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Vitamin Deficiency and Food Recommendation Using Machine Learning

Ms. Manyala Naga Sailaja[1], D. Sunil Kumar[2], B. Deeksha[3], B. Pranav Sai[4]
[1]*Assistant Professor, Department of CSE, CMR College of Engineering & Technology, Hyderabad, Telangana*
[2, 3, 4]*UG Student, Department of CSE, CMR College of Engineering & Technology, Hyderabad, Telangana*

Abstract: ***This project's unique dataset is created from a of both high and low levels of a few vitamins (a, b, c, d, e, and k). Qualities are divided into Vitamin-related regular and irregular while the As usual, labels are divided into o and 1as abnormal. Another dataset predicts illnesses caused by vitamin shortages by utilizing a different that produces based based on deficiencies in multiple vitamins additionally food recommendations depending Whatever one does not own. KNN and naïve are among the classifier methods employed. bayes classifier, support vector machine, voting classifier random forest. The precision of every algorithm is evaluated after which the best performing algorithm is used to predict. Flask web application shows the prediction; it can identify vitamin deficiencies; it forecasts disease types; and suggest different meal combinations too.***
Keywords: KNN, random forest, flask web application, Naive Bayes Classifier, Support Vector Machine, Voting Classifier.

I. INTRODUCTION

The recommendation three primary phases make up the process. gathering information, learning, and making recommendations. First data regarding a certain issue is gathered, following which the many approaches to that issue are categorized. Following the information gathering phase, there's a learning phase wherein various inferences are acquired from the collected data. The last stage, referred to as the recommendation phase, results in an output provides several suggestions. The user's preferences, body mass index, and physical attributes define the suggested result of our project. Everyone needs a balanced nourishment as part and parcel of their healthy way of living. Moreover, eating a well-balanced diet, regular exercising is vital for keeping healthy. Nutrition and health have been neglected these days. Most people are either diabetic or have heart diseases, some get cancer while others suffer from strokes etc. The causes of the sicknesses are almost always poor eating habits. For example, the body requires essential vitamins to be healthy; nutrition provides them with essential nutrients that keep off illnesses from us. A balanced and healthy feeding plan would typically constitute minerals, vitamins, fats, fibers, proteins among others.

II. RELATED WORK

In the pursuit of innovation and efficiency, modern projects frequently rely on existing solutions as fundamental building blocks for development. This strategy not only recognizes the skills and developments of those who came before us but also nurtures a collaborative ecosystem where ideas can evolve and confront new challenges. In our project, we wholeheartedly embrace this ethos, conscientiously integrating elements from existing solutions to enrich our endeavor. These existing solutions serve as guiding lights, offering insights and frameworks that shape the direction of ourproject.

A. Content Based Food Recommender System

A content-based food recommendation system is suggested, which will recommend food dishes Considering the user's previously entered preferences. The ingredients in the user's favorite recipes are categorized, and ratings are applied to each one Considering the desires of the individual have been maintained. Recipes that call for the right ingredients are suggested. The writers fail to take into account the importance of diet balance and nutritional aspects. Furthermore, since the user's preferences might not alter every day, there's a potential that the recommendations is going to be the same.

B. Vitamin D Deficiency Severity Using Machine Learning.

An important nutrient, vitamin D has a significant impact on many bodily systems. Approximately one billion people worldwide suffer from a severe vitamin D deficiency. A lack of vitamin D has been linked to a number of autoimmune conditions, including diabetes, breast cancer, and cardiovascular disease. Even though the medical industry collects enormous amounts of data on a daily basis, processing massive data sets will provide challenges for conventional methods, It's possible to apply measures successfully.

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The application of machine learning for VDD diagnostics Applied to VDD, machine learning models diagnosis will show to occupy cost-effective approach to better therapy.

C. Diet Recommender System Using Web Data Mining

This research explores the web data mining-based design and putting in place a system of advise for a nutritious diet. It's an application of data mining methods to identify trends on the internet. We apply two decision-tree analysis algorithms, ID3 and C4.5, to a healthy food program and examine their accuracy and time performance as a recommender system.

III. METHODS AND EXPERIMENTAL DETAILS

A. Dataset Collection

The vitamin dataset obtained from Kaggle contains valuable Information such as a dietary recommendation dataset, which is generated using the lowest and maximum vitamin levels acquired from the test results, is available. Its characteristics include labels indicating deficiency and non-deficiency for K, A, B, C, D, E, and vitamin B. Food is produced using different combinations determined by the vitamin insufficiency dataset. Vitamin deficiency values and food type labels are included in this feature set.

B. Data preprocessing

In our undertaking, The characteristics were derived from the dataset and saved in a variable called the Y train variable contains the labels, whereas the x train variable stores the labels.. A conventional scalar function is utilized to preprocess the data, followed by the generation of new functions and labels.

C. Testing

In the testing and training stage the data will be sent to the purpose and it will be divided into four parts of Training for both x and y tests. Train variables are used to pass data to the algorithm, whereas tests are used to ascertain the algorithm's accuracy. The Ethical considerations, and privacy information protection, and the responsible application of data are paramountthroughout the project's development and implementation.

D. *Training with Algorithms*

In during At the moment, machine learning techniques are used to teach the values provided to the machine algorithm6 for education The algorithm will be Capable of ascertaining the characteristics and labels based on this information. After that, the system models the data and stores it in a pickle file that may be utilized for prediction. The optimal model is utilized in prediction after the collection of data is trained using several algorithms, and each model's accuracy is computed.

E. Predict Data

In our Vitamin deficiency and Food Recommendation, In this step, fresh serves as input, loaded with trained models via pickle, and values undergo preprocessing before being sent into the forecasting function ascertain the output that is displayed on the web page.

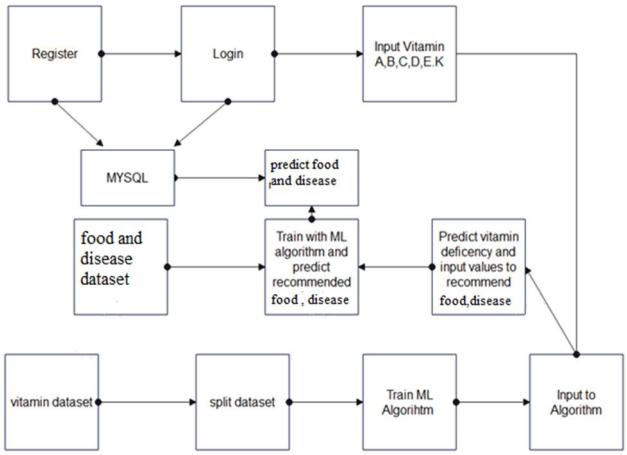


Fig1. Flow chart of the Model

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IV. RESULT AND DISCUSSIONS

The exploration of existing solutions sheds light on thediverse approaches and methodologies available to enhance the capabilities of integration of multiple models.

A. *Content Based Food Recommendation System*

1) *Approach:* Content-based system for recommending foods is proposed that will recommend recipes for cuisine based on preferences already entered by the user. The user's preferred recipes are divided into ingredients, these will be assigned ratings based on saved user preferences. Recipes with appropriate ingredients are recommended. The writers fail to consider nutritional factors and the balance of the diet. Moreover, There's a potential for identical recommendations since The preferences of the user might not change daily.
2) *Benefits:* Considering the brands and ratings specified within the user preferences, the algorithm will suggest a recipe that is unique to the user. The algorithm of the suggested system made use of matrix factorization and latent symptom vectors. Using brands that closely align recommendations with customer preferences helps to improve prediction accuracy. But the writers don't take nutrition into account while balancing the diet to meet his needs. The diagnosis of a disease was produced using its symptoms.

B. *Severity of Vitamin D Deficiency Using ML*

1) *Approach:* Vitamin D deficiency (VDD) has a significant impact on the global population and is linked to various health problems like autoimmune disorders, cardiovascular disease, diabetes, and breast cancer. Conventional techniques for data analysis in medicine may struggle with processing the vast amounts of data collected daily. But according to recent studies, utilizing (ML) models can provide better insights. ML algorithms can analyze extensive datasets to uncover patterns and correlations that might not be evident through traditional statistical approaches. This capability may result in more precise prediction models for diagnosing VDD and identifying individuals at risk. Moreover, ML can help reveal underlying mechanisms and pathways contributing to VDD, improving our understanding of its causes and potential preventive measures. integrating ML into the study and management of VDD possesses the capacity to advance our understanding of this health issue and improve patient care. However, it's crucial to address ethical considerations and validate ML models in real-world settings to maximize their benefits in healthcare.
2) *Benefits:* Techniques for machine learning offer a promising alternative for accurately predicting the intensity of vitamin D deficiency (VDD). Research demonstrates that machine learning models, particularly random forest classifiers, are highly effective in this regard. Specifically, classifier achieved an impressive accuracy rate of 96%, surpassing other classifiers tested. This advancement holds substantial possibility for real-world medical applications, enabling healthcare professionals to accurately assess the severity of VDD. Notably, the study's strengths lie in its exploration of a unique the random forest method modelling and its thorough evaluation of model performance across various metrics in adolescent populations.

C. *Diet Recommender Web Data Mining System*

1) *Approach:* This project focuses on designing and implementing a nutritious diet advice system that makes advantage of web data mining. It is an information mining approach used to identify trends in the web. We evaluate the accuracy and time efficiency of a recommender system utilizing two decision tree learning algorithms, ID3 and C4.5, and apply them to a healthy eating program.
2) *Benefits:* The system decision tree first gathers information from the content base filter undertake a performance examination of the healthy eating suggestions. We choose the created rule during the implementation phase. Next, the healthy eating suggestions dataset is subjected to these rules. The administrator chooses the profile to which the rule should be applied after it has been applied. Profile's suggested food is utilized in the chosen profile, the rules are applied accordingly. Next, we examine and apply the system's rules.

D. *Comparison*

Every option has advantages of its own. Conversely, though, diet recommendation systems like the ones mentioned above concentrate on specific diseases or imbalanced food patterns. The systems make dietary suggestions based on signs without considering the severity of the sickness, which might fluctuate according to the situation and have detrimental effects on the person. Similar to this, nutrition factors are frequently disregarded when making food recommendations for a balanced in spite of the reality that they essential for encouraging a healthy diet.

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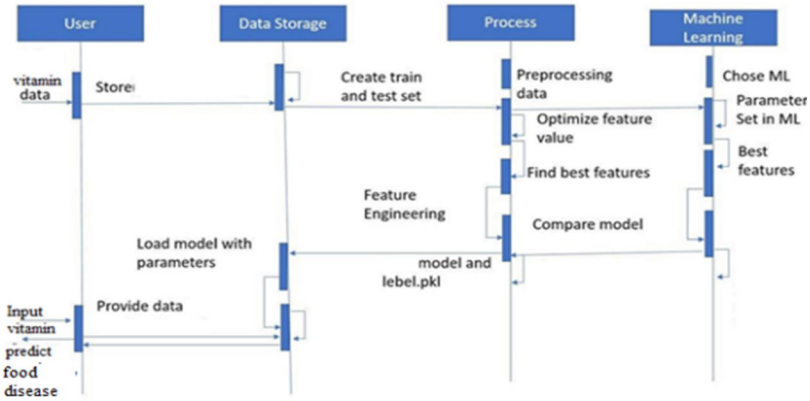


FIG 2: System architecture

V. PROPOSED MODEL

The system operates in a ml environment. In order to confirm The precision with which vitamin deficiency, we employ several several kinds of algorithms for machine learning, such as KNN, logistic regression, and random forest. These algorithms are employed to forecast diseases due to a lack of certain vitamins and to suggest foods in addition to disease prediction. The optimal model is then employed in the Flask online application for prediction purposes. Upon a user's entry their vitamin values, an An algorithm will ascertain whether or not they are deficient in any vitamins and will then recommend foods according to the vitamin dataset, food recommendation dataset, and disease detection dataset. These datasets are prepared according to the minimum and maximum vitamin values obtained from test results, and the labels for the values are both lacking and having enough.

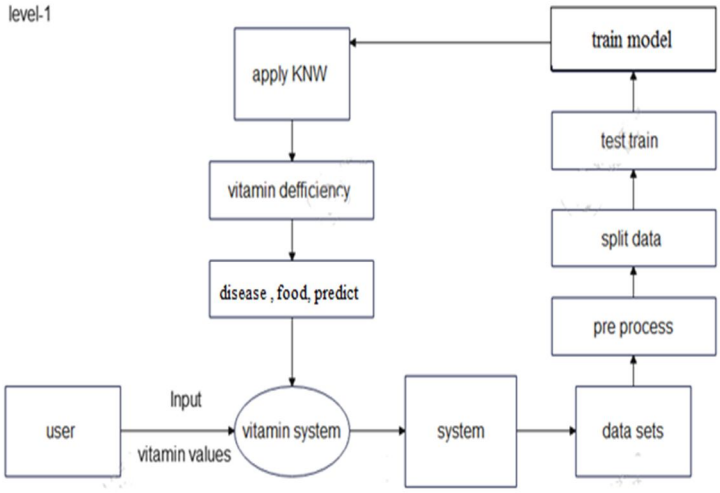


FIG 3: Input Screen

VI. CONCLUSION

We developed a webpage that provides dietary guidelines and forecasts vitamin deficits. We applied prediction by requesting information about vitamins and vitamin deficiencies. The system's initial phase training is to classify dietary products according to vitamin deficiencies. Various dietary guidelines are offered, including various ailments contingent atop the deficiency from a certain vitamin. After training, The nearest food items that best fit the suggested diet are predicted using the KNN classifier method. In essence, our diet guidance program gives customers up-to-date information regarding a nutritious food plan with an eye toward potential vitamin deficiencies for diseases that are anticipated. Therefore, in comparison to other models, the study may be employed to forecast high severity and accuracy. The model will be validated using various combinations of multivitamin datasets from all age groups as the next stage of our research.

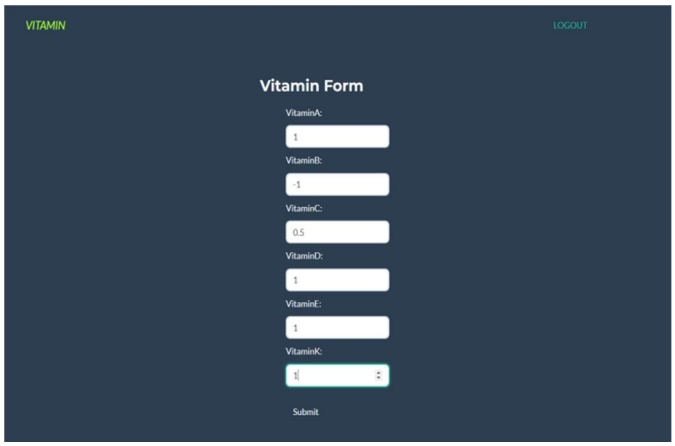


FIG 4: Input Screen

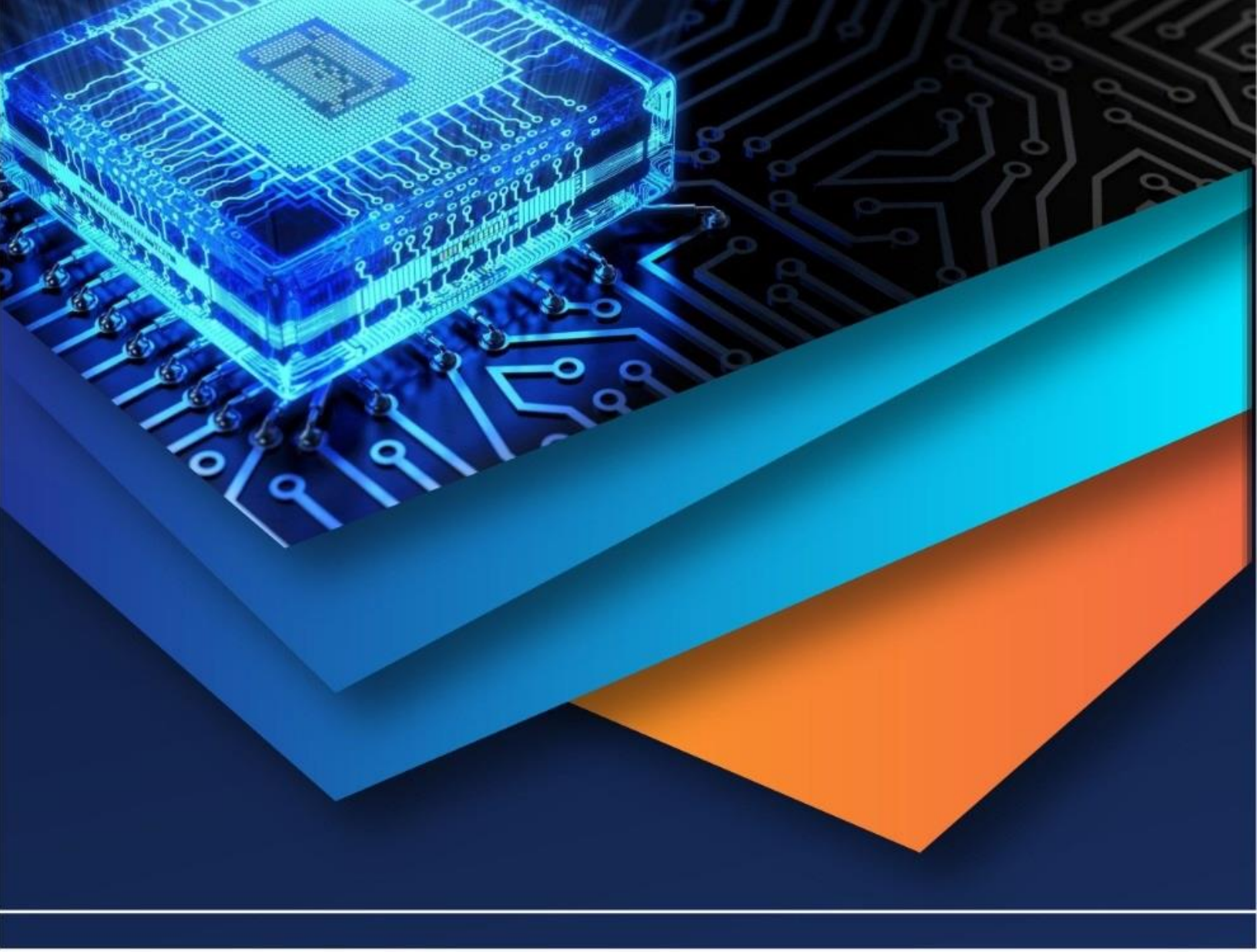
We have given the vitamin value ranges as input, and depending on the data, the program will run the algorithms and select the one output having the greatest accuracy, which will be displayed on the output screen using the backend algorithm.



FIG 5: Output Format

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