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A Survey on Web-Based Real-Time Health Monitoring and Nutrition Recommendation

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ABSTRACT -

In today's fast-paced world, maintaining a healthy lifestyle has become increasingly challenging due to hectic schedules and the absence of personalized health management systems. This survey explores the development of intelligent nutrition tracking and personalized meal planning solutions that adapt to individual needs based on factors such as dietary habits, age, gender, BMI, and physical activity levels. By leveraging data-centric approaches, these systems analyse user health profiles to generate accurate dietary recommendations, enabling individuals to make informed nutritional choices. The paper further investigates advancements in web-based technologies and machine learning that support personalized nutrition planning. Many systems incorporate interactive dashboards to enhance user experience by offering visual insights into nutrient intake and analysing dietary behavior. Additionally, the ability to adapt to regional and cultural food preferences ensures inclusivity and relevance across diverse user groups. The reviewed systems commonly employ technologies such as HTML, CSS, and JavaScript for front-end development, with Flask serving as the back-end framework. Machine learning algorithms play a central role in delivering customized suggestions. By integrating intelligent analytics with user-friendly interfaces, these platforms provide scalable and efficient solutions aimed at minimizing nutrient deficiencies and encouraging healthier eating practices.

Key Words: Flask, HTML, CSS Dietary Recommendation, Nutrition Tracking, Machine Learning (ML), Customized Meal Plans

1. INTRODUCTION

Maintaining a healthy and balanced diet is essential for overall wellness. However, many individuals struggle to make informed dietary choices due to demanding schedules, limited nutritional awareness, and a lack of access to personalized meal planning tools. Since nutritional requirements vary from person to person, generalized dietary guidelines often fall short, underscoring the importance of individualized meal planning to promote better health outcomes. This survey investigates current methodologies and platforms that leverage web development and machine learning to offer tailored nutrition tracking and meal planning services. These systems commonly personalize recommendations based on several factors, including user preferences, age, gender, body mass index (BMI), and physical activity levels. By analyzing user health metrics, they strive to generate diet plans that align with each individual's specific needs. A key component of many such systems is the integration of visual dashboards, which help users monitor nutrient intake, recognize dietary patterns, and assess their eating behavior over time. The study also reviews how cultural and regional food preferences are incorporated to enhance user inclusivity and relevance. Moreover, the role of data-driven insights in identifying nutrient gaps and recommending balanced dietary choices is thoroughly examined. This paper reviews the technical aspects of such systems, including the use of technologies like Flask for server-side development, and HTML, CSS, and JavaScript for building responsive user interfaces. It also surveys various machine learning models applied to generate dynamic and adaptive meal suggestions. Through this comprehensive overview, the survey aims to highlight effective practices and identify ongoing challenges in designing intelligent, user-centric nutrition management tools.

2. LITERATURE SURVEY

The goal of this project is to develop an intelligent system that uses body measurements to determine daily caloric requirements and recommend customized diet programs. With personalized dietary guidance, the objective is to enhance health and aid in the prediction of obesity. To precisely predict caloric requirements, the system makes usage of ml algorithms likes support vector regression and decision tree regression. A rule-based system for dietary advice is also included, along with data visualization. It is simple to use thanks to a web platform.1,000 obese patients, ages 12 to 67, from Mansoura University Hospital are included in the dataset (35% male, 65% female). In order to generate customized diet regimens, it takes into account 15 important variables are included in this with personal details like age, height, weight, BMI. Benefits of this model include improved machine learning accuracy, personalized dietary recommendations, and insights into health variables like metabolism and muscle mass. Managing complexity, maintaining high data quality, and customizing it for various users are challenges Future enhancements might take into account lifestyle choices and medical history, leverage data from wearable technology, and let consumers modify meal plans according to their tastes [1].

In order to improve patient care through ongoing health monitoring and streamlined medical procedures, this study investigates the application of Pervasive Monitoring Systems (PMS) in conjunction with Internet of Things technologies. It emphasizes important technologies utilized here those are cloud computing, artificial intelligence and internet of things. Real-time health data is gathered by wearable IoT devices, processed and stored securely by cloud computing, and analysed by AI to enhance medical decision-making. For easy access and interaction, the system runs on a web platform built with Django. Vital health indicators such as blood pressure, blood sugar, pulse rate, ECG readings, and cholesterol levels are tracked by smart devices and sensors that collect the data. To make the data usable for healthcare practitioners, it must be properly managed because it comes in a variety of formats. AI is essential to efficiently managing and interpreting data as its amount rises. Continuous health monitoring, lower healthcare expenses, and it makes better decision making on clinical system with some few advantages of this system. Early intervention is made possible by real-time tracking, which lowers administrative costs and hospital readmissions while preventing problems. There are obstacles, too, such handling massive amounts of health data, IoT devices' short battery lives, and possible cloud computing delays, which might affect emergency reaction times. In order to provide more creative and efficient healthcare solutions, future developments should concentrate on improving device battery efficiency, creating better data management plans, and combining wearable, IoT, and AI technologies [2].

Through the use of data to generate individualized meal plans, this study examines how technology might enhance personalized nutrition (PN). It addresses important issues while concentrating on various approaches to data collection and analysis. Knowledge graphs arrange data, optimization algorithms enhance meal recommendations, and machine learning (ML) and artificial intelligence (AI) aid in information analysis. For increased precision, the system collects information such as body measurements and genetic characteristics. Users can easily access a web platform created with Django. More precise nutrition programs can be produced by combining data from several sources. According to research, these techniques can successfully tailor diets; yet, there are certain difficulties, such as maintaining user privacy, accommodating individual variances, and integrating with pre-existing apps. Future developments should concentrate on enhancing privacy protection, collaborating with initiatives such as Food2030, and utilizing new technology to decrease food waste and increase the effectiveness of individualized nutrition [3].

This study examines how AI can improve nutrition by tracking health conditions, developing individualized diet programs, and preventing diseases. To comprehend eating patterns and their impact on health, it makes use of a variety of data sources, including genome sequencing, food photos, and recipe databases. Finding trends in nutrition data and enhancing dietary recommendations are made possible by technologies like machine learning, deep learning (CNN), and data analysis. Benefits of AI include improved hospital nutrition management, tailored diets, and disease prediction. By improving the efficiency of nutrition analysis, it also expedites diagnosis and reduces healthcare expenses. But there are obstacles, such as making sure the data is reliable, dealing with moral dilemmas, and refining data collection techniques. Refining AI models, enhancing data quality, and establishing moral standards for safe usage in nutrition should be the main goals of future advancements [4].

The goal of this research is to employ IoT technology to create a real-time health monitoring system that tracks patient health and stores data in the cloud. Physicians can react to medical situations more rapidly thanks to the system. Temperature, heart rate, and oxygen level sensors are controlled by an Arduino UNO microcontroller. To identify potential health hazards, machine learning—more especially, the Support Vector Machine (SVM) algorithm—analyses the data. By enabling remote access to medical records, the technology facilitates early detection and preventive care for both patients and physicians. But there are certain difficulties. Concerns about privacy arise when health data is stored in the cloud, and the system depends on sensors and an internet connection, both of which could malfunction. IoT may potentially be less accessible due to the expensive setup and device costs. Future enhancements could involve creating online and mobile applications for tracking health in real time and storing a thorough history of medical records, which would make the system more practical for both physicians and patients [5].

In order to help users achieve their daily calorie demands and enhance their health, this study focuses on developing customized meal plans based on their specific information. In order to identify nutritional needs and recommend appropriate meals, the system examines user data. It employs Ant Colony Optimization (ACO) to guarantee a range of food options, the Weighted Sum Model (WSM) for meal selection, and fuzzy k-means clustering to group users with comparable attributes. Accuracy is increased through machine learning. It is user-friendly due to its web-based interface. Although it relies on precise user data and might not account for all dietary preferences or constraints, the system encourages balanced eating and individualized nutrition. More nutritional options, the use of real-time data from wearable technology, and the application of sophisticated machine learning for better suggestions are possible future developments [6].

This main aim of this paper is to create the machine learning health-based monitoring system which offers individualized dietary and activity recommendations. To help people with illnesses like diabetes, high blood pressure, and thyroid issues, it analyses health data using decision tree algorithms like ID3 and C4.5. The technology integrates a BMI dataset for assessment and uses medical information from the UCI Chronic Kidney dataset to determine the stages of kidney disease. Accuracy is increased via ml algorithms like support vector machine and random forest and Deep Learning, C4.5, and ID3. Prior to analysis, the data is refined and processed. Users can obtain their health insights through a web-based application developed with Django. The system makes recommendations that are more accurate by taking into account a variety of medical issues. It may not be beneficial for everyone, though, as it depends on the calibre and diversity of input data. Furthermore, for machine learning models to be implemented correctly, a lot of processing power and knowledge are needed. Future developments might involve improving machine learning models for increased accuracy and dependability as well as broadening the system to incorporate more users and health conditions [7].

This paper is to create a useful chatbot that employs a Large Language Model (LLM) to deliver information on Philippine cuisine and nutrition. In order to enhance food stability and health consciousness in the Philippines, the objective is to link regional food items with their nutritional advantages and accessibility. Using web scraping, the chatbot's dataset was collected from 30 reliable sources, such as the National Nutrition Council, the Department of Agriculture, and DOST-FNRI. Meta Llama 2 7B HF was used for training, while Meta Llama 3 7B Instruct was used for evaluation. ROUGE, GLEU, and BERT Score were used to measure accuracy. By offering precise nutritional information in an intuitive manner, this chatbot assists users in making well-informed food choices. However, the quality of the data determines its dependability, and inaccurate or lacking information may compromise its accuracy. Additionally, users could find it difficult to confirm the legitimacy of comments. Future enhancements can include adding additional data, utilizing cutting-edge AI to provide better answers, and incorporating augmented reality to create a more engaging experience [8].

The target of this paper is to create a web application that employs machine learning to offer individualized fitness and diet advice. By providing individualized diet and exercise programs based on BMI, age, and activity levels, the aim is to assist users in reaching their health objectives. Meals are divided into three categories under the system: breakfast, lunch, and dinner. It classifies meals using a Random Forest classifier and suggests diets using K-means clustering. Web technologies guarantee a user-friendly experience, while machine learning evaluates user data to produce personalized recommendations. By learning from user comments, the platform provides customized strategies and gradually enhances recommendations. However, users must supply accurate information for it to be accurate. Additionally, certain consumers could have trouble understanding recommendations based on machine learning. Refining suggestions, utilizing more sophisticated AI models, and including features like community support and real-time health tracking are possible future enhancements [9].

This project focuses on automating food detection and estimating calorie content from photos using deep learning. In seven categories that includes all the junk food which examines that 2,800 food photos from Kaggle. real-time models like YOLO increase accuracy while deep learning approaches like CNNs recognize food item making the system mobile-friendly. Performance is improved by large datasets, and manual feature extraction is less necessary with deep learning. Real-time detection and sophisticated models increase speed and dependability. However, the implementation of these models is complicated due to their requirement for high-quality data and substantial processing capacity. For better nutritional tracking and healthier eating, future developments might concentrate on boosting accuracy, adding additional features, and broadening the food categories [10].

3. VARIOUS METHODS ARE USED IN WEB-BASED REAL-TIME HEALTH MONITORING AND NUTRITION RECOMMENDATION SYSTEM

A. Data Collection Methods

These systems start by collecting basic user information. This includes age, gender, height, weight, food preferences, allergies, and activity levels. Users usually fill out this information using online forms. In some advanced systems, data is also collected from fitness devices that track things like heart rate, sleep, and calories burned. Users can also log their food by typing it in.

B. Health Metric Calculations

Once data is collected, systems calculate key health metrics to assess the user's current nutritional and fitness status. The Body Mass Index (BMI) is used to determine weight categories, while the Basal Metabolic Rate (BMR) calculates the energy required for the body to function at rest. Combining BMR with activity levels results in the Total Daily Calorie Expenditure (TDEE), which guides daily caloric intake. The system also determines appropriate macronutrient distribution (carbohydrates, proteins, fats) based on the individual's goals—like weight loss, maintenance, or muscle gain.

C. Machine Learning and Recommendation Algorithms

Machine learning helps the system understand user habits and give better meal suggestions. It looks at user data to find patterns and make smart decisions. Content-based filtering recommends meals similar to what the user liked before. Algorithms like decision trees and Random Forest help group users by health risk or find missing nutrients. Clustering methods, like K-means, group people with similar food needs. Regression models are used to predict how many calories or nutrients someone might need. In some advanced cases, deep learning is used to understand complex food habits and give more personalized advice.

D. Visualization Techniques

Effective visualization improves user engagement and helps in understanding daily nutritional habits. Interactive dashboards display progress toward calorie and nutrient goals in an intuitive way. Bar and line graphs show consumption trends over days or weeks, while pie charts offer a quick look at macronutrient balance. Some systems use heatmaps to highlight unhealthy eating patterns, guiding users to improve. These visuals not only make data accessible but also motivate users by showing progress in real time.

E. Visualization Techniques

The web-based interface is developed using modern technologies for accessibility and responsiveness. HTML structures the content, CSS styles the interface, and JavaScript adds interactivity. Popular frontend frameworks such as React or Vue may be employed for dynamic rendering. On the backend, lightweight frameworks like Flask or more robust options like Django or Node.js are used to handle data processing, ML model integration, and user session management. These technologies ensure smooth performance and seamless interaction.

TABLE - I: COMPARISON OF DIFFERENT METHODS

S.NO	AUTHOR	TECHNIQUES	ADVANTAGES	DISADVANTAGES	DATASET INFORMATION
[1]	Sweidan, S., Askar, S. S., Abouhawwash, M., & Badr, E.	Support Vector Regression, Decision Tree for calorie estimation and data visualization.	This Models advantage include personalized calorie and diet recommendations, accuracy from combining data-driven methods, detailed metrics like muscle mass and BMR for a comprehensive	The disadvantages include the need for high-quality input data, complexity in implementation ,and the limited applicability of model	It Contains nearly 1000 obese patients from Mansoura university hospital, aged 12 to 67 years people.
[2]	Mahmmod, B. M., Naser, M. A., Al-Sudani, A. H. S., Alsabah, M., Mohammed, H. J., Alaskar, H., & Abdulhussain, S. H.	IoT devices, Cloud computing and artificial intelligence, IoT devices ,like wearable, track health data, Web Django Platform used as interface.	This system helps to continuous health, that reduces health costs, and improves decision-making. That monitors the real-time data which helps doctors make better decisions.	There is large amount of data, limited power and battery life in IoT devices.	The Dataset comes from smart devices and sensors that health data like blood pressure, sugar levels ,pulse, ECG and cholesterol.
[3]	Tsolakidis, D., Gymnopoulos, L. P., & Dimitropoulos, K.	Machine Learning, Artificial Intelligence to analyse data, knowledge graphs to organize information.	In this system create personalized meal plans based on individuals preferences and health data.	There is concern about the privacy while using the personal data as well as challenges in accounting for differences between individuals.	--
[4]	Theodore Armand, T. P., Nfor, K. A., Kim, J. I., & Kim, H. C.	Machine Learning, Deep Learning(Convolutional Neural Networks),and data analysis	It help predict diseases, provide personalized diet plans, and improve nutrition checks in hospitals.	There are some challenges in using AI for nutrition.	These include genome sequencing data, vision-based dietary analysis (DA), and large recipe collections.
[5]	Khan, M. N., Rahman, Z., Chowdhury, S. S., Tanvirahmedshuvo, M. R. H. O., Hossen, M. D., Khan, N., & Rahman, H	Support vector machine	This will help you to predict health problems early.	The system also relies on sensors and internet connectivity, which could cause problems if they fail.	The system allows real-time health monitoring, so issues can be detected immediately. Both patients and doctors can access health records remotely.
[6]			It offers personalized meal plans, promotes better health by	The system depends on accurate user data and	

	Widhianta, A., Susetianingtias, D. T., Riyanto, S., Harmanto, S., Al Hakim, S., Saptarini, T., ... & Kushadiani, S. K.	Fuzzy K-means Clustering to group similar users, Weighted Sum Model WSM for meal recommendations	maintaining a balanced diet, and is user-friendly through a web-based interface.	may not address all dietary preferences or restrictions.	The dataset includes user details like age, gender, height, weight, and daily activities, used to calculate nutritional needs and generate meal recommendations.
[7]	Vemula Jhansi Rani, D. V.	Random Forest, Support Vector Machine, Machine Learning, Deep Learning, C4.5, ID3, and Django for the web-based application	The system gives health advice based on a person's data.	However, the system relies on specific data, so it may not work for everyone. Also, machine learning models can be complex and require a lot of computing power.	Data from the UCI Chronic Kidney dataset to check different stages of kidney disease
[8]	Peñas, R. T. L., & Cajote, R. D.	BERT score , Rouge and GLEU for assessment	The chatbot gives nutrition information for the Philippines, helping people make better food choices	The chatbot's accuracy depends on good data	This Chatbot's contains dataset comes from 30 trusted sources and includes food and nutrients.
[9]	Shah, J., Yadav, V., Pandey, S., Patel, Y., & Patil, M. S.	Machine Learning, Web development.	The system creates personalized diet and exercise plans based on user profiles.	The system works best with accurate user data.	The dataset includes three meal types: Breakfast, Lunch, and Dinner. It uses K-means for diet recommendations and Random Forest for meal classification.
[10]	Ibrahim, S., Hasnan, W. M. A. A. W., Ghani, N. A. M., Samah, K. A. F. A., Mangshor, N. N. A.,	Deep Learning like CNN' are used for food recognition ,while YOLO enables real-time food detection.	Used for food recognition, while YOLO enables real-time food detection. Large food image datasets enhance system accuracy.	Deep learning relies heavily on high-quality, large datasets, and setting up models can be complex and resource-intensive	It Contains 2800 images from Kaggle covering seven food items.
[11]	Shah, M., Degadwala, S., & Vyas, D. .	This paper includes clinical nutrition, mobile apps, wearable devices, decision support system.	Digital technology improves nutritional evaluations and recommendations	A major challenge is data quality since recommendations depend on complete and accurate data.	The dataset will have 2800 images from Kaggle covering all the fast food

[12]	Ünal, C., & Çılgın, C.	It Uses Prolog, PHP, Bootstrap, MySql	They help people check their nutrition without a doctor.	They depend on technology and can't fully replace human judgment.	The dataset covers all the diseases and their diet plans, helping with the system to give accurate nutrition.
[13]	Mogaveera, D., Mathur, V., & Waghela, S.	Logistic Regression, Random Forest, Gradient Boosting, Decision Trees, K-Means clustering, Naïve Bayes	The C4.5 algorithm improves ID3 by reducing overfitting and handling continuous data better.	It improves on this. Some datasets may not cover diabetes, thyroid, and blood pressure together.	This includes all the diet and exercise plans for trainers, doctors, and online sources from previous studies
[14]	Kardam, S. S., Yadav, P., Thakkar, R., & Ingle, A.	Machine Learning, AI, Random Forest and K-Means Clustering	The system provides personalized diet plans using height, weight, age, and activity level.	The accuracy depends on the dataset quality.	This includes breakfast, lunch, and dinner, and also nutrition to help suggest meals
[15]	Kirk, D., Catal, C.,	Machine Learning, Deep Learning Algorithms	These technologies help predict nutrition needs accurately.	Challenges include overfitting, where the model works well on training data but	--

4. CONCLUSION

To sum up, our system successfully combines web technology and machine learning to produce customized meal plans based on user-specific inputs. It promotes healthier eating habits by utilizing predictive analysis to make sure that meal recommendations match nutritional requirements for each individual. It is a workable solution for individualized nutrition management because of the interactive dashboard and insights, which further increase user engagement. More precise and flexible meal recommendations are also made possible by the system's capacity to evaluate a variety of health factors and dietary preferences. Constant observation and revisions guarantee that the suggestions are still applicable and advantageous, which eventually enhances general wellbeing.

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