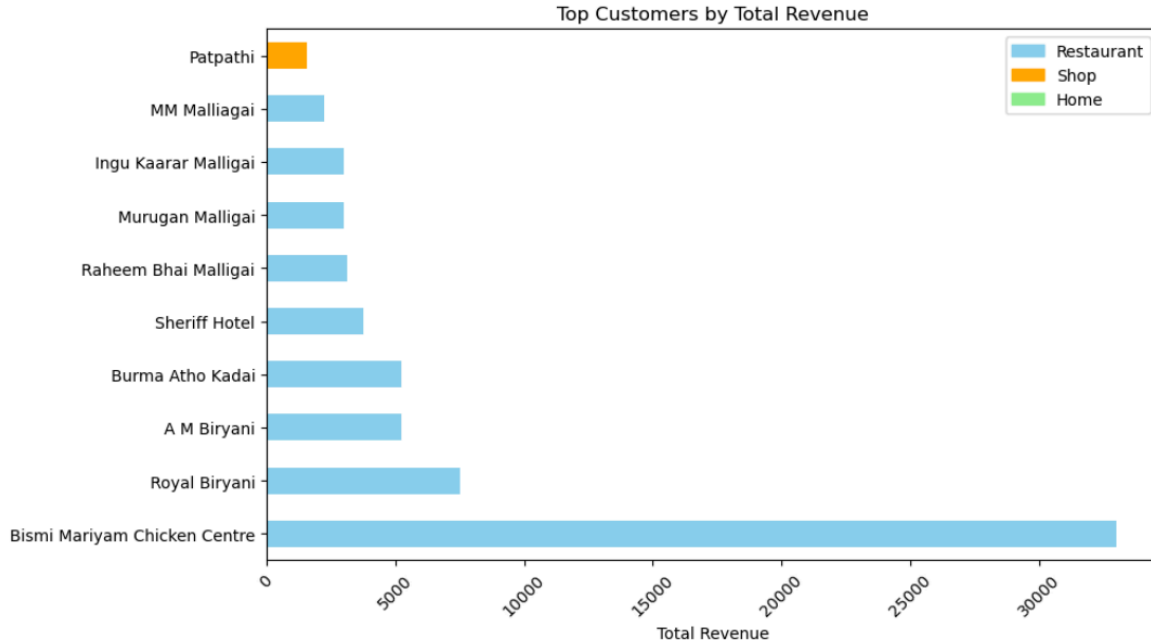
The pie chart illustrates customer distribution among various localities. Specifically, 8% of customers are from Ammapet, while the predominant 92% hail from Kitchipalayam. This data underscores the notable concentration of customers within the Kitchipalayam area, suggesting its significance in terms of customer base. It's evident that the majority of customers (92%) originate from Kitchipalayam, indicating the area's importance as a primary market hub. With only 8% of customers coming from Ammapet, it suggests a potential opportunity for business expansion or customer outreach in that locality. To retain and attract more customers, focusing efforts on Kitchipalayam due to its significant customer base. Additionally, we increase visibility and engagement in Ammapet to tap into its potential market.

Categorical data analysis: Customers per Business Type

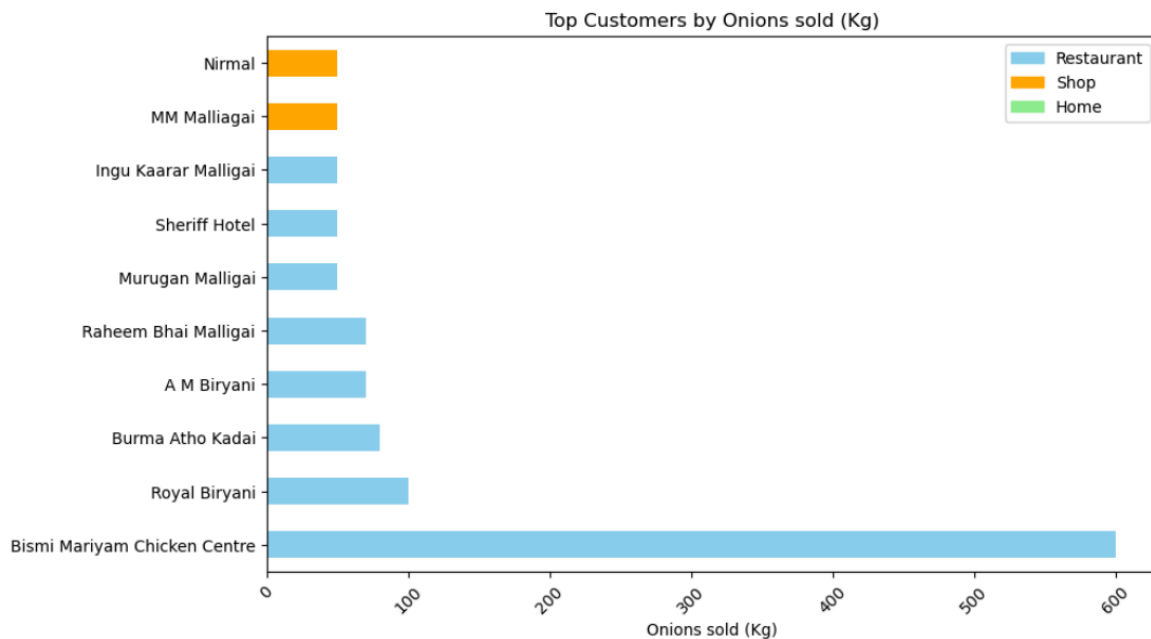


The pie chart presents the distribution of customers across different business types, with restaurants comprising 18%, shops 8%, and homes 74% of the total customer base. This breakdown highlights a substantial portion of customers being residents (home-based), followed by restaurants and shops. It's crucial to recognize the dominance of home-based customers, indicating a significant market segment that likely values convenience and delivery services. Additionally, while restaurants and shops constitute smaller portions of the customer base, there's still potential for growth and customer retention. In summary, leveraging the dominance of home-based customers while simultaneously investing in tailored strategies for restaurants and shops can optimize customer retention and drive business expansion.

Categorical data analysis: **Top 10 Customers by Total Revenue(in Kg)**



Categorical data analysis: **Top 10 Customers by Onions Sold (in Kg)**



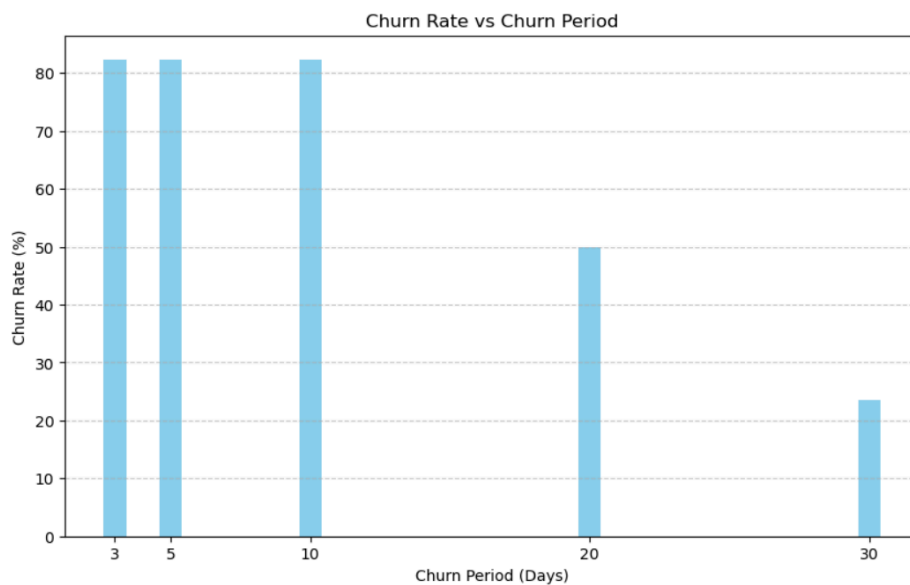
The horizontal bar chart offers a detailed snapshot of the top-performing businesses, analyzing both their total revenue and onion sales. Notably, establishments such as Bismi Mariyam Chicken Center and Royal Biryani stand out as major players in both categories. What's intriguing is that a significant majority

90% of total revenue and 80% of onion sales originates from the restaurant sector, showcasing its undeniable dominance. This insight emphasizes the critical need for strategic initiatives geared toward customer retention and expansion, particularly within the restaurant industry. By tailoring efforts to meet the specific demands of restaurant patrons, businesses can solidify their market presence and pave the way for sustained profitability and growth.

Detailed Explanation of Analysis Process/Method

Customer Churn Analysis ([Refer](#)):

The following bar chart analyzes the number of customers who stopped ordering onions within a given time frame.

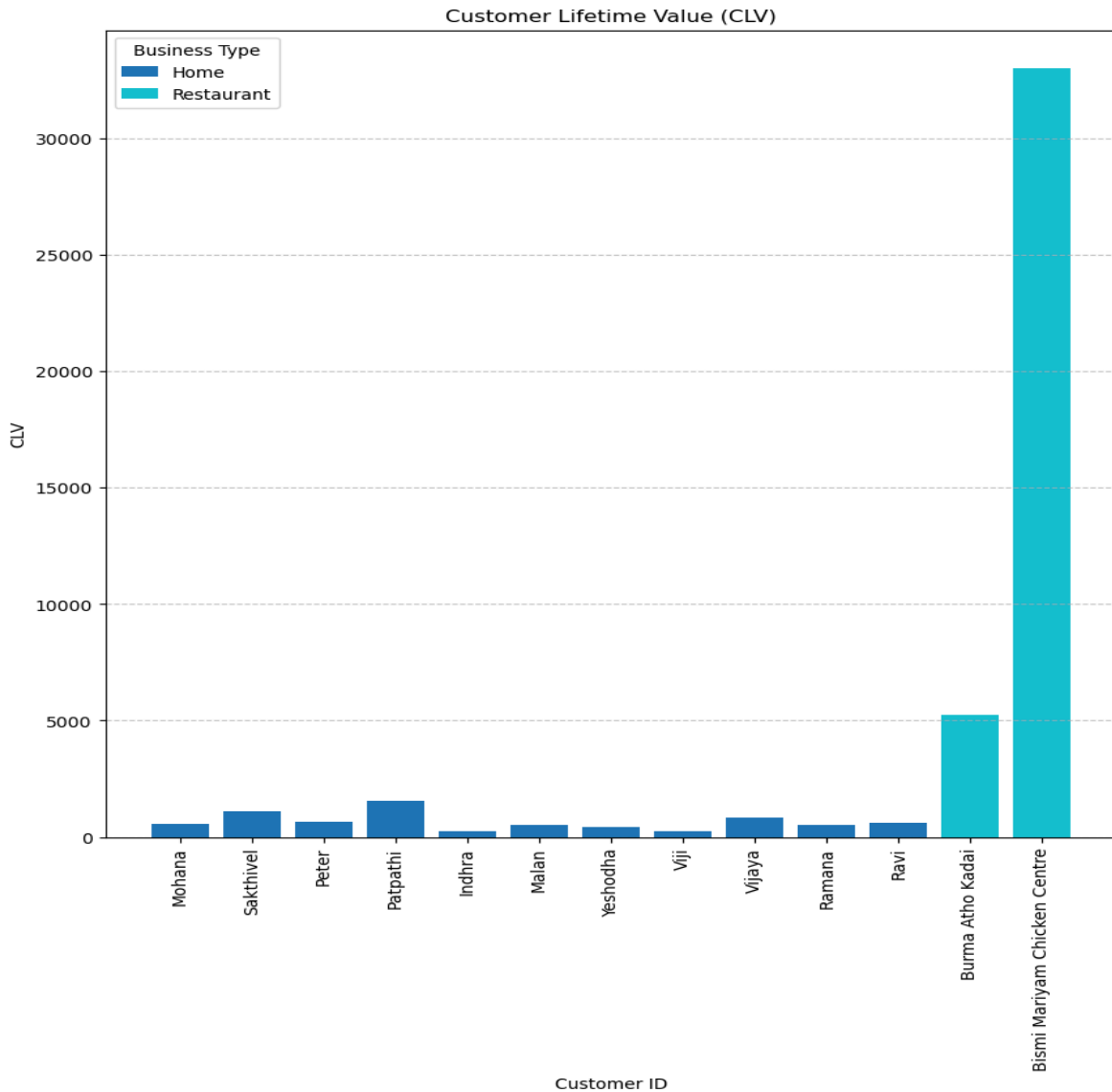


The provided churn rates indicate the percentage of customers discontinuing their engagement with your business within specific time frames. Across the examined durations of 3, 5, and 10 days, a consistent and notably high churn rate of 82.35% suggests rapid customer turnover, potentially signaling dissatisfaction, service issues, or competition challenges. However, as the churn period extends to 20 days, there is a significant drop to a 50.00% churn rate, indicating a more prolonged engagement window.

This suggests that customers may require more time to assess your product/service or that issues leading to churn are mitigated over slightly longer periods. Furthermore, for a 30-day churn period, the churn rate decreases notably to 23.53%, signifying improved customer retention over this extended duration.

Customer Lifetime Value (CLV) Analysis ([Refer](#) from this chart we decided to target rest. based):

Historic Customer Lifetime Value:



The CLV analysis based on total revenue for frequent customers (customers who repeated more than one time) reveals compelling insights into customer value and business dynamics. It showcases a diverse range of customers, from small home-based ventures to larger restaurants. Notably, certain customers stand out for their substantial CLV, suggesting strong revenue generation potential. For instance, Customer "Bismi Mariyam Chicken Centre," boasts a remarkable CLV of 33000.0, indicative of significant business success. Moreover, the data underscores the importance of repeat business, as reflected in CLV

calculations. Additionally, restaurant-based businesses hint at potential opportunities regarding higher value.

GeoSpatial Analysis For Potential Business Expansion(Refer):

Note: The following images were created using the Python library ‘folium’.

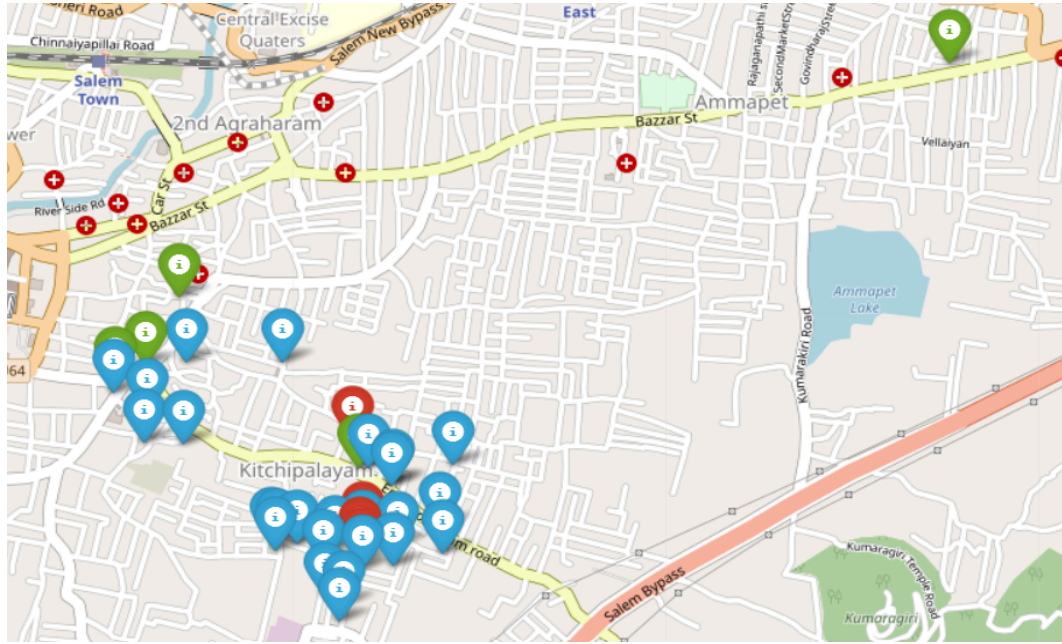


Figure 1.1: Location of Customers By Business Type

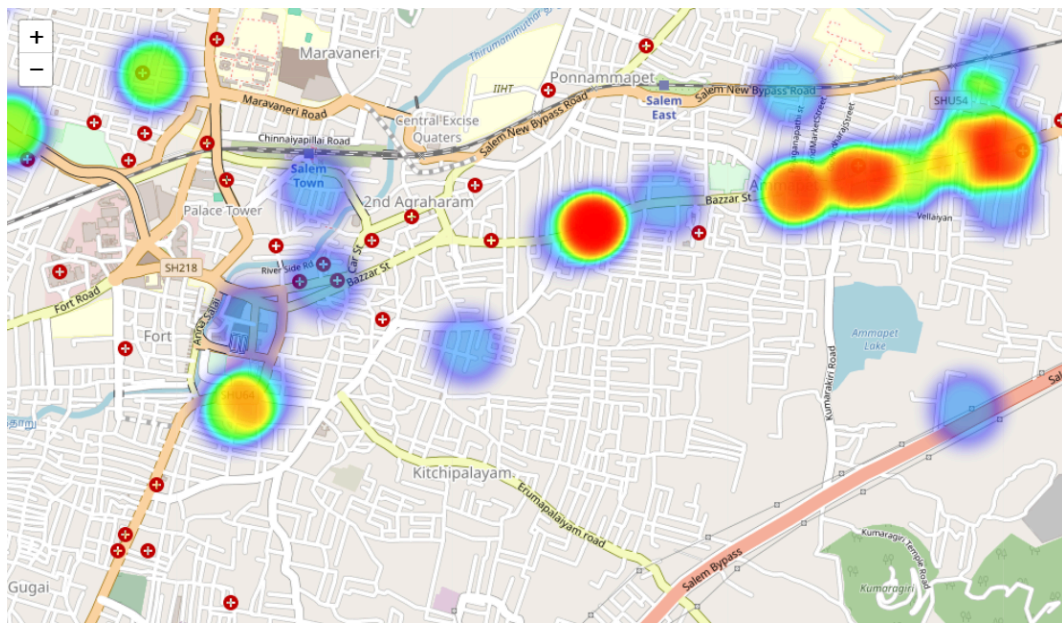


Figure 1.2: Potential Restaurants Heatmap

Figure 1.1 illustrates the geographical distribution of our business expansion around the Salem area. Blue pins denote residential areas, green pins represent restaurants, and red pins signify retail outlets such as grocery stores. The concentration of customers predominantly lies in the Kitchipalayam vicinity.

Figure 1.2 presents a heatmap depicting the density of restaurants in proximity to Kitchipalayam (coordinates sourced from web scraping). Notably, there exists substantial business potential near Ammapet and Salem town. Targeting these regions for marketing initiatives holds promise for driving further growth and geographic diversification of our business.

Upon analyzing customer retention metrics, it becomes apparent that restaurants constitute a significant segment of both retained clientele and revenue generation. By directing targeted marketing efforts toward restaurants, we can enhance customer retention rates and facilitate the geographic expansion of our customer base.

Results and Findings

- The analysis of sales data spanning from November to December of 2023 yields valuable insights into customer behavior, business performance, and strategic opportunities for customer retention and geographical expansion. Notably, the dataset underscores the significance of Kitchipalayam as a primary market hub, with 92% of customers originating from this locality. This highlights the need to focus efforts on customer engagement and retention strategies in Kitchipalayam. However, with only 8% of customers from Ammapet, there's a clear opportunity for geographical expansion and customer outreach in this locality to tap into its market potential. To enhance customer engagement, we plan to conduct an inaugural survey, gathering feedback by asking customers about their needs and preferences. Subsequently, this data will be collated via digital forms by delivery personnel.
- Furthermore, the distribution of customers across different business types reveals that home-based customers dominate the customer base at 74%, followed by restaurants at 18% and shops at 8%. Hence, leveraging the dominance of home-based customers while tailoring strategies for restaurants and shops can optimize customer retention and drive business expansion.
- Analyzing the top customers by total revenue and onion sales unveils the significant contribution of restaurants to overall revenue, with 90% of total revenue and 80% of onion sales originating from this sector. This underscores the critical importance of targeting restaurant-based customers for sustained profitability and growth. Through geospatial analysis, potential restaurant expansion locations are identified for location-based marketing initiatives.

In summary, the analysis emphasizes the importance of customer-centric strategies, geographical diversification, and targeted approaches towards specific business segments, particularly restaurants, to optimize customer retention and foster business expansion in the competitive market landscape.