



VITAMIN DEFICIENCY AND FOOD RECOMMENDATION USING MACHINE LEARNING

Mr. Mukund Harwalkar, Sneha Jadhav, Sakshi Birdar, Sanjeevini Joshi
Department of ISE
PDA College of Engineering
Gulbarga, Karnataka, India

Abstract—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 billions children are suffering from different types deficiency from Vitamin-A to vitamin k deficiency, 0.2 billion people are suffering from iron deficiency (anaemia), 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 from the dataset.

Keywords—Recommendation System, Machine Learning, Deficiency.

I. 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 (anaemia), 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.

II. LITERATURE SURVEY

Prof. Prajkta Khaire, Rishikesh Suvarna, Ashraf Chaudhary, "Virtual Dietitian: An Android based Application to Provide Diet", International ,Volume: 07 Issue: 01, Jan 2020: They built an application which provides a generic diet to its users. It acts as an diet consultant similar to a real dietitian. This system acts in the similar way as that of a dietitian. A person in order to know his/her diet plan needs to give some information such as body type, weight, height and working hour details. In this way the system provides diet plan according to the information entered by the user. This system will give accurate results as it accepts the data entered by the user and processes it depending on some metrics already known to the application on the basis of which a diet plan is generated and ask the user if the accepts the diet plan.

Nandish Shah, Ishani Shah, "Nutrition Diet Recommendation System using User's Interest", in International Journal of Advanced Research in Engineer and Technology (IJARET), Vol 11, Issue 12, December 2020: They 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.

III. PROBLEM STATEMENT

The fast-food consumption rate is alarmingly high and this consequently has led to the intake of unhealthy food. This leads to various health issues such as obesity, diabetes, an



increase in blood pressure etc. Hence it has become very essential for people to have a good balanced nutritional healthy diet. But in this fast pace generation not everyone has the time and money to spend on personal dietitian and nutrition who will look upon and take care of their health by advising them a healthy diet plan according to the individual personal information. In this report we have discussed person unhealthy eating habit and tried to provide a satisfactory solution to them for healthy life.

IV. 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.

KNN Algorithm

- K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique.
- K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories.
- K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm.
- K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems.

Decision Tree Algorithm

The Decision Tree Algorithm is one of the popular supervised type machine learning algorithms that is used for classifications. This algorithm generates the outcome as the optimized result based upon the tree structure with the conditions or rules. The decision tree algorithm associated with three major components as Decision Nodes, Design Links, and Decision Leaves. It operates with the Splitting, pruning, and tree selection process. It supports both numerical and categorical data to construct the decision tree. Decision tree algorithms are efficient for large data set with less time complexity. This Algorithm is mostly used in customer segmentation and marketing strategy implementation in the business.

V. DESIGN METHODOLOGY

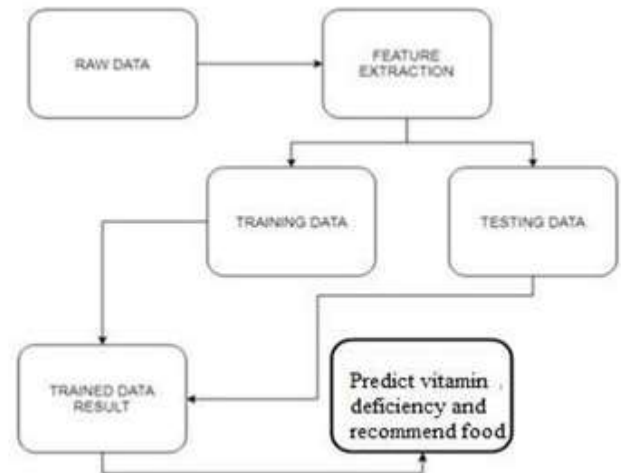


Fig 1: System Architecture

Here the own data set is prepared based on various high and low values of vitamins from (vitamin a, b, c, d, e, k) and features are divided from normal and abnormal conditions of vitamins and labels are divided in to 0 and 1 as normal and abnormal. Another dataset is prepared based on combination of various vitamins and their deficiency and food to be recommended based on which vitamin is deficient. In this project, multiple classifier algorithms are used (knn, decision tree, random forest, logistic regression, voting classifier) ensemble algorithm is used to combine multiple algorithms and train a new algorithm. Accuracy of each algorithm is calculated and best algorithm is used for prediction purpose. Prediction is shown using flask web application which will detect deficiency of vitamin and recommend type of food to be taken on various combinations.

- The dataset was first divided into training set (80%) and pre-training set (20%). The pretraining set was divided into pretrain (80%) and pre-test (20%).
- Now, the training set is further is divided into train (80%) and validation set(20%). This train
- set is again divided into train(80%) and test set(20%). So, now I have train validation and test sets separate which are nonoverlapping.
- The pretrain set was used to find the best models for the given dataset. I took best 4 models using pretest set. Their performance was compared based on their mean absolute errors.
- Once the best 4 models were obtained, hyperparameters for these models were tuned and the best parameter was selected using the k-fold validation set.
- The k-fold validation was done for the train set and the number of folds used were 5. This was done for the models which were selected after the pretraining process.

- As from the flowchart, it is seen that the cross validation is used for all the models to find the best parameter and then it is evaluated on the validation set using the best parameter.
- The validation set was used to give the best models for the given best parameter and the performance was compared based on their mean absolute error.
- Now, the best model with the best parameter was used on the test set which wasn't seen yet by the data to find the evaluation of the dataset.

VI. RESULT



Fig 2: Dashboard of Vitamin Deficiency and Food Recommendation.



Fig 3: Registration of Vitamin Deficiency and Food Recommendation.



Fig 4: Login of Vitamin Deficiency and Food Recommendation



Fig 5: Form where vitamin values are to be entered.



Fig 6: Final output where according to Deficiency, Food is recommended.

VII. CONCLUSION

We have created a web application which recommend the food items and predicts vitamin deficiency in which we have implemented BMR by taking input as vitamins and their deficiency. For training of the system, the initial process involves the segregation of food items depending upon the meal for which they are consumed i.e. Breakfast, Lunch and Dinner. The clustering of various nutrients depending upon which are essential for the weight loss, weight gain and healthy is performed. 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 to get balanced diet plans.

VIII. REFERENCES

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