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Vitamin Deficiency and Food Recommendation System Using Machine Learning

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Abstract:

According to a WHO study, insufficient and inadequate food consumption accounts for around 9% of heart disease deaths, 11% of ischemic heart disease deaths, and 14% of colorectal cancer deaths globally. Furthermore, around 0.25 billion children have vitamin deficiencies ranging from A to K, 0.2 billion adults have iron deficiency (anaemia), and 0.7 billion people have iodine deficiency. This project's main purpose is to prescribe a diet to a variety of people. The suggested framework will have to deal with a large volume of data in the dataset.Several high and low component values (vitamins a, b, c, d, e, and k) are used to form an individual data set, and qualities are classed as normal or abnormal. There are two types of vitamin and label diseases: normal and abnormal.Another database is being built based on a mix of several vitamin supplements and their deficits, as well as meal suggestions based on which vitamin is deficient.

This study uses a Bayesian network technique to incorporate many classifier approaches (knn, decision tree, random forest, logistic regression, voting classifier) and train a new algorithm.The accuracy of each algorithm is determined, and the best algorithm is used for prediction. The forecast is generated with the use of the flask web application, which identifies vitamin deficiency and advises meals to eat in a variety of combinations.

Keywords: Authenticate, credential security, public cloud availability, key is generated are some of the terms used in this paper.

1. INTRODUCTION

Nowadays, a human being is suffering from various health problems such as fitness problem, inappropriate diet, mental problems etc. Various studies depict that inappropriate and inadequate intake of diet is the major reasons of various health issues and diseases. A study by WHO reports that inadequate and imbalanced intake of food causes around 9% of heart attack deaths, about 11% of ischemic heart disease deaths, and 14% of gastrointestinal cancer deaths worldwide. Moreover, around 0.25 billion children are suffering from Vitamin-A deficiency, 0.2 billion people are suffering from iron deficiency (anemia), and 0.7 billion people are suffering from iodine deficiency. The main objective of this work to recommend a diet to different individual. The recommender system deals with a large volume of information present by filtering the most important information based on the data provided by a user and other factors that take care of the user's preference and interest. It finds out the match between user and item and imputes the similarities between users and items for recommendation based on their physical aspects (age, gender, height, weight, body fat percentage), preference (weight loss or weight gain). The recommendation process has basically three stages that are Information Collection Phase, Learning Phase and Recommendation Phase. The information is firstly collected about a particular problem and the various solutions related to that problem are categorized. After the collection of information Learning Phase comes in which various conclusions are made out of that information which is gathered and in last phase i.e., Recommendation Phase an output is given in which various recommendations are made. In our project the output of recommendation is based on

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user's physical aspects, preference and their Body mass Index (BMI) 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 Page | 2 VITAMIN DEFICIENCY AND FOOD RECOMMENDATION SYSTEM USING MACHINE LEARNING 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.

2. LITERATURE SURVEY

Racielyeratoledo 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. MohdAfisi 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. The authors INGMAR WEBER and PALAKORN ACHANANUPARP [1] made an attempt to gain insights from machine leaned - diet success prediction which would help people trying to stay fit and healthy by keeping a track on their dietary intake. The authors used public food diaries of more than 4,000 long-term active MyFitnessPal users to study the characteristics of an unsuccessful diet. Concretely, authors trained a machine

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learning model to predict repeatedly being over or under self-set daily calorie goals and then look at which features contribute to the model's prediction, where research was centered around “quantified self " data. The authors observed that classification performance was sufficient and the token-based model performed better than the category-based model and used such data feasibly for more in-depth data mining NANDISH SHAH and ISHANI SHAH [2] presented a proposal of healthy food habits and eating system based on web data mining, to discover hidden patterns and business strategies from their customer and web data, which would track eating habits and recommend the types of food that will improve the health and avoid the types of food that raise the risk of illness. The authors used data mining algorithms like classification, clustering, association rules, etc. in the data mining process to extract useful information about people’s eating habit. The nutritive structure of each kind of food was analyzed and the fat, energy, vitamin percentage in the recipe was calculated. Then they used the classification mining algorithm to process the composition data and give out the result whether the diet is healthy or not. As a result, personalized recommendations were suggested for each person. How a coding system at the meal level might be analyzed by using data mining techniques was demonstrated by the authors AINE P. HEARTY AND MICHAEL J. GIBNEY [3] through this article. They evaluated the usability of supervised data mining methods to predict an aspect of dietary quality based on dietary intake with a food-based coding system and a novel meal-based coding system. The authors used Food consumption databases from the NorthSouth Ireland Food Consumption Survey 1997–1999. A healthy eating index (HEI) score was developed. Quintiles of the HEI based on combinations of foods were predicted by Artificial neural networks (ANNs) and decision trees. As a result, the ANN had a slightly higher accuracy than did the decision tree in relation to its ability to predict HEI. However, on the basis of the meal coding system, the decision tree had higher accuracies than did the ANN. Data mining was used by CHRISTY SAMUEL RAJU, SANCHIT V CHAVAN, KARAN PITHADIA, SHRADDHA SANKHE, PROF. SACHIN GAVHANE [4] to develop a Fitness Advisor System. “Fitness Advisor” developed by authors was a desktop application that advised the user according to his/her problem associated with body weight by an efficient diagnosis of the same and spreading proper awareness about the health hazards. The authors considered different factors in the system such as height, weight, body type, sex, smoking, drinking, health condition, physical activity, sleeping hours etc. A combination of clustering, association and classification algorithms to effectively deliver the best possible expert advice to the user's problem was used by authors. Apriori algorithm was used by authors for generating association rules. The final output of the system was expert’s advice in terms of diet and exercise.

3. OVERVIEW OF THE SYSTEM

3.1 Existing System

Content based food recommender system is proposed which recommend food recipes according to the preferences already given by the user. The preferred recipes of the user are fragmented into ingredients which are assigned ratings according to the stored users’ preferences. The recipes with the matching ingredient are recommended. The authors do not consider the nutrition factors and the balance in the diet. Moreover, chances of identical recommendation are also present because the preference of the user may not change on daily basis.

- Tags and latent factor are used for android-based food recommender system [2]. The system recommends personalized recipe to the user based on tags and ratings

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provided in user preferences. The proposed system used latent feature vectors and matrix factorization in their algorithm. Prediction accuracy is achieved by use of tags which closely match the recommendations with users' preferences. However, the authors do not consider the nutrition in order to balance the diet of the user according to his needs.

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3.1.1 Disadvantages of Existing System

The above-mentioned diet recommendation systems are specifically dealing with some diseases or related to balance the diet plans. In case of food recommendation for specific diseases, the systems recommend different foods for patients without knowing the level of disease which may vary in different cases and cause severe effects on patients. Similarly, in case of food recommendations to balance the diet, nutrition factors are ignored which are very much important to recommend food and balance diet.

3.2 Proposed System

The System works in a Machine Learning Environment, we use multiple machine learning algorithms to check accuracy of vitamin deficiency and food recommendation and best model is used for prediction in flask web application. When user enters vitamin values algorithm will predict deficiency is vitamin and recommend food.

Automates process of vitamin deficiency detection and food recommendation

- Previous datasets are used to training and testing.
- Accuracy of model is improved compare to existing methods.

3.3 Proposed System Design

In this project work, I used these modules and eachmodulehas ownfunctions,suchas:

1. DATASET
2. Data pre-processing
3. Testing training
4. Algorithms and training
5. Predict data

Dataset

In this project se are using vitamin dataset and food recommendation dataset which is prepared based on min and max vitamin values from the test results and features are min and max values of vitamin a, b, c,d,e,k values and labels are deficiency and non-deficiency.

Data preprocessing

Features are extracted from data set and stored in variable as xtrain variable and labels are stored in y train variable. Data is preprocessing by standard scalar function and new features and labels are generated.

Testing training:

In this stage data is sent to testing and training function and divided in to four parts x test train, and y test train. Train variables are used for passing to algorithm whereas test are used for calculating accuracy of the algorithm.

Initializing Multiple Algorithms and training with Logistic regression:

In this stage machine learning algorithms are initialized and train values are given to algorithm by this information algorithm will know what are features and what are labels. Then data is modeled and stored as pickle file in the system which can be used for prediction.

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4. ARCHITECTURE

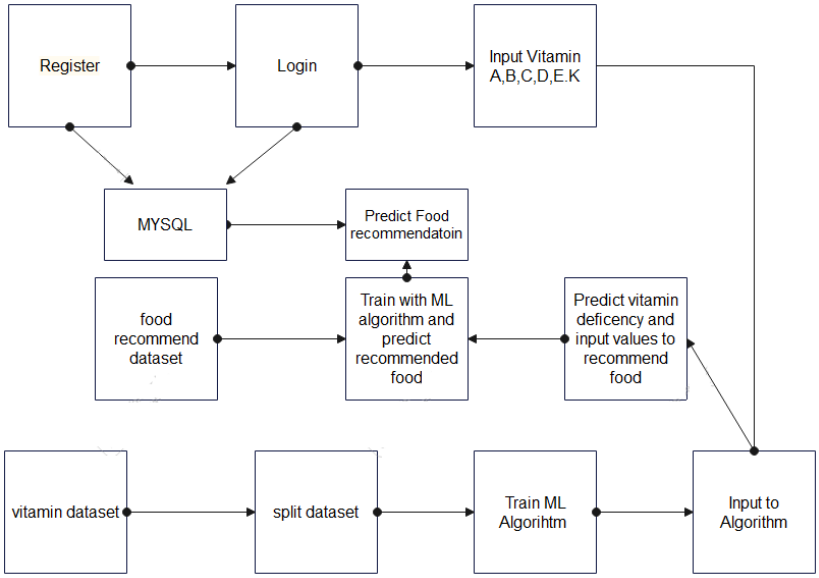

Fig 1: Architecture diagram

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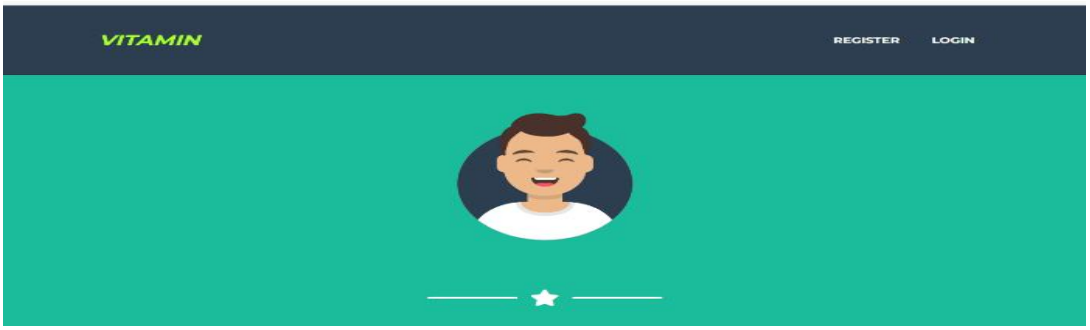
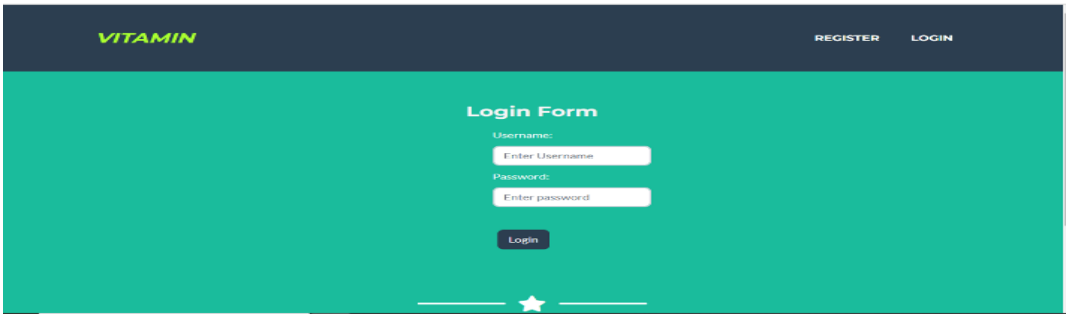
5. RESULTS SCREEN SHOTS

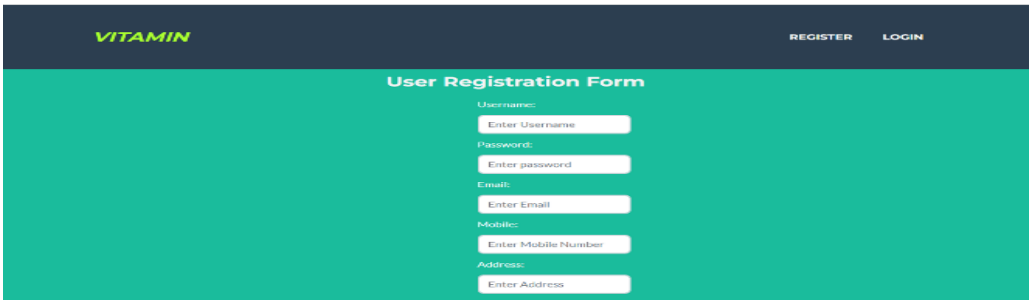
Home Page:

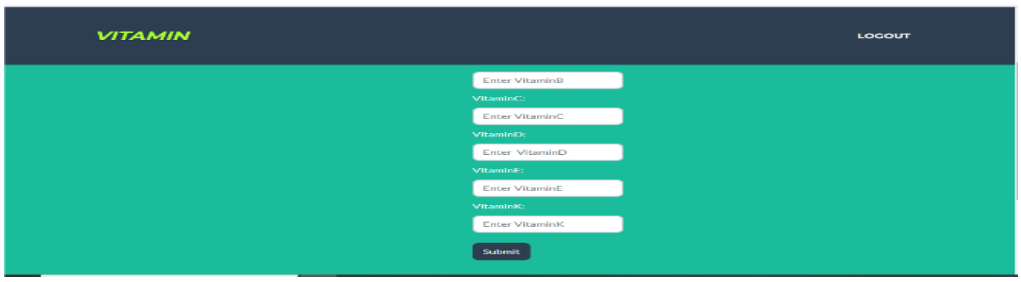


Login Page:

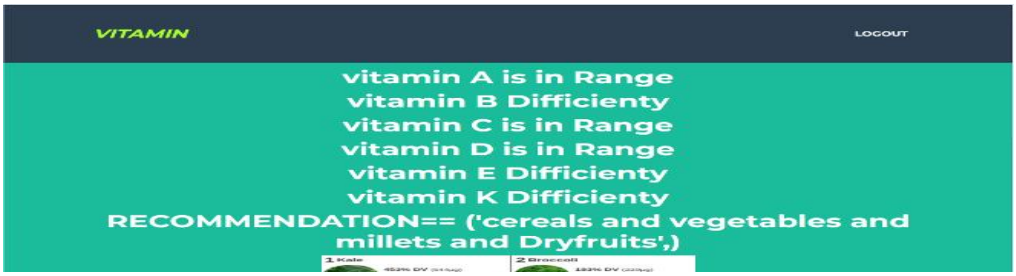


Upload vitamin values Page:





Predicted vitamin values:



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Food recommended screen:

Accuracy:

	precision	recall	f1-score	support
0	1.00	0.90	0.95	21
1	0.82	1.00	0.90	9
accuracy			0.93	30
macro avg	0.91	0.95	0.93	30
weighted avg	0.95	0.93	0.94	30

```
[[19  2]
 [ 0  9]]
Accuracy of Support Vector Machine 93.33333333333333 %
```

6. CONCLUSION

We have created a website which recommend the food items and predicts vitamin deficiency in which we have implemented prediction by taking input as vitamins and their deficiency. For training of the system, the initial process involves the dataset preparation of food items depending upon the vitamin deficiency. The prediction of various food recommendation depending upon which are essential for the for type of vitamin deficient. After the clustering is performed, using Random Forest classifier, the nearest food items are predicted which best suited for the appropriate diet. Our diet recommendation system allows users to basically get the desired healthy diet on the bases of vitamin deficiency.

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