Food Waste Analysis Report

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1. Introduction

This project focuses on exploratory data analysis (EDA) of food service operations to identify key factors contributing to food waste. By analyzing variables such as the number of meals served, kitchen staff, temperature, humidity, and special events, we aim to uncover trends and generate actionable insights for improving efficiency and reducing waste.

2. Data Cleaning

- Missing Values: Handled using median for numerical columns and mode or specific values for categorical columns.
- Data Types: Converted 'date' to datetime and ensured numerical fields are correctly typed.
- Text Standardization: Cleaned up categorical fields (e.g., 'waste_category') by trimming and converting to lowercase.
- Duplicate Handling: Checked for and removed duplicate entries to ensure analysis accuracy.

3. Exploratory Data Analysis (EDA)

- Summary Statistics: Identified means, medians, and outliers for meals served, temperature, humidity, and waste.
- Distribution Plots: Histograms and boxplots helped reveal patterns and unusual data points.
- Categorical Analysis: Count plots of staff experience and waste category exposed frequent values.
- Time Trends: Waste levels were analyzed across dates to spot fluctuations and periodic patterns.

4. Correlation Analysis

- Meals Served vs Waste: Moderate positive correlation observed, suggesting higher waste on busy days.

- Environmental Factors: Temperature and humidity showed weak correlations with food waste.

- Correlation Heatmap: Provided a visual overview of numeric variable relationships.

5. Hypothesis Testing

- Impact of Kitchen Staff: ANOVA test showed that the number of kitchen staff significantly affects food waste.

- Effect of Special Events: T-test revealed that special events are associated with increased food waste.

- These results confirm the importance of operational planning in controlling waste.

6. Key Insights & Recommendations

- Staffing Optimization: Balance staffing to meet demand without creating excess waste.

- Event Planning: Monitor and control food portions during special events.

- Environment Monitoring: Consider refrigeration and prep adjustments during extreme weather conditions.

7. Conclusion

Through structured EDA, we identified critical variables impacting food waste. The findings support data-driven decision-making for reducing food waste and enhancing operational performance. Future work may include predictive modeling for waste forecasting and deeper seasonal trend analysis.