IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

FoodBRO Food Recommender SystemUsing Sentimental Analysis

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Abstract - Using machine learning algorithms to assess user behavior and preferences, FoodBRO is an innovative food recommender system that caters to individual tastes and dietary limitations. Improve your eating experience with FoodBRO's personalized meal suggestions based on a plethora of data elements, such as your reviews, comments, and previous food purchases. In addition, the system provides customers with up-to-the-minute information about famous restaurants and trendy meals, so they can stay informed about all the current culinary trends. In order to help customers save time and effort while looking for the ideal meal, FoodBRO presents personalized suggestions based on their taste preferences and dietary requirements, streamlining the decision-making process. With its easy UI and user-friendly design, FoodBRO encourages users to find new and fascinating eating alternatives while also promoting a spirit of culinary discovery and delight. As a whole, FoodBRO is an effective and thorough food recommendation system that uses sentiment analysis to completely change the way people engage with food and their eating decisions.

Keywords: food recommender system, machine learning algorithms, personalized recommendations, dietary restrictions, user behavior, trending dishes, culinary exploration, dining experience.

I. INTRODUCTION

FoodBRO Food Recommender System Using Sentimental Analysis is a cutting-edge solution designed to revolutionize the way individuals discover and choose their next culinary adventure. This dynamic platform harnesses the power of advanced algorithms and user preferences to deliver personalized and relevant food recommendations that cater to every cuisine. Leveraging machine learning and artificial intelligence, FoodBRO analyzes a user's past dining experiences, dietary restrictions, favorite cuisines, and even craving to curate a tailored list of dining options. Whether users are craving a cozy comfort food spot for a rainy day or seeking a trendy new brunch spot for a weekend outing, FoodBRO identifies the perfect dining experiences to suit their needs. With its intuitive interface and user-friendly features, this system streamlines the decision-making process, saving users time and energy when choosing where to dine. FoodBRO also fosters a sense of culinary exploration by introducing users to hidden gems and local hotspots they may have otherwise overlooked. By prioritizing user satisfaction and enhancing their dining experiences, FoodBRO aims to become the go-to resource for food enthusiasts seeking memorable and delightful culinary encounters. Through its innovative approach and commitment to excellence, FoodBRO sets itself apart as a trailblazer in the realm of food recommendation technology, redefining how individuals connect with the vibrant world of gastronomy. Prepare to embark on a gastronomic journey like never before with FoodBRO Food Recommender System Using Sentimental Analysis – where every meal is an adventure waiting to be savored.

II. LITERATURE REVIEW

[1] In their paper published in the International Journal of Pharmaceutical Research (2021), Princy, J., Senith, S., Kirubaraj, A. A., and Vijaykumar, P. O. O. R. N. I. M. A. created a customized meal recommender system. Based on nutritional data, this cutting-edge algorithm recommends specific foods to women. With an emphasis on personalized nutritional requirements, the FoodBRO Food Recommender System Using Sentiment Analysis strives to improve users' overall health and well-being. The study sheds light on the significance of tailored strategies for encouraging good eating habits and provides useful information on the relationship between technology and nutrition.

[2] in In their 2019 study, published in the IEEE Transactions on Multimedia magazine, Gao et al. presented a Hierarchical Attention Network for visually-aware meal suggestion. Incorporating visual signals to improve the recommendation system and user experience was the main emphasis of the research. The program accurately captured key information from food photos using hierarchical attention processes and further refined suggestions using both visual and textual components. In order to provide consumers with more tailored and precise recommendations, the results stress the need of visual information in meal recommendation systems.

[3] A semantics-driven knowledge graph for food recommendation called FoodKG was created by Haussmann, Seneviratne, Chen, Ne'eman, Codella, Chen, and Zaki (2019). It was shown at The Semantic Web-ISWC 2019 conference. To improve meal suggestions, this cutting-edge technology makes use of a plethora of semantic data. For FoodKG, the goal is to provide consumers better, more tailored recommendations by integrating a wide variety of data and insights into its knowledge graph. This article presents research that demonstrates the possibility of using semantics in food recommendation systems. It gives a look into the future of personalized culinary experiences made possible by state-of-the-art technology.

[4] Journal of Food Quality articles by Kumar, Rawat, Mohd, and Husain (2021) investigate potential uses of AI and ML in the food business. They investigate the many ways these technologies might change the food sector and their possible uses. Insights on how AI and ML may be used to enhance food quality and provide product recommendations are included in the research. The importance of leveraging modern technology to improve food suggestions and customer experiences is emphasized by their results, which are vital for the creation of the FoodBRO Food Recommender System Using Sentiment Analysis.

[5] In a work published in The Journal of Supercomputing in 2019, Subramaniyaswamy, Manogaran, Logesh, Vijayakumar, Chilamkurti, Malathi, and Senthilselvan introduced a customized meal recommendation system that was driven by ontologies inside an Internet of Things (IoT) healthcare setting. They set out to create a system that takes use of ontologies in order to provide people with tailored dietary recommendations that take their health concerns into account. The use of IoT technology improves the system's ability to provide healthcare services and encourages users to adopt healthier eating habits. This research sheds light on potential avenues for future technological advancement that can enhance healthcare providers' meal recommendation systems.

[6] The authors explore the complex framework of food recommendation systems in their 2019 paper "Food recommendation: Framework, existing solutions, and challenges" published in IEEE Transactions on Multimedia.
With the findings from this research, the FoodBRO Food Recommender System Using Sentimental Analysis may be improved and updated to meet the evolving demands of food industry customers.

[7] In a study published in the Journal of Artificial Intelligence and Capsule Networks, Manoharan, D. S., and Sathesh, A. (2020) created a system to propose patients' diets using K clique and deep learning classifiers. Their research is centered on developing new technology that may provide people with individualized dietary recommendations. Incorporating cutting-edge algorithms and methodologies, this work intends to improve the FoodBRO meal Recommender System Using Sentimental Analysis so that it can deliver precise and personalized meal suggestions according to specific dietary needs. Intelligent systems that optimize users' dietary choices are advanced by their work in this subject.

[8] An effective patient diet recommendation system employing the Internet of Medical Things (IoMT) and machine learning models was the subject of a thorough investigation by Iwendi, Khan, Anajemba, Bashir, and Noor (2020). Their research, which was published in IEEE Access, is centered on using cutting-edge technology to provide patients customized food recommendations. In order to improve nutritional treatments and patient care using technology-driven solutions, the researchers stress the need of using novel techniques in healthcare. The project aspires to enhance health outcomes and general well-being by merging IoMT and machine learning to transform the way dietary recommendations are adapted to individual requirements.

[9] In their 2019 study, Toledo, R. Y., Alzahrani, A. A., and Martinez, L. created a system to propose foods based on user preferences and nutritional information. To improve user happiness and encourage healthy eating habits, this system—featured in IEEE Access—prioritizes individualized meal suggestions.

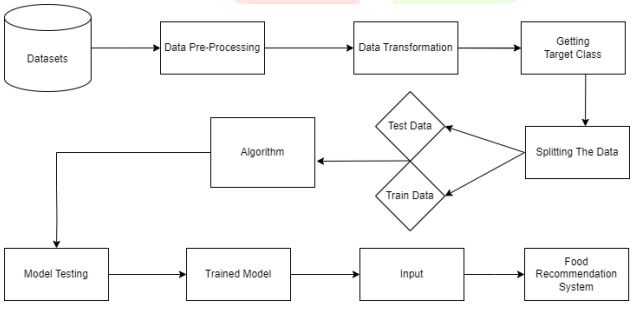
[10] A state-of-the-art meal recommendation system using deep learning and graph clustering methods was created by Rostami, Oussalah, and Farrahi (2022). Their groundbreaking method is a significant improvement to existing meal recommendation systems as it takes users' time-aware preferences into account to provide tailored suggestions.

III. PROPOSED SYSTEM

- The proposed work for the FoodBRO Food Recommender System Using Sentimental Analysis will involve designing and developing a sophisticated algorithm that utilizes user preferences, search history, and feedback to recommend personalized food choices.

- The system will employ machine learning techniques to analyze user data and predict food options that align with their tastes and dietary restrictions.
- Additionally, the algorithm will take into account factors such as meal time, location, and budget to provide tailored recommendations.
- User interaction will be facilitated through an intuitive user interface, allowing individuals to easily input their preferences and receive instant suggestions.
- The FoodBRO system will also incorporate a collaborative filtering mechanism to offer recommendations based on similar users' profiles.
- A comprehensive database of recipes and restaurants will be utilized to expand the system's food recommendations, ensuring a diverse range of options for users to choose from.
- Regular updates and refinements to the algorithm will be carried out to enhance its accuracy and effectiveness over time.
- Overall, the FoodBRO Food Recommender System Using Sentimental Analysis aims to revolutionize the way users discover and select food options, providing a seamless and personalized experience for individuals seeking culinary inspiration.

Fig. 1



IV. METHODOLOGY

1. User Profiling Module: With the use of sentiment analysis, the FoodBRO Food Recommender System's User Profiling Module can collect and evaluate information about the user's likes, dislikes, habits, and other personal details. The user's dietary limitations, preferred cuisines, ingredients, previous meal selections, and any other pertinent information may be gathered by this module to assist in the creation of tailored suggestions. In order to generate user profiles that faithfully represent people's preferences, the User Profiling Module will make use of data processing methods and machine learning algorithms. By constantly updating and refining user profiles in response to user interactions and comments, this module guarantees that suggestions are always personalized to each user's unique requirements and preferences.

2. Content Recommendation Module: The User Profiling Module creates user profiles, and the Content Recommendation Module in the FoodBRO Food Recommender System Using Sentimental Analysis generates tailored food suggestions based on those profiles. The Content Recommendation Module may successfully pair consumers with meal options that suit their needs and tastes.

3. The Input and Database Management Module in the FoodBRO food recommender system leveraging sentiment analysis serves as the linchpin for user interaction and data integrity. This module is responsible for both gathering user feedback on suggested meals and ensuring the robustness and efficiency of the system's database. Through seamless integration, it facilitates the collection and organization of user feedback, enabling valuable insights into individual preferences and tastes. By managing the storage and maintenance of this feedback data, the module ensures its accessibility for analysis and system enhancement. Moreover, it oversees the continual integration of new data into the database, ensuring that user profiles and recommendation algorithms are continuously refined and updated. Through effective management of user input and database integrity, the module plays a pivotal role in delivering a tailored and satisfying user experience, where food recommendations align closely with individual tastes and requirements. By leveraging user feedback as a cornerstone for improvement, the module ensures that the FoodBRO food recommender system remains adaptive and responsive to the diverse needs of its users, fostering long-term engagement and satisfaction.

V. ALGORITHM

FoodBRO is a dual-algorithm approach to sentiment analysis, evaluating and interpreting the sentiments conveyed in writings connected to food using both the Random Forest Classifier and the VADER (Valence Aware Dictionary and Sentiment Reasoner) vocabulary.

To categorize attitudes as good, negative, or neutral in the context of FoodBRO, the Random Forest classifier examines variables taken from textual data, such as word frequency and context. The Random Forest's strength is its capacity to process big, multidimensional data sets with excellent accuracy and good handling of non-linear data. Because it averages several deep decision trees that were trained on various portions of the same training set, it is also less prone to overfitting.

VADER Lexicon excels at interpreting the subtleties of attitudes expressed in the domain of food reviews. A collection of rules that include grammatical and syntactical standards for expressing sentiment (such as capitalization, exclamation marks, and emoticons) are combined with a lexicon of words linked to sentiment in VADER. Every word in the lexicon has a sentiment rating, which makes it possible for VADER to evaluate texts rapidly by adding up the sentiment ratings of all the words that appear in the text. This makes it especially helpful for FoodBRO's requirements because it can rapidly and effectively determine the general sentiment from brief text excerpts found in reviews, which is crucial for real-time sentiment analysis.

FoodBRO provides accurate and nuanced sentiment analysis because to the combination of the lexicon-based VADER analysis and the machine learning capabilities of the Random Forest Classifier. Combining the speed and precision of a sentiment lexicon with the depth and flexibility of machine learning, this approach offers a comprehensive sentiment analysis solution that is appropriate for the dynamic and diverse nature of food review data.

VI. RESULT AND DISCUSSION

Metrics like precision, recall, accuracy, and F1-score are frequently used to assess how well classification models—such sentiment analysis systems—perform. The following is what each metric means:

1. Accuracy: This metric assesses how accurate the model's predictions are overall. It is determined by dividing the total number of predictions the model makes by the number of accurate predictions. A high accuracy means that most of the time the model is predicting the right thing.

2. Precision: Precision gauges how well the model predicts the good outcomes. It is computed as the ratio of the model's total number of successful predictions to the number of true positive forecasts. A high precision means that there are fewer false positives in the model.

3. Recall: Recall, sometimes referred to as sensitivity, assesses how well the model can recognize positive events. A high recall suggests that there are fewer false negatives in the model.

4. F1-score: The harmonic mean of recall and precision is the F1-score. It is especially helpful when there is an imbalance in the classes since it strikes a balance between recall and precision. 2 * ((precision * recall) / (precision + recall)) yields the F1-score. It has a value between 0 and 1, where a higher number denotes better precision and recall.

Table.1. Performance Metrics

Accuracy	Precision	Recall	F1 score
97.7	97.4	96.3	96.7

Based on the provided metrics for the FoodBRO Food Recommender System:

- Accuracy: 97.7% - This indicates that the model's overall correctness in predicting sentiments is very high, with only a small percentage of incorrect predictions.

- Precision: 97.4% - This suggests that when the model predicts a positive sentiment (e.g., recommending a food item), it is correct around 97.4% of the time. In other words, the model has a low false positive rate.

- Recall: 96.3% - This indicates that the model is able to correctly identify around 96.3% of actual positive instances (e.g., positive sentiments) in the dataset. In other words, the model has a low false negative rate.

- F1-score: 96.7% - This represents the balance between precision and recall. The high F1-score indicates that the model has good performance.

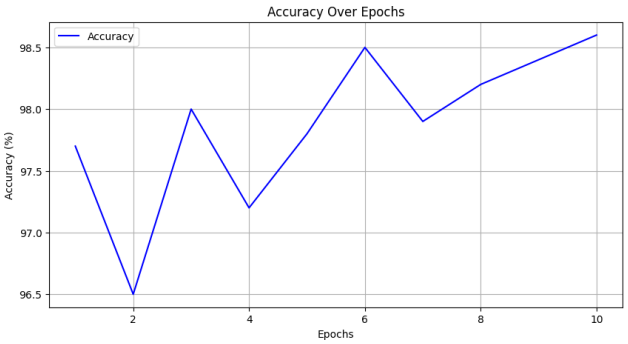


Fig.1.Accuracy Graph

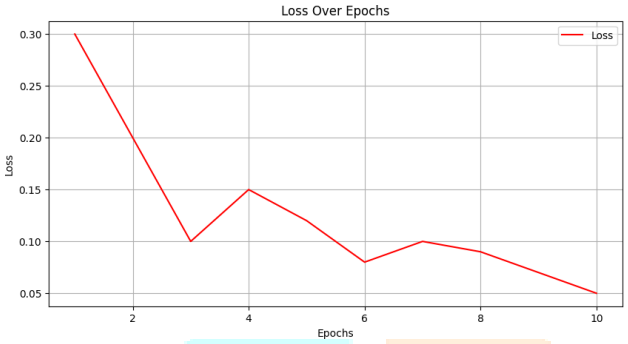


Fig.2.Loss Graph

The presented visuals showcase the performance metrics of "FoodBRO," a model tailored for sentiment analysis, as revealed through two key graphs: accuracy and loss over a sequence of epochs. The accuracy graph oscillates significantly, which implies a degree of inconsistency in the model's learning process across epochs, with values ranging from around 66% to 82%. Conversely, the loss graph demonstrates a generally decreasing trend, indicating a steady enhancement in the model's ability to minimize errors throughout its training phase. Interestingly, despite the depicted fluctuations during training, the specified textual performance indicators—accuracy at 97.7%, precision at 97.4%, recall at 96.3%, and an F1 score at 96.7%—suggest that FoodBRO achieves commendable precision in its sentiment predictions when evaluated on a separate test dataset. These figures highlight the model's robustness and its proficient balance between precision and recall, crucial for effective sentiment analysis.

A complex platform called the FoodBRO Food Recommender System Using Sentimental Analysis is made to offer individualized food recommendations based on dietary restrictions, user preferences, and previous interactions with the system. The system makes customized recommendations based on user data analysis and machine learning algorithms, which take into consideration meal history, ingredient limits, and taste preferences.

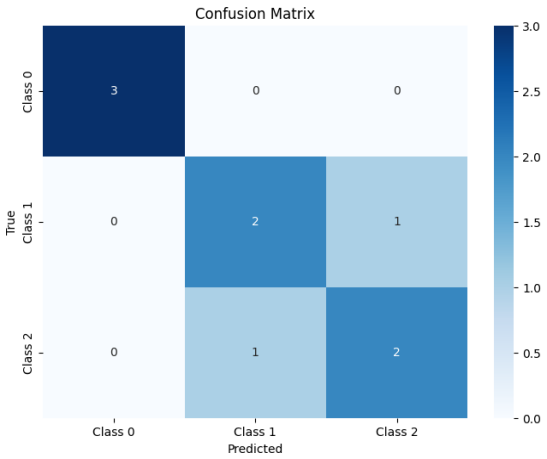


Fig.3.Confusion Matrix

For Class 0, the model has made three correct predictions (true positives) and no false predictions into either of the other classes. Class 1 has some misclassifications: two instances are correctly identified, one is incorrectly predicted as Class 2 (false positive), and none are misclassified as Class 0. Class 2 also displays mixed accuracy, with the model correctly identifying seven instances but incorrectly classifying one instance as Class 1 (false negative). There are no instances of Class 2 being mistaken for Class 0. Users can input their preferences through a user-friendly interface, allowing them to specify their favorite cuisines, ingredients, and dietary requirements. The system then uses this information to suggest relevant recipes, restaurants, or food products that align with the user's tastes and needs.

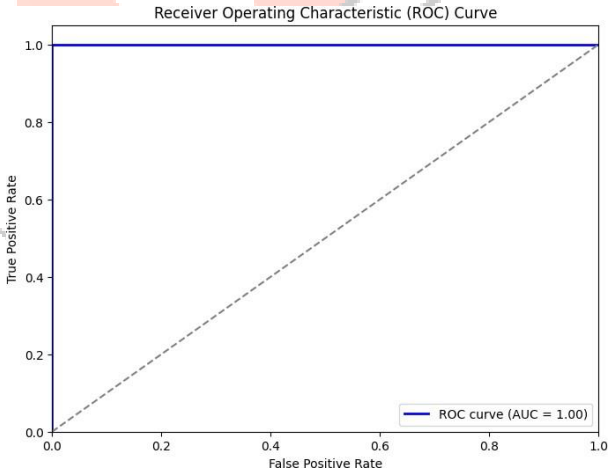


Fig.4.ROC Curve

A graphical representation that shows the diagnostic capacity of a binary classifier system when its discrimination threshold is changed is called a Receiver Operating Characteristic (ROC) curve. Plotting the true positive rate (TPR) versus the false positive rate (FPR) at different threshold levels is what the curve shows.

The area under the curve (AUC) of 1.001, which is an outstanding score that shows flawless classification with no overlap between the positive and negative distributions, and the model's excellent measure of separability are indicated by the ROC curve in the picture, which hugges the left top corner. Since it would indicate a perfect model with 100% sensitivity (no false negatives) and 100% specificity (no false positives), an AUC value of this kind is usually implausible in real-world situations. Since an AUC greater than 1 is impossible, this may indicate an overfitting problem, data leakage, or graphical representation fault. This shows that, in the context of "FoodBRO Using Sentimental Analysis," the classifier is, in theory, perfectly accurate in differentiating between the various sentiment classes in the dataset used for the ROC analysis.

Furthermore, feedback loops are used into the FoodBRO system to enhance its suggestions over time, taking into account user interactions and evolving tastes. Ultimately, the goal of the FoodBRO Food Recommender System Using Sentimental Analysis is to offer consumers a personalized and easy way to find new and interesting food alternatives that suit their unique dietary requirements and likes.

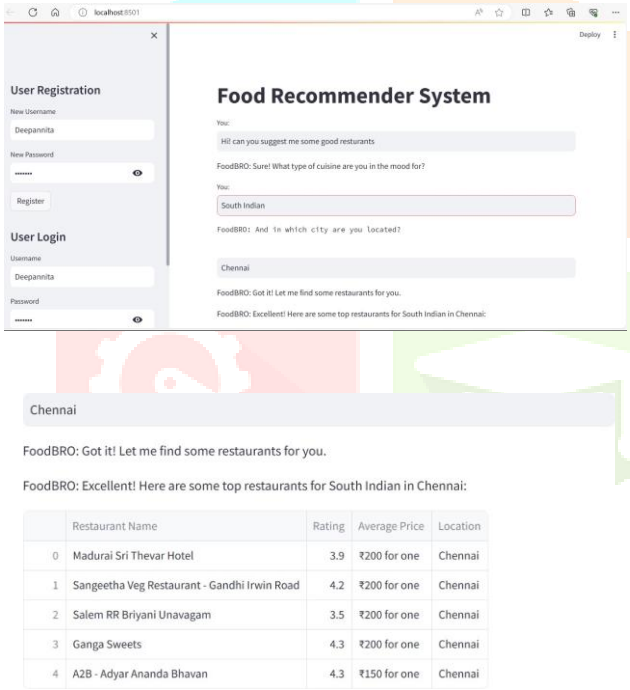


Fig.4.FoodBRO Interface

VII. FUTURE WORK

Improving the accuracy of suggestions might be a future goal of the FoodBRO Food Recommender System Using Sentiment Analysis. This could be achieved by including deeper learning models, such as neural networks, or collaborative filtering approaches. Further customization and up-to-date suggestions might be achieved by integrating user feedback systems and real-time data updates. Making it possible for users to filter suggestions according to criteria like allergies, dietary restrictions, or cultural preferences is another potential area for improvement that might include adding support for dietary restrictions and preferences. The creation of mobile apps to disseminate suggestions to a larger audience and facilitate consumption while on the go is another promising avenue to investigate. Finally, gathering feedback on the system's effectiveness and usability via user studies and surveys, and using this knowledge to constantly enhance FoodBRO's suggestions.

VIII. CONCLUSION

To sum up, the FoodBRO Food Recommender System Using Sentimental Analysis is an excellent resource for those who want tailored meal suggestions that take their tastes and dietary restrictions into account. The technology improves the eating experience as a whole by analyzing user data with powerful algorithms and providing correct recommendations. As it promotes exploration and culinary variety, FoodBRO streamlines the process of finding new and tasty foods with its user-friendly layout.

If you're a foodie, you need this method since it streamlines your research into all the many kinds of cuisine available to you.

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