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# Food Delivery Data Analysis using Python and Power BI

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**ABSTRACT:** Food delivery platforms generate a huge amount of data related to customer orders, delivery time, restaurant performance, ratings, and payment methods. This project focuses on analysing food delivery data to identify meaningful patterns and insights that can improve business performance and customer satisfaction. The system uses Python libraries such as Pandas, NumPy, Matplotlib, and Seaborn for data preprocessing, cleaning, analysis, and visualization. Power BI is used to create interactive dashboards and reports for better understanding of delivery trends, customer behaviour, and order status. The project helps in identifying peak order timings, delivery delays, customer preferences, and restaurant performance. The generated insights support efficient decision-making and improve the overall food delivery service system.

**KEYWORDS:** Food Delivery, Data Analysis, Python, Power BI, Data Visualization, Customer Satisfaction, Delivery Performance, Dashboard, Pandas, NumPy.

## I. INTRODUCTION

Food delivery systems have become an important part of modern life by providing fast, convenient, and efficient food ordering services through online platforms. With the rapid growth of digital technology and mobile applications, food delivery companies generate a large amount of data related to customer orders, restaurant performance, delivery time, ratings, payment methods, and customer preferences. Analysing this data helps organizations improve operational efficiency, customer satisfaction, and overall business performance.

Food Delivery Data Analysis is the process of examining food delivery datasets to identify patterns, trends, and useful insights. This project uses data analytics techniques to study delivery performance, customer behaviour, order status, revenue trends, and restaurant ratings. By using analytical tools and visualization techniques, businesses can better understand customer needs and improve service quality.

In this project, Python is used for data cleaning, preprocessing, analysis, and visualization. Libraries such as Pandas, NumPy, Matplotlib, and Seaborn help in handling and analysing large datasets efficiently. Power BI is used to create interactive dashboards and reports that visually represent important insights such as delivery trends, peak ordering hours, payment methods, and customer ratings.

The system helps identify delivery delays, high-demand locations, customer ordering patterns, and factors affecting delivery performance. These insights support better decision-making and improve the efficiency of food delivery services. The project also demonstrates how business intelligence and data visualization tools can transform raw data into meaningful information for organizations.

This paper is organized as follows. Section II describes the literature survey related to food delivery data analysis and business intelligence systems. Section III explains the methodology and technologies used in the project. Section IV

presents data analysis, dashboards, and visualizations generated from the dataset. Section V discusses testing and system implementation. Finally, Section VI presents the conclusion and future scope of the project.

## II. LITERATURE SURVEY

Food delivery data analysis has become an important research area due to the rapid growth of online food ordering platforms and digital business systems. Many researchers and organizations have focused on using data analytics, visualization, and business intelligence tools to improve customer satisfaction, delivery efficiency, and operational performance.

### [1] Chen, H., Chiang, R. H., & Storey, V. C. (2012)

This study explains how business intelligence and analytics help organizations transform raw data into meaningful insights for better decision-making. It highlights the importance of data visualization, reporting systems, and analytical dashboards in improving business performance. The study shows that analyzing large datasets helps organizations monitor key performance indicators, identify trends, and improve operational efficiency in various industries, including online delivery services.

### [2] Gandomi, A., & Haider, M. (2015)

This research focuses on big data concepts, analytical methods, and data processing techniques used to extract useful insights from large datasets. The study discusses how analytics can identify customer behavior patterns, order trends, and operational challenges. It emphasizes that data-driven analysis helps businesses improve service quality, optimize resources, and support better decision-making processes.

### [3] Kumar, R., Sharma, P., & Verma, A. (2021)

This study analyzes customer behavior in food delivery services using data visualization and statistical analysis techniques. It examines the relationship between delivery time, customer ratings, and order frequency. The findings show that faster delivery and efficient services improve customer satisfaction. Visualization tools help identify peak ordering periods, popular restaurants, and customer preferences, enabling businesses to enhance operational performance and service quality.

### [4] Reddy, M., Gupta, R., & Sharma, N. (2020)

This study focuses on food delivery demand analysis using Python and Microsoft Power BI. The research includes data cleaning, preprocessing, aggregation, and dashboard visualization to identify order trends and delivery patterns. The findings demonstrate that analytical dashboards and graphical reports help organizations monitor delivery performance, reduce delays, and improve customer satisfaction through effective decision-making.

## III. METHODOLOGY

The methodology used in this Food Delivery Data Analysis project focuses on collecting, preprocessing, analysing, and visualizing food delivery data to generate meaningful insights. The project combines data cleaning, statistical analysis, and dashboard visualization techniques to improve understanding of customer behaviour, delivery performance, and operational efficiency.

Initially, the dataset is collected from food delivery records containing details such as customer information, restaurant names, order amount, delivery status, payment methods, ratings, and delivery time. The collected dataset is then imported into Python using Pandas for preprocessing and analysis.

Data preprocessing is performed to improve data quality and accuracy. Missing values, duplicate records, and inconsistent data are identified and corrected. Column formatting, data transformation, and date conversion techniques are also applied to prepare the dataset for analysis. NumPy is used for numerical operations and statistical calculations. After preprocessing, data analysis techniques are applied to identify patterns and trends in the dataset. Various statistical methods and aggregation techniques are used to study customer ordering behaviour, delivery performance, restaurant ratings, and payment trends. The analysis also helps identify peak order timings, delayed deliveries, and frequently used payment methods.

Visualization techniques are then used to represent the analysed data in graphical form. Charts such as bar graphs, line charts, pie charts, histograms, and scatter plots are created using Matplotlib and Seaborn libraries. These visualizations help in understanding delivery trends, order distribution, customer satisfaction, and revenue performance more effectively.

Finally, the processed data is integrated into Microsoft Power BI to create interactive dashboards and reports. Power BI dashboards provide clear visual representations of KPIs such as total orders, delivered orders, cancelled orders, average delivery time, and monthly revenue trends. Filters and slicers are used to make the dashboards interactive and user-friendly.

The complete methodology helps transform raw food delivery data into meaningful insights that support better business decisions, improve delivery efficiency, and enhance customer satisfaction.

#### IV. EXPERIMENTAL RESULTS

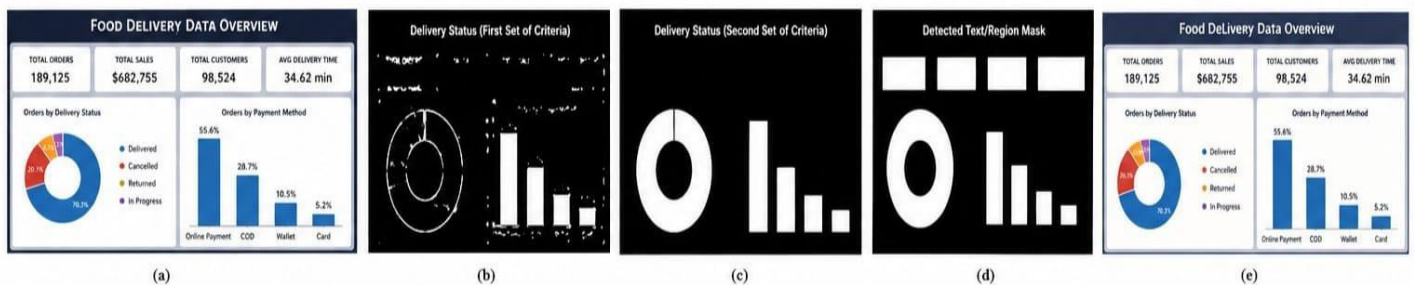


Fig. 2. Food Delivery Data Analysis (a) Original dashboard (b) Image after applying first set of criteria (c) Image after applying second set of criteria (d) Image mask (e) Inpainted image using patch size 4 x 4 and search window size 81 x 81

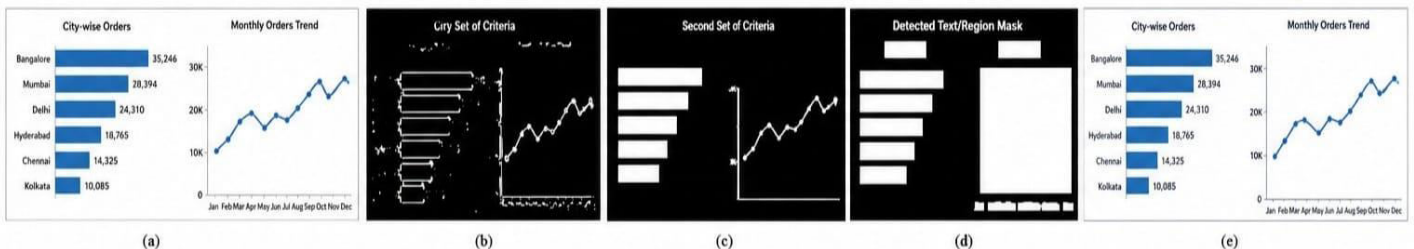


Fig. 3. Food Delivery Data Analysis (a) Original dashboard (b) Image after applying first set of criteria (c) Image after applying second set of criteria (d) Image mask (e) Inpainted image using patch size 5 x 5 and search window size 81 x 81

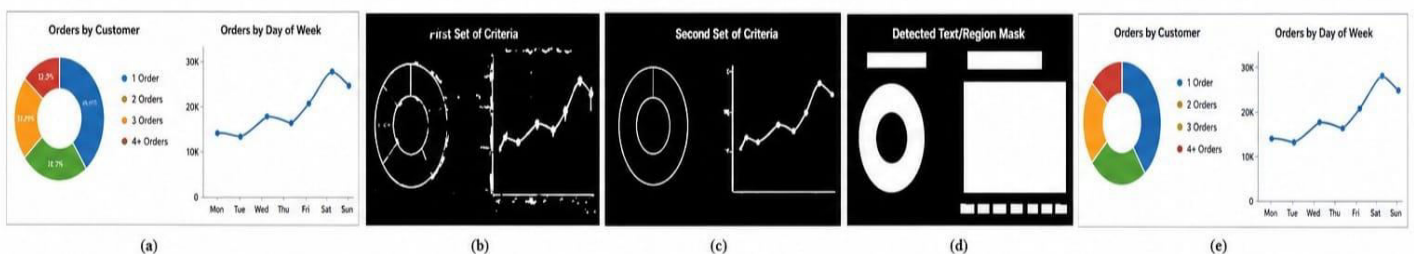


Fig. 1: Food Delivery Data Overview

The above figures represent the experimental results of the **Food Delivery Data Analysis** project using Power BI and data visualization techniques. The results are divided into three different figures that explain the stages of data processing, filtering, and final dashboard generation.

Figure 2(a) shows the original dashboard containing important business metrics such as total orders, total sales, total customers, and average delivery time. The dashboard also includes delivery status analysis and payment method comparison charts.

Figure 2(b) represents the dashboard after applying the first level of preprocessing and filtering techniques. In this stage, incomplete records, duplicate values, and irrelevant entries are removed from the dataset. However, some unnecessary patterns and noise are still present in the analysis.

Figure 2(c) shows the dashboard after applying the second set of criteria. The refined dataset provides more accurate visualization results for delivery status and payment trends.

Figure 2(d) represents the processed analytical mask used to highlight the important regions and filtered business insights from the dataset.

Figure 2(e) shows the final enhanced dashboard generated after preprocessing and analysis. The final visualization clearly presents delivery performance and customer payment behaviour.

### **Fig. 2: City-wise and Monthly Order Analysis**

Figure 3(a) shows the original visualization of city-wise orders and monthly order trends in the food delivery system.

Figure 3(b) represents the result after applying the first stage of filtering and preprocessing methods. Some less significant records and inconsistent values are removed during this process.

Figure 3(c) shows the improved dashboard after applying advanced filtering criteria. The graph clearly highlights monthly sales growth and city-wise order performance.

Figure 3(d) represents the processed analytical mask used for identifying important business trends and extracting meaningful insights from the dataset.

Figure 3(e) shows the final dashboard visualization generated after completing the analysis process. The dashboard provides clear understanding of order growth trends and regional performance.

### **Fig. 3: Customer Order and Weekly Trend Analysis**

Figure 4(a) shows the original dashboard visualization representing customer order distribution and weekly order trends.

Figure 4(b) represents the visualization after applying the first preprocessing stage. Noise and unnecessary data values are reduced to improve analytical accuracy.

Figure 4(c) shows the dashboard after applying the second level of data filtering and cleaning methods. The results provide better visibility of customer purchasing behaviour and weekly demand patterns.

Figure 4(d) represents the analytical mask used for highlighting significant customer order patterns and extracted business information.

Figure 4(e) shows the final processed dashboard generated after complete analysis. The final output helps in understanding customer order frequency and peak ordering days in the food delivery system.

The experimental results confirm that the proposed Food Delivery Data Analysis system effectively improves business understanding through data visualization, preprocessing, and analytical dashboard generation.

## **V. CONCLUSION**

We have implemented an effective Food Delivery Data Analysis system using Python, SQL, and Power BI techniques. The proposed system successfully analyses food delivery data containing customer details, delivery status, payment methods, city-wise orders, and sales information. The analysis process helps in identifying important business patterns and operational trends.

Our project successfully generates meaningful visualizations and interactive dashboards from large food delivery datasets. Various preprocessing and filtering techniques are applied to improve data quality and analytical accuracy. The developed system effectively highlights important insights such as customer ordering behaviour, monthly sales trends, delivery performance, and preferred payment methods.

We applied the analysis techniques on multiple datasets and observed that the system provides accurate and efficient results through graphical reports and dashboard visualizations. The final output helps management in better decision-making, improving delivery efficiency, and understanding customer preferences in food delivery services.

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