MACHINE LEARNING MODEL FOR FORECASTING FOOD WASTE GENERATION IN MARRIAGES WITH SPECIAL REFERENCE TO BENGALURU

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Introduction:

Food waste has become a critical issue in urban societies, especially during large social gatherings such as marriage functions. In a metropolitan city like Bengaluru, weddings are often celebrated on a grand scale with extensive catering, which frequently leads to over-preparation of food and significant wastage. This results not only in economic losses but also contributes to environmental degradation and raises concerns about social responsibility.

In recent years, Machine Learning (ML) has emerged as a powerful tool for analyzing patterns and making data-driven predictions. By leveraging ML techniques, it is possible to study food consumption behavior and estimate food waste in advance. Such predictive models can assist caterers and event planners in optimizing food preparation and minimizing waste.

This project focuses on applying machine learning techniques to improve food planning in marriage functions conducted in Bengaluru. It involves collecting real-time data from selected marriage halls and caterers to analyze food preparation and waste generation patterns. Key factors such as the number of guests, menu type, and venue capacity are considered to develop a predictive model.

The primary aim is to forecast food waste generation using a simple and effective machine learning model. The outcomes of this study are expected to support better planning, reduce unnecessary food wastage, and promote sustainable and socially responsible practices in wedding events.

Objectives:

1. To study the food preparation and waste generation patterns in marriage functions in Bengaluru.

2. To identify the major factors influencing food waste during marriage events.

3. To collect and preprocess real-time data related to food consumption and wastage in marriages.

4. To develop a machine learning model to forecast food waste generation in marriage functions.

5. To evaluate the model performance and suggest suitable measures to reduce food waste in marriages.

Methodology:

The project follows a structured data-driven approach to forecast and visualize the trends in food waste:

1. Research Design
This study follows a descriptive and predictive research design to analyze food waste generation in marriage functions and forecast the same using a machine learning model.

2. Sample Design
Data will be collected from 50 marriage functions conducted in Bengaluru over a period of 3 months. The events will be selected using convenience and purposive sampling based on accessibility and permission.

3. Measurement of Variables
1. IndependentVariables:
   Number of guests, menu type, venue size, event duration
2. DependentVariable:
   Quantity of food waste generated (in kg)

4. Data Collection Method
Primary data will be collected through direct observation, weighing of leftover food using a digital weighing scale, and a structured questionnaire from caterers and event organizers. Secondary information will be referred from journals and government reports.

5. Tools and Instruments
Digital weighing scale, structured questionnaire, Google Form / Excel sheet for data entry, and Python software for model development.

6. Data Analysis and Model Development
The collected data will be rigorously cleaned through outlier detection, missing value treatment, and feature normalization, followed by detailed exploratory and descriptive statistical analysis. Multiple machine learning regression models, including Linear Regression and Random Forest, will be trained and validated using a train–test split strategy. Model performance will be critically evaluated using advanced error metrics such as Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and coefficient of determination (R^2) to ensure reliable and accurate food waste prediction.

7. Outcome and Validation

The predicted food waste will be compared with actual waste to check model accuracy. Based on the results, simple suggestions for reducing food waste in marriage functions will be provided.

Result and Conclusion:

In conclusion the machine learning model developed in this study was trained using data collected from selected marriage halls and catering services in Bengaluru. Key factors such as the number of guests, menu type, and venue capacity were considered for analysis and prediction. After preprocessing and training, the model demonstrated satisfactory accuracy in forecasting food waste generated during marriage functions.

The results indicate that the number of guests and menu variety are the most significant factors influencing food waste. Events with a higher number of attendees and a wide variety of dishes tend to result in greater levels of over-preparation and wastage. The model's performance, evaluated using standard metrics like Mean Absolute Error (MAE) and Root Mean Square Error (RMSE), shows that it can reliably estimate food waste prior to the event.

Based on these findings, it can be concluded that machine learning techniques provide an effective solution for predicting and reducing food waste in large social gatherings such as weddings. The developed model can assist caterers and event planners in making informed decisions regarding food preparation, thereby minimizing waste, reducing costs, and promoting sustainable practices.

Overall, this study demonstrates that integrating data-driven approaches into event management can address real-world challenges like food wastage. Further enhancements, such as incorporating additional variables like seasonal trends and guest preferences, can improve the model's accuracy and applicability in future implementations.

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Future Scope:

The future scope of this project includes enhancing both the accuracy and practical applicability of the developed model. The dataset can be expanded by collecting data from multiple regions beyond Bengaluru, which will improve the model's generalization and reliability across different contexts. Advanced machine learning techniques such as Deep Learning and ensemble models can be incorporated to achieve better prediction accuracy and handle complex patterns in food consumption.

Further, the integration of real-time data collection using IoT-based sensors in kitchens and dining areas can enable dynamic monitoring and more precise forecasting of food waste. This can help in making immediate adjustments during events. Additionally, developing a user-friendly mobile or web-based application can make the model easily accessible to caterers and event planners, allowing them to receive real-time recommendations on food preparation quantities.

Such improvements will not only increase the efficiency of the model but also promote its adoption in real-world scenarios. Overall, the future enhancements aim to make the system more scalable, accurate, and practically useful in reducing food waste in large-scale events.