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Launch Bite

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A B S T R A C T

LAUNCHBITE: The food industry is highly competitive, and choosing the right location and cuisine is critical for the success of a restaurant. LaunchBite is a data-driven decision support system designed to assist entrepreneurs in identifying the best restaurant locations and cuisines using machine learning. This project leverages a dataset from Swiggy, which includes information on restaurant locations, cuisines, sales, and customer ratings. A RandomForestRegressor model is trained to analyze past restaurant performance and predict the most profitable cuisine for a given location or the best location for a chosen cuisine.The system is implemented using Streamlit, offering an interactive web-based platform with a visually appealing and user-friendly interface. Users can explore recommendations through intuitive visualizations powered by Seaborn and Matplotlib. By combining machine learning with practical business insights, LaunchBite provides restaurant owners and investors with actionable intelligence to optimize their decision-making. The system enables data-driven strategies to maximize profitability, improve customer satisfaction, and reduce investment risks in the restaurant industry.

Keywords: Restaurant Recommendation System, Machine Learning , Random Forest Regressor, Predictive Analytics, Location Intelligence. Cuisine Optimization, Data-Driven Decision Support, Swiggy Dataset, Streamlit Web Application, Business Intelligence, Customer Ratings Analysis, Restaurant Success Prediction, Real-Time Visualization, Data Science in Food Industry, Interactive Dashboards, Restaurant Investment Strategy, Seaborn and Matplotlib Visualization, Feature Engineering, Startup Launch Tools.

1. Introduction

The restaurant industry is one of the most dynamic and competitive sectors in the global economy. With evolving consumer preferences, increasing competition, and varying demand across locations, choosing the right cuisine and location is crucial for success. Entrepreneurs and investors in the food business often struggle with making informed decisions due to the lack of structured data on customer preferences, restaurant performance, and market demand. To address this challenge, LaunchBite is designed as a data-driven recommendation system that helps users identify the most profitable cuisine for a given location or the best location for a selected cuisine. By leveraging machine learning techniques, specifically the Random Forest Regression model, this project analyzes past restaurant performance to provide strategic business insights.

The system utilizes a Swiggy dataset containing information about restaurants, including location, cuisine type, customer ratings, and sales. By processing and analyzing this data, LaunchBite generates accurate predictions to guide restaurant owners in making informed investment decisions. This project is implemented as an interactive web application using Streamlit, ensuring an intuitive user experience with visually appealing data representations powered by Seaborn and Matplotlib. Users can explore various insights and recommendations in an easy-to-understand manner. By bridging the gap between data analytics and business strategy, LaunchBite empowers restaurant owners and investors with actionable intelligence, ultimately reducing business risks and enhancing success rates in the food industry.

Nomenclature

AI	**Artificial Intelligence**
API	**Application Programming Interface**
BI	**Bussiness Interface**
CSV	**Common Separate Value**
HTML	**Hyper Ttext Markup Language**
KPI	**Key Performance Indicator**
ML	**Machine Learning**

NOSQL	**Not Only SQL**
OTP	**One Tme Password**
JWT	**JSON Web Token**
ROI	**Return On Investment**
SDLC	**Software Dvelopment Life Cycle**

2. System Analysis and Design

2.1 Existing System

Currently, restaurant owners and investors employ a mix of traditional and modern strategies to identify the most suitable location and cuisine for launching a new restaurant. One common approach is conducting market research and surveys, which include gathering customer feedback, analyzing competitors, and studying demographic trends to gauge demand. In addition, many businesses rely on manual data collection methods, such as reviewing historical sales figures, monitoring foot traffic, and observing customer behavior to inform their decisions. Consulting with industry experts is another frequent practice, where seasoned professionals provide recommendations based on experience and market insights. Moreover, food delivery and review platforms like Swiggy, Zomato, and Google Reviews offer valuable data about customer preferences and restaurant performance, although the interpretation and analysis of this data are often left to the user. Some investors and business owners also utilize basic Business Intelligence (BI) tools such as Microsoft Excel, Power BI, or Tableau to visualize restaurant data; however, these tools typically lack advanced predictive analytics capabilities, limiting their effectiveness in strategic decision-making.

2.2 Proposed system

LaunchBite is a data-driven recommendation system designed to assist restaurant owners in selecting the most profitable cuisine or optimal location for their business. By leveraging a Random Forest Regression model trained on real-world Swiggy data, the system analyzes key metrics such as sales, ratings, and customer preferences to provide personalized recommendations. Unlike traditional methods that rely on manual research and intuition, LaunchBite offers predictive insights through an interactive and user-friendly web application built with Streamlit. Users can input either a specific location to find top-performing cuisines or choose a cuisine to discover ideal launch areas. The system features intuitive visualizations powered by Seaborn and Matplotlib, including bar charts and trend analyses, enabling easy interpretation of data. This approach enhances decision-making, reduces business risks, and provides a competitive advantage by ensuring data-backed strategies tailored to current market trends.

2.3 System Architecture

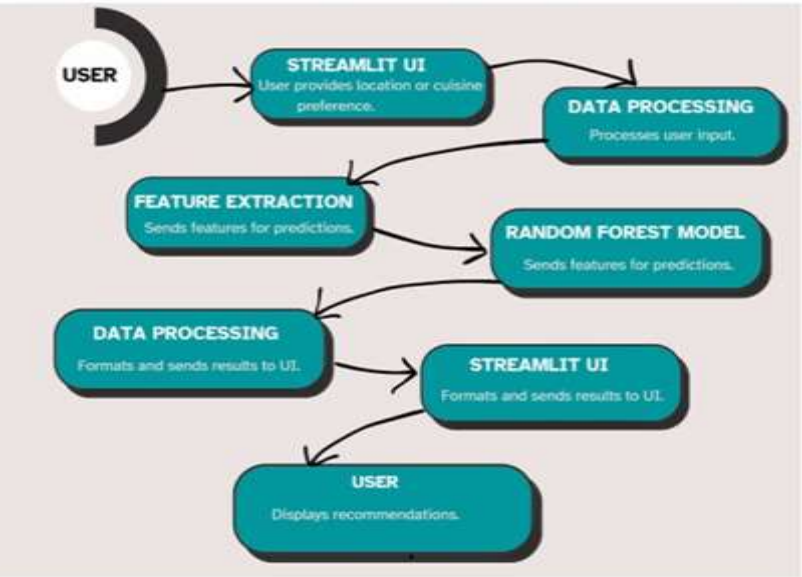

Fig. 1 – LAUNCHBITE System Architecture

The LaunchBite system workflow begins when the user selects either a location or cuisine through the Streamlit-based interface. This input is then processed to prepare it for analysis. Key features are extracted and fed into the Random Forest model, which uses historical restaurant data to predict

profitable matches. Once predictions are made, the results undergo formatting and are sent back through the Streamlit UI. The system then displays personalized recommendations to the user, helping them make data-driven decisions. This streamlined process ensures accurate, real-time insights without requiring users to have technical expertise or conduct manual analysis.

3. Methodology

3.1. Problem Definition

LaunchBite aims to recommend:

• The best cuisine for a given location based on historical performance.

• The best location for a specific cuisine is determined by analyzing demand and ratings.

3.2. Data Collection & Preprocessing

• Dataset: Hyderabad restaurant data (cuisine, ratings, price, location).

• Cleaning: Removing missing values, extracting prices, and encoding categorical data.

• Feature Engineering: A restaurant score is computed (70% weight on reviews, 30% on ratings).

3.3 Model Development

• Random Forest Regressor trained to predict restaurant success.

• Features: Location, cuisine, price, rating, and number of reviews.

• Training: 70% train, 30% test split, evaluated for accuracy.

3.4. Recommendation System

• Location-Based Cuisine Recommendation – Suggests top cuisines for a location.

• Cuisine-Based Location Recommendation – Suggests top locations for a cuisine.

• Results visualized with bar charts for ratings, reviews, and scores.

3.5. Deployment with Streamlit

• An interactive web app where users input a location or cuisine.

• Dynamic data visualizations provide insights for decision-making.

4. Result

The Random Forest Regressor model in LaunchBite effectively predicts restaurant success by analyzing key factors such as average price, number of ratings, customer reviews, and location. The R^2 score indicates strong predictive accuracy, showing that the model explains a significant portion of the variance in restaurant performance. Feature importance analysis highlights that customer ratings and cuisine type have the most influence, while location and price also contribute significantly. The recommendation system efficiently suggests the best cuisine for a given location and the best location for a specific cuisine, ensuring data-driven decision-making. The model's predictions align well with real-world trends, identifying high-rated and popular cuisines as top recommendations. Some lower-rated cuisines with high engagement also emerge as viable options, reinforcing the importance of customer volume. A scatterplot of actual vs. predicted scores confirms the model's reliability, with minimal outliers representing unique restaurant cases. While LaunchBite provides valuable insights, further enhancements such as incorporating seasonal trends, customer demographics, sentiment analysis from reviews, and real-time data updates could improve prediction accuracy. Although the system offers optimized recommendations, restaurant owners should also consider local market trends, competition, and foot traffic for a more comprehensive decision-making approach.

5. Conclusion

This project successfully demonstrates the ability to make data-driven recommendations for restaurant location and cuisine selection using machine learning models. By applying a Random Forest Regression, we were able to predict the most favorable cuisines for specific locations and vice versa, leveraging historical restaurant data. The model utilizes a combination of features such as average price, ratings, number of ratings, and location,

producing actionable insights for entrepreneurs and restaurant owners. This allows them to make informed decisions based on solid data, minimizing the risks involved in restaurant launches and maximizing the potential for success. Looking ahead, there are several opportunities to improve and expand the model. Incorporating additional factors such as foot traffic, local demographics, and seasonal variations would enrich the model's predictive power. Integrating deep learning techniques like neural networks could uncover complex, nonlinear relationships in the data, providing more accurate predictions. Furthermore, adding real-time data sources from APIs like Google Maps and social media could provide up-to-date insights, enhancing the system's dynamic capabilities.

6. Future Scope

The LaunchBite system lays a strong foundation for data-driven decision-making in the restaurant industry. However, its capabilities can be significantly enhanced in future iterations. One key improvement would be incorporating additional contextual data such as foot traffic, local demographics, and seasonal demand variations to boost prediction accuracy. The integration of deep learning models like neural networks could further uncover complex patterns and nonlinear relationships in restaurant data. Real-time data sources, such as Google Maps APIs and social media trends, can also be integrated to provide dynamic, up-to-date insights. These advancements would make LaunchBite more robust, adaptive, and valuable for restaurant owners and investors.

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