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Food Recommendation And Delivery System Using Machine Learning And React Native

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Abstract: Primarily, online food delivery apps work by involving customers, restaurant partners and delivery partners as a three-sided marketplace. To meet the increasing demands of food delivery, a recommendation system has been developed to prioritize both food taste preferences and preparation time. LPUEatzz, a custom meal delivery software made for Lovely professional University (LPU) campus in Phagwara, Punjab. It smoothly integrates preparation time and taste preferences in its recommendation system. Built on the ML algorithm FNN and using the React Native framework as it's foundation, this research paper validates LPUEatzz's capability to deliver personalized meal suggestions customized to the distinct preferences of users of LPU campus. LPUEatzz fills the gap in food delivery experience within the campus which contributes to overall user satisfaction.

Keywords: FDA (Food Delivery App), **FNN** (Feedforward Neural Network), **ML** (Machine Learning).

I. INTRODUCTION

Recently, an increasing use of technology and its services was observed.[1] A defining characteristic of the internet is its high accessibility, spanning across residential, academic, and mobile platforms like smartphones, wearable devices, and sensor networks.[2] This accessibility of internet has created a confusion among users, because of excessive information present on the internet.[3] Recommender systems are important tools for dealing with too much information [14]. They help people find what they're looking for by giving personalized suggestions based on their likes and preferences. These systems are used in different areas like suggesting movies, books, or music, helping students with learning materials, managing diets for patients, and suggesting products to buy online.[5] Traditionally, people visit restaurants to have their favourite food, or they order online.

In recent years, food delivery apps have become increasingly popular.[13] They allow us to order food online and get it delivered at our doorsteps. There are many such food delivery applications available online but most of them do not use machine learning to recommend food items according to the user's preference. Understanding user preferences and suggesting excellent food options based on taste preferences and preparation time is important. If a person is timeconstrained, the application can recommend foods that match with their preferences and require minimal preparation time.

Restaurants aim to provide high-quality food, while customers look for tasty and satisfying options.[15] A systematic approach is required to satisfy both customers and owners by suggesting suitable restaurants based on the user's preference [6]. Using machine learning algorithms in recommender systems can help customers find famous and delicious food items nearby, especially for those who are on campus and seeking traditional and high-quality food. This can reduce the struggle of finding good food on campus and make the experience more enjoyable.

This paper addresses this gap in the literature by proposing a personalized food recommendation system that considers individual's taste preference and the time it takes to prepare meals. This research seeks to create something exciting by blending insights from computer science, data analytics, and culinary arts. Our goal is to build a recommendation system that understands people's diverse tastes and constraints. It is our belief that this system could change how people engage with food online, making meal planning a more personalized and enjoyable experience for everyone.

A. Machine Learning

From the moment humans are born, their lives are surrounded by data. Their senses, like eyes, ears, nose, tongue, and nerves, continuously absorb information. The human brain quickly analyses and processes this raw data, converting it into meaningful insights. With time, many manual tasks have become automated and computerized due to advancements in technology. Nowadays, facial expressions can be easily analysed through machine learning.[9]

Machine learning involves creating algorithms capable of analysing data and deriving meaningful insights from it. These insights help businesses make informed decisions. Additionally, machine learning acts as a powerful tool in transforming raw or unprocessed data into meaningful information. It helps various organizations and businesses improve their decision-making power and foster innovation in different areas.[4]

B. Background and Motivation

In Lovely Professional University (LPU), where students and staff members have a very busy schedule, it is difficult to find good food and get it delivered to their desired location. Specifically, girl's hostel is time constrained which is a big issue for girls to get their desired food at their location. This problem sparked interest in finding a solution. It became apparent that the traditional food delivery apps available just weren't up to the mark of meeting the needs of LPU students and staff members. Hence, the aim was set to create something designed specifically for the university. A significant gap was observed between what people needed and what was currently available. The mission became clear: develop a brand-new application that is not only easy to use but also perfectly matched with the needs of LPU students and staff. By embracing the latest technology and understanding what people want, confidence grew that a huge difference could be made.

The objective is straightforward: Create a mobile application that addresses the challenge of food delivery within the LPU campus, while also enhancing the overall user experience of using this mobile food delivery and recommendation application.

II. LITERATURE REVIEW

Many researchers are using machine learning to develop food recommendation systems in today's world.[11] Similarly, one food delivery app used sales data for recommendations, applying a K-nearest neighbour algorithm based on order percentages.[12] The approach they follow suggests restaurants that receive over 10% of orders, showing what customers prefer. By achieving these goals, the project aims to transform things for customers.[7] The system manages to recognize people's favourite restaurants about 24% of the time from a list of around 7.7 suggestions, which shows it's doing a pretty decent job.[10] Customers confirm their orders online, either through UPI or by paying online, and that leaves a record in the system.[14] When it comes to delivery charges, it's the delivery people you choose who set them, and reviews by other customers. While applying different machine learning algorithms to food suggestions, random forest shows the maximum accuracy compared to other algorithms like decision tree regression, KNN, and extra tree classifier.[8]

Fig.1: Methodology

III. METHODOLOGY

A. Objective

The main objective of this project is to develop a Food Delivery App (FDA) with different facilities for the campus after observing the issue of finding preferred food with best quality and less preparation time nearby. This app is built by using advanced machine learning (ML) algorithms to increase the user's overall experience. The app is user-friendly and with easily understandable Graphical User Interface (GUI), it provides students and staff a platform to find different variety of food items from nearby locations within the campus. For recommendation system, Feedforward Neural Network (FNN) algorithm is used to analyse user preferences, historical data, and vendor offerings. This Food delivery application offers a variety of suggestions to users based on taste profile and preparation time, i.e. overall best food option. The app is easy to use. By minimizing delivery charges, it makes it more affordable and accessible for all the users. This application has Cash on Delivery (COD) as main method of payment. It promotes local vendors and small businesses within the LPU campus, providing them with a platform for their business. This app will show high-quality and diverse food options based on taste preference, preparation time and user rating. The project aims to improve food delivery services inside the LPU campus. *B. Data Collection*

As shown in Fig. 1, For the project, two different datasets are involved. The primary dataset was collected through physical visits to every food court inside the LPU campus. During these visits, team members collected all menu items and their prices from each shop. The secondary dataset

was collected from Kaggle. This dataset contained information about different food items, including their taste and preparation times. These two datasets were combined to create a dataset for training the machine learning models. This model was used to analyse both taste preferences and preparation time for each dish.

C. Data Processing

After collecting the raw data, it was converted into a CSV file format. After converting the data, basic Exploratory Data Analysis (EDA) was performed. In this data, the presence of null values, duplicate values and outliers were checked and treated accordingly. This step was very important for making sure that the model training process was more efficient, and the predictions were accurate. The processed dataset was then used to train the Machine Learning model.

D. Model Development

The chosen Machine Learning model for training was Feedforward Neural Network (FNN), this machine learning model was trained on the bases of taste preference and preparation time. The decision of using Feed Forward Neural Netwok was done by considering research which was conducted for this specific case of recommending the best food item and the Feed Forward Neural Network came out as the best Machine Learning algorithm for this task, as this Machine learning algorithm provided the best accuracy. Initially, the dataset containing food items, along with their taste profiles and preparation times, was numerically encoded. After the numerical encoding, the dataset was divided into training and testing data. The training set was 80% and testing set was 20%. Subsequently, the FNN model was trained, comprising of input layers dedicated to taste profile and preparation time. The model was trained by using deep learning library PyTorch. Through hyper tuning of parameters FNN model fit to map input taste and preparation times to their corresponding food items recommendation.

E. API Development

In the Food Delivery Application (FDA) project, the API development part is very important. It connects front-end and back-end with each other. In this application, Flask is used, which is a simple web tool built in Python. This part is all about storing information needed from users, like their food preferences. Once that information gets stored, Flask communicates with PyTorch for food suggestions.

PyTorch recommend food based on information that Flask got from user. The Flask part needed to be extra careful while dealing with any mistakes, it makes sure everything works as per the plan and suggestions should be accurate. After it figure out the perfect food suggestions for its users, it store all that information in JSON format.

For smooth functioning of all tools, Gunicorn and Docker are used. Gunicorn is used to manage incoming HTTP requests and pass those requests to Python application for processing, and then return responses to the users. Docker is basically used to package and deploy application. So, basically, API development part is to make sure that user can get food suggestions based on their taste profile and preparation time.

F. Android App Development

The customer and seller side of the Food Delivery Application (FDA) was built using React Native which is a framework that helps to make mobile applications for both iOS and Android. Redux JS

toolkit was used for the state management of the FDA. For making logging in and managing the state of the application smoothly, **react-native-google-sign-in** was used.

Both seller and customer functionalities were integrated for the best user experience. For customers, the app featured four tabs offering various functionalities such as browsing toprated shops, viewing liked shops, accessing personalized food recommendations generated by the machine learning model, and reviewing order history.

For the seller side, Local login method was used to make sure that only authorized people could manage orders. Sellers could easily handle new orders, marking them as preparing or order completed as per the progress of the order.

Drizzle ORM was used to connect the FDA with NeonDB serverless Postgres database. A serverless database is a database which turn itself up or down as per the user traffic. If the database is not in use, it can turn down automatically.

Also, the FDA was able to get updates in real-time from the server by using Drizzle ORM's WebSocket connection feature. This meant that when new orders were made or sellers updated order statuses, users saw the changes instantly. This made the app smooth and quick to respond, ensuring users always knew what was happening with their orders. For pictures of shops and items, Image Kit was used, a system that stores and shares images efficiently all over the world. This made sure that images loaded fast no matter where users were. Using Image Kit made the app look better and work smoother, making it more enjoyable for users.

IV. CONCLUSION

To conclude, developing the Food Delivery Application (FDA) involved structured process using advanced technologies with user-friendly design principles. Firstly, the FDA aimed to meet the specific needs of the users of LPU campus by providing an accessible and convenient way to order food. Technologies like Redux JS Toolkit, React Native, and Drizzle ORM was used to build a strong and fully functional app. Through these technologies features like managing information, logging in, connecting to databases, and getting updates in real-time have become easier. Finally, utilisation of machine learning algorithm like FNN, the FDA provided personalized food recommendations to users.

V. FINAL APP OVERVIEW

This food delivery and recommendation application is a platform designed for ordering food and having it delivered within Lovely Professional University campus. FDA serves as a gateway connecting customers and sellers, easing the process of food delivery. Sellers can access this application through a local login mechanism. On the customer side, a one-tap login feature is available. This application offers various features like browsing top-rated shops, receiving personalized food recommendations, and accessing past orders. On the other hand, sellers can accept orders and, upon completion, mark them as completed. Additionally, FDA is a user-friendly solution that simplifies the process of food ordering and delivery. The Food Recommendation System integrated into the application helps users select food based on their taste preferences and preparation time, making it efficient to choose their favourite food with minimal preparation time. This makes the process hassle-free and reduces delivery time, allowing users to manage their time more effectively amidst their busy schedules.

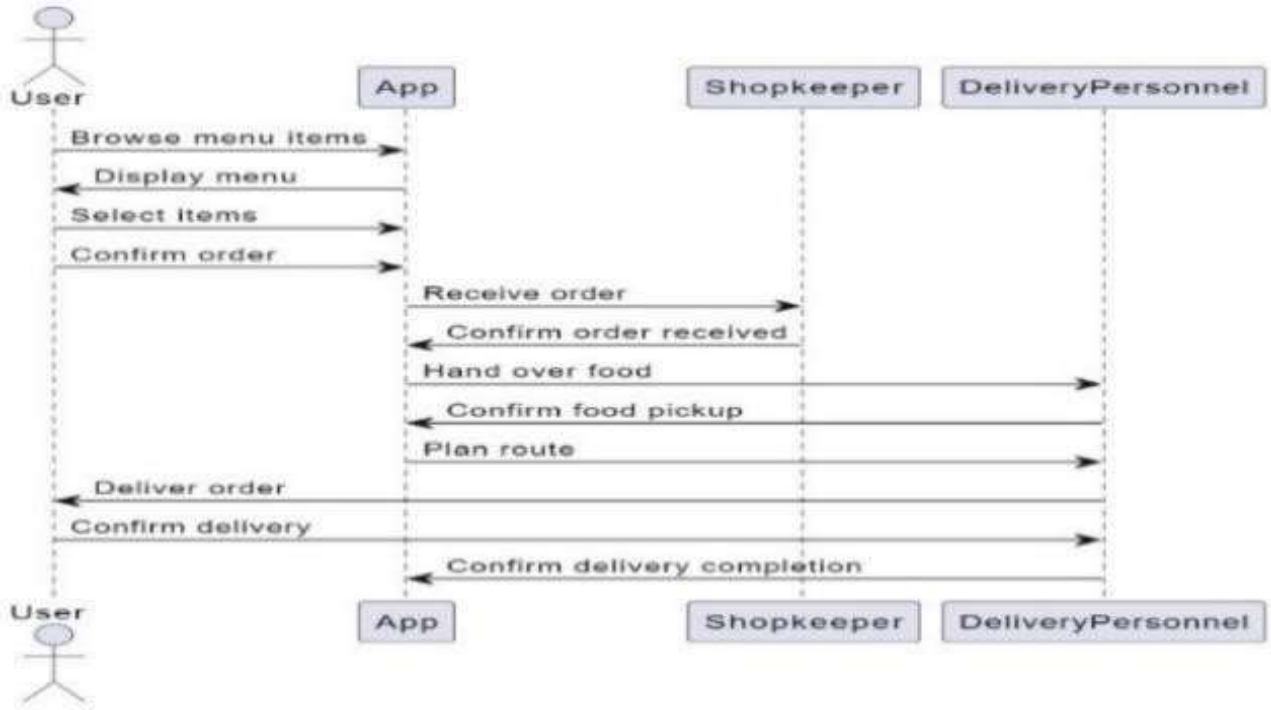

Fig. 2: App Overview

TABLE 1: COMPARISONS OF THE RELATED WORK.

Ref. No.	Objective	Technique/Tool	Dataset	Findings
3.	Deep Learning and Embedding Based Latent Factor Model for Collaborative Recommender Systems.	dual deep neural network (DNN), SVD++ algorithm	two real-world datasets- Movie Lens 100k Dataset and Movie Lens 1M Dataset	Explored a dual DL and embedding-based latent factor method for recommender systems
11.	Probabilistic Unsupervised Machine Learning Approach for a Similar Image Recommender System for E-Commerce	K-Means++ clustering	40,000 fashion product image datasets from the Kaggle	By using unsupervised statistical machine learning techniques, it fetches similar images for e-commerce portals when the user selects the desired product image
13.	Zero Cost Online Food Delivery System with Machine Learning Prediction	Random Forest, Decision Tree Regression, K-Nearest Neighbour	Use data from Different paper of Scopus and Google Scholar databases.	Use different ML models such as random forest algorithm, decision tree regression, K nearest neighbour, extra tree classifier models to forecast food items based its high accuracy and performance.
14.	Restaurant Recommendation System Using ML Algorithms. RIET-IJSET International Journal of	k-Nearest neighbours' algorithm, and multiclass SVM classification	Used Kaggle dataset contains 9 csv files including ratings, cuisine, user payment etc.	Develop the restaurant recommendation system using machine learning with the web interface.

	Science Engineering and Technology.			
15.	Recommendation System for a Delivery Food Application Based on Number of Orders	k-nearest neighbour, Artificial Neural Network, Random Forest,	survey-based studies and use data from social networks such as TripAdvisor, Zomato, and Yield, among others	calculate the performance of recommendation systems based on metrics that are used for classification or regression models,

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