ABSTRACT

The creation of a Restaurant Recommendation System Popularity-based and Collaborative Filtering is the main focus of this project, which is an important application in the fields of recommendation systems and machine learning. The system uses the different python libraries like scikit-learn, pandas, NumPy, Linear Regression, face_recognition, Hashlib and Matplotlib as well as technologies like Python and the Flask Framework, to recommend the restaurants to the users based on the ratings out of 5 and their tastes.

With features including face recognition user registration, face recognition user login, feedback, User profile, restaurant browsing, recommendation, Favourites, the suggested system is a user-centric program. The system offers a smooth user experience by combining backend Python and flask frameworks with frontend technologies like HTML, CSS, and Bootstrap. A thorough analysis of the literature made it clear that recommendation systems are essential for improving user pleasure and experience across a range of industries.

But my cutting-edge restaurant suggestion system offers a fresh approach. My solution combines cutting-edge machine learning algorithms with intelligent analysis of customer preferences to deliver customized restaurant recommendations. My system uses collaborative and popularity-based filtering algorithms to make sure that users receive recommendations based on their interests and preferences. Through the integration of data from many sources, such as restaurant attributes and user ratings, My system generates precise and pertinent recommendations that boost user engagement and pleasure. Furthermore, My platform offers a user-friendly experience with little additional infrastructure requirements by seamlessly integrating with current websites and applications. My goal is to revolutionize the restaurant discovery process and improve the eating experience for people globally by promoting the widespread adoption of My technology through smart relationships with industry players.

The system is deployed using a Flask application, presenting users with detailed information on the top 50 restaurants, including name, image, cost, votes, location, rating, and link. Additionally, linear regression and bar regression graphs based on ratings and costs are provided.

The collaborative filtering approach recommends restaurants to users based on their ratings. By treating each restaurant as a two-dimensional point, the system calculates the Euclidean distance between them, employing cosine similarity to propose eateries that align with user preferences. This method considers users who have rated a minimum of 200 restaurants and restaurants rated by at least 50 users.

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ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude and extend my sincerest appreciation to all those who have contributed to the successful completion of this mini project report.

First and foremost, I would like to thank my mini project guide **Prof. N. B. Aherwadi** sir, for their valuable guidance, support, and encouragement throughout the entire process. Their expertise, patience, and insightful feedback have been instrumental in shaping this report and enhancing its quality. I am truly grateful for their mentorship and for sharing their knowledge and expertise in the subject matter.

I would also like to express my gratitude to NKOCET-SOLAPUR for providing me with the opportunity to undertake this mini project and for the resources and facilities made available to me. The access to the library, research materials, and databases has been immensely helpful in conducting in-depth research and gathering relevant information for this report.

I am indebted to my colleagues and friends for their continuous support and valuable discussions. Their constructive feedback, brainstorming sessions, and exchange of ideas have played a significant role in refining my understanding of the topic and in shaping the direction of this Mini Project report.

I would like to thank Our Principal **Dr. B. K. Sonage** and Head of Department (HOD) **Dr. V. V. Bag** , for their valuable guidance, support, and encouragement throughout the entire process.

In conclusion, I would like to express my deepest gratitude to all those mentioned above and to anyone else who has directly or indirectly contributed to this Mini Project report. Your support, guidance, and encouragement have been indispensable, and I am truly honoured and privileged to have had the opportunity to learn and grow through this experience.

INTRODUCTION

When it comes to eating experiences, customers looking for customized suggestions have a significant hurdle when sorting through the multitude of restaurant selections. My creative restaurant recommendation system seeks to successfully handle this problem by utilizing collaborative filtering and Popularity based methods and machine learning capabilities. Through the application of sophisticated algorithms, My technology is particularly good at determining user preferences and making customized recommendations, which improves the dining experience for people in a variety of culinary contexts.

For this system I have created a secure face recognition register and login system. When user enters his username, email and capture image and if image clearly visible then he will Register Successfully otherwise not. And when user logging in to my website then he will enter his same username and capture image which is process during signup process if signup image and login captured image then user will successfully login to system otherwise not.

The underlying principle of My system is to comprehend user behavior and preferences in order to generate intelligent recommendations that are predicated on previous interactions and preferences. My software creates individualized suggestions by evaluating past data, restaurant features, and user ratings to maximize customer pleasure and engagement during the restaurant choosing process. I adopted a Popularity-based method for my project.

I utilized one Kaggle dataset entitled zomato.csv, which has approximately 56117 data points. So, what I did was read the dataset with pandas and then preprocessed some data in jupyter notebook. Then I deleted all of the duplicate values from the dataset and filled in the null location with 0. After that, I did popularity-based filtering. Popularity-based filtering is simply a method or type that displays the top material available on the platform and recommends the same top content to all users. Examples include YouTube's trending page and IMDB's 250 movies.

I used the Flask application to display the top 50 restaurants based on their average rating, including name, image, cost, votes, location, rating, and link.

Below the top 50 restaurants, I've provided a linear regression and a bar regression graph based on ratings and costs. And for this, I utilized the WR formula. I employed the collaborative filtering approach in my project. I recommend restaurants to users based on their ratings. My collaborative filtering method involves collecting user ratings out of 5 for each of 56117 restaurants and approximately 1000 people. So collaborative based filtering treats each restaurant

as a two-dimensional point on the x axis (assume user1) and the y axis (user2), and shows the restaurants in that space. So, after arranging the restaurants on that two-dimensional space, it takes the one plotted restaurant and finds the nearest distance from it to other plotted restaurants, so basically it calculates the Euclidian distance between each plotted restaurant and It then recommends restaurants based on their proximity to the user's search criteria. So, it uses cosine similarity to propose the eatery.

I also used the flask application to deploy on the website, so when the user goes to the recommend menu and enters one of the restaurants in his city, I present the 5 recommendations with the image name, cost, location, rating link, and 5-star symbol rating, allowing the user to review the restaurant. For this, I filtered the data as follows: I examined only those users who rated a minimum of 200 restaurants, and I considered only those restaurants where a minimum of 50 users rated them. Based on these, I made a recommendation to the user based on these criteria. I've also given the linear regression graph for the recommended restaurants, as well as the bar regression graph, to help the user understand better.

Furthermore, I guarantee that My system interacts with current platforms and apps without any problems, providing customers with a simplified experience that requires the least amount of extra infrastructure. This is part of My dedication to seamless integration. My technology, which is compatible with several platforms and flexible, has the potential to transform how people find and explore restaurants, improving their overall dining experiences.

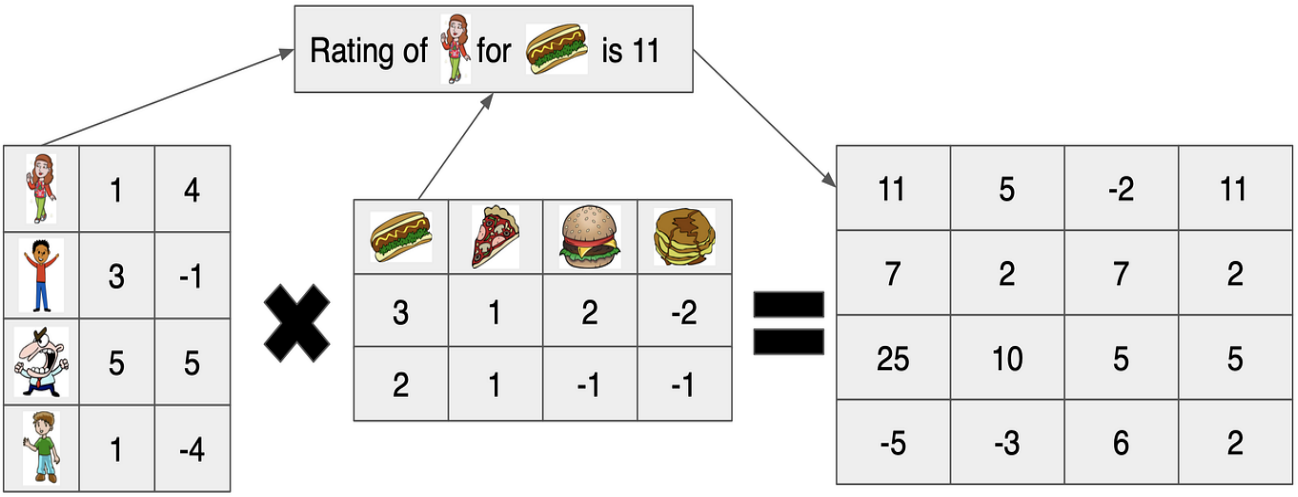


Fig.1 Collaborative Filtering

LITERATURE REVIEW

There is a corresponding need to address issues in the field of personalized recommendation systems, particularly in the restaurant industry. By reviewing relevant studies, we can obtain insights into the methodology and technology used in related areas, which will inform the development of our Popularity-Based and Collaborative Filtering-Based Restaurant Recommendation Systems.

Title: Personalized Restaurant Recommendation System with Collaborative Filtering

Publication Year: June 2018

This study digs into personalized recommendation systems for restaurants, with a focus on the use of collaborative filtering approaches. By assessing user preferences and habits, the system delivers individualized recommendations, increasing user satisfaction and engagement. The research emphasizes the efficiency of collaborative filtering in generating accurate and relevant ideas, paving the path for further investigation in the subject of Collaborative filtering-based Restaurant Recommendation System.[01]

Title: Enhancing User Experience in Restaurant Discovery Platforms Through Machine Learning

Publication Year: September 2020

This article investigates the application of machine learning algorithms in restaurant discovery platforms to improve customer experience. By utilizing modern techniques such as natural language processing and sentiment analysis, the system harvests useful insights from user reviews and feedback, allowing for individualized suggestions. The study emphasizes the importance of user-centric techniques in restaurant recommendation systems, specifically the role of machine learning in enhancing recommendation accuracy and relevance.[02]

Title: Comparative Analysis of Restaurant Recommendation Systems: A Review

Publishing Year: December 2019

This detailed evaluation compares numerous restaurant recommendation systems' methodology, algorithms, and performance measures. The paper investigates common approaches such as content-based filtering, collaborative filtering, and hybrid strategies, emphasizing their advantages

and limits. By conducting a comparison analysis, the study provides useful insights into the efficiency of various recommendation tactics, assisting in the selection of relevant methodologies for restaurant recommendation systems.[03]

Title: Leveraging Big Data Analytics for Personalized Restaurant Recommendations

Publication Year: March 2021

This study looks into the function of big data analytics in making personalized restaurant suggestions to users. The system generates specialized suggestions by combining enormous amounts of data from many sources, such as user preferences, historical patterns, and restaurant qualities, using advanced analytics techniques. The study underlines the scalability and versatility of big data-driven approaches for meeting the changing demands and preferences of restaurant customers. [04]

Title: Future Directions in Restaurant Recommendation Systems: A Roadmap

Publishing Year: July 2022

This forward-looking study examines future directions and developing trends in restaurant recommendation systems. The study looks at current advances in machine learning, artificial intelligence, and data analytics to identify possible areas for innovation and improvement. The report sees a future in which restaurant recommendation systems use cutting-edge technology to provide users with seamless and tailored dining experiences around the world.[05]

METHODOLOGY

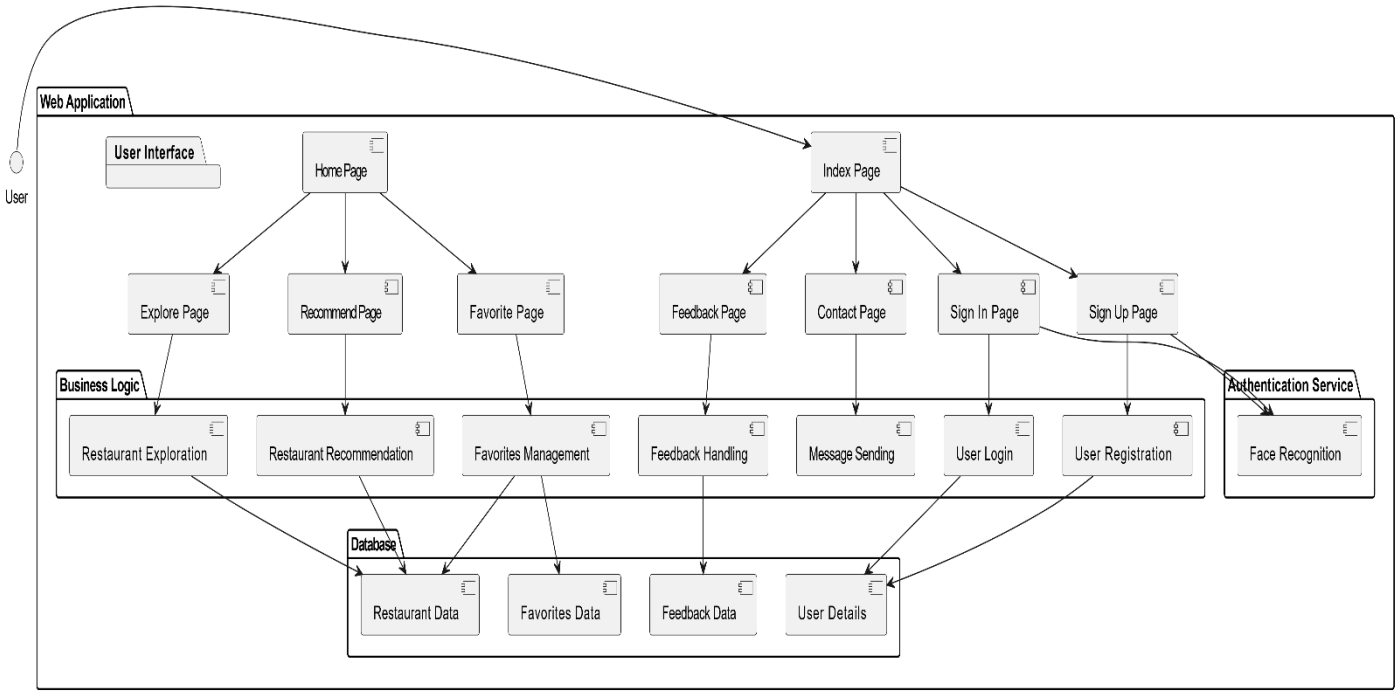


Fig 2. Activity Diagram

In this section, we outline the methodology and technology stack employed in the development of a Popularity-Based and Collaborative Filtering Based Restaurant Recommender System uses the Machine Learning algorithm to recommend the restaurants to users based on rating out of 5 which given by more than > 200 users and on more than > 50 restaurants.

This methodology consists the following :

1. Data Acquisition and Preprocessing:

Python offers a rich ecosystem of libraries and frameworks for developing the popularity-based collaborative filtering-based restaurant recommendation system. My System uses the dataset Named Zomato.csv From Kaggle which Contains 51717 rows and 18 columns which are, URL, name, online order, book table, rate, votes, phone, location, rest type, dish liked, cuisines, approx. Cost(for two people), review list, menu item, listed in(type), listed in(city) and Image Columns.

Preprocessing steps include using the Python Pandas Library my system reads the Zomato.csv file and displays the data, handling missing values, removing duplicates, selecting relevant features, normalizing or standardizing numerical features, encoding categorical variables, and saving the preprocessed data to a new file in Jupyter notebook.

```
In [6]: restaurant.head()
```

Out[6]:

	url	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_li
0	https://www.zomato.com/bangalore/jalsa-banasha...	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1/5	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pa Lu Bu Ma Pa Par La
1	https://www.zomato.com/bangalore/spice-elephan...	2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...	Spice Elephant	Yes	No	4.1/5	787	080 41714161	Banashankari	Casual Dining	Mon Lu Bu Choco Nirv Thai
2	https://www.zomato.com/SanchurroBangalore?cont...	1112, Next to KIMS Medical College, 17th Cross...	San Churro Cafe	Yes	No	3.8/5	918	+91 9663487993	Banashankari	Cafe, Casual Dining	Chur Cannell Minestr Soup, Ch
3	https://www.zomato.com/bangalore/addhuri-udupi...	1st Floor, Annakuteera, 3rd Stage, Banashankar...	Addhuri Udupi Bhojana	No	No	3.7/5	88	+91 9620009302	Banashankari	Quick Bites	Ma D
4	https://www.zomato.com/bangalore/grand-village...	10, 3rd Floor, Lakshmi Associates, Gandhi Baza...	Grand Village	No	No	3.8/5	166	+91 8026612447\r\n+91 9901210005	Basavanagudi	Casual Dining	Pani Gol Ga

Fig 3. Zomato.csv

2. Popularity-Based Filtering:

Popularity-based filtering is a straightforward yet effective approach which I have used in My system to recommend restaurants to users based on their overall popularity or average ratings. Here's a detailed explanation of how popularity-based filtering works in my system, including methodologies and formulas:

a) Calculation of Average Rating:

To determine the popularity of each restaurant, I have calculate the average rating by aggregating all user ratings and dividing by the total number of ratings.

The formula to calculate the average rating AvgRating for a restaurant is given by:

$$\text{AvgRating} = \frac{\sum_{i=1}^{n} \text{Rating}_i}{n}$$

Where Ratingi represents the rating given by the ith user, and n is the total number of ratings for the restaurant.

b) Selection of Top-Rated Restaurants:

Based on the calculated average ratings, I have selected the top-rated restaurants to recommend to users.

Restaurants with higher average ratings are considered more popular and are prioritized in the recommendation list. To show the top 50 restaurants from my platform I have used the Weighted rating formula:-

$$\mathrm{WR} = \frac{v}{v+m} \cdot R + \frac{m}{v+m} \cdot C$$

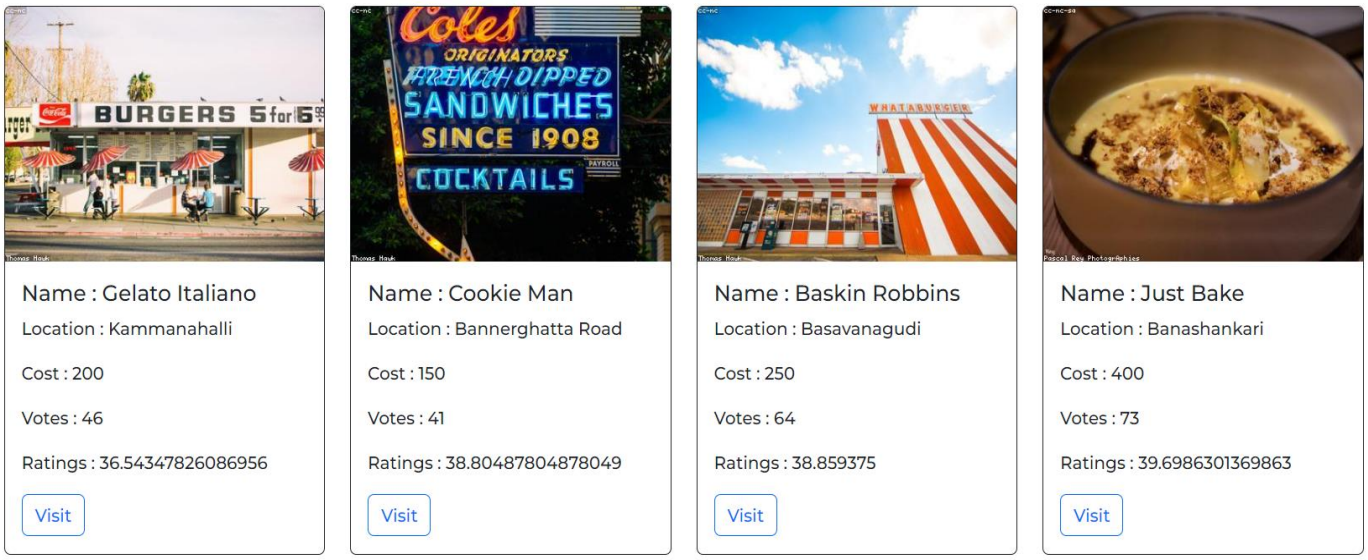
Variables

WR	weighted rating (dimensionless)
v	number of votes for the movie = (votes) (dimensionless)
m	minimum votes required to be listed in the Top 250 (currently 25000) (dimensionless)
R	average for the movie as a number from 0 to 10 (mean) = (Rating) (dimensionless)
C	the mean vote across the whole report (currently 7.0) (dimensionless)

c) Presentation and Visualization:

The top-rated restaurants are prominently displayed on the website, providing users with easy access to popular dining options.

Each recommended restaurant is accompanied by relevant details such as name, image, cost, location, and rating, enhancing user engagement and decision-making.



d) Presentation and Visualization:

Recommendations are presented to users through a Flask-based web application, where they can input a restaurant name from their city. The application displays the top 5 recommendations along with relevant details such as image, name, cost, location, rating, and a 5-star symbol for user feedback. Additionally, linear regression and bar regression graphs are shown to provide users with insights into the recommended restaurants' characteristics.

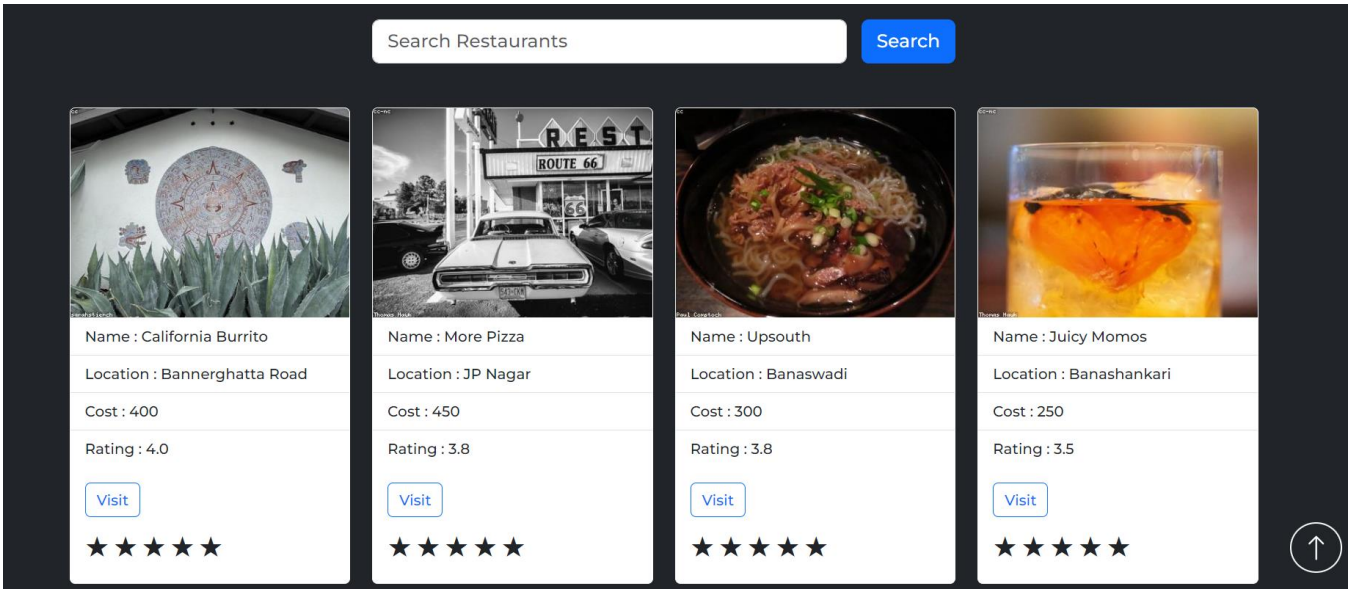


Fig 4. Recommendations

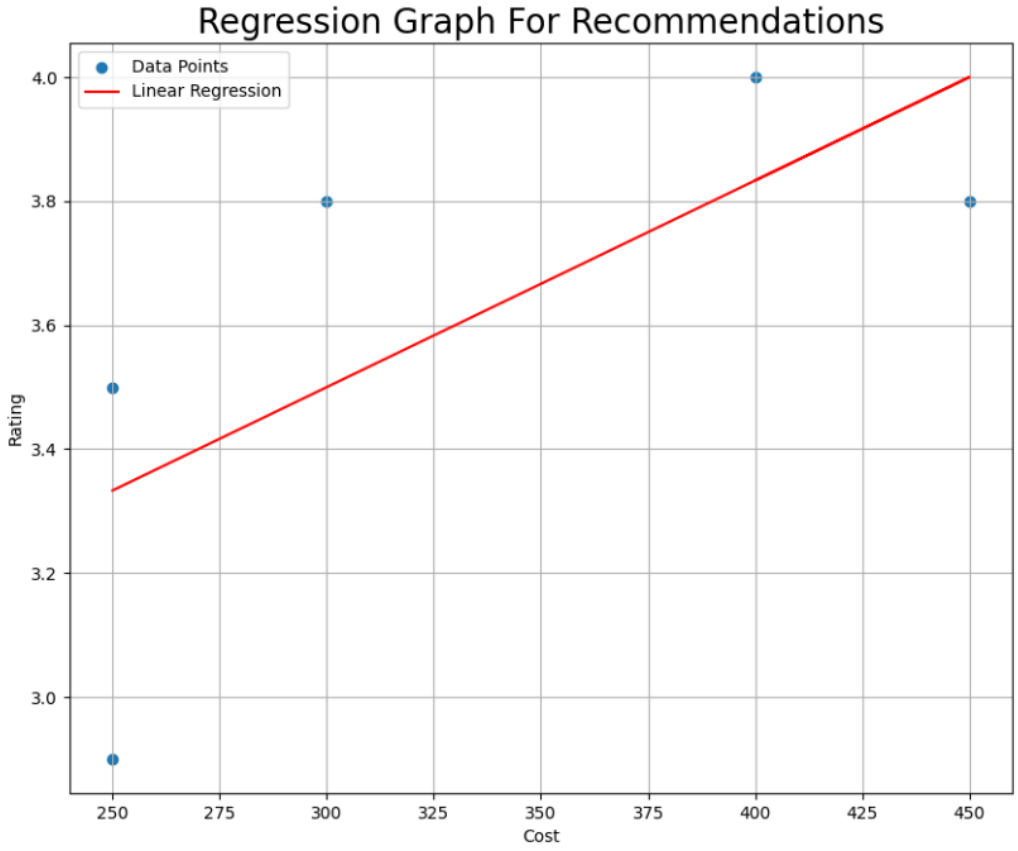


Fig 5. Linear Regression for 5 Recommendations

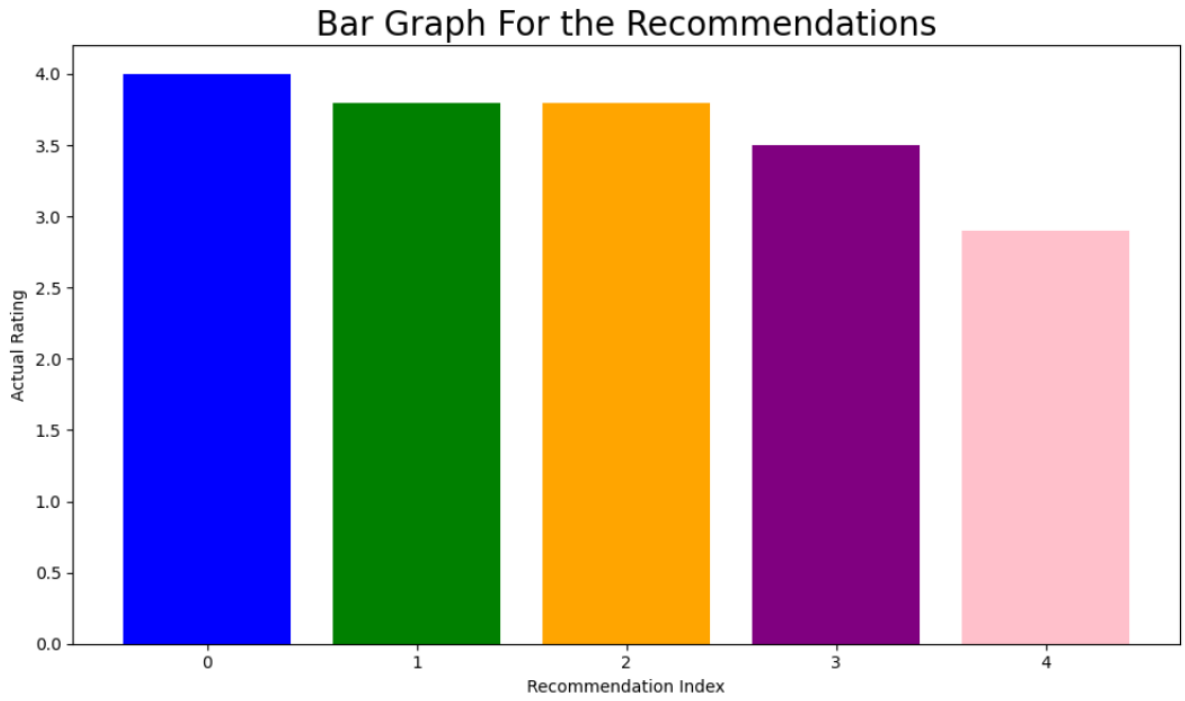


Fig 6. Bar Regression for 5 Recommendations

SYSTEM DESIGN

Aim

My System's main goal is to create a reliable restaurant recommendation system that makes efficient use of machine learning algorithms to improve user experience and optimize restaurant choices. This system combines collaborative and popularity-based filtering techniques to deliver personalized suggestions based on user preferences. My objective is to enhance customer pleasure and boost platform engagement by tackling this goal.

Objectives

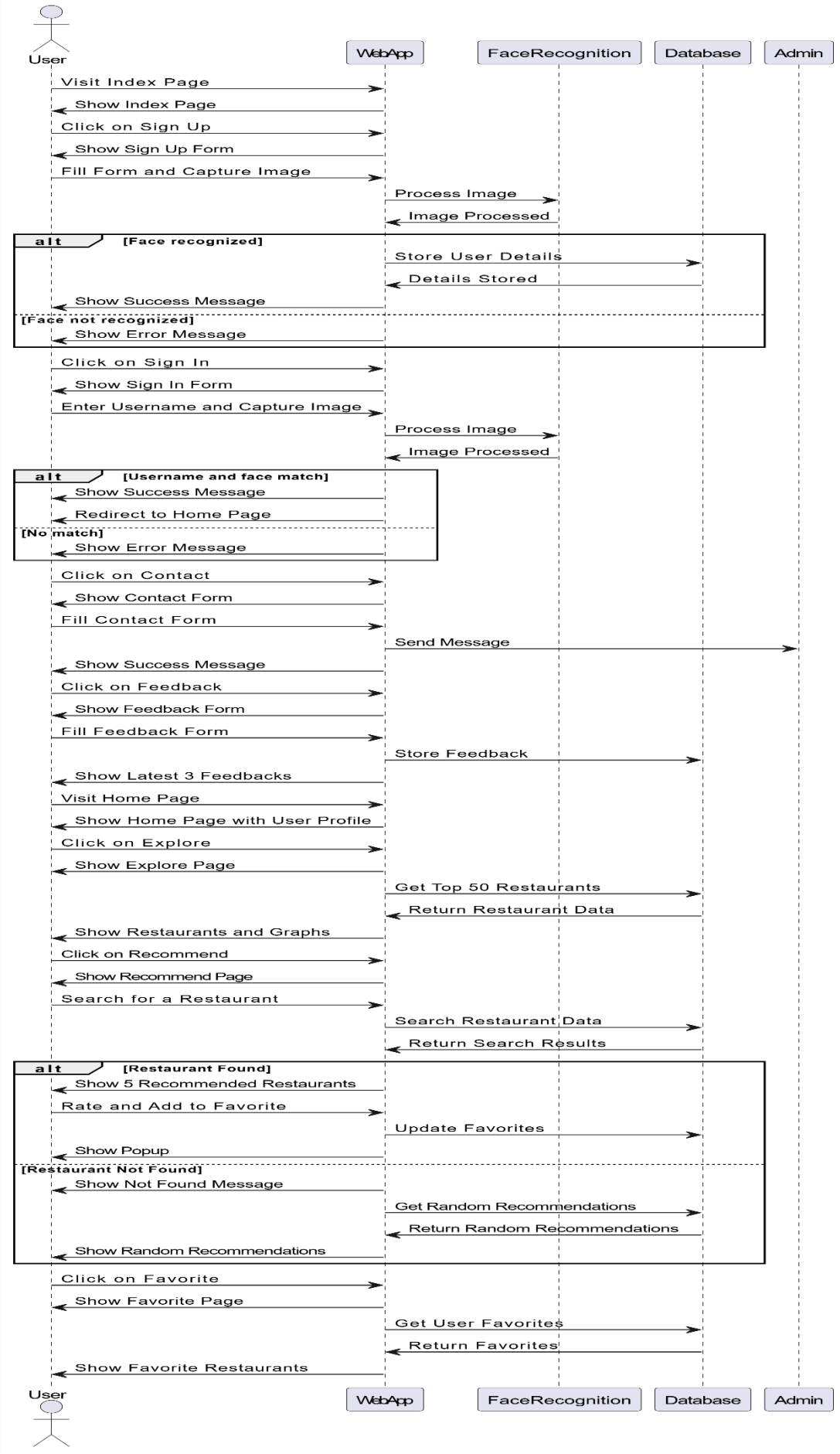
1. **Personalized Recommendations:** The system aims to provide personalized restaurant recommendations tailored to individual user preferences, enhancing the overall user experience.
2. **Integration of Multiple Filtering Techniques**: By incorporating both popularity-based and collaborative filtering approaches, the system seeks to leverage the strengths of each method to generate accurate and diverse recommendations.
3. **Real-time Adaptability:** The system must be capable of adapting to changing user preferences and restaurant data in real-time, ensuring that recommendations remain relevant and up-to-date.
4. **Enhanced User Engagement:** By presenting users with relevant and appealing restaurant recommendations, the system aims to increase user engagement and retention on the platform.
5. **Optimized Performance:** The system must deliver recommendations efficiently, minimizing response times and ensuring a seamless user experience.
6. **Scalability and Flexibility:** The system should be scalable to accommodate a growing user base and flexible enough to incorporate new features and functionalities in the future.
7. **Data Privacy and Security:** Ensuring the privacy and security of user data is paramount. The system must implement robust measures to protect user information and adhere to data protection regulations.

Problem Statement

The main goal of this project's issue statement is to create an intelligent recommendation system that will help users choose restaurants more easily. Current recommendation systems often don't

personalize enough or don't adapt well enough to different user preferences. By employing machine learning algorithms to examine user behavior and preferences and produce customized recommendations, my proposed solution solves this issue. We anticipate that by resolving this problem, user retention and platform engagement would increase, leading to increased business growth.

In order to solve this problem, my suggested method combines collaborative and popularity-based filtering algorithms to offer customized restaurant recommendations that are in line with user tastes and behavior. By resolving this problem, we intend to raise user engagement and satisfaction levels and, eventually, promote revenue growth for restaurateurs.


User
WebApp
FaceRecognition
Database
Admin
Visit Index Page
Show Index Page
Click on Sign Up
Show Sign Up Form
Fill Form and Capture Image
Process Image
Image Processed
alt
[Face recognized]
Store User Details
Details Stored
Show Success Message
[Face not recognized]
Show Error Message
Click on Sign In
Show Sign In Form
Enter Username and Capture Image
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[Username and face match]
Show Success Message
Redirect to Home Page
[No match]
Show Error Message
Click on Contact
Show Contact Form
Fill Contact Form
Send Message
Show Success Message
Click on Feedback
Show Feedback Form
Fill Feedback Form
Store Feedback
Show Latest 3 Feedbacks
Visit Home Page
Show Home Page with User Profile
Click on Explore
Show Explore Page
Get Top 50 Restaurants
Return Restaurant Data
Show Restaurants and Graphs
Click on Recommend
Show Recommend Page
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Search Restaurant Data
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[Restaurant Found]
Show 5 Recommended Restaurants
Rate and Add to Favorite
Update Favorites
Show Popup
[Restaurant Not Found]
Show Not Found Message
Get Random Recommendations
Return Random Recommendations
Show Random Recommendations
Click on Favorite
Show Favorite Page
Get User Favorites
Return Favorites
Show Favorite Restaurants
User
WebApp
FaceRecognition
Database
Admin

ADVANTAGES

1. **Enhanced User Experience:**

- Personalized Recommendations: Collaborative filtering tailors recommendations to individual users based on their preferences and past interactions, improving user satisfaction.
- Popular Choices: Popularity-based recommendations highlight top-rated restaurants, helping users quickly find highly regarded options.

2. **Diverse Recommendation Strategies:**
    - Popularity-Based Filtering: Provides reliable recommendations based on overall ratings, which is useful for new users without prior data.
    - Collaborative Filtering: Offers personalized recommendations, catering to users' unique tastes and preferences.

3. Comprehensive Data Utilization:
    - Rich Dataset: Utilizes a large dataset (56117 records) from Zomato, ensuring a broad range of restaurant options and accurate recommendations.
    - User-Generated Content: Leverages user ratings to inform collaborative filtering, making recommendations more relevant and dynamic.

4. **Interactive and Engaging Interface:**
    - Visualization Tools: Linear regression and bar regression graphs help users understand rating trends and cost distributions.
    - User Ratings: Allows users to rate restaurants, continuously improving the recommendation system and engaging users in the platform.

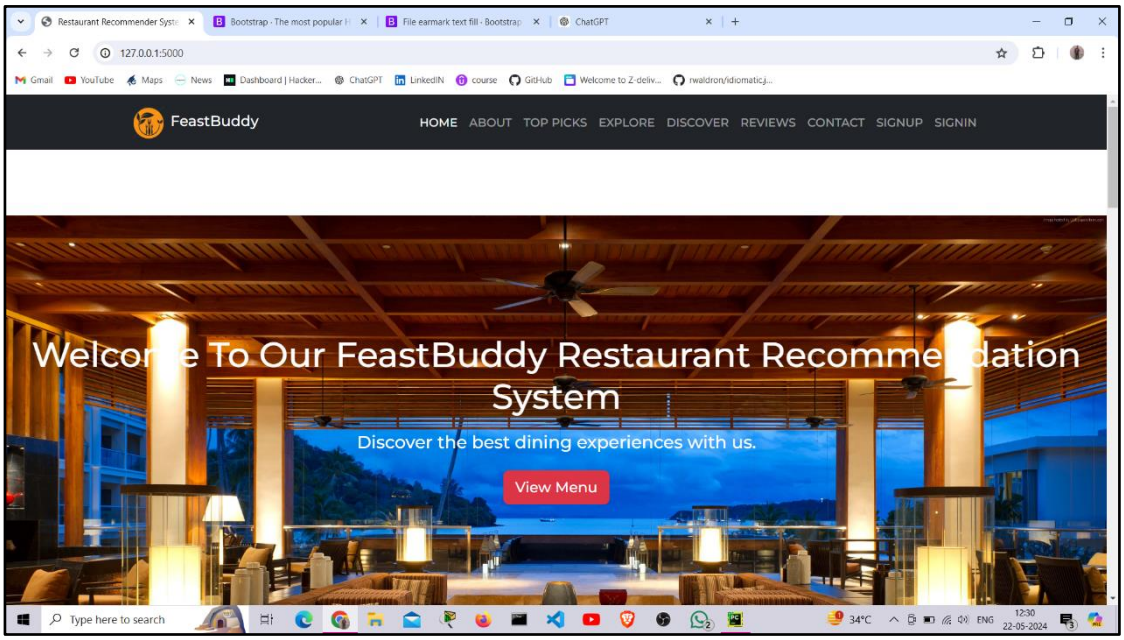
5. **Scalability:**
    - Scalable Architecture: The Flask framework and AWS deployment enable the system to handle increasing numbers of users and data points efficiently.
    - Modular Design: Easy to extend and enhance with additional features or new recommendation algorithms in the future.

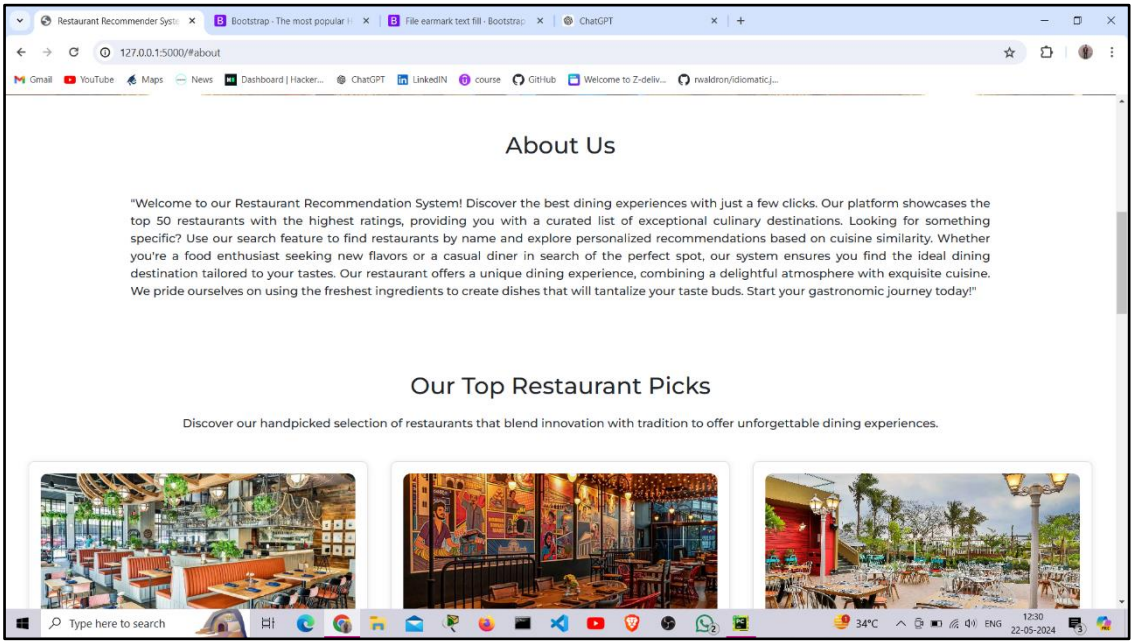
PROJECT DESCRIPTION

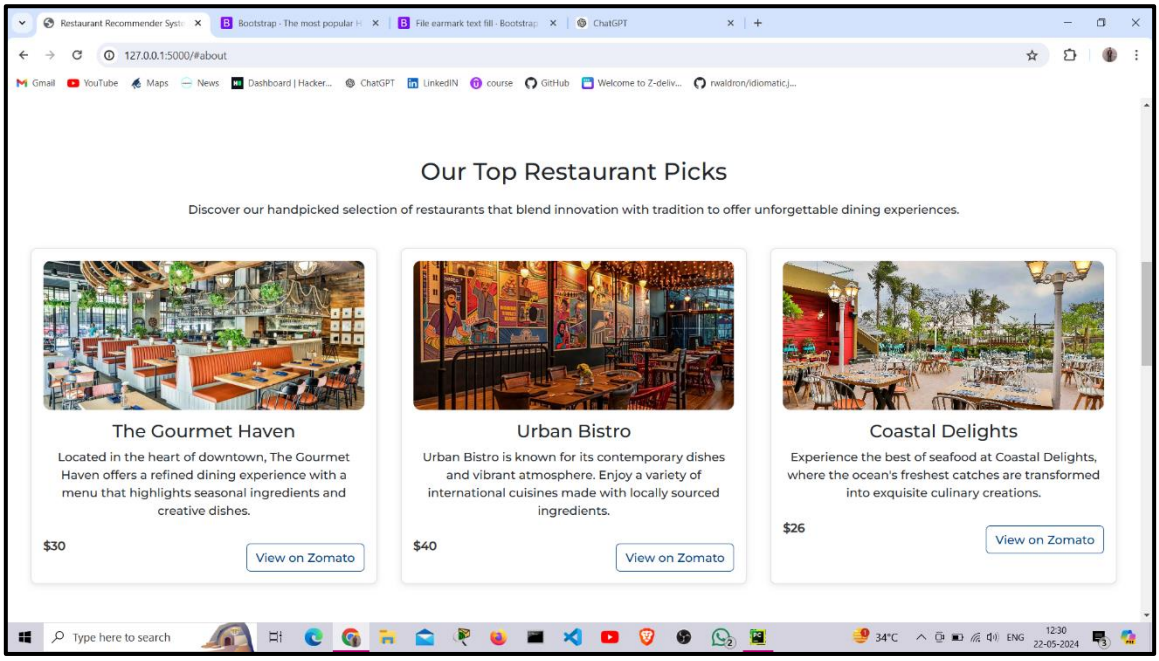
1. Index Page :-

So firstly there is Index Page before login for the user where I have shown the Title of Project and its small description with random image with navigation bar which contains menus Home, About, Top Picks, Explore, Discover, Reviews, Contact, Feedback, SignUp and SignIn. This home page also contains the footer. I have created this home page using Html css and bootstrap and python in flask application.

INDEX PAGE



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127.0.0.1:5000/#about
Gmail
YouTube
Maps
News
Dashboard | Hacker...
ChatGPT
LinkedIN
course
GitHub
Welcome to Z-deliv...
rwaldron/idiomatic.j...
Our Top Restaurant Picks
Discover our handpicked selection of restaurants that blend innovation with tradition to offer unforgettable dining experiences.
The Gourmet Haven
Located in the heart of downtown, The Gourmet Haven offers a refined dining experience with a menu that highlights seasonal ingredients and creative dishes.
$30
View on Zomato
Urban Bistro
Urban Bistro is known for its contemporary dishes and vibrant atmosphere. Enjoy a variety of international cuisines made with locally sourced ingredients.
$40
View on Zomato
Coastal Delights
Experience the best of seafood at Coastal Delights, where the ocean's freshest catches are transformed into exquisite culinary creations.
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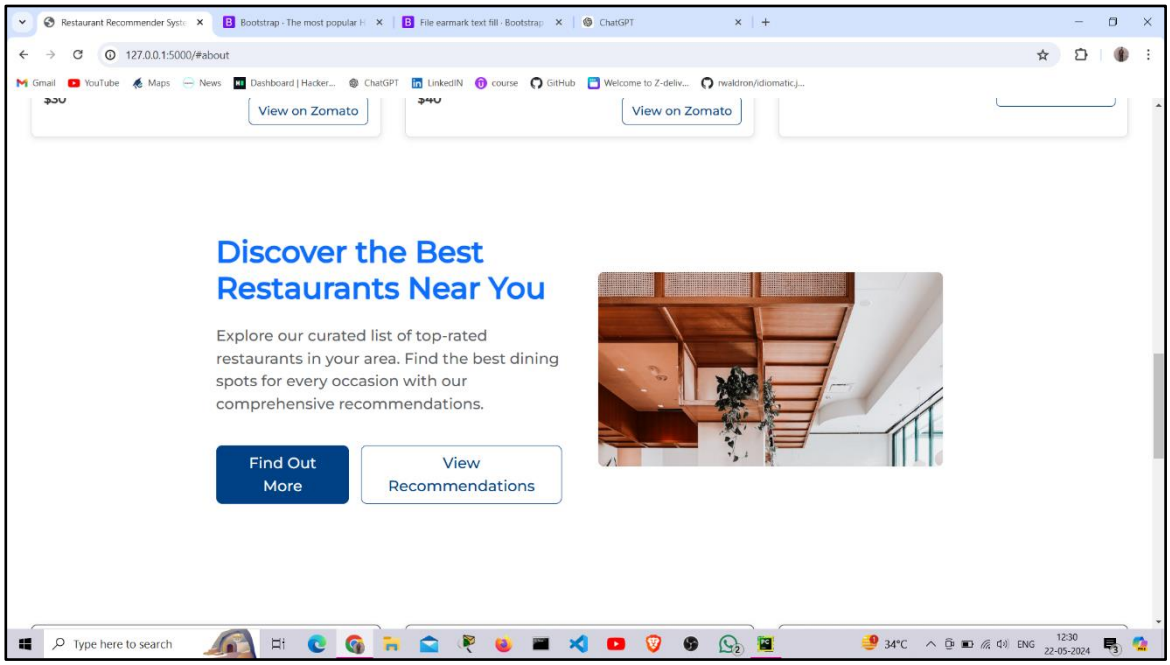
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Dashboard | Hacker...
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View on Zomato
View on Zomato
Discover the Best Restaurants Near You
Explore our curated list of top-rated restaurants in your area. Find the best dining spots for every occasion with our comprehensive recommendations.
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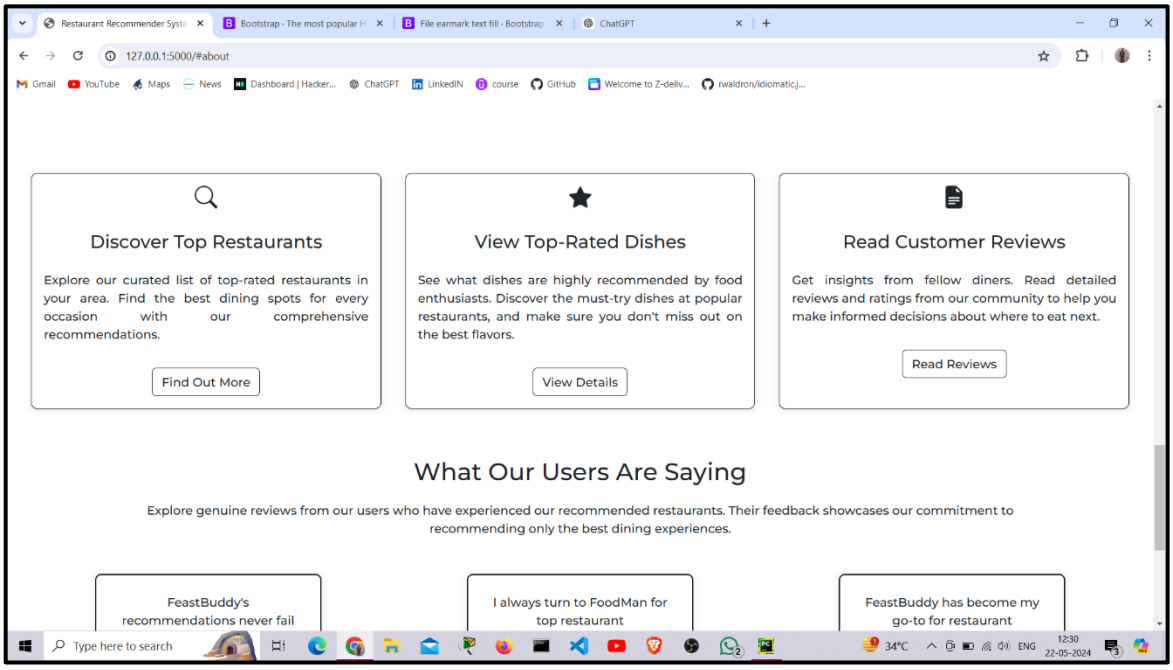
Restaurant Recommender Syste
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File earmark text fill - Bootstrap
ChatGPT
127.0.0.1:5000/#about
Gmail
YouTube
Maps
News
Dashboard | Hacker...
ChatGPT
LinkedIN
course
GitHub
Welcome to Z-deliv...
rwaldron/idiomatic.j...
Discover Top Restaurants
Explore our curated list of top-rated restaurants in your area. Find the best dining spots for every occasion with our comprehensive recommendations.
Find Out More
View Top-Rated Dishes
See what dishes are highly recommended by food enthusiasts. Discover the must-try dishes at popular restaurants, and make sure you don't miss out on the best flavors.
View Details
Read Customer Reviews
Get insights from fellow diners. Read detailed reviews and ratings from our community to help you make informed decisions about where to eat next.
Read Reviews
What Our Users Are Saying
Explore genuine reviews from our users who have experienced our recommended restaurants. Their feedback showcases our commitment to recommending only the best dining experiences.
FeastBuddy's recommendations never fail
I always turn to FoodMan for top restaurant
FeastBuddy has become my go-to for restaurant
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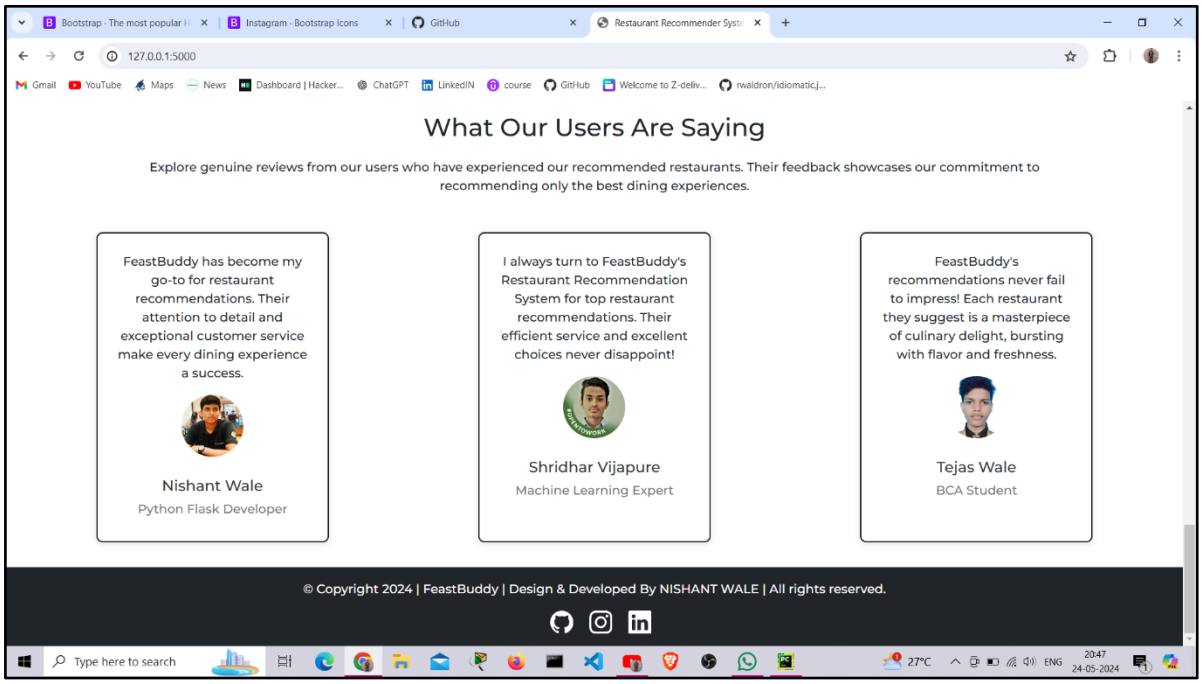
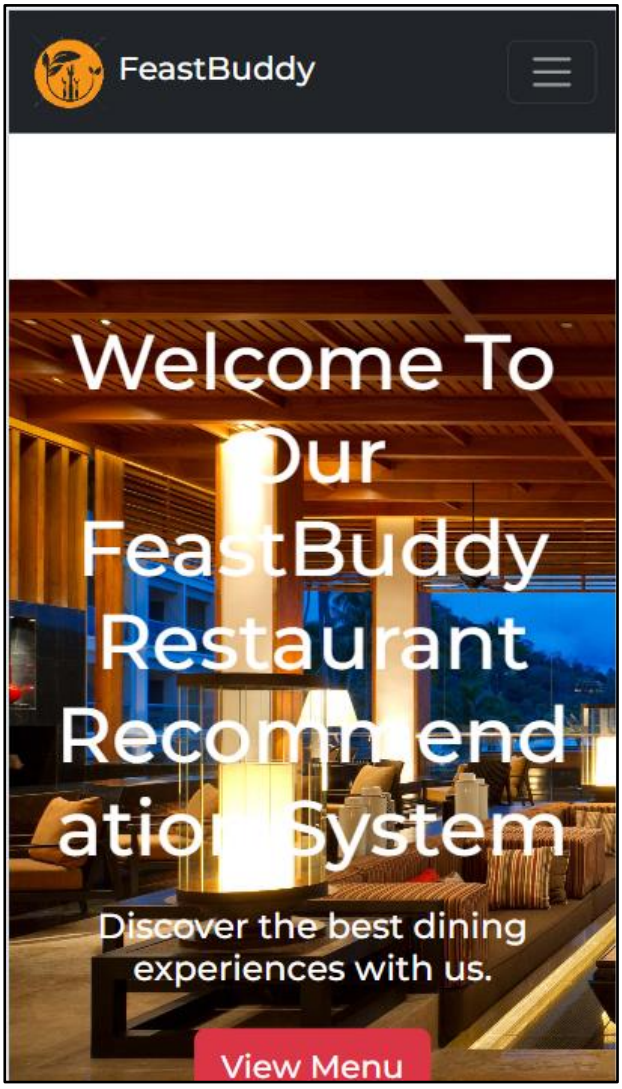




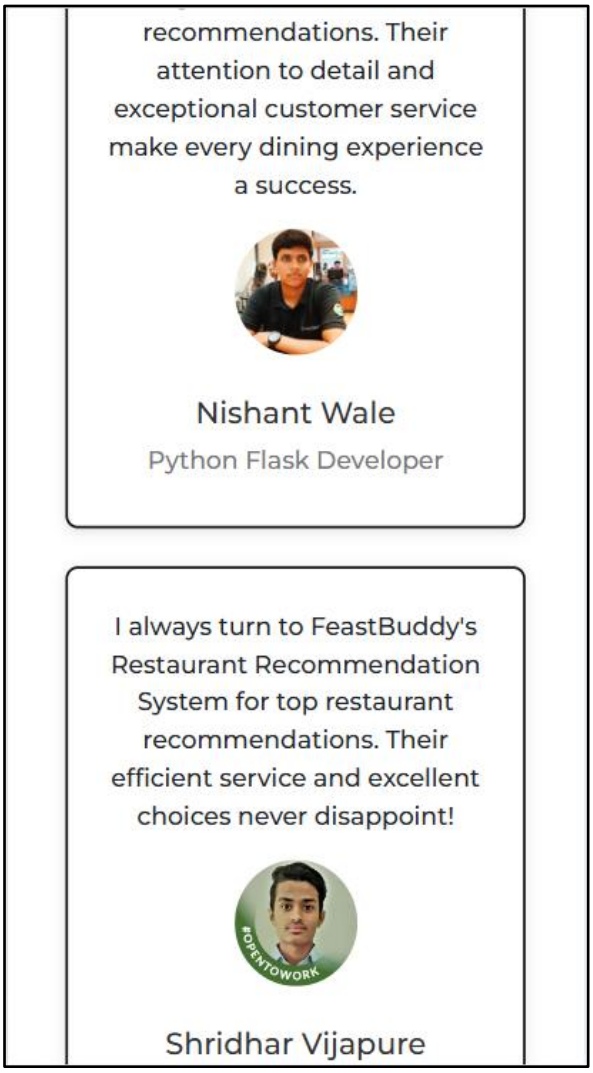


Fig. 8.1 INDEX PAGE

2. Contact page –

when user click on the contact menu on index page then he directs to contact page of mine where I have provided the form when user enters the email id name and message and click on send then the that message is directly come to my email id.

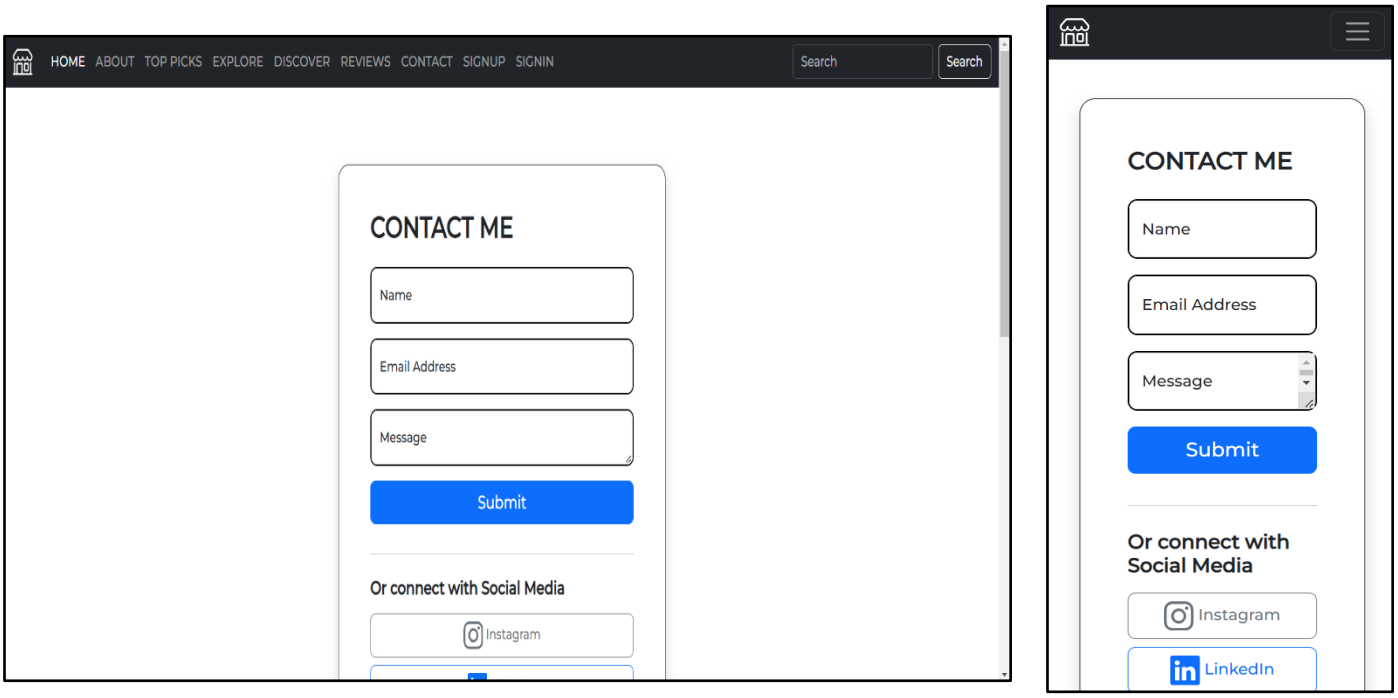


FIG. 8.2 CONTACT PAGE

3. Feedback page –

when user clicks on Feedback menu on index page then he redirects to feedback page where I have provided the four input fields to user such as Name, Qualification, Upload Image and Message text Area to take the feedback from user about my website for what he felt. after submitting the feedback user automatically redirects to index page and on that page in Review section the users latest 3 feedbacks are updated with user review name qualification and image.

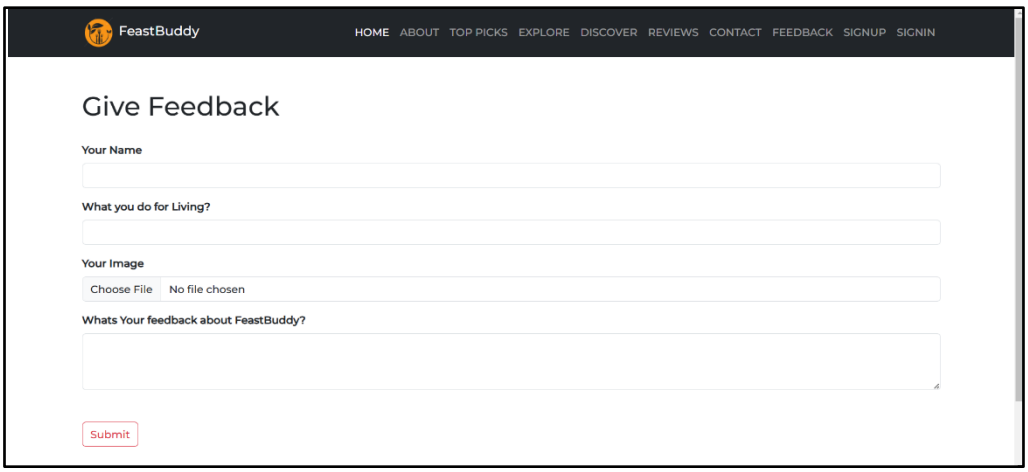
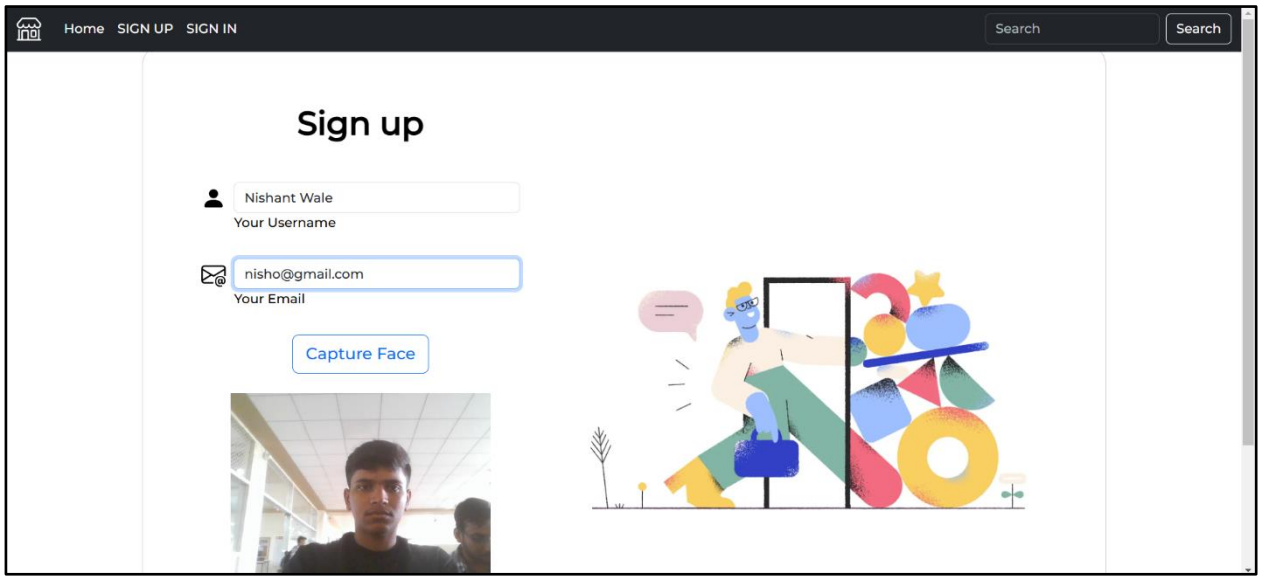


FIG. 8.3 FEEDBACK PAGE

4. Signup page –

so when user click on Signup menu on Index page navigation bar then he redirects to signup page where I have created Advanced signup form including username, email and the one Capture Image button. For this Sign Up I have Integrated the Face recognition with the library of face_recognition in python. when user clicks on signup menu on index page then this signup page takes the access for the video and after allowing the device's camera will open. I have provided the username, email and one video frame in this so user can easily fit his face in frame and clicks on capture image then captured image will be shown below the video frame and when clicking Register button if image will store in SQLite database in encrypted format and if captured image is clear then it will show the message on that signup page Registered Successfully otherwise show Face not detected. I have created This using html css bootstrap for frontend and python for backend in flask application.



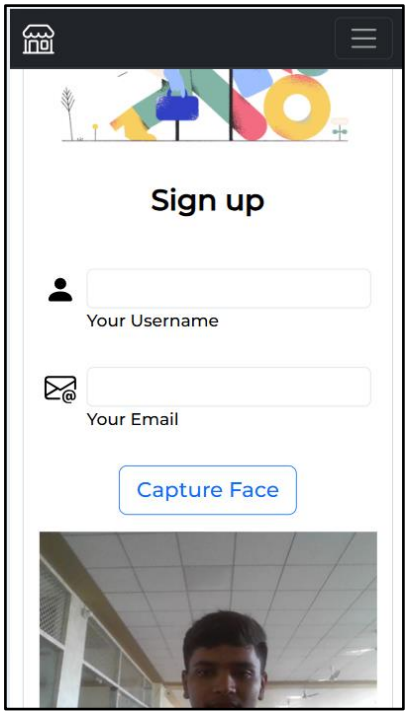


FIG. 8.4 USER SIGN UP PAGE

5. Sign In Page –

when user clicks on the sign in menu on navigation bar of the index Page or signup page Then he redirects to the sign in page where he can enter the same username capture the image which he was done during signup process and if the username and captured image is matching with image which stored during signup process in database then it will login the user on home.html with the flash message logged in successfully and if username or face doesn't matches then shows error message No Face detected, Try Again.

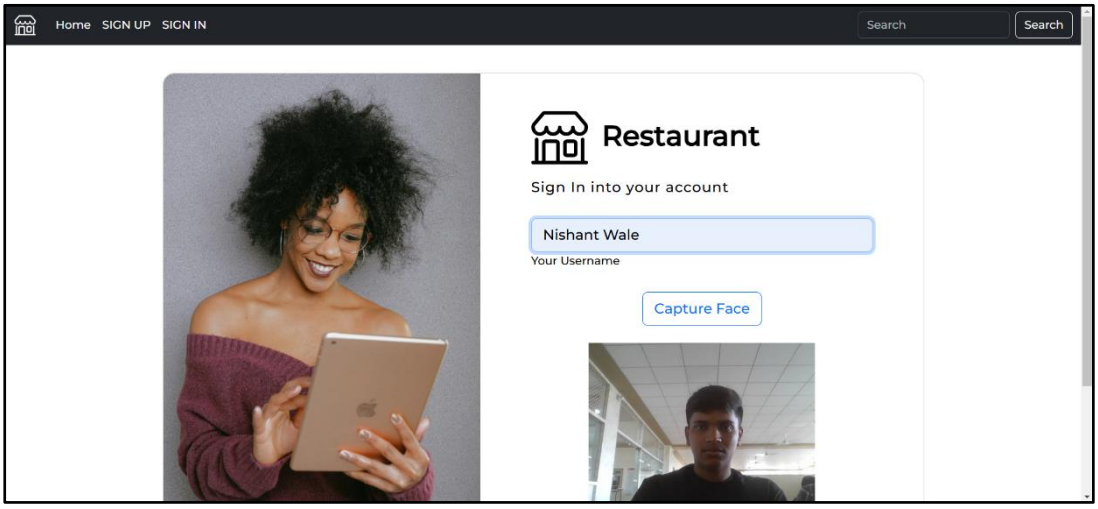


FIG. 8.5 USER SIGN IN PAGE

6. Home page –

after login successfully user will redirect to this Page where user profile is showing like Welcome, Username! with username email and logout button with footer and navbar

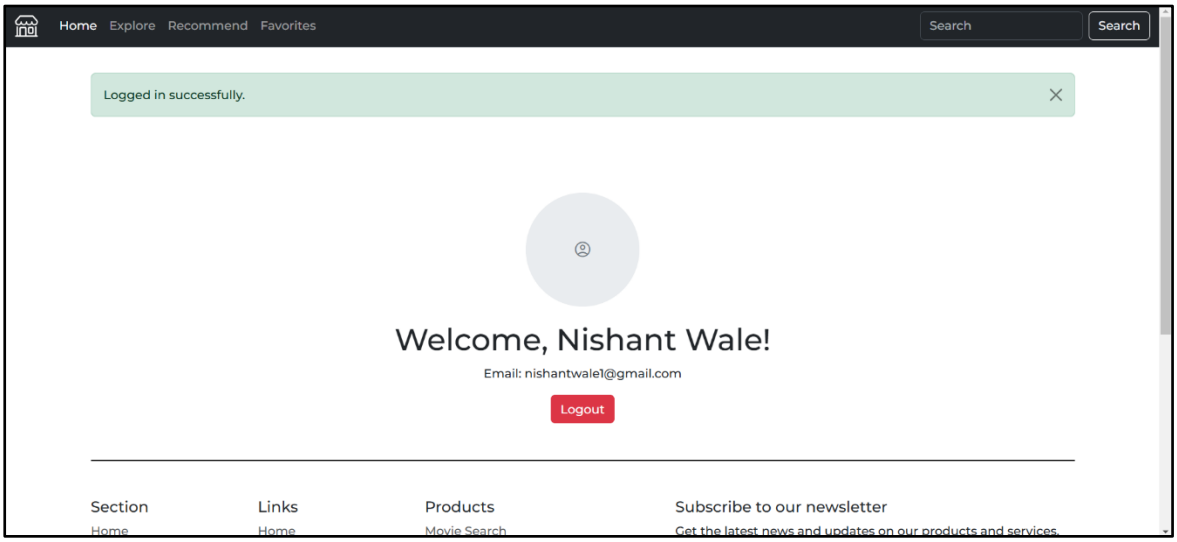


FIG. 8.6 USER HOME PAGE

7. **Explore Page –**

This page contains the Top 50 Restaurants with image location cost votes and avg_rating and link of the restaurant and I have arranged them in ascending order based on the avg_rating. for these 50 restaurant I have used Zomato dataset from kaggle and I have preprocessed the data on it in jupyter notebook and generated the pickle of these 50 restaurants and used it in flask application and then deployed on web using html, css and bootstrap. this also contains navigation bar with 4 menus Home, Explore, Recommend and favorite and also contains the footer. and also in this I have shown the linear regression line graph for the 50 restaurants and the bar regression graph. for this I have used the Popularity based filtering.

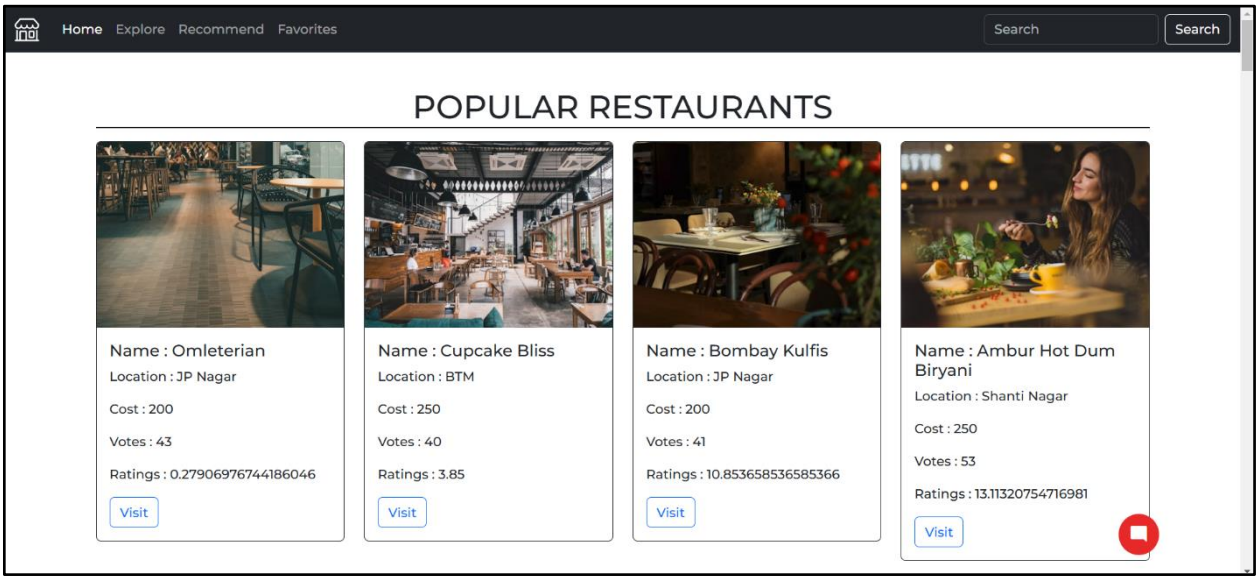


FIG. 8.7 EXPLORE PAGE

8. **Recommend Page –**

when user click on Recommend Menu on the Home Page Navigation bar after the Login Then The Recommend Page opens where there is one search bar and search button So When user search the specific restaurant name from the dataset then after hitting search button I have recommended him 5 restaurants based on the cuisines of that searched restaurant name. So basically on that dataset I did some preprocessing and filtered the data. for this I have used the content based filtering. first i have selected the specific columns from the dataset to show on the website and then selected the specific column which is best for filtering the data and show the recommendations so I selected the cuisine and then filtered the data. I have also provided one feature to add the recommended favorite restaurant to Favorite section by clicking on Add to Favorite button on each recommended restaurant. when clicking on add to favorite button then one popup will show like restaurant is added to favorites and if user gain clicks on that same restaurant add to favorite button then again

one popup will show like restaurant is already in favorites. I have also added 5 star symbol rating so if user likes that restaurant then he can give the rating and after refreshing the page then user can also see the updated rating. I have also shown the linear regression line and bar regression graph for the recommended restaurants. and if the entered restaurant name not found it shows the message the restaurant name not found you can try these instead and then again shown the random 5 recommendations.

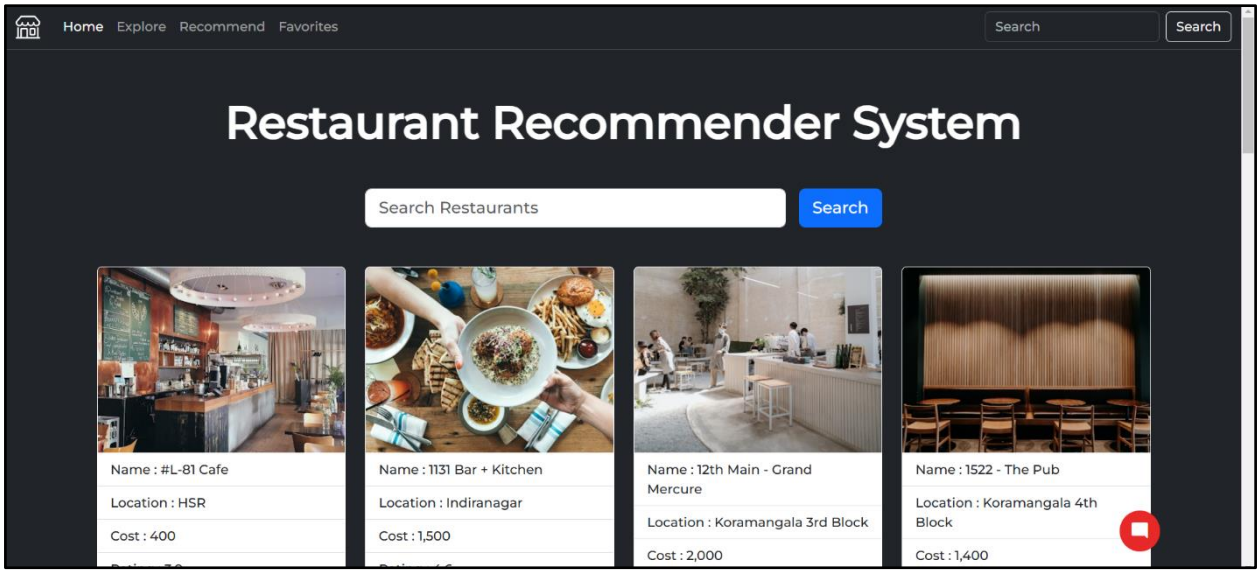


FIG. 8.8 RECOMMEND PAGE

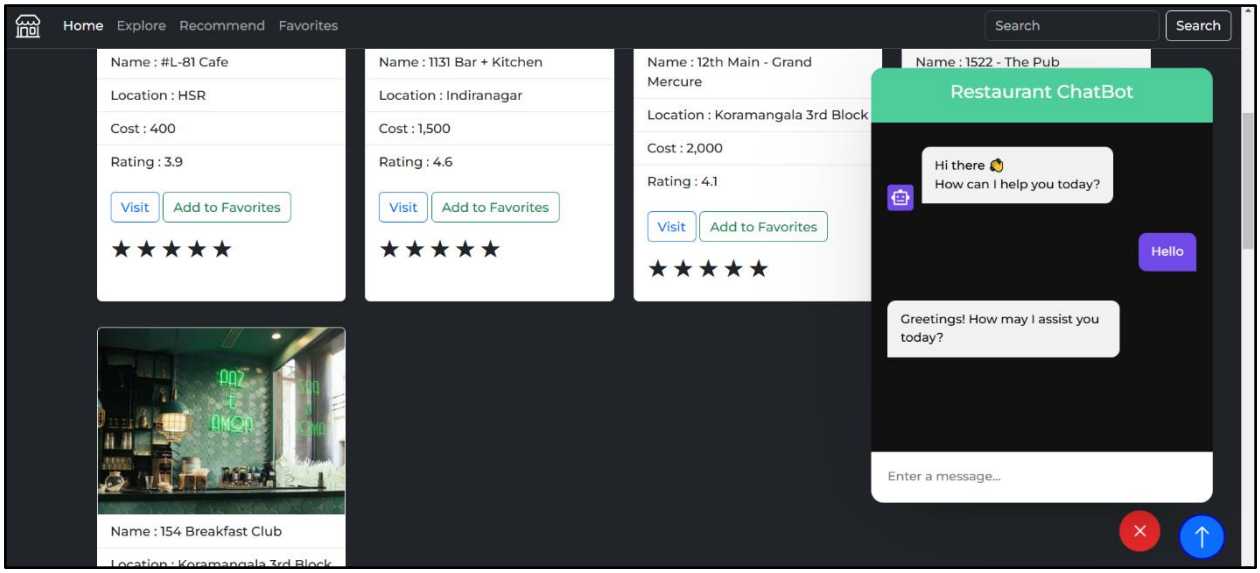


FIG. 8.8.1 RECOMMEND PAGE CHATBOT

9. Favourite Page–

This is the favourite page of user where user's added favourites restaurant are shown.

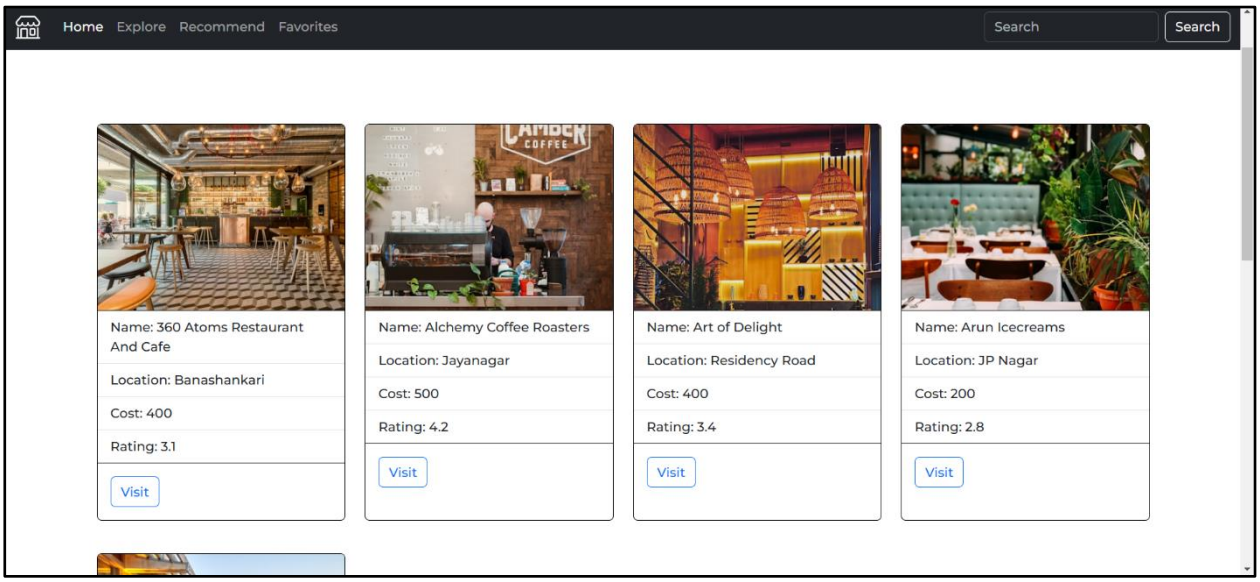
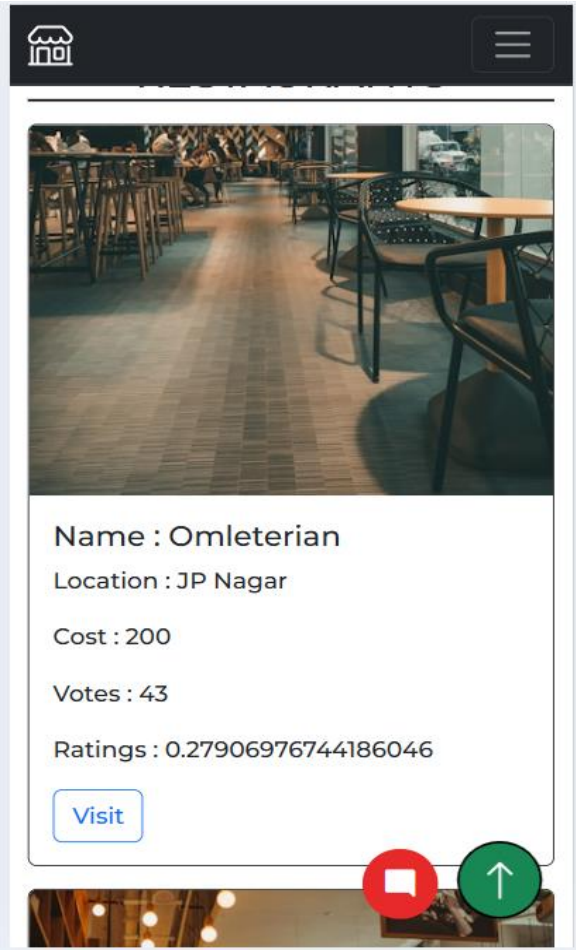


FIG. 8.9 FAVOURITE PAGE



TECHNOLOGIES

The restaurant recommendation system uses a range of technologies to collect data, process user preferences, and provide personalized recommendations. Each technology contributes significantly to the system's performance and usability. The following are the technologies used in the project:

1. Dataset Acquisition and Processing

The Zomato dataset obtained from Kaggle serves as the primary data source for the restaurant recommendation engine. This dataset provides information about thousands of restaurants, such as their names, locations, cuisines, ratings, and other pertinent features. The dataset serves as the foundation for building machine learning models and making suggestions based on user preferences.

2. Machine Learning Algorithms

As a branch of artificial intelligence (AI), machine learning (ML) aims to create models and algorithms that can learn from data and produce conclusions or predictions without the need for explicit programming instructions. In order to provide personalized recommendations, machine learning analyzes past interactions, institution data, and client preferences. This is a critical function of machine learning in restaurant recommendation systems. The following is a list of the key components and principles of machine learning that apply to the project.

a) Supervised Learning: In supervised learning, a model is trained using labeled data, with each data point representing a target label or outcome. In the restaurant recommendation system, supervised learning techniques are utilized to anticipate customer preferences or restaurant ratings based on previous data.

b) Unsupervised Learning: Unsupervised learning involves training a model on unlabeled data to discover patterns, structures, or groupings within the data. In the context of the recommendation system, unsupervised learning techniques may be used for clustering similar restaurants or identifying user segments based on preferences.

c) Collaborative Filtering: Collaborative filtering is a popular technique used for recommendation systems, where similarities between users or items are leveraged to make predictions or recommendations. In the restaurant recommendation system, collaborative filtering algorithms analyze user ratings or interactions with restaurants to identify similar users or restaurants and make personalized recommendations.

d) Popularity-Based Filtering: Popularity-based filtering is a simple yet effective approach where recommendations are based on the overall popularity or average ratings of items. In the recommendation system, popularity-based filtering may be used to recommend top-rated or trending restaurants to users.

e) Linear Regression: The relationship between a dependent variable and one or more independent variables can be statistically represented using linear regression. The relationship between restaurant variables (such as pricing and location) and user ratings can be investigated in the context of the recommendation system using linear regression, potentially providing insights for recommendation development.

3. Flask Framework

Developing online applications and APIs is made simple with Flask, a lightweight and flexible Python web framework. Flask can be used for projects of different sizes and complexity since it provides a set of straightforward but effective web application development tools. User interaction with the restaurant recommendation system is facilitated by the web application interface created with Flask framework. Relevant to this project, the following are significant Flask features and components:

a) Routing: Flask uses routes to map URLs to functions, allowing developers to define endpoints for handling requests from clients. Routes specify the URL pattern and the corresponding function to execute when the pattern matches a request.

b) Templates: Flask supports the use of Jinja2 templates for generating dynamic HTML content. Templates allow developers to create reusable HTML templates with placeholders for dynamic data, making it easy to generate dynamic web pages.

c) Request Handling: Flask provides built-in functions for handling various types of HTTP requests, including GET, POST, PUT, and DELETE. Developers can define route functions to handle different types of requests and access request data such as form inputs or URL parameters.

d) Response Generation: Flask enables the generation of HTTP responses using built-in functions or custom response objects. Developers can return HTML content, JSON data, or other types of responses based on the client's request.

FUTURE SCOPE

1. **Advanced Machine Learning Algorithms:** The recommendation system can become more accurate and efficient with further developments in machine learning techniques. Researching reinforcement learning algorithms and deep learning approaches can result in more accurate recommendations catered to the tastes of certain users.
2. **Integration with Emerging Technologies:** To create immersive eating experiences, embrace cutting-edge technology like augmented reality (AR) and virtual reality (VR). While VR simulations allow consumers to digitally sample restaurant ambiance before making reservations, augmented reality overlays can provide real-time restaurant information and the reviews.
3. **Dynamic Pricing and Promotions:** Use dynamic pricing tactics in response to changes in user preferences, seasonal trends, and demand. Increase user engagement and boost sales for affiliated restaurants by integrating promotional offers and discounts that are customized for particular user categories and the user preference.
4. **Enhanced User Interaction:** Enhance user interaction through chatbots and voice-enabled interfaces for intuitive navigation and personalized recommendations. Incorporate natural language processing (NLP) capabilities to understand user queries and provide relevant restaurant suggestions in real-time.
5. **Geo-fencing and Location-Based Services:** Utilize geo-fencing technology to send targeted notifications and special offers to users when they are in proximity to recommended restaurants. Leverage location-based services to provide accurate directions, parking information, and real-time traffic updates for seamless dining experiences.
6. **Social Media Integration:** Integrate social media platforms to enable users to share their dining experiences, reviews, and recommendations with friends and followers. Leverage social media analytics to identify trending restaurants and influencer recommendations for inclusion in the recommendation system.
7. **Sustainability and Dietary Preferences:** In order to support environmentally responsible dining options and accommodate customers with certain dietary requirements or preferences, such as vegan, gluten-free, or organic selections, integrate sustainability indicators and dietary preferences into the recommendation algorithm.

CONCLUSION

To summarize, the development of the Popularity-Based and Collaborative Filtering-based Restaurant Recommendation System is a big step forward in the use of machine learning algorithms to improve user dining experiences. The system promises to give personalized restaurant suggestions based on individual interests and user behavior by combining popularity-based and collaborative filtering methodologies.

The system's architecture uses complex AI algorithms to assess user ratings, restaurant features, and geographical data in order to create appropriate suggestions. Popularity-based filtering displays the highest-rated eateries, whereas collaborative filtering uses user ratings and preferences to provide individualized recommendations based on similarity criteria.

Moving forward, the project has enormous potential for future improvements and extensions. Integration with developing technologies, including augmented reality, dynamic pricing techniques, and social media integration.

Furthermore, attempts to improve data privacy, expand into new areas, and continuously develop based on user feedback will be critical for the system's relevance and competitiveness in the ever-changing field of restaurant recommendation systems.

Overall, the Popularity-Based and Collaborative Filtering-Based Restaurant Recommendation System demonstrates the ability of machine learning and artificial intelligence in transforming how people discover and interact with restaurants. By using the richness of available data and smart algorithms, the system not only aids informed decision-making but also fosters a more delightful and personalized dining experience for users worldwide.

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