International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

Personal Nutritionist Diet Recommendation System Based on User Health Information

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ABSTRACT

Diet recommendation system can be expected for a better solution for people healthy eating habits. Due to busy lifestyle healthy eating habits are overlooked. With this unhealthy eating habits, we get health problems. This system provides functionalities to change their eating behavior in positive ways. Healthy living is a biggest factor in these days. A small change can have a big impact in our health. The system is constructed on USDA dataset, grocery data, consumed food and user's quetelet Index (BMI). Most recommendations suggest proper diet plan for individual users quetelet Index (BMI value), and food consumed that day and our system suggests the remaining nutrition food suggestions to fill that day dietary food recommendations. The body quetelet Index (BMI) is used to assess user's body fat. The user's diet recommendations are varied with interested food of user. Grocery data is varied with continuous data collection given by the user. This application will help users to structure diet recommendations according to various individual factors which include food suggestions, nutrition's, deficiencies, quetelet Index (BMI) and tracking of his food habits of the user.

Key words: Food, Nutrients, recommendations, USDA, BMI.

1. INTRODUCTION

Balanced nutrition is important aspect of healthy lifestyle for peoples. Along with balanced diet, a regular physical exercise is crucial for healthy life. Now a day's nutrition and health are often overlooked.

The majority people suffering with diabetes, heart disease, cancer, stroke etc. The diseases are almost directly related to unhealthy eating habits. So, our body needs nutrients to stay healthy, and food supplies essential nutrients that stop us from getting sick. A healthy, balanced diet will usually include vitamins, minerals, protein, healthy fats, proteins, carbohydrates, and fiber. A healthy food pyramid is combination of plant foods, moderate amount of animal products. Which includes vegetables, grains, fruits, oils and sweets, dairy, meat and beans. Generally, a person remains unaware of major causes behind deficiency or excess of various vital substances, such as calcium, proteins, and vitamins, and how to normalize such substances through balanced diet.

With the advantage of technology, the people can leave a healthier lifestyle. In this project to build a system that will aim to recommend appropriate nutrition intake to its users based on body mass index (BMI) and grocery data preferences. BMI calculate weight status categories

which includes underweight, healthy weight, overweight, obese. Grocery data includes seasonal food, user's intreated food, plant foods and animal products. This project will help users' daily diet recommendations along with BMI range, healthy food choice, eating behaviour, health problems, and to change user behaviour.

2. RELATED WORK

Raciel yera toledo proposed a food recommender system considering nutritional information and user preferences. The meal plan for the user recommended using users' preferences. This tool manages both user preferences and nutritional information.

Vijay Jaiswal proposing a healthy food habits, eating patterns and calories burned count can be intake of nutrients and so on using the data mining tools. In this tool the hidden patterns and customer food taking habits are found from different data sources. In this tool decision tree learning algorithm, Random Tree algorithms are used on different datasets.

H. Jiang proposed a system to calculate the daily calorie demand. The Knapsack algorithm is used for recommended diet combinations of users. Different from other diabetic diet recommendation systems, this system can rank the recommended diet combinations using TOPSIS algorithm according to user's food nutrition.
Jung-Hyun Lee proposed a customized diet recommendation service managing heart diseases. This service provides customers customised general information, family history of diseases, seasonal food intakes.

Rung-Ching Chen construct a recipe ontology that defines some common diseases healing with verity of food recommendations and an inference engine for customer health condition and a recipe ontology can be used for proper recipe recommendations on food priorities.

FidelsonTanzil uses ABC algorithm to extract information from database according to user's requirements. Kmean and SOM algorithms are used on datasets.
Mohd Afisi projected ABC algorithm in Data Mining and tested compared to six traditional classification algorithms successfully and ABC proved as a suitable algorithm for recommendation.

Xiaoyan Gao proposed the food recommendation problem on user choice recipe recommendation factors. By using a neural network-based solution on Ordered diet Recommendation.
Raza Yunus proposed a system to estimate the food attributes such as ingredients and nutritional values of food are classified using the input image of food. This method works on deep learning models for accurate food identification.

Omar Arif proposed system to implement a mobile application in the healthcare sector. The mobile-based application takes the image of the meal and presents approximate ingredients and nutritional values in food.

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3. PROPOSED MODEL

This proposed model is solution to diet recommendations and it has a huge scope to give better nutrient diet for people.
USDA nutrient dataset will be used in calculating the recommendation diet for user. Grocery data set consisting of a user choice of food as intake. USDA database is responsible for maintain nutrition factors for every individual food item. The input values will be based on USDA id for every 100 grams. The values required in calculating BMI (body mass index) need to be given as an input which will be utilised in calculating the final diet recommendations. The second input while calculating the diet recommendation for the user is based on the consumed food for that day. While calculating the diet recommendation, initially the deficit nutrition is calculated based on the food consumed for that day and sorted the input nutrients dataset based on the BMI value, and the deficit food will be filled from the sorted grocery dataset. Obesity parameter is used for food recommendation. According to obesity the diet recommendations are calculated to control fat levels.

3.1. Recommendation System at Client Side

At the front end, the user has register in the application to login and need to enter the grocery data available in user's food pantry of the user's interest and food consumed on that day along with his personal information to calculate BMI. Based on these inputs recommendation system gives nutrient diet suggestions, deficiencies in consumed food logs and display the deficit nutrients to fulfill the nutrition food to the user to fill the nutrition for that day.

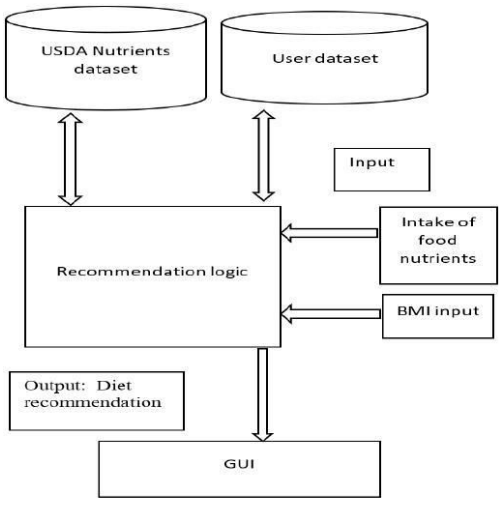

Figure.1: Client-side Nitration diet recommendation system

In this paper, we can provide an informative and user-friendly application that provides

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food suggestions, nutrition's in food, deficiencies, quetelet Index (BMI) and tracking of his food habits of the user. This application is designed to provide a framework for true nutrient tracking and feedback.

3.2. Recommendation System at Server Side

At server-side nutrition diet recommendation application runs in React.js web browser framework. It is efficient, flexible and declarative JavaScript library fir building UI components. React is an open-source, front end applications and build one or more nested applications.

Express is a flexible Node.js web application framework to rapidly develop Node based web applications. Express is a middleware to respond HTTP requests. Express application uses request and response callback objects. Node.js is an open source, cross platform, back-end, JavaScript environment to run the web application outside the web browser. MongoDB is used along with Node.js. With MongoDB reading data from grocery data, inserting, deleting, and updating data is done.

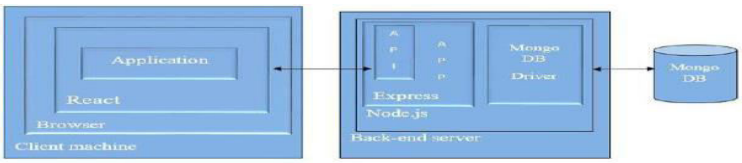

Figure 2 Server-side Nitration diet recommendation system

A memory-based collaborative recommendation engine algorithm is used in this application. Other hybrid approaches and recommendations are generated based on both collaborative filtering and content-based filtering recommendations. JSON or Java Script Object Notation is a web application format used to exchange information between applications to communicate with each other.

We build this application nutrition diet recommendation system with a node express application along with react browser application with mongo DB server to store and serve data.

JavaScript, CSS, and HTML languages are used to develop the nutrition diet recommendation system. The main reason for using Javscript is due to the vast variety of available libraries as open source and user friendly. The nutrients are taken from mongo DB database directories foods.js and users.js and recommended from USDA API to proper serving size from database.

4. METHODOLOGY

Dataset will be gathered from USDA database who is responsible for storing food nutrition information. Grocery data is created by user as per his food interest.

As a first level Quetelet Index (BMI) and food consumed in that day from the grocery data will be taken as input and at second level we will query nutrition information for the user pantry data from the USDA database. According to user's BMI food nutrition's are recommended to complete the nutrition food for user interest and health conditions . The deficit nutrition food, available food items, food list, tracking of every day nutrition factors, suggestions, and symptoms are provided in this nutrition diet recommendation system web application.

The collaborative filtering method do predictions based on the user's grocery data, USDA API datasets and deficient nutrients. Content-based filtering recommends food items based on a comparison between the content of the food items and a user's pantry data.

5. FLOW OF THE PROCESS

In this application memory-based Content-Based and Collaborative recommendation engine algorithms are used to recommend healthy eating habits of the user's interest.

fig 2. shows the flow of the food recommendation system.

Step 1: enter the BMI index of the user to create user profile.

Step 2: Enter the consumed food items from the user grocery.

Step 3: Send a request to USDAAPI to get consumed diet information.

Step 4: Filter the nutrition factors and find the deficit nutrients.

Step 5: Cluster the nutrients with nutrients in food intake.

Step 6: Apply recommendation engine algorithms on user's food intake and profile.

Step 7: Display deficit nutrients, food items, food list, symptoms, and suggestions.

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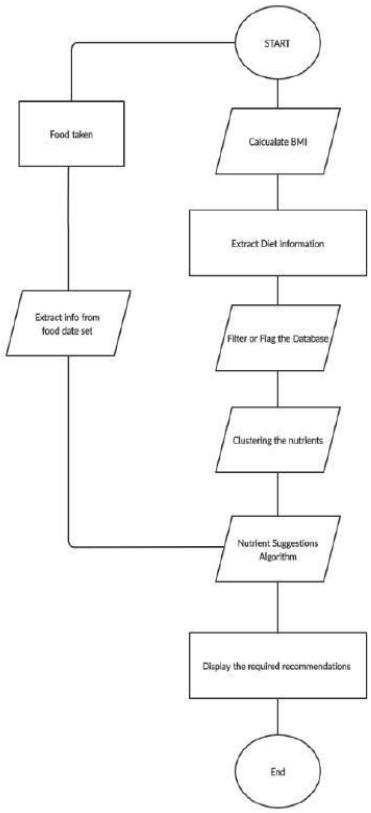

Figure.3: Flow diagram of nutrition diet recommendation system

We query the USDA dataset based on input grocery datasets and we recommend the energy required for the user in that day. We extract recommended nutrients using sorting and memory-based collaborative and content-based recommendation engine algorithms in this applications. All the nutrients are clustered together and shares to the user in a systematic way. Along with the other module, the user can search about the food he wants to know the food combinations to have an appropriate diet input to the dataset. The previous diet intake history also available for user.

6. RESULTS AND OUTPUT

 Install Node.js source code and NPM from browser to run application . NPM stands fir Node Package Managet, which is repositiry for developing and sharing JavaScript code.

 Run the application in React web browser.

- After register with username, mail id, and create a password to use this recommendation system. Login with registered username and password.

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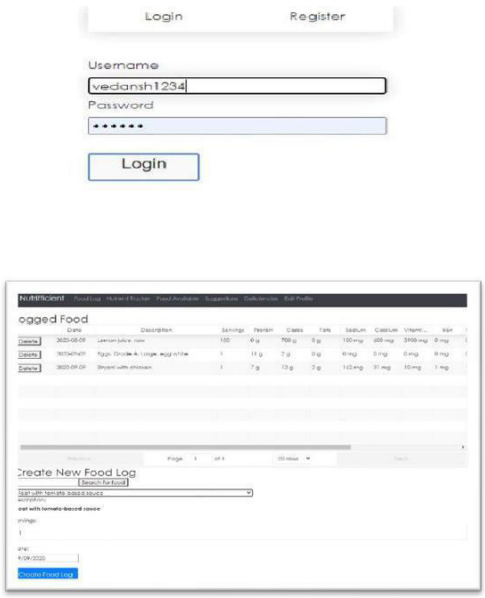

Figure 4 Login page

- Consumed food log of the user is entered by the user and create a new food log.

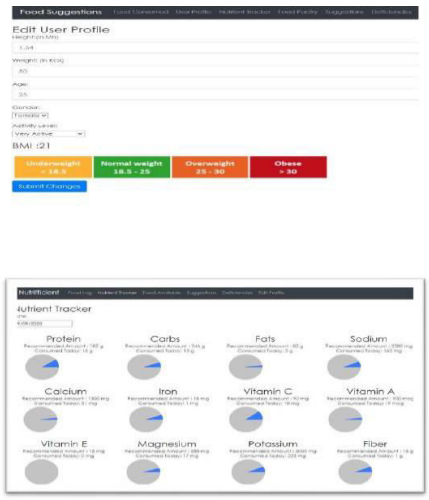

Figure 5: Consumed food log page

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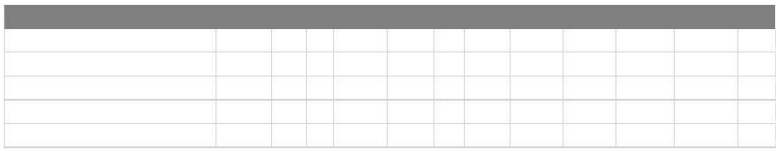
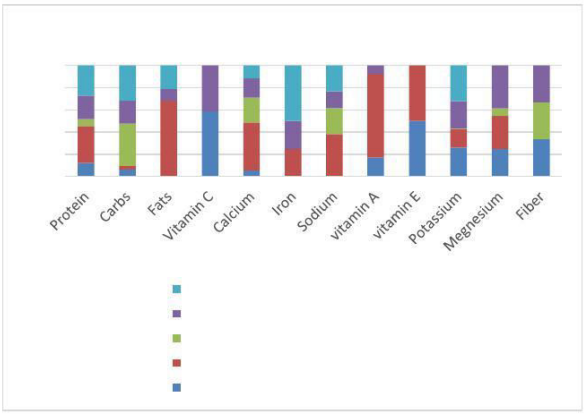
- User profile is created by height, weight, age, gender and activity levels to estimate the BMI of user.





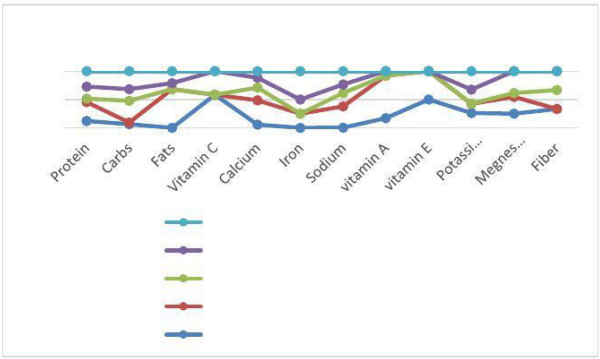


Figure 6: Edit User Profile log page

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- Nutrition tracker estimate consumed food nutrients and display every individual nutrition values.

- Food items available in the database is displayed for the user. From this user select food items to fulfill the nutrients for user. Food nutrition statistics based on USDA organization.

In nutrition diet recommendation food consumed by the user is taken input given by the user. Food consumed by the user can be taken as primary key elements. Input is taken from user's grocery data. The nutrition suggestions are recommended by calculating t he nutrition present in intake food and calculate is it enough for the user according to his BMI .If nutrition is not satisfy the user intake food deficit nutrients are recommended to complete the nutrition diet recommendation for the user on that day.

The food consumed table shows the food nutrients protein, carbs, fats, vitamin C, calcium, iron, sodium, vitamin A, vitamin E, potassium, magnesium ad fiber with their presence in every 100-gram food.

Intake food in this application is combination if food elements, like snakes, lunch, dinner menu is taken as intake food. According to these combinations the input is taken and recommend the nutrient diet recommendations of the user.

Food consumed by the user and its nutrient values are taken as an input. Food consumed by the user and its nutrient values are taken are displayed below:

Table 1: consumed food details in a day by user (nutrients measured in grams)

Name	Protein	Carbs	Fats	Vitamin C	Calcium	Iron	Sodium	vitamin A	vitamin E	Potassium	Megnesium	Fiber
Tomatoes,raw	4	4	0	0.014	0.01	0	0.00 5	0.042	0.001	0.237	0.01 1	0.00 1
Egg omelet made with butter	11	2	13	0	0.077	0.0 1	0.40 4	0.185	0.001	0.15	0.01 3	0
Rice noodles, cooked	2	24	0	0	0.04	0	0.25	0	0	0.004	0.00 3	0.00 1
Biryani with chicken	7	13	2	0.01	0.031	0.0 1	0.16 2	0.019	0	0.223	0.01 7	0.00 1
Snacks,rice cakes, brown rice, multigrain	9	20	4	0	0.021	0.0 2	0.25 2	0	0	0.294	0	0

Consumed food nutrition chat shows the nutrient values of intake food nutrition values. The consumed food chart is displayed below:

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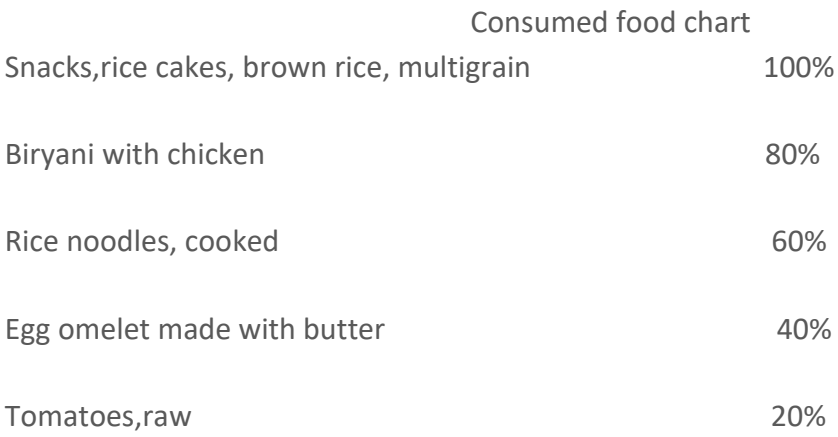

Chart 1: Consumed food chart

The recommendation output chart shows the deficit levels of intake food nutrients. According to this chart the nutrition diet recommendation system recommends the deficit food nutrients. With this chart the recommendation system suggests users to fill nutrition with preferred food intake recommendations.

Food nutrition statistics based on USDA organisation. USDA is a food database; the nutrient values and weights are organised for the food items. With nutrition values calculate food intake data with their respective nutrient values. The JSON version database is used to recommend dietary intake food of user. Our recommendation system suggests nutrition dietary from this USDA database.

Sample food nutrition information of USDA dataset is displayed below:

Table 2 Sample food nutrition information for 100 grams of grocery.

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S no	Name	Protein	Carbs	Fats	Vitamin C	Calcium	Iron	Sodium	vitamin A	vitamin E	Potassium	Megnesium	Fiber
1	Tomatoes,raw	1 g	4 g	0 g	14 mg	10 mg	0 mg	5 mg	42 mg	1 mg	237 mg	11 mg	1 mg
2	Egg omelet made with butter	11 g	2 g	13 g	0 mg	77 mg	1 mg	404 mg	185 mg	1 mg	150 mg	13 mg	0 mg
3	Rice noodles, cooked	2 g	24 g	0 g	0 mg	4 mg	0 mg	250 mg	0 mg	0 mg	4 mg	3 mg	1 mg
4	Biryani with chicken	7 g	13 g	2 g	10 mg	31 mg	1 mg	162 mg	19 mg	0 mg	223 mg	17 mg	1 mg
5	Snacks,rice cakes, brown rice, multigrain	9 g	80 g	4 g	0 mg	21 mg	2 mg	252 mg	0 mg	0 mg	294 mg	0 mg	0 mg
6	Restaurant, Chinese, Lemon chicken	12 g	21 g	14 g mg	2	40 mg	1 mg	252 mg	3 mg	1 mg	161 mg	16 mg	1 mg
7	Crisp, apple, apple dessert	2 g	31 g	3 g	2 mg	35 mg	1 mg	169 mg	29 mg	0 mg	83 mg	8 mg	2 mg
8	Rice with deans and tomatoes	4 g	19 g	4 g	3 mg	34 mg	2 mg	177 mg	5 mg	1 mg	222 mg	24 mg	4 mg
9	Egg curry	3 g	7 g	4 g	10 mg	39 mg	1 mg	123 mg	158 mg	1 mg	209 mg	19 mg	2 mg
10	Meat with gravy, NS as to type of meet	22 g	2 g	7 g	0 mg	8 mg	2 mg	360 mg	0 mg	0 mg	188 mg	15 mg	0 mg

Application output with recommended data.

Table 3 Project Application output

Name	Protein	Carbs	Fats	Vitamin C	Calcium	Iron	Sodium	vitamin A	vitamin E	Potassium	Megnesium	Fiber
Tomatoes,raw	4	4	0	0.014	0.01	0	0.005	0.042	0.001	0.237	0.011	0.001
Egg omelet made with butter	11	2	13	0	0.077	0.01	0.404	0.185	0.001	0.15	0.013	0
Rice noodles, cooked	2	24	0	0	0.04	0	0.25	0	0	0.004	0.003	0.001
Biryani with chicken	7	13	2	0.01	0.031	0.01	0.162	0.019	0	0.223	0.017	0.001
Snacks,rice cakes, brown rice, multigrain	9	20	4	0	0.021	0.02	0.252	0	0	0.294	0	0

7. CONCLUSION

In this project, we can provide nutrition recommendations based on BMI calculations in an informative and user-friendly environment. In this food recommendation application, we focus on daily diet plan and nutrition need. According to user food preferences and consumption we get suggestions, food nutrition's, deficiencies and tracking history of his food habits. In this application Content-Based Filtering and Collaborative Filtering methods are used to get users choice of his food recommendation for the daily nutrition with the help of USDA dataset and grocery data, the nutrition diet recommendations will help the user to maintain and improve their health conditions.

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