Survey on Personalized Healthy Diet Recommendation System Using Machine Learning

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ABSTRACT

Nowadays if you are suffering from any chronic disease you not only need a good medication but also a proper diet. Most people do not have time to visit a dietitian which also sometimes takes a long time to cure. Recommendation systems are nothing but predicting what product a user can buy. Here we mainly focus on Hybrid filtering. Using the above-mentioned technique we use the personal information of the user such as age, height, weight, type of diet, nutrients, and any disease they are dealing with, we are going to find the similarity between the users and going to recommend kind of food items they need to include in their diet using KNN algorithm. We can use this recommendation process to personalize the content for the user such as food and tell them what to eat specifically according to their interests, and if there is no availability of food items we can also order those food items in which their purchase history is also stored in their profile. In this way, one can take care of oneself without going to any particular dietitian and thus save money and time. This project is mainly concerned with building a recommendation system for providing meals depending on their health conditions using machine learning algorithm.

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I.INTRODUCTION

"HEALTH IS WEALTH" is the most familiar saying we all hear. Today, people tend to eat unhealthy food and careless behavior can lead to serious illnesses. On the other hand, busy schedules prevent people from managing their health better. People often don't know what to eat or how to stay active and healthy. According to one study, more than 70% of people suffer from diseases caused by malnutrition. Hiring a nutritionist is also a monthly expense, so most people avoid visiting a nutritionist or nutritionist. People's lifestyles have evolved with smartphones, giving them instant access to any information they choose. Thus, the idea was born to create a nutritionist who acts as a nutritionist, just like a real dietitian.AI could become a technology that enables tongue-in-cheek interactions between humans and machines. It requests all the user's data and processes them to deliver the diet plan to the user. As a result, users no longer need to consult a nutritionist, saving time. Proper coaching helps ordinary people stay healthy.

The AI section provides a plus for creating healthy meal plans. Adjusting the diet plan on a regular basis requires familiarity with the food, which can be a time-consuming process. The problem is that the data is not updated. Meal plans vary from person to person, and this has been overlooked in the development of most systems and AI applications. This program is especially important for monitoring the user's health. You don't need a professional nutritionist or spend money on self-examinations. This online application will help you with that. Smartphones and the Internet that comes with them have transformed communication and changed people's lifestyles. The number of smartphones and personal digital assistants (PDAs) is increasing.

PDAs allow consumers to connect to the Internet anytime, anywhere. They can use the internet to get almost any information they need. Users can

receive free nutrition advice anytime via their smartphone. A personal dietitian could be her AI application related to nutrition for humans. Act as a nutritionist, like an experienced nutritionist. This method works just like a nutritionist. In order to know your nutrition plan, you will need to provide your nutritionist with certain information such as your body type, weight, height, and hours of operation. Similarly, the technology creates a nutrition plan according to the user's information. All user data is collected and processed by the system to present the nutrition plan to the user. This eliminates the need for consumers to visit a nutritionist, saving time and getting the nutrition plan they need in just one click. The project also includes a login page that requires users to set up an account before using the app. This project requires an internet connection and is prone to server failure. The system takes the user's data and, before creating a diet plan, processes it based on some metrics known to the program and asks the user if the diet plan is acceptable to increase its accuracy. Generating Results If a diet is rejected, the system can recommend another diet plan.

II. LITERATURE SURVEY

The following papers used different machine learning algorithms and others. These research papers have different approaches for recommending healthy diet.

This paper proposes a strategy that provides generic every user receives recommendations based on movie popularity and/or genre. and it has exhibited the modeling of a movie recommendation system using content-based filtering. The KNN approach, coupled with the concept of cosine similarity, is employed in this model because it is more accurate than other distance metrics and has a lower complexity. In the internet age, recommendation systems have become the most essential source of relevant and accurate information, and the proposed system is capable of storing a large amount of data and delivering efficient results. This recommendation algorithm looks for the best movies in the category that are similar to the one we just viewed and gives the results. This study also discusses the issues that may be faced in content-based recommendation systems, as well as our efforts to overcome them. Simple ones look at one or two features, whereas more complex ones look at numerous. Extra parameters are utilized to modify the results and improve their usability. With advanced deep learning and extra filtering methods. Techniques like collaborative filtering and hybrid filtering can be used to build a decent movie recommendation system. This might be a key advancement in the development of this model since it will not only become more efficient to use but will also increase its economic worth..[1]

To profile health, the author of this study created a novel recommender system called DIETOS (DIET Organizer System). Users' status and offering common meals in adaptive approach to enhance the quality of life of both healthy and sick individuals, as well as people suffering from chronic dietary ailments The proposed system can create a user's health profile, and it can specifically profile those with CKD, hypertension, and diabetes, as well as healthy users. As a result, a fully automated system capable of adjusting the patient's nutritional prescription in real time based on clinical and laboratory data is needed. In this context, we want to enhance current DIETOS services in the future by advising consumers on diets and/or meals consistent with their health status. Although DIETOS was designed to advise just Calabrian traditional meals, they want to develop a set of functionalities that would allow experts to easily add other traditional foods or/and recipes, as well as track users' progress and motivate/communicate with them. As a result, more engagement between users and medical doctors will be possible, resulting in a richer user experience.Finally, by adding new questionaries capable of profiling new diseases as well as new specific conditions such as pregnant, athlete, and so on, more users will be able to be advised with recipes and foods suited for their health status. [2]

A sickness is discussed in this work. Hypertension is one of the top causes of mortality in Mauritius. Proper eating habits and diets can help to improve the country's situation.

As a result of the findings, the study proposes a DASH diet recommendation system for promoting healthy meals and dishes. The recipes suggested are intended to help not only a hypertensive person maintain his diet, but also a typical user avoids health difficulties. Machine learning and content-based filtering algorithms are used by the system to generate suitable suggestions based on allergies, blood pressure, age, weight, smoking/alcohol usage, nutritional intake, and dietary preferences. The method makes help of a mobile application that is simple to use and has been evaluated with a group of hypertension patients and determined to be adequate. Relevant charts are projected to display the user's varied blood pressure data over time. The technology will be used in future works to identify and evaluate the user's eating patterns. As a consequence, the user's progress might be monitored.[3]

The study's author created a recommender system that supports users in tracking their calorie goals based on their BMI and provides meal choices based on the user's history and preferences. After the user enters their BMI, food habits, and allergies, a daily calorie target will be recommended. Creating a recommender framework utilizing Collaborative Filtering and Fuzzy logic to provide meal recommendations based on user preferences. Users may utilize the Step Counter or Pedometer in the Android-based software to track their steps as part of an operation or workout. According to a recent review of comparable efforts, while much research focuses on the development of computer-assisted food counting tools, many of them indirectly address dietary and data crucial to healthy living. In these conditions, this article presents the standard structure of food recommendations, which consists of a data gathering layer, a user, a user profile database, a smart system layer, and a user-friendly interface. It has also provided a global solution that may be used as a smart system layer. Using Fuzzy logic and Collaborative Filtering, they create a Diet Recommendation System that provides nutrition targets and meal ideas. As a result, when we compared fuzzy logic and collaborative filtering to other approaches and parameters, we determined that our approach is more efficient and accurate. The integration of modules for displaying Restaurants based on the user's geolocation, giving Workout regimens based on the user's fitness objectives, and providing detailed Diet Plans are among the future possibilities for this application.[4]

This study introduces the notion of Nutrigenomics and how it relates to a person's nutrition. Nutrigenomics is the study of the effects of nutrition on a person's DNA. Protein genes make up a genome (a collection of DNA). These genes are in charge of a person's overall health. Any infected gene can affect a person's health. Various methods may be applied to deliver dietary facts to a person by studying gene variation. Generic algorithms will examine the DNA sequence. The application will also generate a nutrition assessment based on lifestyle and other factors. A smartphone application is being developed that will collect a person's genetic information and then recommend a meal to that individual based on that information. The dietary products mentioned may be scrutinized in terms of weight, nutritional content, and other considerations. There are also recipes for a variety of items that may be utilized to make a healthy diet. The study just explored the association between a person's diet and his or her genes, with no mention of developing any algorithms that might be used for the same. Furthermore, the method utilized in the produced application may have been clarified for better comprehension. It did not, however, take into account a person's age, height, weight, and other aspects that are equally crucial for a diet.[5]

According to this article, it is usual for persons with chronic diseases to fail to stick to a good diet, not exercise consistently enough, and not pay adequate attention to their illnesses owing to their hectic schedules. As a result, in this article, we offer healthier diets and exercise regimens to treat a wide range of conditions using health metrics and values from the most recent data on analyzed and monitored disorders. We suggest a strategy to improve the health of those who suffer from They looked at those who had diabetes, high blood pressure, or

thyroid condition. Health monitoring, second diet, and exercise advice The system proposes follow-up sessions in the Health Monitoring module until the report is healthy. A classification decision tree is a method used in the Diet and Exercise Recommendations module. In particular, is utilized to offer nutrition and exercise recommendations. Regarding a bespoke dataset, the C4.5 decision tree recommends and decides if a certain diet and exercise should be offered to a specific individual helpful. They separated the system approximately into two parts to do this.

1) In this case, a patient/physician is an actor or user of the system.

2) User Interface - To engage with the system, users can enter physical characteristics such as height, weight, age, gender, lifestyle, activity level, medical issues (diabetes, blood pressure, or thyroid), and recent reports for that specific medical condition.

3) Patient Health Record - This is where all of the information indicated in POINT 2 is kept.

4) Physician Database - predefined parameters for identifying illness types. H. This field stores whether a person is normal, pre-diabetic, or diabetic based on a specific illness report. The database contains the following parameters: a) Fixed illness category detection parameters used for surveillance, validated by clinicians, and surveyed on several websites.

5) Recommendation System - Using machine learning technology, this system assists doctors in recommending food and fitness regimens to their patients. Fitness trainers, physicians, and numerous websites help to develop customized nutrition and exercise data sets. a) Exercise Records - A total of 1261 records contain 107 workouts for fitness, yoga, age, and activity levels that consumers like. b) Diet Records - A total of 102 records include 102 food items with calorie intake and portions indicating vegetarian or non-vegetarian preference by the user.

6) Calculation of BMI (Body Mass Index) and calorie requirements. [6]

This paper is about content aware recommendation. Because of lack of communication infrastructures and citizenship collaboration, content aware recommendation has some limitations. Though we have web 2.0 we still use recommendation systems. Collaborative filtering comprises of large family of methods. It recommends set of items based on preferences of user. To make it work worthy it relies on smart city sensors and databases. The CARS has taken the form of a computer application that runs on a server. It suggests paths for citizens. The routes are chosen via collaborative filtering, as well as taking into consideration of the user's preferences, health status, and real-time data from city sensors.[7]

The author of this study explored machine learning methods as well as data mining approaches. In computer science, machine learning plays an important role in categorization and predictive analytic systems. Machine learning models are offered to handle difficulties in particular ways to ensure the success of the prediction model. An efficient cloud-based cluster architecture handles massive amounts of data. While neural networks may be used to mine secrets, genetic algorithms function best with patterns. Data mining is a technique for retrieving and visualizing information from databases. Furthermore, text diagnostic evidence. Data mining is a tool for finding information in databases.[8]

In this paper, the key to a successful diet plan is not a dogmatic diet, but an individual's dietary preferences. This is because diet plans based solely on nutritional supplements are less likely to be acceptable increase. A questionnaire for user preference research. Explicit evaluation to reveal personal preferences. A statistical auto-scoring method that automatically estimates a user's preferences based on past eating habits. The advantage is that cumbersome data collection procedures can be avoided. In this article, we propose k-comparison annotations and hierarchical inferences to efficiently and accurately extract individual dietary preferences. Unlike the existing method that requires the user to explicitly rate each product/food, the proposed method selects the most preferred product among k products presented by the user each time. You just need (k is configurable). The

goal of hierarchical reasoning is to deduce a user's intrests about an unidentified (i.e., without user annotations) meal, dish, or food item. Unlike previous studies, which treated recipes/foods as core elements and didn't break them down into single ingredients, the proposed method propagates the relative evaluation of foodstuffs from the recipe/foods level to the ingredients level, Reintegrate them without annotation, and close the grocery store. Researchers and dietitians may benefit from a hierarchical perspective of a user's preferences, which he couldn't get using traditional approaches owing to one layer of reasoning. Dietary Limitations: Dietary limits specify the amount of each nutrient in each meal. To ensure a balanced and nutritious diet, we employ thresholds to define default dietary limits. Restriction on Variety Meals should include a variety of food items from several food categories (appetizers, salads, main dishes, desserts, snacks, and so on), rather than just one. As a result, the diversity restriction set a maximum quantity of each dietary variable within the same food category. Restrictions on location (food vendors or restaurants)When preparing meals, keep food availability in mind. If there is no food nearby, the decision variable Xi is equal to zero. Budget Restriction If consumers are concerned about their budgets and prefer cheaper goods, budget constraints allow you to limit the overall cost of a meal. [9]

II. COMPARISION TABLE :

Author	Algorithm/Technique	Advantages
Agapito G., et.al(2018)	OWL based Collaborative filtering	DIETOS creates a model for each user profile using only the user's health information, without merging it.
Romeshwar Sookrah.et.al(2019)	Content-based filtering.	Age, Food Preferences, Allergies Alcohol Smoking BP level
Ramni Harbir Singh.et.al(2021)	KNN with Cosine similarity	More accurate than other distance measures, and the complexity is likewise minimal.
Mohan Shrimal.et.al(2020)	Collaborative Filtering and Fuzzy logic	A robust system that can handle a variety of inputs and does not require exact inputs.
Jitao Yang.et.al(2019)	Genetic Algorithm	Interpretations for individual nutrition requirements and respond to food.
Jen-Hao Hsiao.et.al(2021)	Automatic Statistical Inference. k-Comparative Annotation and Reasoning. Hierarchical Reasoning.	Diversity constraint. Constraint of location (food provider or eatery).Budget constraint.
Divya Mogaveera.et.al(2018)	Decision Tree Algorithm	BMI (Body Mass Index) And calories calculation
Fran Casino.et.al(2018)	Collaborative Filtering	Feasible in practices and provides better recommendations with a high percentage of unknown data.

III. METHODOLOGY

Data Collection: In this project we need to know about the food items like what type of ingredients they made up etc. Using the python library beautiful soup to convert unstructured data to definite structure And the technique is known as web-scrapping. Here, we are going to collect the information about the food items from the web pages.

Data pre-processing: Data pre-processing is a crucial stage in the creation of machine learning models. It is the process of processing raw data so that it may be used by a machine learning model. A data set contains duplicate values, noises, missing values, and null values that we cannot utilize directly for machine learning models, so we apply data preparation.

Feature Selection: Feature selection in machine learning is the key aspect where important features to input are selected. In our project, firstly we have done feature selection for whole dataset and calculated the mean occurance(MO).After we are done with that, the main features we got are nutrients, disease, and diet.

Recommendations: In this project we have used filtering technique i.e.., Hybrid Filtering is a blend of content-based and collaborative filtering strategies for finding user-user similarities and based on recent activity we have used KNN algorithm.

IV. CONCLUSION

The work presented in this paper present in the field of Machine Learning in personalized health diet Recommendation. We proposed a system which helps the users with recommendation of their diet. It deals with the health monitoring of diseases like hypertension, diabetes etc., and also deals with nutrients and type of diet it recommends the food items accordingly. The information provided by the user while registering is taken as input and uses hybrid filtering technique with KNN algorithm to recommend food items and displays as an output to the users.

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