Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 6, No.1, June : 2024

ARTIFICIAL INTELLIGENCE (AI) DIETICIAN BOT

Srinivas Kalime, Assistant Professor, CSE(Data Science),Sreyas Institute of Engineering and Technology,India
Kadiyala Sai Sathvik, Ranamalla Nithin Reddy, M. Sridurga, Nagaram Trinay, UG Scholar, Sreyas Institute of Engineering and Technology,Hyderabad, India. ***trinaynagaram@gmail.com***

ABSTRACT
The AI Dietician Bot project aims to change the way people consume and manage their diet by combining the power of Artificial Intelligence with nutritional knowledge. This virtual dietitian will provide personalized meal plans, personalized recommendations and ongoing support for users who want to improve their health and wellness through nutrition. Using Machine Learning Algorithms like SVM, Random Forest, Neural Network, Naïve Bayes, the AI dietitian bot will analyze user's dietary preferences, health goals, and personal needs to create personalized meal plans healthy and delicious with age, weight, activity level and dietary restrictions by considering factors, the bot will ensure that users eat the right balance of nutrients to support their health goal. Users will be able to interact with the AI Dietician bot via a user-friendly chat interface, where they can input information about their dietary habits, track their meals, ask questions about specific foods, and receive guidance. The bot will also proactively suggest meal ideas, recipes, and tips to help users stay on track and make healthier choices. Additionally, the AI Dietician bot will constantly learn and adapt based on user feedback and results, adjusting meal plans as needed to optimize results. With 24-hour availability, the bot will give users the guidance and accountability they need to stay in control of their diet. Overall, the project represents a brilliant solution to address the challenges of food and nutrition in the modern world.
keywords: AI Dietician, Artificial Intelligence, Machine Learning, SVM, Random Forest, Neural Network, Naïve Bayes.

1. INTRODUCTION
The healthy eating is crucial for maintaining good health and nutrition. It can help individuals manage their weight, improve their overall health, and meet their nutritional requirements. With the advancements in digital tools and artificial intelligence, individuals can now easily track their nutrient intake. The Body Mass Index (BMI) is a valuable tool for assessing a person's weight in relation to their height. Calculated by dividing their weight in kilograms by their height in meters squared, the BMI can help individuals determine if they area at healthy weight range.The Basal Metabolic Rate (BMR) is a useful measurement for determining how many calories a person needs to maintain their current weight. Calculated based on factors such as age, weight, height, and gender, the BMR represents the number of calories the body needs to perform basic functions at rest. Calories are a measure of the energy content in a diet, and a person's calorie needs depend on various factors such as gender, age, and level of physical activity. Consulting a dietitian can help individuals determine their specific calorie needs and create a personalized diet plan. However, not everyone may have access to a dietitian or be able to afford their services.To address this issue, an AI-Based Dietician system has been developed. This system allows users to receive customized diet plans based on their individual needs, including gender, age, BMI, allergies, and personal preferences. Utilizing machine learning models, the system processes user inputs to generate personalized diet plans that are free of cost and accessible at any time. This AI-based approach aims to make healthy eating more convenient and available to individuals who may not have access to traditional dietitian services.
In this project, we aim to analyse the effectiveness of four different machine learning algorithms in predicting personalized diet plans based on individual characteristics such as BMI, BMR, age, weight, height, and gender. To achieve this, we will gather a dataset consisting of individuals with known diet plans and their corresponding input parameters. The dataset will be divided into two sets: a training set and a testing set. The training set will be used to train each machine learning algorithm by feeding it

with the input parameters of the individuals and the corresponding diet plans. Once the algorithms are trained, we will evaluate their performance on the testing set.

2. LITERATURE SURVEY

[1] Nutrients Profiles of Food Items in Adolescent Diet: Cluster Analysis of Data Collected from a High School Citizen Science Project (2022), demonstrated the study that presents a cluster analysis of nutrient profiles of food items in the adolescent diet, utilizing data collected from a high school citizen science project using K-means and Gaussian Mixture Modelling (GMM). The aim was to understand the dietary habits of adolescents and identify patterns in the nutritional composition of commonly consumed foods. Data were collected from a diverse sample of high school students who documented their dietary intake over a specified period.

[2] Artificial Intelligence (AI) based Nutrition Advisor using an app (2023), It is a synthetic intelligence software approximately human nutrition. Act as a nutritionist, similar to an actual nutritionist. This machine is very much like that of a nutritionist. Anyone trying to recognize their consuming plan should offer their nutritionist with statistics including: The human body type, weight, height, and statistics on working hours. A nutrition is also provided via this app primarily based on the data uploaded by way of the person. The machine requests all of these statistics from the user, analyses it, and then affords the user with a dietary plan.

[3] An AI Based Approach for Personalized Nutrition and Food Menu Planning (2022), In this paper, we present the framework of our AI-based system to control nutrient intake. As a result, the tool is still useful for support and possibly replace traditional methods of food analysis that are now in use. As far as possible, plan to continue to improve and optimize the system to increase accuracy and usability. Overall, the authors are committed to improving their AI-based approach to nutrition planning to ultimately provide users with a reliable and efficient tool for managing their nutrient intake.

[4] An Artificial Intelligence-Based System to Assess Nutrient Intake for Hospitalized Patients (2020), In this paper, the development of a new AI-based automated system for measuring the nutritional status of hospitalized patients under development manner. Several alternatives have been introduced such as Another multimedia-feed that integrated the database storing the data MTCNet with a dedicated system in a real clinical setting proposed summary classification for food classification and food identification. Although the proposed software has been developed and evaluated using images taken with a PC driven intensive camera Can be easily transferred to a smartphone - well-equipped Depth sensor makes it quite easy.

[5] Diet Recommendation System based on Different Machine Learners: A Review (2022), In this research, it covers methods, materials, and advanced classifiers to demonstrate its usefulness. Consequently, we can say that succession to establish a good dietary counseling program, it must first be defined Recipes, followed by chemistry sections. Consequently, in the future, if the system modified selection method a voting based on the method of Machine Learning classifier, will very effective for classifying systems and retrieving options food that is vegetarian or non-vegetarian in nature.

3. RELATED WORK

3.1 BMI CALCULATION

The AI Dietician can then provide personalized recommendations for maintaining a healthy weight based on the BMI calculation. This could include suggestions for diet, exercise, and lifestyle changes to help the user achieve their health goals.

The Body Mass Index (BMI) is a measure of body fat based on a person's weight in relation to their height. It is calculated by dividing a person's weight in kilograms by their height in meters squared.

The formula for calculating BMI is as follows:

BMI = weight (kg) / (height (m) x height (m))

BMI Categories based on the World Health Organization (WHO) guidelines are as follows:

- Underweight: BMI less than 18.5
- Normal weight: BMI 18.5-24.9
- Overweight: BMI 25-29.9
- Obesity: BMI 30 or greater

It is important to note that BMI is a screening tool and does not directly measure body fat, muscle mass, or overall health. It is best used in conjunction with other measurements and assessments to determine an individual's overall health status. In the context of the AI Dietician bot project, incorporating BMI calculations can provide users with a general idea of their weight status and potentially help guide their dietary and exercise recommendations. By prompting users to input their weight and height data, the AI bot can automatically calculate their BMI and provide personalized advice based on their BMI category. This information can help users track their progress and make informed decisions about their health and wellness goals.

3.2 BMR CALCULATION

Basal Metabolic Rate (BMR) is the amount of energy expended by an individual at rest in a neutrally temperate environment, in the post-absorptive state (meaning the individual has not eaten for 12 hours and has been resting for at least 30 minutes). BMR is typically expressed in terms of calories burned per day.There are several formulas that can be used to calculate BMR, with some of the most common ones being the Harris-Benedict equation and the Mifflin-St Jeor equation. These formulas take into account factors such as age, weight, height, and sex to estimate an individual's BMR. For example, the Mifflin-St Jeor equation for calculating

BMR in men is: BMR = 10 x weight (kg) + 6.25 x height (cm) - 5 x age (years) + 5

for women is: BMR = 10 x weight (kg) + 6.25 x height (cm) - 5 x age (years) - 161.

Once the BMR is calculated, it can be used as a baseline for determining daily caloric needs based on activity level. For example, to lose weight, an individual could aim to consume fewer calories than their BMR, while to maintain weight, they would aim to consume roughly the same number of calories as their BMR. In the context of an AI Dietician bot project, the BMR calculation would be a crucial component in providing personalized diet and nutrition recommendations to users. By inputting information such as age, weight, height, and sex, the AI bot could calculate the user's BMR and use that information to create a customized meal plan tailored to their specific needs and goals.

We require certain key information in order to predict an appropriate diet plan for an individual. This includes the individual's Body Mass Index (BMI), Basal Metabolic Rate (BMR), age, weight, height, and gender. The BMI is a measure of body fat based on height and weight, the BMR is the number of calories the body needs to function at rest, and age, weight, height, and gender all play a role in determining nutritional requirements. By analyzing this data, we can create a tailored diet plan that is suited to the individual's specific needs and goals.

4. PROPOSED SYSTEM

This project aims to help users create a daily diet plan that meets their calorie intake requirements while ensuring that the food items they consume are nutritionally balanced. Now a days atmosphere, people from all over the world are becoming more concerned with their health and way of life. But simply staying away from junk food and working out is insufficient; we also need to consume a balanced diet. A healthy life is possible with a well-balanced diet.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 6, No.1, June : 2024

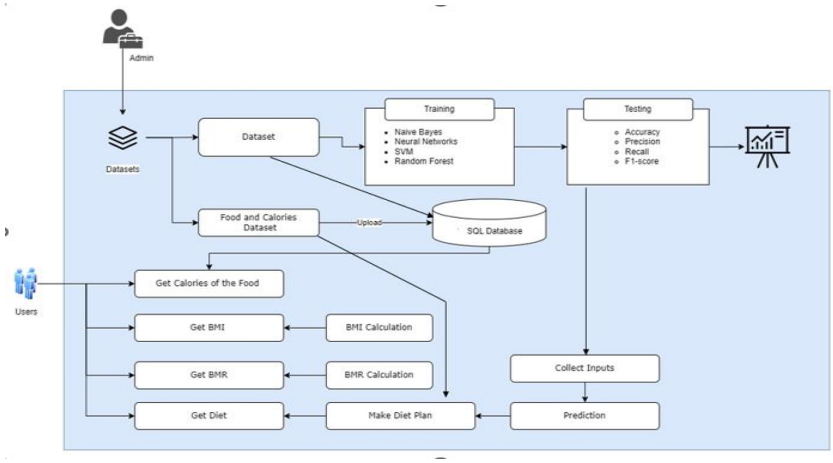

Fig 4.1: Proposed System architecture

The present project utilizes a combination of machine learning techniques, such as Naive bayes, Neural Network, Random Forest, and Support Vector Machine algorithms, to create a personalized and nutritionally balanced diet plan for the user. Data is collected on food items and their nutritional values from public food databases.

Serial No.	**Input Parameter**
1	Weight
2	Height
3	Age
4	Gender

Table 4.1: Information given by user

This application uses a sophisticated algorithm to give the user a diet plan based on personal information like height, weight, age, gender for BMI and BMR. In the case of developing a diet plan based on personal information, Random Forest has been found to have the highest accuracy among four different algorithms: Support Vector Machine (SVM), Neural Networks, Naive Bayes, and itself. The high accuracy of Random Forest in this application can be attributed to its ability to handle a large number of input variables and complex relationships between them. This allows it to make accurate predictions and provide personalized diet plans that are both effective and efficient for the user. Overall, Random Forest proves to be a reliable and powerful algorithm for developing personalized diet plans based on personal information, making it a valuable tool for individuals looking to improve their nutrition and achieve their health and fitness goals.

Industrial Engineering Journal
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Fig 4.2: Suggested Diet Plan for Breakfast, Lunch and Dinner.

S.no	Algorithm	Accuracy	Precision	Recall	F1-score
1	Naïve Bayes	35.82	28.62	29.09	26.36
2	Neural Networks	35.58	15.78	24.55	17.74
3	SVM	14.76	9.15	13.39	8.48
4	Random Forest	99.87	99.81	99.90	99.85

Table 2: Performance Evaluation Table

5. RESULTS AND DISCUSSION

In this study, we evaluated the performance of four different machine learning algorithms for classifying the dataset. The results show that Random Forest achieved the highest accuracy of 99.87%, with precision, recall, and F1-score all above 99%. This suggests that Random Forest is the most suitable algorithm for this classification task.On the other hand, Naïve Bayes, Neural Networks, and SVM achieved lower accuracy scores of 35.82%, 35.58%, and 14.76% respectively. The precision, recall, and F1-scores for these algorithms also varied, with Naïve Bayes demonstrating the highest recall at 29.09% while Neural Networks had the highest precision at 15.78%.Overall, these results highlight the importance of selecting the appropriate machine learning algorithm for a given task, as the performance can vary significantly. In this case, Random Forest outperformed the other algorithms in terms of accuracy and overall classification metrics.

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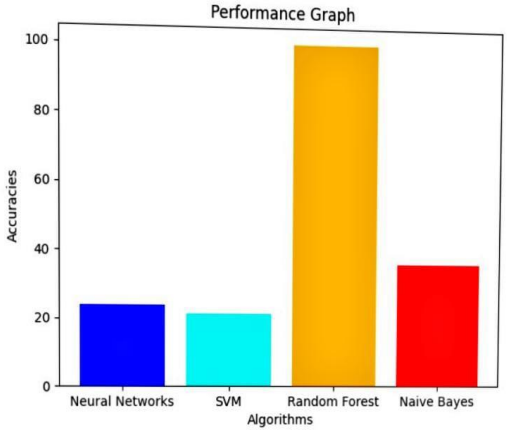

Fig 3: Performance Graph

5.1 Discussion:

In our proposed system, we are incorporating various machine learning algorithms including SVM, random forests, naive Bayes, and neural networks to optimize dietary recommendations for users. SVM is being used for its ability to effectively classify and predict dietary patterns based on the complex relationships present in the data. Random forests are helpful in improving the accuracy of dietary advice by aggregating the predictions of multiple decision trees. Naive Bayes is employed for its simplicity and efficiency in handling large amounts of data to make accurate predictions about dietary choices. Additionally, neural networks are being utilized to analyze and provide personalized recommendations based on the unique dietary preferences and health goals of each individual. By combining these diverse algorithms, we aim to enhance the effectiveness and precision of our AI dietitian system for improved user outcomes.

5.2 Comparison with Existing Systems

The existing system in the base paper utilizes cluster analysis techniques such as K-means and Gaussian Mixture Modeling to identify patterns in the nutritional composition of commonly consumed foods by adolescents. While this analysis provides valuable insights into the dietary habits of adolescents, it may not offer personalized meal plans and recommendations tailored to individual users' specific needs and goals.The proposed AI Dietitian Bot project utilizes a combination of Machine Learning techniques such as Random Forests, Naive Bayes, Neural Networks, and Support Vector Machines to provide personalized meal plans and recommendations based on the user's dietary preferences, health goals, and personal needs. This approach allows for a more precise and tailored analysis of nutrient profiles, dietary habits, and overall health requirements compared to the existing system described in the base paper.

5.3 Advantages of the Proposed System

- **Convenience**: Convenience refers to the ease and simplicity of performing a task or accessing a product or service An AI Dietician bot offers convenience to users by providing them with instant access to personalized dietary advice and guidance at any time, without the need to schedule an appointment or wait for a response from a human dietitian. Users can get quick answers to their questions and receive recommendations for healthy eating habits on-the-go.
- **Personalization**: Personalization refers to the customization of products, services or experiences to meet the specific needs or preferences of individual customers.
- **Time Efficiency**: Time efficiency may involve features such as fast checkout processes, quick response times, and efficient delivery options that help customers save time and complete their transactions quickly and easily.

5.4 How It's Better

The proposed system is superior to the existing system in the base paper due to its ability to provide personalized meal plans and recommendations tailored to individual users' dietary preferences, health

goals, and personal needs. By utilizing advanced Machine Learning algorithms such as Random Forests, Naive Bayes, Neural Networks, and Support Vector Machines, the AI Dietitian Bot can offer more precise and tailored analysis of nutrient profiles and dietary habits. This personalized approach allows for real-time feedback and guidance to help users make healthier choices and achieve their desired health outcomes.This dynamic and interactive feature sets the proposed system apart from the existing system in the base paper, offering a comprehensive and highly personalized approach to nutrition management and wellness. Overall, the AI Dietitian Bot project represents a significant advancement in the field of nutrition management, providing a more advanced and efficient solution for individuals looking to improve their dietary habits and overall health.

6. CONCLUSION

In conclusion, the personalized dietary assistance project aimed at revolutionizing the way individuals receive nutritional guidance. The system utilizes cutting-edge technology to provide users with tailored nutrition recommendations and guidance similar to that of a human dietitian. By analyzing user input, including personal preferences, dietary restrictions, and health goals, the AI diet consultant generates customized meal plans and recipe suggestions that optimize health and wellness. Acknowledging the valuable guidance and input from mentors and the support of the academic institution, the project has laid a solid foundation for future advancements. By continuously integrating advanced algorithms, real-time monitoring capabilities, and expanding the database of nutritional information, the AI diet consultant can adapt to individual needs and preferences, resulting in a more personalized and effective user experience.

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