Project: Food Waste Exploratory Data Analysis

Problem Statement:

You are given a food service dataset with attributes like meals served, kitchen staff count, weather conditions (temperature, humidity), staff experience levels, special events, and food waste categories (dairy, meat, vegetables, barley, wheat, grains). The goal is to analyze food waste patterns and identify factors contributing to waste to provide actionable recommendations for reducing food waste in meal service operations.

Requirements:

Data Preprocessing:

- Remove duplicate records from the dataset
- Handle missing values in meals_served, kitchen_staff, humidity_percent, past_waste_kg, staff_experience, and waste_category columns
- Correct inconsistencies in categorical variables (staff_experience, waste_category)
- Identify and cap outliers in numerical variables
- Convert date column to datetime format and sort data chronologically

Time Series Analysis:

- Plot meal service trends over time (line plot)
- Identify and analyze spikes in meal service (meals > 3000)
- Create seasonal categorization (Spring, Summer, Autumn, Winter)
- Analyze waste patterns by day of the week and months

Categorical Analysis:

- Compare average food waste by staff experience levels (bar plot)
- Analyze waste distribution across different food categories (pie charts/bar plots)
- Create seasonal waste analysis by food category (heatmap)
- Examine the relationship between special events and meal volume

Correlation Analysis:

- Plot correlation heatmap between numerical variables (meals_served, kitchen_staff, temperature, humidity, past_waste_kg)

- Analyze relationship between weather conditions and food waste
- Study correlation between staff count and waste levels

Visualization Requirements:

- Time series line plots showing meal trends and waste patterns over time
- Seasonal heatmaps displaying waste by food category across seasons
- Bar plots comparing waste levels across staff experience categories
- Box plots showing waste distribution by food categories
- Scatter plots analyzing relationships between meals served and waste generated
- Interactive visualizations for exploring waste patterns by multiple dimensions

Key Insights to Discover:

- Seasonal patterns in food waste across different categories
- Impact of staff experience on waste reduction
- Identification of high-waste periods and their causes
- Weather influence on food waste patterns
- Optimal inventory recommendations based on seasonal trends

Deliverables:

- Comprehensive data cleaning and preprocessing pipeline
- Statistical analysis of waste patterns across multiple dimensions
- Visual dashboard showing key waste metrics and trends
- Actionable recommendations for waste reduction strategies
- Documentation of methodology and findings