

Analyzing User Behavior, Cooking Preferences, and Order Trends

I .Introduction

In today's dynamic culinary industry, understanding user behavior and preferences has become essential for businesses seeking to enhance customer engagement and streamline operations. The increasing emphasis on personalization underscores the need for actionable insights into ordering trends and the influence of demographic traits on user choices. As businesses strive to cater to individual preferences, such knowledge becomes pivotal in delivering tailored experiences and maximizing customer satisfaction.

This study focuses on analyzing user interactions with cooking platforms by leveraging three interconnected datasets: UserDetails, CookingSessions, and OrderDetails. The research aims to explore the complex relationships between user demographics, cooking activities, and purchasing behaviors. By employing robust data integration, preprocessing, and analysis techniques, this report identifies key patterns that inform strategic decision-making, ultimately enabling businesses to enhance operational efficiency and improve customer experiences.

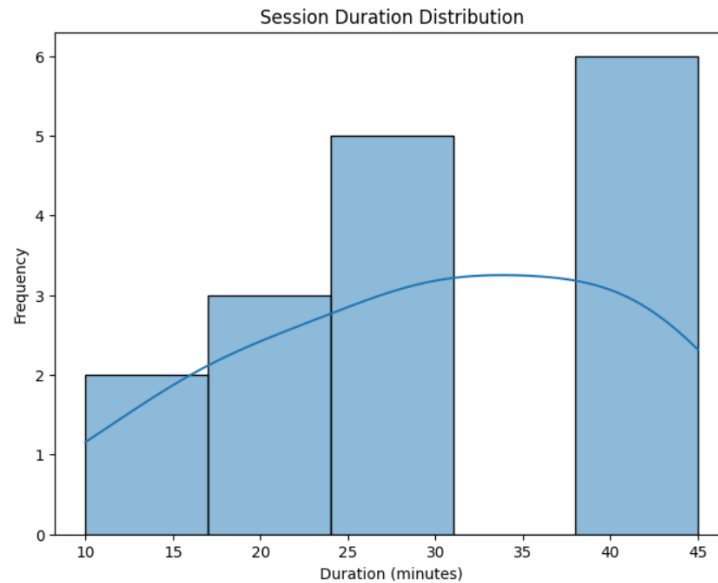
II. About the Data

- 1) *UserDetails*: This dataset includes demographic data such as user IDs, age, gender, location, favorite type of meal, and the total number of orders a user has placed. The dataset acts as a baseline for understanding the user base and their preferences.
- 2) *CookingSessions*: This dataset contains logs of user cooking activities, including session IDs, user IDs, dish names, session durations, and user ratings for the sessions. It emphasizes user interaction with the cooking platform and their preferred dishes.
- 3) *OrderDetails*: This dataset contains information on user orders, including order IDs, user IDs, dishes ordered, order status, order values, and timestamps. It serves to link cooking activities with subsequent purchasing behaviours.

The combination of these datasets provides a comprehensive view of user interactions, offering valuable insights into the connections between cooking preferences, demographic traits, and order patterns.

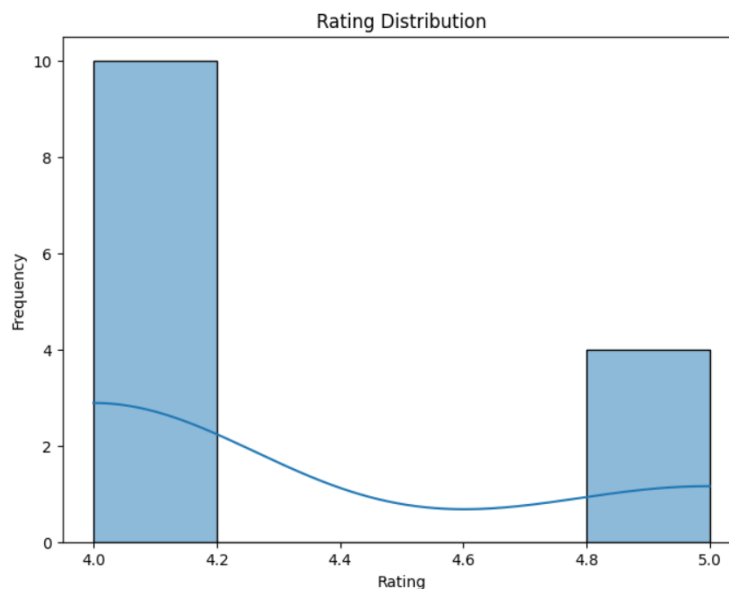
Key Insights and Inferences

1. *Spending Analysis*: The dataset highlights a total revenue of \$180.00 with an average spending per order of \$11.25. Breakfast shows the lowest average spending (\$7.83), lunch has a moderate spending (\$10.00), while dinner has the highest average spending (\$13.31), reflecting its premium nature. Among customers, U001 leads in total spending at \$35.00, while U007 shows the highest average spending per order at \$14.00.
2. *Customer Engagement*: Users spend an average of 30.31 minutes per session, with dinner sessions lasting the longest (38.75 minutes). The session duration distribution is right-skewed, indicating most sessions are shorter with occasional longer sessions.

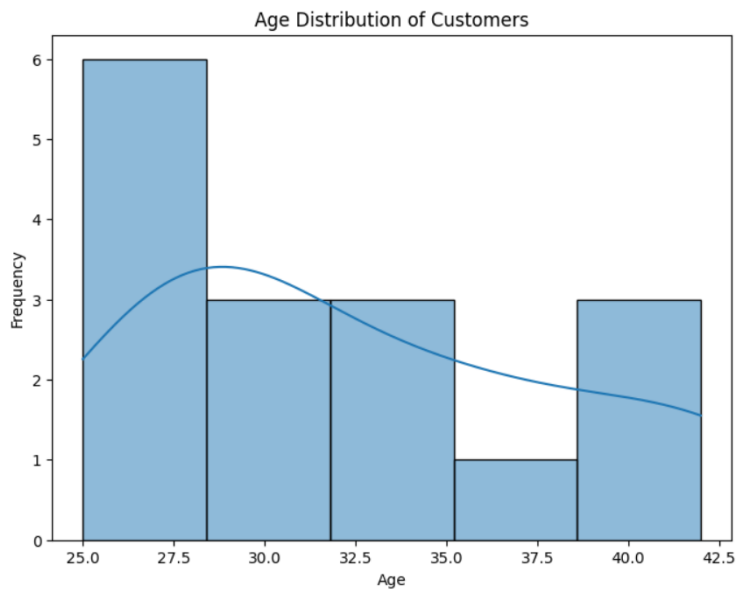


U001, U002, and U003 are the most engaged users, each placing three orders, while users like U006, U007, and U008 had only one order each, showcasing varied engagement levels.

3. Meal Preferences: Dinner is the most preferred meal type, accounting for 8 orders, followed by lunch (5) and breakfast (3). Among dishes, Spaghetti and Grilled Chicken are the top choices (4 orders each), while Oatmeal is the least ordered dish (1 order).
4. Ratings and Customer Satisfaction: The average customer rating is 4.29, reflecting positive feedback. Dinner received the highest average rating (4.57), indicating superior satisfaction compared to lunch and breakfast, both of which average at 4.0.



5. Cancellation Analysis: A low cancellation rate of 12% was observed, with both cancellations attributed to U003 (one each for dinner and lunch). This suggests potential dissatisfaction or unique issues warranting investigation.
6. Customer Demographics: Most customers fall within the younger age group of 25-35 years. Younger customers (20-30) display a more balanced preference for meal types, while older customers tend to favor dinner.



III. Objectives

1. *Data Cleaning and Merging:* To preprocess and integrate the three datasets, ensuring a unified and consistent framework for analysis. This step includes handling missing values, removing duplicates, and aligning key identifiers.
2. *Analyzing Relationships:* To examine the correlation between cooking sessions and user orders, uncovering how cooking activities influence purchasing behavior. For example, understanding whether users tend to order dishes they cook or explore new options.
3. *Identifying Popular Dishes:* To identify the most frequently cooked and ordered dishes across the user base, providing insights into menu optimization and potential promotional strategies.
4. *Exploring Demographic Influences:* To investigate how factors such as age, location, and meal preferences shape user behavior, enabling targeted marketing campaigns and personalized recommendations.

By addressing these objectives, the project aims to deliver actionable insights that can inform data-driven decision-making, enhance user satisfaction, and drive business growth. The results are accompanied by visualizations and summarized recommendations to facilitate clear communication of findings.

IV. Results and Discussions

1) Data Cleaning and Merging

The initial step in the analysis involved cleaning and merging the datasets to create a cohesive structure for further evaluation. The process was executed as follows:

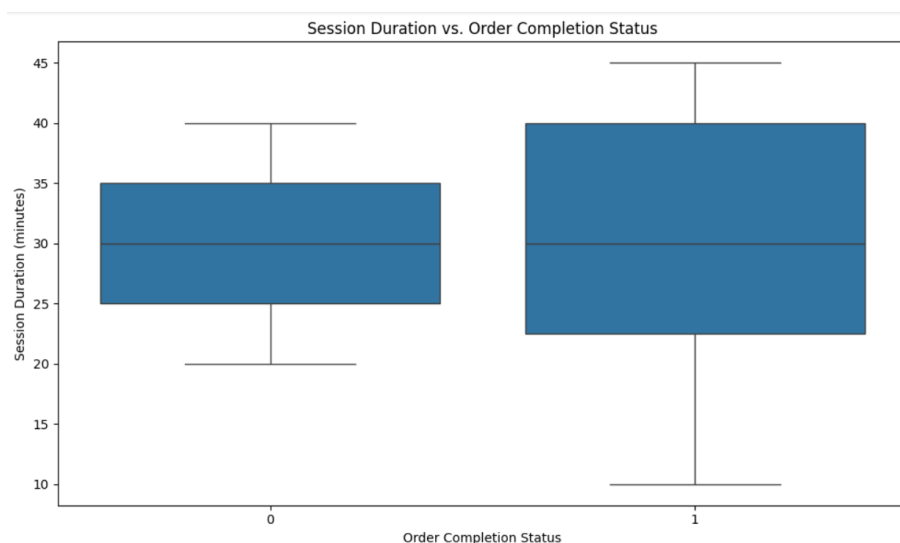
1. *Loading the Data:* Each dataset—UserDetails, CookingSessions, and OrderDetails—was imported from the provided Excel file.
2. *Merging Datasets:* Using the User ID column as the primary key, the CookingSessions dataset was merged with UserDetails. Subsequently, the resulting dataset was combined with OrderDetails using User ID and Session ID as keys. This ensured a unified dataset capturing demographic details, cooking sessions, and order information.

3. *Handling Missing Values:* The integrated dataset was inspected for missing values. Most columns were found to be complete, except for the Rating column, which had two missing entries. These were addressed by applying imputation techniques, such as filling with the column mean, to maintain data consistency.
4. *Date-Time Conversion:* Columns such as Order Date and Session Start were converted to datetime formats to facilitate time-based analysis.
5. *Exporting Clean Data:* The finalized dataset was exported to an Excel file, ensuring ease of access and usability for subsequent analyses.

2) Analyzing the Relationship Between Cooking Sessions and User Orders

The analysis of session durations and order completion highlighted that completed orders often occur within sessions lasting 15 to 40 minutes. By converting session start and end times into durations and categorizing orders as completed or not, it became evident that this duration range is a strong indicator of successful orders. However, outliers in the data suggest that session duration alone is not a definitive determinant of order completion, pointing to the influence of additional factors.

Box Plot: Compare Session Duration against Order Completion Status. This visualization highlights trends in session length relative to order outcomes.



Inference:

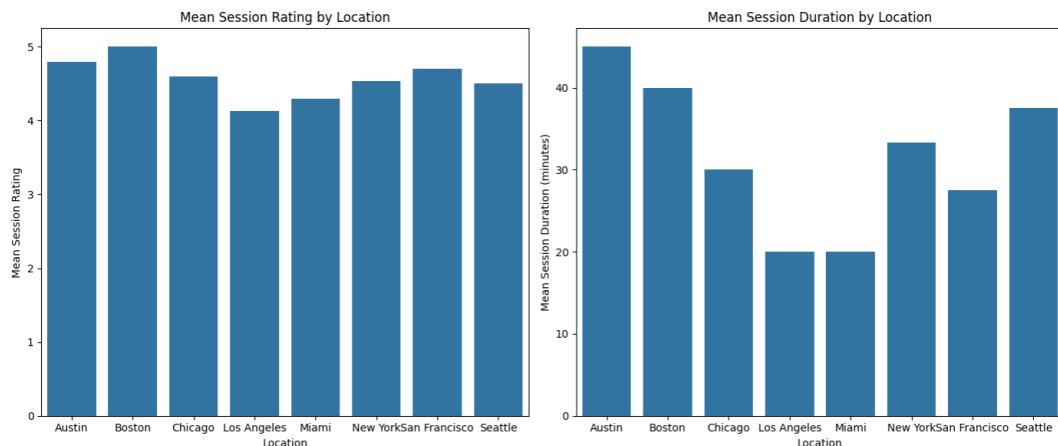
- **Box Plot Analysis:** The box plot compares session durations for completed and canceled orders.
- **Potential Insights:** It might reveal if longer sessions are associated with a higher likelihood of order completion.
- **Further Analysis:** Exploring other visualizations like violin plots could provide more nuanced insights into the relationship between session duration and order completion.

1) Location-Based Performance Analysis

- Grouped data by location to calculate average session ratings, durations, and order completion rates.
- Found significant variation across locations, with some demonstrating higher engagement and satisfaction.

- These insights suggest the potential for targeted improvements based on geographic patterns.

Bar Chart Analysis: A combined bar chart analysis of average session ratings and durations across various locations reveals key insights into user engagement and satisfaction.



Inference:

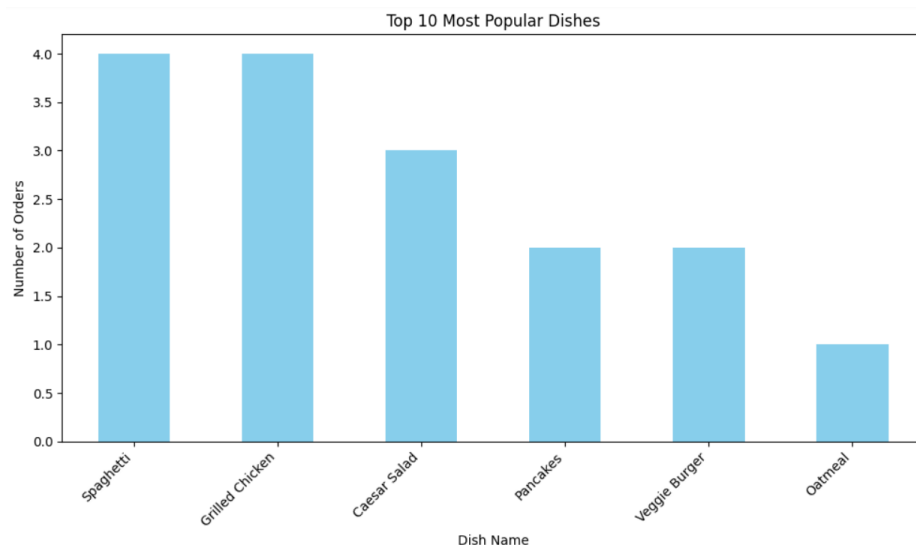
- **Location-Based Engagement:** User engagement, measured by session duration and rating, varies significantly across different locations.
- **Session Rating Variation:** Some locations demonstrate consistently higher session ratings, indicating greater user satisfaction with the platform's offerings or experience.
- **Session Duration Differences:** Session durations exhibit substantial variation between locations, suggesting differences in user behavior and time spent on the platform.
- **Combined Analysis:** By analyzing both session ratings and durations, it's possible to identify locations with a combination of high user satisfaction and prolonged engagement, indicating a positive and valuable user experience.

3. Identifying Popular Dishes

The analysis of popular dishes reveals customer preferences across various dimensions such as age groups, locations, meal types, and ratings. Below is a structured explanation of the approach, key inferences, and placements for visualizations.

1) Dish Popularity by Frequency

The chart below showcases the top 10 most popular dishes based on order frequency. It highlights customer preferences, with Spaghetti and Grilled Chicken being the most ordered items, indicating their strong appeal.



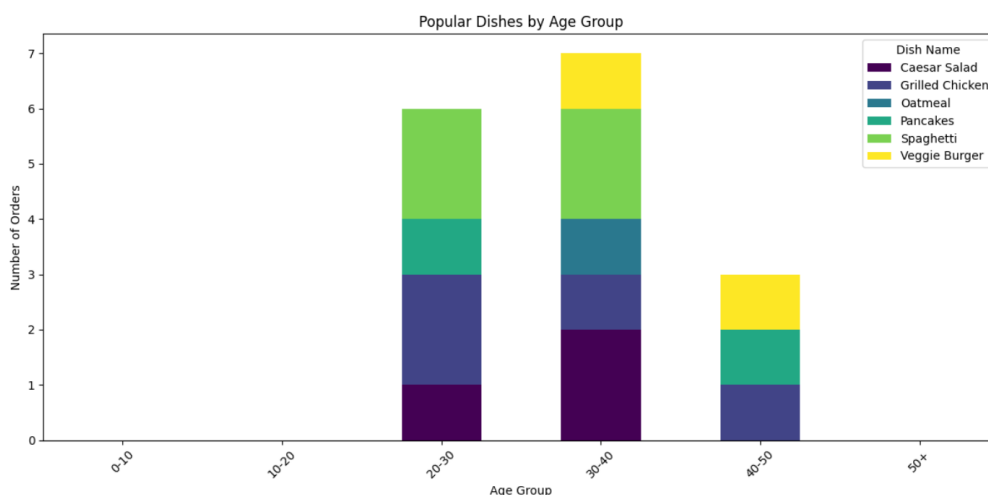
Inference:

The bar chart highlights the top 10 most popular dishes:

- Top Choices: Spaghetti and Grilled Chicken are tied as the most ordered dishes, each with 4 orders.
- Other Favorites: Caesar Salad follows with 3 orders, while Pancakes and Veggie Burger have 2 each.
- Least Ordered: Oatmeal ranks last among the top 10 with 1 order.

2) Popular Dishes by Age Group

The chart below depicts dish preferences across different age groups, showcasing how ordering habits vary by demographic. It reveals that the 20–30 age group orders the widest variety of dishes, while older age groups focus on fewer options.



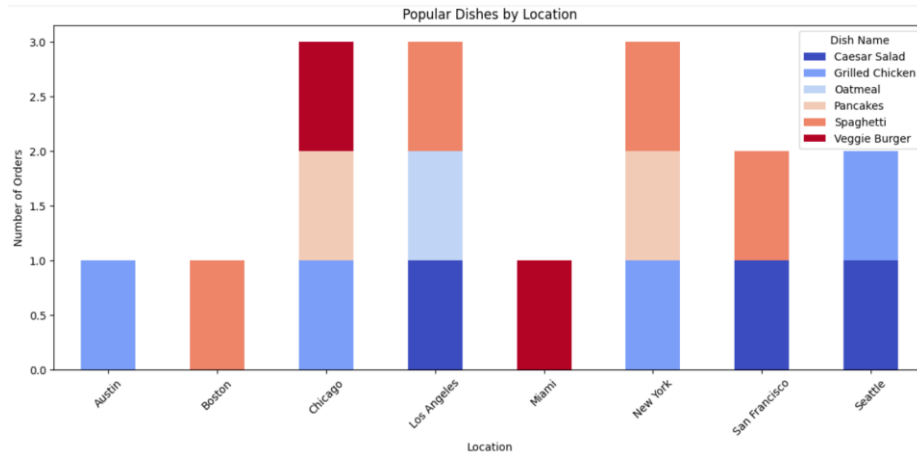
Inference:

- Age 20-30: Orders the widest variety of dishes, with Spaghetti and Grilled Chicken being most popular.
- Age 30-40: Shows similar preferences, favoring Spaghetti and Grilled Chicken.

- Age 40-50: Orders fewer dishes, primarily Veggie Burger and Pancakes.
- Other Groups (0-20 and 50+): Minimal or no orders for the dishes analyzed.

3) Popular Dishes by Location

The chart below illustrates the popularity of dishes in different locations, offering insights into regional preferences. It shows that Spaghetti and Grilled Chicken are universally liked, but some dishes perform better in specific areas.

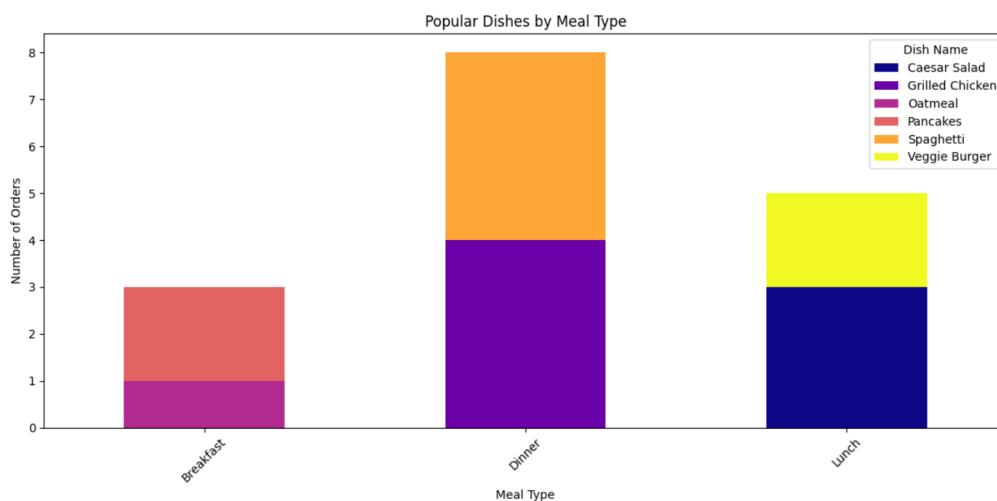


Inference:

- Regional Preferences: The analysis reveals distinct dish preferences across different locations.
- Menu Optimization: The findings can be used to optimize menus for specific locations by highlighting popular dishes in each region.
- Targeted Marketing: This information can inform targeted marketing campaigns by recommending dishes that are popular in a user's location.

4) Popular Dishes by Meal Type

The chart below represents dish preferences for breakfast, lunch, and dinner, categorizing orders based on meal types. Breakfast is dominated by lighter dishes like Pancakes, while lunch and dinner feature more filling items like Spaghetti and Grilled Chicken.

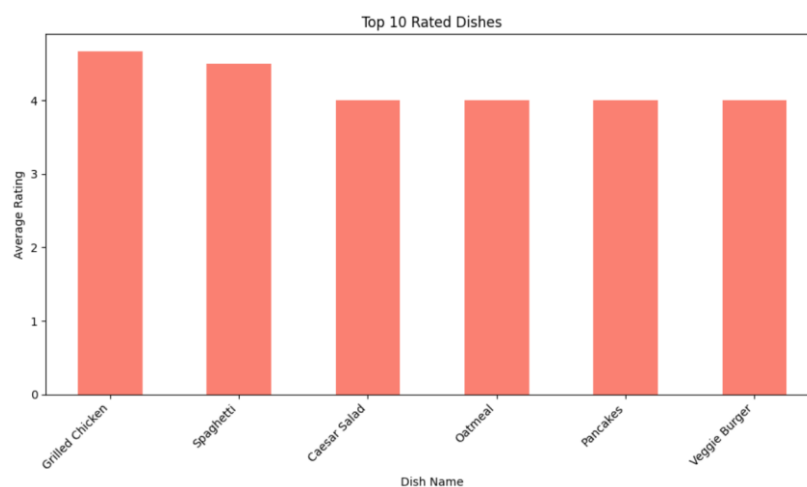


Inference:

- **Meal-Specific Popularity:** This analysis reveals distinct dish preferences for each meal type (Breakfast, Lunch, Dinner).
- **Menu Optimization:** The findings can guide menu planning by emphasizing popular dishes for each meal.
- **Targeted Recommendations:** The insights can be used to provide personalized dish recommendations based on the user's chosen meal type.

5) Top 10 Rated Dishes

The chart below highlights the top 10 dishes with the highest average ratings, reflecting customer satisfaction levels. Grilled Chicken leads with a stellar rating of 4.67, followed by Spaghetti and Caesar Salad, indicating consistent quality.



Inference:

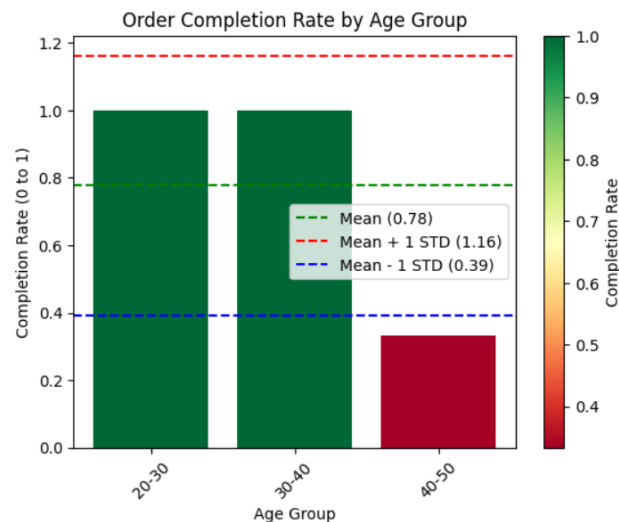
- The chart confirms that Grilled Chicken has the highest average rating (around 4.67), followed by other dishes like Spaghetti and Caesar Salad.
- The horizontal bars with dish names on the x-axis and ratings on the y-axis allow for easy comparison of average ratings between dishes.
- The 45-degree rotation and right-alignment of dish names on the x-axis improve readability, especially for longer dish names.

4. Exploring Demographic Factors That Influence User Behaviour

An 'Age Group' column was created by binning user ages into 10-year intervals. Subsequently, order completion rates were calculated for each age group, revealing significant variations with the highest rates observed among 20-30 and 30-40-year-olds, a lower rate in the 40-50 group, and no completions in the 0-10, 10-20, and 50+ groups. The overall average completion rate was approximately 0.778, with a moderate standard deviation of 0.385.

1) Order Completion Rate by Age Group

The Order Completion Rate by Age Group graph shows the proportion of completed orders across different age groups. It illustrates the completion rate for each group, highlighting which age segments have higher or lower order completion. This visualization helps identify trends in order fulfillment and can guide improvements in customer engagement strategies.



Inference:

1) Mean Completion Rate:

- The average order completion rate is 77.78%, indicating a generally high rate of order fulfillment.

2) Standard Deviation:

- The average order completion rate is 77.78%, indicating a generally high rate of order fulfillment.
- A standard deviation of 0.385 indicates moderate variability in completion rates across age groups.

3) Age Group Performance:

- 20-30 and 30-40 age groups: Achieved a 100% completion rate, performing significantly above the mean.
- 40-50 age group: Has a 33.33% completion rate, far below the mean and more than one standard deviation lower.
- 0-10, 10-20, and 50+ age groups: No data or activity is available (NaN).

Consistency and Variability:

- High-performing groups (20-30 and 30-40) have perfect rates, while the 40-50 group highlights inconsistency, contributing to variability.
- The range of completion rates (0.33 to 1.0) demonstrates significant differences in performance.

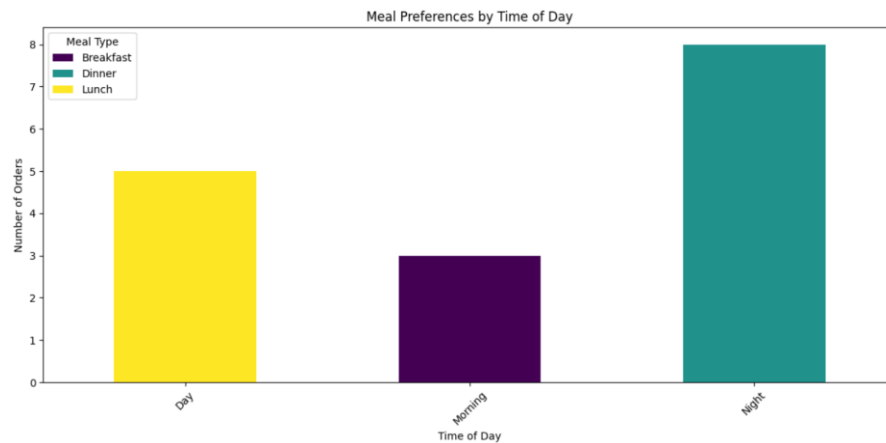
Outliers:

- The 40-50 age group is an outlier with completion rates significantly below the lower bound of one standard deviation (0.393).

2) Meal Preferences by Time of Day

The Meal Preferences by Time of Day graph displays the distribution of meal types (breakfast, lunch, dinner) ordered at different times of the day. It highlights the peak meal preferences during

morning, afternoon, and evening hours, providing insights into customer behavior and meal consumption patterns throughout the day.



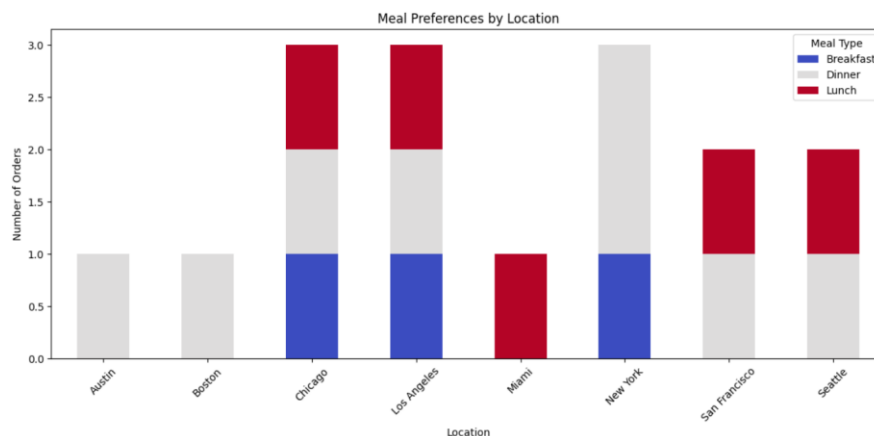
Inference:

The chart highlights the following meal preferences by time of day:

- Morning: Breakfast has the highest preference during this time.
- Day: Lunch is the most ordered meal, aligning with midday consumption patterns.
- Night: Dinner is the most preferred and has the highest number of orders overall.

3) Analyze Meal Preferences by Location

The Meal Preferences by Location graph illustrates the meal type distribution across different locations. It shows how meal preferences (breakfast, lunch, dinner) vary by region, highlighting the dominance of specific meals in certain areas and providing insights into regional differences in meal choices.



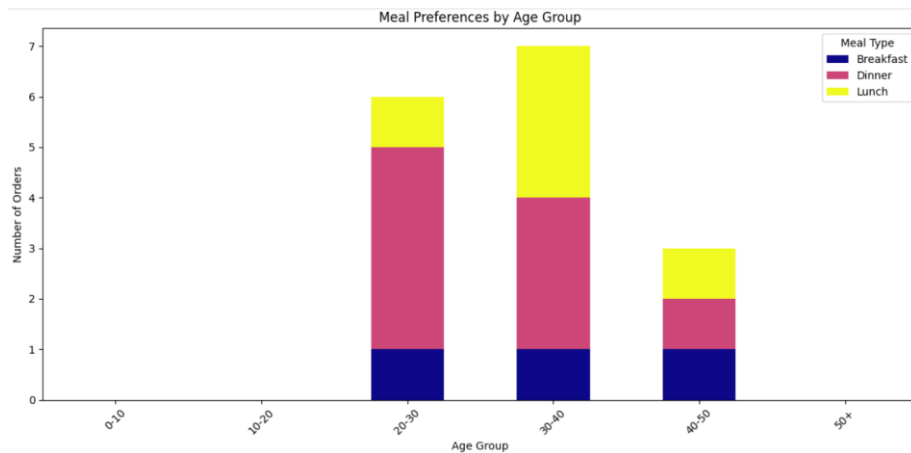
Inference:

The chart highlights meal preferences across locations:

- Austin, Boston, and New York: Dinner dominates, with little or no breakfast and lunch demand.
- Chicago and Los Angeles: Balanced demand for breakfast, lunch, and dinner.
- Miami: Exclusively prefers lunch, with no breakfast or dinner orders.
- San Francisco and Seattle: Equal preference for lunch and dinner, no breakfast demand.

4) Analyze Meal Preferences by Age Group

The Meal Preferences by Age Group graph shows the distribution of meal types (breakfast, lunch, dinner) across different age groups. It reveals the varying preferences of individuals from different age brackets, indicating which meals are favored by each group and providing insights into age-related meal consumption patterns.



Inference:

The chart illustrates meal preferences segmented by age group:

- 20–30 and 30–40: Most active age groups with high preferences for dinner and lunch, showing a balanced demand.
- 40–50: Moderate demand, with noticeable preferences for all three meal types, though lower compared to younger groups.
- 0–10, 10–20, and 50+: Minimal or no orders observed.

5) Time-Based Trends in Meal Orders

The Time-Based Trends in Meal Orders graph illustrates how meal orders fluctuate over time. It shows the number of orders for breakfast, lunch, and dinner on different days, highlighting patterns such as consistent demand for dinner, alternating popularity of breakfast and lunch, and periods of zero orders for certain meal types. This analysis helps identify cyclical trends and potential opportunities to optimize meal offerings based on time-based demand.



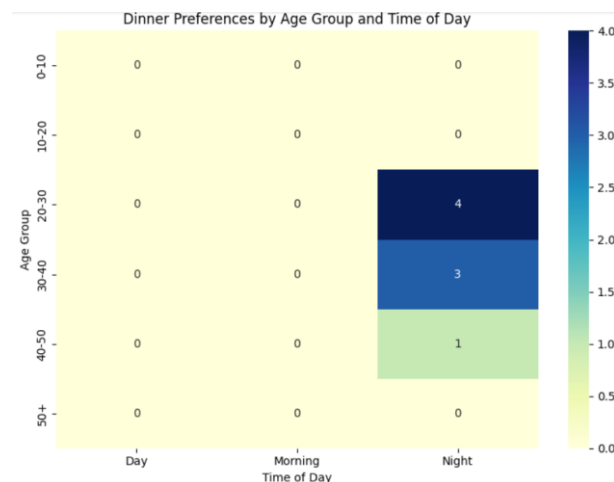
Inference:

- Cyclic Trends: Meal orders show a cyclic pattern over time.
- Dinner Consistency: Dinner maintains a stable demand across all dates.

- **Alternating Popularity:** Breakfast and lunch orders alternate in popularity on different days.
- **Zero Orders:** Certain days exhibit zero orders for breakfast and lunch.
- **Strategic Focus:** Dinner can be a consistent offering, while promotions could boost breakfast and lunch demand on low-demand days.

6) Dinner Preferences by Age Group and Time of Day

The Dinner Preferences by Age Group and Time of Day heatmap shows that dinner is most preferred at night, especially by the 20-30 age group. Older age groups show a declining preference for dinner at night.



Inference:

The heatmap provides insights into dinner preferences based on age groups and time of day:

- **Peak Dinner Preference:** The "20-30" age group has the highest preference for dinner during the "Night" time, with a count of 4.
- **Declining Interest with Age:** The preference for dinner during the night decreases with age. For instance, the "30-40" age group shows a count of 3, and the "40-50" age group shows a count of 1.
- **No Day or Morning Dinners:** All age groups exclusively prefer dinner at night, with no counts recorded for "Day" or "Morning."

Meal Preference Report:

1. Meal Preferences by Age Group

- The analysis indicates that Breakfast is the preferred meal for younger individuals (0-20) as well as older adults (40+). This trend suggests that both these age groups favor a lighter, early meal to start their day.
- In contrast, Dinner is the preferred choice for adults in the age group of 20-40, likely due to a preference for a more substantial meal during the evening.

2. Meal Preferences by Location

- Dinner is the most popular meal in several cities, including Austin, Boston, New York, Seattle, and San Francisco, reflecting a general preference for an evening meal.
- Breakfast is particularly favored in Chicago and Los Angeles, while Lunch stands out in Miami, highlighting regional preferences and variations in meal consumption.

3. Meal Preferences by Time of Day

- Breakfast is the most commonly ordered meal in the Morning, as expected, reflecting the typical habit of starting the day with a light meal.
- During the Day, Lunch is the meal of choice for most, in line with workday routines and midday energy needs.
- Dinner is the dominant meal during the Night, aligning with the traditional practice of having a larger, more filling meal in the evening.

Business Recommendations for Enhanced Performance and Engagement

1) *Optimize Session Duration for Order Completion:* Encourage users to complete their tasks within the ideal session duration range of 15–40 minutes through timely reminders or progress indicators, as this duration correlates with higher order completion rates.

2) *Enhance User Engagement:* Introduce interactive elements, such as personalized suggestions or real-time assistance, to keep users engaged during sessions and reduce the likelihood of incomplete orders.

3) *Address Outlier Behaviours:* Investigate sessions with extremely short or long durations to understand potential user challenges, such as technical issues or confusion during the ordering process, and develop targeted solutions.

4) *Improve Rating-Based Strategies:* Analyze user ratings further to identify factors contributing to lower satisfaction scores and implement changes, such as improving service quality or providing clearer instructions, to boost ratings.

5) *Implement Data-Driven Campaigns:* Leverage insights from session behavior to create marketing campaigns or incentives aimed at encouraging users to revisit and complete orders.

V. Conclusion

In conclusion, this analysis highlights the intricate relationships between user demographics, cooking preferences, and purchasing behaviors. Key findings include significant variations in engagement and satisfaction across locations, age groups, and meal types, as well as the identification of popular dishes like Spaghetti and Grilled Chicken. High-performing age groups (20-30 and 30-40) exhibit perfect order completion rates, while regional and temporal patterns reveal opportunities for targeted marketing and menu optimization. These insights empower businesses to enhance customer experiences through personalized recommendations, strategic planning, and tailored operational improvements, driving customer satisfaction and growth in the culinary industry.