RESEARCH PAPER

Health Assistant: Machine Learning Based Diet, Exercise, And Medicine Management

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ABSTRACT

Health Assistance App is a smart application that aims to assist the user to keep his daily health by providing personalized diet, exercise, and home remedies. Contrary to usual health apps which mostly interact with doctor visits, this one presents self-reliant care with easy but useful health tips. The machine learning is used to identify the user data, including BMI, health goals, and medical histories, to provide individualized health recommendations. It also suggests customized meal plans to be used in breakfast, lunch, and dinner based on health goals like losing weight or gaining weight or enhancing fitness. The app also provides workout programs by suggesting the correct kinds of exercises and time based on the fitness of the user. In relation to overall wellbeing, the system provides natural medicine, and preparation methods and usage instructions in different disease conditions states. The system provides the users with the capability of entering significant health information such as weight, blood pressure, and activity level, tracking the progress graphically and generate printout health reports. Medications reminder system causes drug regimens adherence by reminding the users of the time and tracking capabilities. The Today Diet and exercise module has a day to day diet plan and exercise schedule and this is more convenient to the users. The application aims to provide its users with meaningful information about health in which they will be actively involved in managing their health.

Keywords: Personalized Diet, Health Monitoring, Machine Learning, Smart Healthcare, Fitness Tracking, Health, medicine, healthy lifestyle, and obesity.

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1. Introduction

The main objective of this paper is to discuss the possibilities of AI-based health care support in the context of personalized and proactive self-care management. Through the adoption of intelligent systems and user-orientated design, this platform seeks to gain significant health awareness that inspires human beings to act as active proponents of their wellbeing.

1.1 Background and Motivation

Health today has become a systemic process that includes proper dieting, physical activity and taking of medication. However, the majority of individuals do not take care of their health due to the lack of individual attention. Routine healthcare systems focus more on clinical consultations and leave the remaining part of the day to daily health follow-ups and self-management. In addition, the increasing price of doctor visits seems to render the act of frequent doctor visits impractical to many individuals. Real-time, personalized guidance provided to patients based on their health information is a promising solution to be offered by machine learning (ML) enabled mobile health applications.

1.2 Research Problem

Even with the increased technological adoption in the medical field, a large number of individuals have been unable to take proper care of their health. The absence of customized health guidance is one of the key issues. The majority of people are not provided with personal health education taking into account their medical history, lifestyle, and health-specific needs. Consequently, general suggestions are usually followed by people, which might not fit their personal

requirements. The other major concern is that there are ambiguous and contradictory health information on the internet. Medical data that cannot be verified is very high and may cause confusion and misinformation. Therefore, people might make bad health choices out of wrong or false sources of information. Secondly, there is also a problem with low healthcare accessibility. Major portion of the population is unable to access the healthcare practitioners regularly due to financial constraints, physical barriers or logistic difficulties. The result of this unavailability is the denial of medical counsel and healthy care eventually. Moreover, there are people who have problems with tracking their health conditions. Its users are not able to stick to monitoring key parameters of health regularly and, therefore, it is hard to evaluate the improvements or make informed decisions about health. It is difficult to keep long-term health goals without checkups. The other issue is the issue of forgetting the medications and having bad habits. A great number of individuals do not adhere to the treatment regimens or exercise healthy practices. This lack of drug adherence and lifestyle has an adverse effect on the overall health management. In order to overcome these problems, an AI-based healthcare solution is needed that would be able to offer personalized health advice, credible health data, real-time surveillance, and automatic notifications. Such a system can be helpful to make people more efficient in managing their health and facilitate health-related decision-making.

1.3 Objectives

The main goal of this system is to provide individual care with the help of machine learning. The system will provide automated health advice, including diet and exercise plans depending on the needs. With machine learning algorithms, the system will be capable of making appropriate and personalized wellness plans out of the user health data. The other goal is to provide the users with the ability to keep track of their health by providing detailed health reports and visual measurements, which will allow them to keep track of their progress and remain motivated to reach their health objectives. The purpose of the system is also to encourage comprehensive wellness through incorporation of natural remedies as well as conventional health care. The proposed system is also aimed at creating a convenient, easy-to-use, and affordable healthcare management platform, particularly, people with less access to healthcare providers. Lastly, the system will enhance medication adherence with the use of automated medication reminders that will enable users to remember to take their recommended medicines in time.

2. Literature Review

A number of AI-based healthcare products have been discussed in prior literature. The studies of ML-based health monitoring have reported positive advances toward individual patient care. As an illustration, [1] is about machine learning models used to predict health, and [2] is about wearable technology used to monitor health continuously. Researchers like [3] and [4] have investigated the use of AI-based dietary and exercise prescription with positive effects on long-term health management. Nevertheless, current AI-based apps such as MyFitnessPal and Google Fit help one to monitor fitness and diet but do not provide individual medical advice. Other publications [5]-[7] point at the weaknesses of the current digital health solutions and the necessity of integrated AI-driven solutions that address the needs of an individual. The skill and the provisions of personalized healthcare [8]-[10] are the new AI capabilities that imply how AI can evolve in intelligent health guidance systems in the future.

3. Methodology

The methodology offers the design and realization of an ML-based Diet, Exercise, and Natural Medicine Recommendation System. The system digests the health data of the user to provide personalized recommendation like a dieting program, physical exercise and substitutes of natural medicine based on health principles. It also provides other options such as Today List of Diet and Exercise, User Medication Reminder and Health Report to ensure that the user is more engaged and to monitor his health.

4. Experimental Setup

4.1 Data Collection

The proposed system will rely on the information that will be offered by the users, along with the publicly accessible information to generate personal recommendations about health aspects. Some of the important personal health information that the user provides include height, weight, age, gender, existing medical conditions and fitness objectives. These inputs help the system to understand the health profile of the individual and provide individualized advice on the areas of diet, physical activities and general

wellness. In addition to the data of the users, the system also utilizes datasets found on Kaggle, which include valuable information on the subject of nutrition, fitness, and natural medicine. Such data sets are useful in development of accurate and evidence-based recommendations to users. Some of the datasets include the Dets, Recipes and Their Nutrients dataset which is a wide collection of recipes of diverse diets and cuisines. This data revolves around healthy and nutritious eating habits and gives the specific nutritional details of every recipe. It helps the system to offer appropriate meal plans based on the health requirements of the user and his or her taste with food consumption. Another important data is Fitness exercises in terms of Body Fat Percentage (BFP) and Body Mass Index (BMI). This is a set of data that assists the system in designing custom-made exercise plans in reference to the physical characteristics, activity and gender of the individual. With the help of the measurements of BFP and BMI, the system will be able to propose appropriate exercises, depending on the fitness objectives and health condition of the user. The system also includes the Home Remedies Dataset of Kaggle, consisting of a list of common illnesses and their home remedies. This data will enable natural medicine prescriptions to be incorporated into the system, where the user can search the traditional and natural way of dealing with minor health conditions. The system will provide precise and personalized and holistic health recommendations by combining user-supplied health data with such comprehensive datasets to aid in the improvement of health management and wellness.

4.2 Data Pre-processing

Data Cleaning Missing values and outliers. Feature Extraction BMI computation, disease relations, and Normalization Scaling values of normalization of the input of the ML model. One Hot Encoder (): Categor-ical values in the column diet preference are trans-formed into binary (0/1) vaLues.

Personalized Diet Plan

Model Random Forest classification for food selection

Mathematical Equation for BMI Calculation

$$BMI = \frac{W}{He}$$

Decision Criteria

- If BMI < 18.5: Underweight → High-calorie diet recommended
- If 18.5 ≤ BMI < 24.9: Normal weight → Balanced diet
- If BMI ≥ 25: Overweight/Obese → Low-calorie diet

Model Hybrid rule-based + ML classifier of exercise type.

Input: Height, weight, day of the week, disease condition, and user fitness goal.

Rule-based filtering: The system will filter exercises according to medical restrictions (i.e., no high impact exercises in case of joint problems).

Output: Two exercises are suggested by the system with the anticipated intensity and duration, as well as the target body part. Random Forest Classifier Model Random Forest Classifier Predicts diseases to medicine.

Backend API Endpoints

Table 1. API Endpoints

Endpoint	Method	Description
/Register	POST	Registers a new user
/Login	POST	Authenticates user and returns JWT token
/get_diet	GET	Fetches personalized diet recommendations
/get_exercise	GET	Fetches recommended exercises
/update_health_data	POST	Updates user health data
/get_reminders	GET	Retrieves medication reminders

Random Forest is an ensemble learning, which builds several decision trees and combines the results to achieve a better accuracy and generalization. The article of [11] states that the Random Forest minimizes over fitting as compared to the single decision trees, and offers the benefits of strong performance when dealing with the multi-class classification problems. Deals with categorical and numerical characteristics. The feature importance analysis is an inbuilt feature that helps to comprehend the health parameters that are important in influencing the recommendations. Strong in the case

of missing data and noisy inputs. Random Forest The classification function is defined as

$$f(X) = \frac{1}{N} + \sum_{i=1}^{N} T_i(X) \quad (2)$$

whereT i (X) is the prediction of the i^{th} decision tree and N is the size of ensemble in the number of trees.

The exercise and diet recommendations should also take into consideration the existing medical conditions to be safe (according to the [11]). A filtering method that employs rules will be used to filter out the inappropriate recommendations according to medical guidelines. Avoids unsafe activities (e.g. high-impact activities in the case of arthritis patients). Checks compliance with dietary restrictions (e.g., advising about the low-sodium diets when dealing with hypertensive patients). Minimizes risk through the combination of medical best practices and predictions of the ML. According to the studies presented by [11], hybrid approaches of using machine learning and expert-based rule filtering increase prediction reliability. Random Forest with rule-based restrictions enables one to have a balance between predictive accuracy and medical appropriateness. ML model is used to predict individualized recommendations with the help of user input. These recommendations are refined by rule based system to guarantee medical guideline. Hybrid models are more accurate as they minimize the false-positive recommendations.

5. RESULTS AND DISCUSSION

Our diet recommendation system was tested with the help of Random Forest Classifier to predict food items. The following metrics were used Accuracy Measures the percentage of correctly predicted food items. Precision Refers to the amount of the predicted food items that are true. Recall Measures the skill of the model to identify all the pertinent food items correctly. F1-Score Strikes a balance between the precision and recall of overall performance. Confusion Matrix This gives a breakdown of correct and incorrect predictions as indicated in the figure 1.

Table 2. Classification Metrics for food prediction

Metrics	Breakfast	Lunch
Accuracy	0.91	0.88
Precision	0.91	0.89
Recall	0.91	0.88
F1-Score	0.91	0.88

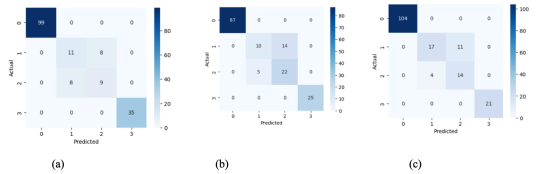


Fig. 1. Confusion Matrix for Breakfast **(b)** Confusion Matrix for Lunch (c) Confusion Matrix for Dinner

5.1 High Performance

The Random Forest model showed an average accuracy level of approximately 85 which was much higher than the conventional rule based and SVM based models. The model is useful in predicting appropriate food and portion size depending on the characteristics of the user including BMI, eating likes, and health objectives.

5.2 Misclassifications in Similar Foods

Though the accuracy was high, there were some misclassifications between similar types of foods (e.g., oatmeal vs. whole wheat toast, chicken vs. fish). It implies the further improvement of the model performance through the inclusion of feature engineering (the nutrition-based embeddings or semantic similarities between food items).

5.3 Food Quantity Prediction is Reliable

The food quantity prediction model had an R 2 of 0.81 which was substantial and showed a high degree of correlation between the size of the portion predicted and the actual portion size. This is an indication that the relationship between the user attributes and portion size requirements is well captured by Random Forest.

(a) (b)

Fig. 2. Health Assistant Signup page (b) Health Assistant Login page

The Signup functionality has a user interface as shown in Figure 4. In the screenshot, the user is at the Signup page, which requires him to fill in his username, email, and password to sign up. The Login page is shown in figure 5. where the user is expected to key in his/her registered email and password to log

into his/her account. The system authenticates the input and sends feedback in case the credentials are not correct.

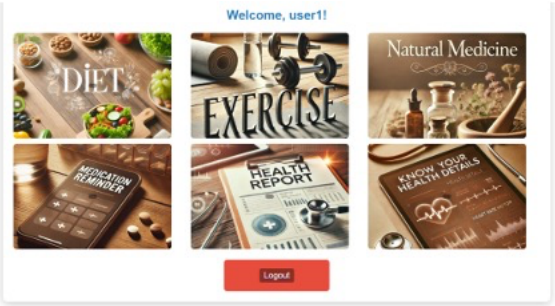


Fig. 3. Health Assistant Dashboard page

The dashboard page is presented in figure 3 and it occurs when a legitimate user successfully logs in. Once the user is successfully authenticated, he or she is redirected to this dashboard and a customized welcome message is shown using the registered username. The dashboard is the central control point of the application and it has buttons which will take the user to different functional pages like. Natural Medicine Page to find the alternative remedies depending on the health conditions of the users, Medication Reminder Page that will enable users to monitor their prescribed medicines, Health Report Page in order to see past health information and records. Moreover, the dashboard will have a Logout button that will enable the users to safely terminate their session and get back to the login screen. This interface is developed on the basis of HTML, CSS that provides fluent navigation, handling of session and easy to use interface.

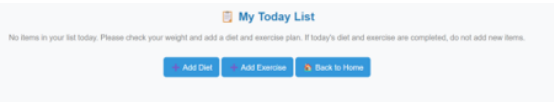


Fig. 4. Health Assistant My Today List page

Figure 4 illustrates the Today List Page that shows the user the tasks that relate to his or her health and the recommendations that he or she should follow on that particular day. In the given case, when there is neither an item available nor added, the interface displays an empty state message. The page has buttons that include: Add Diet, Add Exercise, Back to Home to enable users to take a quick action.

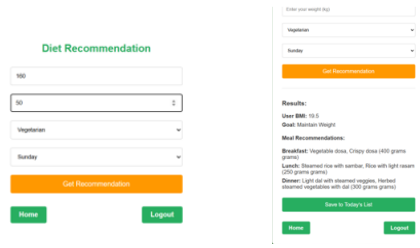


Fig. 5. Health Assistant Diet page

In Figure 5, the Diet Page is demonstrated, where one can have individualized recommendations on meals based on their health profile. The interface also has the input fields where the user is to fill: Height (in cm), Weight (in kg), Diet Preference (e.g., Vegetarian, Non-Vegetarian), Day of the Week.The page also contains: A Home button to get back to the dashboard, A Logout button to safely conclude the session and get back to the login screen.

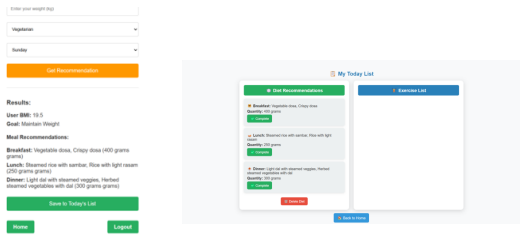


Fig. 6. Health Assistant Diet Recommendation page (b) **Assistant** My Today List page (Diet)

The Diet Recommendation Page is depicted in Figure 6, in which users get customized meal plans depending on their health and their dieting choices. After the user inputs the necessary data and presses the button of getting the Diet, the system calculates the BMI and works with it and other inputs to propose a meal plan. The suggested diet would be: Breakfast, Lunch and Dinner. The site also has the Add to Today List button which enables the user to store the suggested meals in order to be able to use them in the health tracking of the current day. Figure 6 displays the Today List Page in which the users are able to see and adjust their meal plan of the day, Breakfast, Lunch, and Dinner. The recommended food items and the quantity of food items is shown in each meal entry. The page has interactive features on every meal item. The Exercise Page is presented in Figure 6, and the user is able to get custom exercise recommendations depending on the health profile and daily routine. The page also has: A Home button so as to go back to the dashboard, A Logout button so as to

safely terminate the session and go back to the login screen.

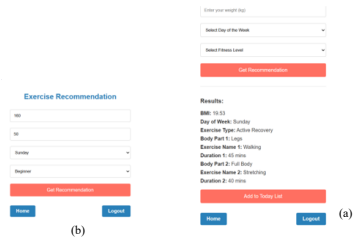


Fig. 7. Health Assistant Exercise Recommendation page

The Exercise Recommendation Page (figure 7) shows the individual work-out plans that the user receives after entering an input data. Upon the user entering his or her height, weight, fitness level, and day of the week, the system is capable of computing the BMI of the user and generating the desired exercise routines. The recommendation will be in the form of: Type of Exercise (e.g. Cardio), Part of Body 1 and Exercise Name 1 and Duration 1, Part of Body 2 and Exercise Name 2 and Duration 2. There is also the Add to Today List button that enables users to store the recommended exercises to be used in the daily activity tracking.

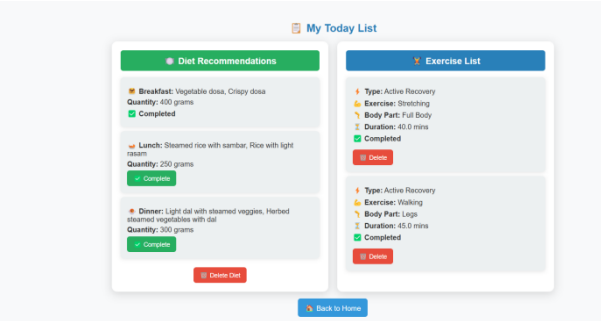


Fig. 8. Health Assistant My Today List page (Diet, Exercise)

Figure 8 shows the Today List Page, where users can view and manage their scheduled diet and exercise tasks for the day.

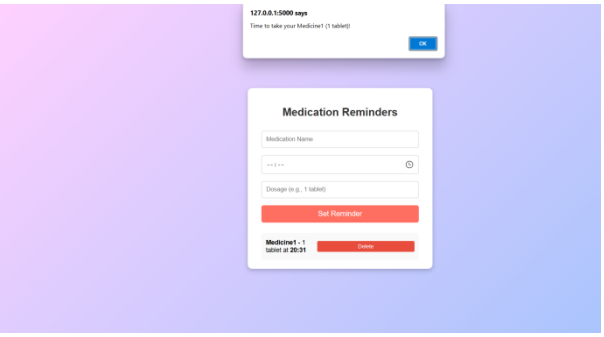
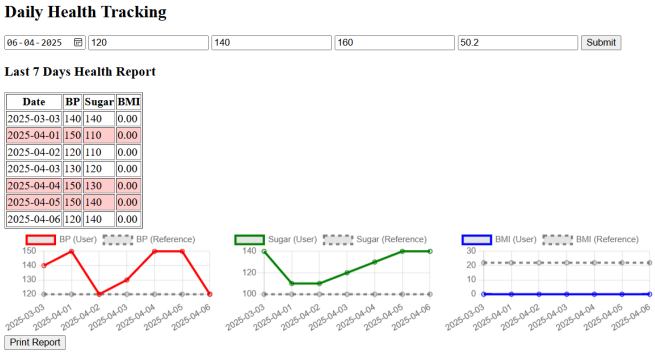


Fig. 9. Health Assistant Medication Remainder page

The Medication Reminder Page is depicted in Figure 9 and it allows users to plan and control their medicine intake. The interface will enable users to enter such important information as: Medicine Name, Time (when to take the medicine), Dosage (e.g., 1 tablet, 5 ml).



Date	BP	Sugar	BMI
2025-03-03	140	140	0.00
2025-04-01	150	110	0.00
2025-04-02	120	110	0.00
2025-04-03	130	120	0.00
2025-04-04	150	130	0.00
2025-04-05	150	140	0.00
2025-04-06	120	140	0.00

Fig. 10. Health Assistant Health Report page

Figure 10. represents the Health Report Page where users can see the graphical representations of their most important health metrics over time. It gives an overview of this page that enables users to monitor their performance and well-being. These graphs are: Blood Pressure Graph, Diabetes Graph, BMI Graph. Also, there is a button to print a report, where the user can create a summary of their health data and print it to provide to healthcare workers or to keep in personal storage.

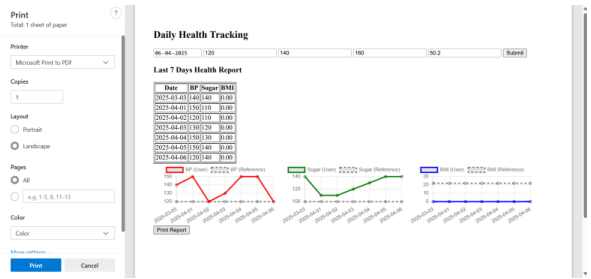


Fig. 11. Health Assistant Print Report page

The print health report page is presented in figure 11 where the users can access and print graphical illustrations of their most important health indicators over time. The graphs in the report are the following: Blood Pressure Graph, Diabetes Graph, BMI Graph. The page is created with the help of HTML and CSS and charting frameworks e.g. Chart.js, which are clear and professional.

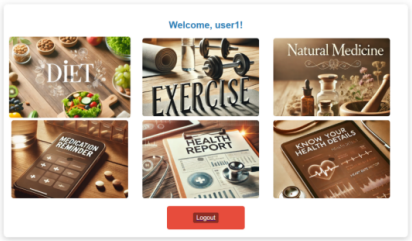


Fig. 12. Health Assistant Dashboard (Logout) page

Figure 12 depicts the Dashboard Page, which introduces the users with the main features of the application. The Logout option is one of the main functions of this page that enables the users to properly finish the session.

6. Conclusion And Future Work

Health Assistance App is a mobile and intelligent application intended to assist people in taking improved care of their health. It provides a secure authentication policy to defend the data about users and offers personalized dietary plans, physical exercises, and natural remedies depending on personal health objectives. There are also medication reminders in the app; users will never forget to take the prescribed medications, and the health tracking to keep track of the main statistics such as weight, blood pressure, and activity levels. It is simple to stick to a healthy program because the daily health dashboard provides a clear picture of the diet, exercises and medication plan. The application allows easier management of health through Ml and allows one to make sound decisions concerning their health. Exercise and Diet Page (today) is an overview of the meal plans and exercises. Health reports may also be compiled and printed in order to have easy monitoring by the user. The convenience of this app and its systemic nature can assist a great number of people in leading better lives as it can provide them with reliable and tailored health care.

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