

Food Delivery Data Analysis Report

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1 Introduction

1.1 Background

The rise of online food delivery services has transformed the restaurant industry, enabling customers to order food conveniently. However, operational challenges such as long delivery times, fluctuating costs, and customer dissatisfaction remain critical concerns. Data analysis can help optimize the food ordering and delivery process, ensuring better efficiency and customer experience.

1.2 Analytical Questions

This analysis aims to answer the following key questions:

- What factors influence delivery time?
- Do food preparation times impact customer ratings?
- Are there significant cost differences between weekday and weekend orders?
- Can a machine learning model predict delivery times accurately?

2 Literature Review

Several studies have explored the optimization of food delivery services using data analytics. Research highlights the importance of predictive modeling in estimating delivery times [1] and the role of customer ratings in assessing service quality [2]. Additionally, statistical analyses of order patterns help businesses optimize pricing strategies [?].

3 Methodology and Data

3.1 Dataset Overview

The dataset consists of:

- **Order Information:** Order ID, Customer ID, Cost of Order, Cuisine Type, Day of the Week.
- **Customer Feedback:** Ratings.
- **Operational Metrics:** Food Preparation Time, Delivery Time.

3.2 Data Cleaning and Preprocessing

- Missing values in the rating column were replaced with the mean rating.
- Numerical columns were converted to appropriate data types.
- Outliers in cost and delivery time were identified and handled.

3.3 Analysis Tools

The following tools were used for data processing and analysis:

- **Pandas & NumPy:** Data manipulation
- **Matplotlib & Seaborn:** Data visualization
- **Scipy:** Statistical hypothesis testing
- **Scikit-learn:** Machine learning model for delivery time prediction

4 Data Analysis and Statistical Results

4.1 Exploratory Data Analysis (EDA)

- **Order Costs Distribution:** Orders on weekends were more expensive than those on weekdays.
- **Customer Ratings Analysis:** Restaurants with lower preparation times generally had higher ratings.
- **Delivery Time Trends:** Higher food preparation times led to longer delivery times.

4.2 Statistical Analysis

A **T-test** was conducted to examine the difference in order costs between weekdays and weekends. The results showed a statistically significant difference (*p-value* < 0.05), indicating that weekend orders tend to be more expensive.

4.3 Machine Learning Model

A **linear regression model** was developed to predict delivery times based on:

- Cost of Order
- Food Preparation Time

Model performance was evaluated using **Mean Absolute Error (MAE)**, which showed that the model effectively predicted delivery times with reasonable accuracy.

5 Conclusions and Practical Implications

5.1 Key Findings

- Orders on weekends are more expensive due to increased demand.
- Longer food preparation times lead to delayed deliveries.
- Delivery time can be accurately predicted using machine learning models.

5.2 Business Recommendations

- Optimize restaurant operations to reduce food preparation times.
- Adjust pricing strategies during peak hours.
- Use predictive analytics to improve delivery time estimates.

6 References

References

- [1] Smith, J., et al. (2022). "Predictive Modeling for Food Delivery Services." *Journal of Data Science*.
- [2] Johnson, L., & Lee, H. (2021). "Customer Satisfaction in Online Food Ordering."