FEEDBACK BASED FOOD RECOMMENDATION SYSTEM USING HYBRID DEEP LEARNING

Manoj P K
Faculty, Dept of Applied Economics, Cochim University of Science and Technology, Kochi-682022,India

Dr.Saritha C K
Cheerakathil house,Kokkunnu,mookkannur PO,Ernakulam Dist-683577,India

Dr.Lakshmi
Principal, Concord Arts & Science College,Muttanur,Kannur,Kerala-670595,India

Mrs Manasi Khadanga
Asst Professor.(Pharma Cology), Jeypore College of Pharmacy, Rondapali, Jeypore, Odisha, Dist Koraput-764001,India

Abstract – Consumers today have high expectations that they can easily obtain meals that suit their own preferences from the wide variety of viral foods available. Conventional recommendation systems focus their suggestions on factors like user ratings or virality of items. Unfortunately, it is challenging to suit the individual requirements of users because to the variations in users' emotional sophistication. This research builds a hybrid recommendation method using evaluations of viral foods together with information from nutrition labels. When making recommendations, we mix two methods, one based on the preferences of individual users and the other on the contents of the page, giving more weight to the user-based method. Hybrid deep learning technique (i.e. Convolutional Neural Networks) is proven to perform better than standard recommendation systems in recognizing the sentiments of user reviews and considering the similarities between people and meals. We may infer that the emotive value of food evaluations, together with the suggested hybrid recommendation technique, presents new perspectives for enhancing the current recommender systems used by e-commerce platforms.

Keywords: Food Recommendation System, User Ratings, and Hybrid Deep Learning

1. Introduction

The recommender system will look into the massive amount of user data and make a preference determination based on the user's stated or inferred preferences, interests, or behaviours [1]. The time and money saved by implementing a recommendation system will be appreciated by users and service providers alike [2]. They enhance the quality of decisions made while shopping online and decrease the transaction costs associated with doing so.

Recommender systems in libraries aid readers by allowing them to find beyond library searches [3]. In e-commerce, proposing items based on consumers' search would improve sale. The nutrition industry can benefit from a recommendation system because it provides a smart system that helps consumers choose what to eat based on factors such as the time of year, the customer's age, their mood, their level of experience, and the restaurant's current sales, any available discounts, and so on. Applying a recommendation system to this situation seems like a promising approach to taking care of issues like these [4, 5].

2. Related Work

One tactic for dealing with the deluge of data being generated online is to categorise and organise it. In light of recommender systems' widespread usage throughout many online apps and their capacity to mitigate numerous difficulties connected with over-choice, their significance cannot be overstated. IT is becoming more essential in all areas of business. Today, the hospitality and food service industries are among the fastest-growing in the country, making important contributions to the economy. Existing methods of recommending restaurants don't take into account the user's present perspective or provide a tailored experience. All of the proposed system's suggestions for food and dining establishments are tailored specifically to each user, taking into account their tastes and preferences at the time. Zomato's data collection is used to pinpoint dining options close to the user. To create a unique system for each user, a website is built in which they must first provide some basic information and then pick an emotion from a list. The software will suggest food products and restaurants based on the user's input. The user is presented with a number of alternatives, each of which is accompanied by information on the quality of the establishment and its food. There are nine eateries suggested to the consumer, the top three being the best. PyCharm is used to create this model, and the KNN algorithm classifies the eateries into geographical clusters. We utilise Flask to build accessible websites. Customers who aren't sure what to eat based on their current emotional state may use this app to get some suggestions. [6]. Based on the user's Body Mass Index (BMI), Basal Metabolic Rate (BMR), k-Nearest Neighbors (k-NN) algorithm, and back-propagation neural network, a novel food recommendation system is presented in [7] for recommending an appropriate calorie daily food for an overweight person to gain a healthy body status (BPNN). Using one's body mass index, the programme may make an educated guess about whether or not they are overweight. The algorithm figures out a person's calorie requirements for the day based on their basal metabolic rate (BMR). Using the maxed-out value of the DNC as a test object, the k-NN algorithm chooses an appropriate daily meal set from the food dataset based on calories. Using numbers for overweight and saturated DNC, the method estimates how many days it will take for a person to reach a healthy body mass index (BMI) while eating the prescribed diet. The BPNN is then used to determine the user's overall satisfaction with the system. In order to raise public awareness about the need of maintaining a healthy weight, the meal suggestion system given here may prove to be an efficient tool. Consumers' decision to purchase a product is influenced by the recommendations made about that product. It's possible to offer a product a recommendation by writing a review or giving it a rating. Malnutrition is very harmful since human calories come from a variety of sources (carbohydrates, fats, proteins, minerals, and vitamins). We present a recommendation system in this article that learns from the feedback of customers who have previously tried the product.

The customer's experience with the product is included into the software's recommendation. A tailored diet is vital to the long-term success and health of the user since everyone has their own unique eating habits based on their likes and dislikes. Both a deep learning algorithm and a genetic algorithm are used in the suggested recommendation technique [8] to provide optimal guidance. In order to improve prediction and classification accuracy and customer happiness, many modern applications use hybrid data mining algorithms. When making a conclusion using a neural network, hybrid data mining algorithms take into account more than one kind of data. In some cases, the different form of data represents image along with numerical data. In the work suggested, a meal suggestion system is created that takes into account the customer's flavour preferences and the feedback of prior diners. As a feedback layer in the neural network, the users' input is used to fine-tune the predictive process. The suggested model makes optimal use of low-range information by combining its architectural design with an ADNet (Adaptively Dense Convolutional Neural Network) algorithm. A pizza flavour recommender dataset is used to test the efficacy of the proposed model. Results from experimental study show that, when used to a hybrid data analysis, the ADNet approach outperforms the more conventional DenseNet and ResNet techniques [9]. Given that it's important for consumers to be able to make informed decisions about what meals to buy, a food recommendation system is a particularly intriguing recommendation issue. In order to better accommodate the preferences and dietary limitations of each user, personalized recommender systems have been employed to provide suggestions for meals or menus. The goal of this work was to use collaborative filtering and the knapsack technique to create a custom-tailored recommendation system for nutritious foods. Users were pleased with all aspects of the collaborative filtering and knapsack problem-algorithm-based, customized healthy food suggestion system tested, from the system's functionality and screen design to its efficiency. Overall, consumers were quite happy with the product, as shown by the average satisfaction score of 4.20 out of 5 [10].

3. Proposed Work

Pick the restaurant, the menu items, and the climate, sometimes even assisting them in making their selections at some eateries. By evaluating daily or monthly sales reports, taking into account the weather, categorising consumers by age and gender, and meeting other individualised needs, they will substantially assist customers in making restaurant and dish selections. In the food business, there is a plethora of data available. The outcome of the web-based application is not simple and adaptable enough for decision making in the food business due to the sheer volume of data involved unless we add certain approaches that improve the quality of our choices. Here is where AI-driven systems shine, since they substantially simplify the process of extracting data for use in making decisions.

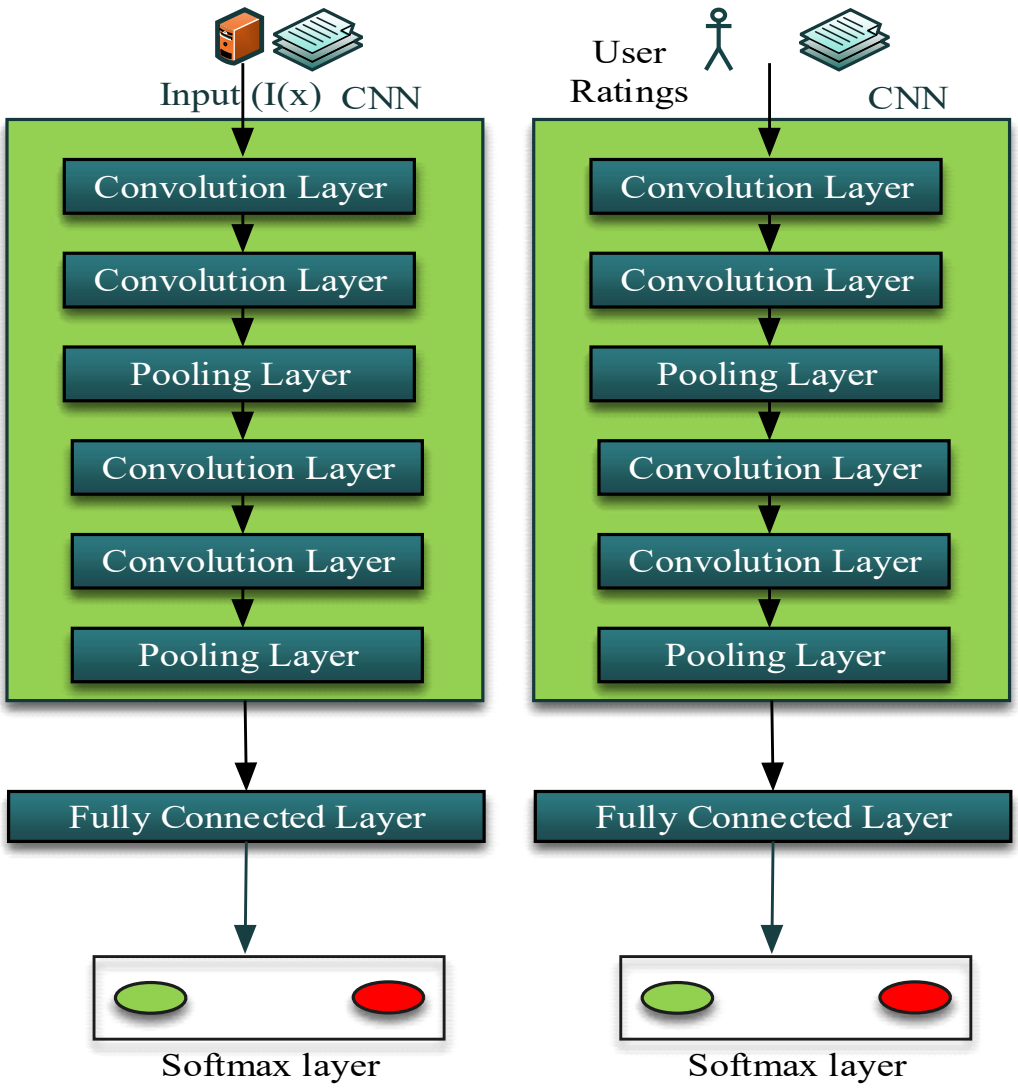

Fig.1. Hybrid Deep Learning for Food Recommendation

By matching and summing the words in the Corpus with the terms in the custom sentiment dictionary, the sentiment analysis based on the sentiment dictionary is accomplished. After segmenting the review text into individual words, the polarity of the words should be established. Adding one to the total of positive words if the word is positive. If it's a bad word, it adds one to the total number of negative words. Additionally, you must determine whether or not the sentimental word is preceded by a degree adverb. The amount of emotive words has to be weighted differently for various degrees of adverbs. In a similar vein, larger values for the sentiment indicators are indicated by the presence of the "!" or "?" symbols at the conclusion of the reviews. Whole-sentence sentiment analysis is used to ascertain the overall emotive tone of the review content. If the result is positive (a score of one or more) or negative (a score of zero or less), the individual has a sentimental propensity. Zero represents a lack of emotional intensity.

The detailed description of the flow chart is as follows:

- Step 1: Combine each food name as well as attribute information into a potential food set and attribute binary matrix by manually segmenting and filtering the 50 crawled food names.
- The second step is to compile a user's meal score matrix by adding up all the dishes they've rated and the emotional ratings they've assigned.
- Third, a matrix of all the user-rated meals and their binary characteristics, 0 and 1, is generated by merging the data on the food set and attributes with the data on the food and score performed by the user.
- In the last step, a user's profile is constructed using their meal evaluations and a binary attribute matrix. To complete the content-based recommendation strategy, we will use the modified cosine similarity calculation method to determine the level of similarity between the candidate food portrait and the user portrait, then we will sort the resulting food recommendation set and finally select the top N recommended foods.
- The fifth step is to choose K closest neighbours. To determine how similar a user is to their closest K neighbours, based on their food-rating matrix, we may use the Pearson similarity approach and sort the results in decreasing order. Finally, the user-based collaborative filtering recommendation strategy is finished by selecting the suggested food from the array of meals based on the choice of the nearby neighbours.
- In Step 6, you'll give more or less weight to the content-based suggestion and the user-based collaborative filtering recommendation until the two add to 1. The result of this hybrid recommendation method consists of the top N meals that were suggested.

Fig.2. Recommendations for Users

4. Results

Ten thousand tweets from a thousand individuals are gathered for analysis. There, tweets are sorted by the content of their messages. We provide the findings of a user research with five participants below. We started by timing how long it took the suggested image-based technique and manual ingredient selection to find recipes that used the specified actual food items. Then, we gave them 3 questions on how simple to use the system, how accurate ingredient detection was, and which is easier to use, picture recognition or picking by hand. We compiled every

response to the five-part questionnaire. We used three different types of freshly prepared whole foods in our experiment. Performance is measured in terms of fig, which depicts precision, accuracy, recall, and f-score.

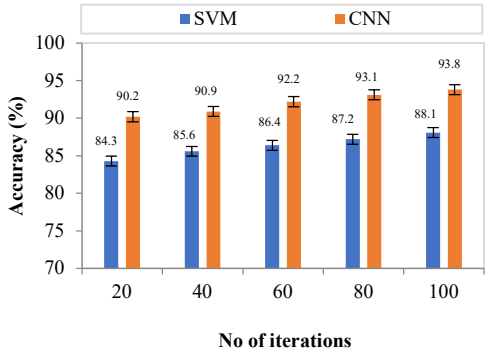

Fig.3.Accuracy vs. No of Iterations

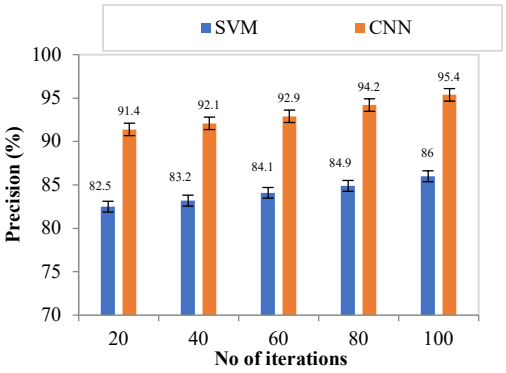

Fig.4.Precision vs. No of Iterations

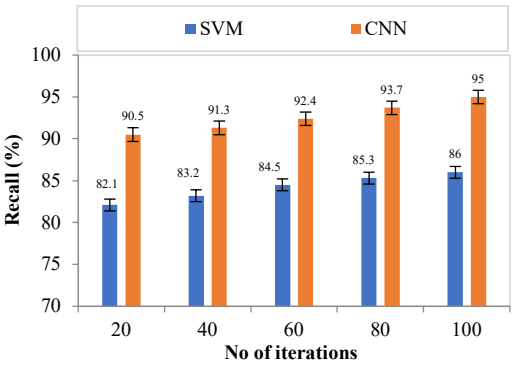

Fig.5.Recall vs. No of Iterations

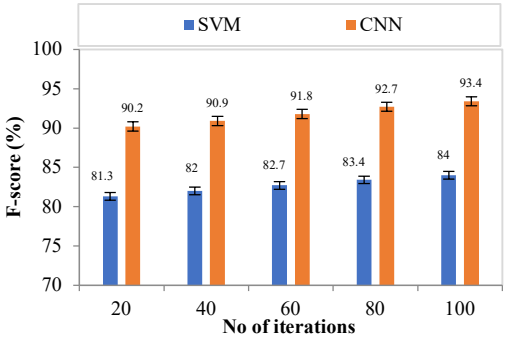

Fig.6.F-score vs. No of Iterations

5. Conclusion

The recommendation system will be enhanced by a hybrid deep learning algorithm that takes into account user preferences and personalization issues. In this work, we use content and collaborative filtering to a variety of datasets and user profiles at various phases. Datasets were gathered and analysed specifically for this article. For the purpose of performance assessment, the datasets were partitioned into test and train data, and a number of machine learning algorithms were put through their paces. Customers' preferences are used to accurately direct the algorithm to suggest restaurants and dishes to them. Price, quantity, ratings, locations, and other factors were all taken into account while making the suggestions. Researchers, finally, need to work on both enhancing performance and actualizing a customised meal suggestion system. We want to refine the system's user interface, its ability to recognise objects, and its ability to propose recipes in future work. By including more picture characteristics and differentiating food component areas from background regions, we want to improve our object identification accuracy to 95% among the top six candidates for the 30 category food elements. We want to integrate recipe search that takes into account combinations of numerous food products, nutrition, and finances for dish recommendations.

References

1. Jiang, H., Wang, W., Liu, M., Nie, L., Duan, L., & Xu, C. (2019). Market2Dish: A Health-aware Food Recommendation System. Proceedings of the 27th ACM International Conference on Multimedia.
2. Rehman, F., Khalid, O., Haq, N.U., Khan, A.U., Bilal, K., & Madani, S.A. (2017). Diet-Right: A Smart Food Recommendation System. KSII Trans. Internet Inf. Syst., 11, 2910-2925.
3. Bundasak, S. (2017). A healthy food recommendation system by combining clustering technology with the Weighted slope one Predictor. 2017 International Electrical Engineering Congress (iEECON), 1-5.
4. Chen, Y., Subburathinam, A., Chen, C., & Zaki, M.J. (2021). Personalized Food Recommendation as Constrained Question Answering over a Large-scale Food Knowledge Graph. Proceedings of the 14th ACM International Conference on Web Search and Data Mining.
5. Subramaniyaswamy, V., Manogaran, G., Logesh, R., Vijayakumar, V., Chilamkurti, N.K., Malathi, D., & Senthilselvan, N. (2018). An ontology-driven personalized food recommendation in IoT-based healthcare system. The Journal of Supercomputing, 75, 3184-3216.
6. Gupta, M., Mourila, S., Kotte, S., & Bhuvana Chandra, K. (2021). Mood Based Food Recommendation System. 2021 Asian Conference on Innovation in Technology (ASIANCON), 1-6.
7. Gopalakrishnan, A.K. (2020). A Food Recommendation System Based on BMI, BMR, k-NN Algorithm, and a BPNN.
8. Naik, P.A. (2020). Intelligent Food Recommendation System Using Machine Learning. Volume 5 - 2020, Issue 8 - August.
9. Wang, H. (2022). Design of a Food Recommendation System using ADNet algorithm on a Hybrid Data Mining Process. Journal of Soft Computing Paradigm.
10. Thongsri, N., Warintarawej, P., Chotkaew, S., & Saetang, W. (2022). Implementation of a personalized food recommendation system based on collaborative filtering and knapsack method. International Journal of Electrical and Computer Engineering (IJECE).