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CD-DIET: A Prediction and Food Recommendation System for Chronic Diseases

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Abstract:- Presently, people face various chronic diseases due to environmental circumscription and their living habits. So the prediction of chronic disease at an earlier stage becomes a primary task. But the accurate prediction based on symptoms becomes too difficult for the doctor. Due to advancements in information science and technology, most people care about their healthy diet. It is also becoming a serious issue among people who led an unhealthy diet for a long time, and other factors to be affected diabetes, heart disease, cancer. Most of the diet recommendation systems don't recommend a healthy diet for the patients suffering from chronic diseases. The correct prediction of those chronic diseases and recommending healthy foods is the most challenging task. Hence we provide CD-DIET, a system that predicts chronic disease based on the symptoms listed by the patients and recommends traditional Indian foods to reduce the effect of chronic diseases.

Keywords:- *Deep Learning; Neural Networks; Chronic Disease; Food Recommendation.*

I. INTRODUCTION

In India, chronic disease is a major cause of death. There are many treatments available for curing chronic disease but the people live in rural areas are not able to pay for the treatment. Most healthcare is put up by the private sector. It is expected that the number of deaths due to chronic disease in India will be 7.63 million in 2020.It is estimated to rise by 52 million by 2030[4].Among chronic disease, heart disease is one of the causes for upper death rates in India is maximum compared with other countries[1]. Many people in India try new recipes by watching cooking channels on social media and Most of the people want to go out on weekends and eat food at hotel, the foods made at hotel won't be healthy because they won't use good quality ingredients and it will be unhealthy and it leads to chronic diseases. So people must take care of their health by taking healthy foods.

The traditional diets constitute fewer calories, less saturated fat, and low cholesterol which protects against chronic disease specifically hypertension[5].The specific changes in diet in comparison with traditional diet are the increase of edible oil consumption and fat intake between the years 1992 and 2005. The persons suffering from chronic diseases must consume less salt which is the main reason for hypertension. Adults should not eat more than 6gm of salt per day[6]. The non-vegetarian diet pattern increases the risk of cardiovascular diseases[1].

The person suffering from cancer must avoid refined items and excessive intake of salt, sugar, and oily foods. The person must intake lot of liquid. And the person suffering from diabetes must totally avoid sugar and oily foods. Therefore the normal diet recommendation system will suggest food based on the people who want to be healthy. It will suggest food based on the calorie value. The food they intake won't be the accurate calorie value mentioned in the application. It doesn't mean that if they intake less amount of calorie then they will be healthy. It is based on their health condition, so the diet recommendation system will not be suitable for every person.

In India most of them are suffering from chronic diseases, it will not be easy for all of them to undergo treatment so they must cure chronic diseases by taking healthy food. They must follow a diet plan so they can cure chronic diseases[10]. Most of the diet recommendation system suggests foods which will not be easy for the persons who live in rural area to follow, so the traditional diet recommendation will suggest food which will be easy for any kind of persons to follow. The Western fast-food chain's establishment and expansion in the cities of India and the population has started to follow the suit. Therefore the analysis of chronic disease and recommending healthy intake is very important to lead a healthy life.

II. EXISTING AND PROPOSED SYSTEM

A. Existing System

The disease Prediction systems nowadays can only accessible by medical staffs. Hence normal as well as novice users are unable to use those disease Prediction systems. In order to Predict disease accurately those disease Prediction Systems uses Complex clinical data and also required importing of X-rays, which imposes that only clinical staffs can use those systems.

The Food Recommendation Systems which many of the people nowadays relies on suggest foods and take care of calorie value. The important question is that, is the calorie value of a food is the actual value. People starts thinking about calorie value which makes them stress at a particular point of time, adapting western culture Foods leads an individual unhealthy.

B. Proposed System

The proposed system allows every individual to predict diseases. The first and foremost an individual feel is the Symptoms. Hence it is used as the primary data for disease prediction. Users can choose symptoms they felt from our own list. The System concentrates on three major chronic diseases Cardiovascular, Cancer and Diabetes. Prediction of disease based on symptoms imposes its users that they have a possibility of suffering from chronic disease and encourage them to visit hospital for further investigation.

The foods recommended by CD-Diet are AYUSH (Ayurveda Yoga Unani Siddha Homeopathy) related treatments. The System suggests foods based on their sugar and BP level. The foods constitutes are Traditional Indian foods, which help users to lead a healthy life.

III. DATASET AND MODEL DESCRIPTION

A. Dataset Description

The disease prediction dataset consist of a list of symptoms and diseases associated with it. The disease symptom database could also be a database of disease-symptom association. This dataset is generated by using discharge summary of patient at New York-Presbyterian Hospital admitted during 2004.It records 150 frequently occurring diseases, which also includes chronic diseases.

The food dataset consist of list of traditional Indian foods referred by the traditional Indian System of medicines such as AYUSH [13]. The foods used in this dataset are collected by interrogating with physicians and verified personally. The attributes of this dataset includes Disease name, Food list, Sugar level before fasting, Sugar level after fasting, Blood Pressure minimum, Blood Pressure maximum. This list will helpful to the users regarding what is healthy and what to eat.

B. Model description

Recently machine learning has its own impact in each and every field. Enhancement of machine learning leads to the simulation of neurons like structure which is known as deep learning. Most importantly the above mentioned techniques have greater impacts in healthcare. This system uses one of the algorithms of deep learning, In order to provide accurate disease prediction.

The food recommendation is a non-personalized recommender in which list of foods is recommend not by their personalized preferences and allergies. But suggest foods based on the sugar and blood pressure level.

IV. ARCHITECTURE

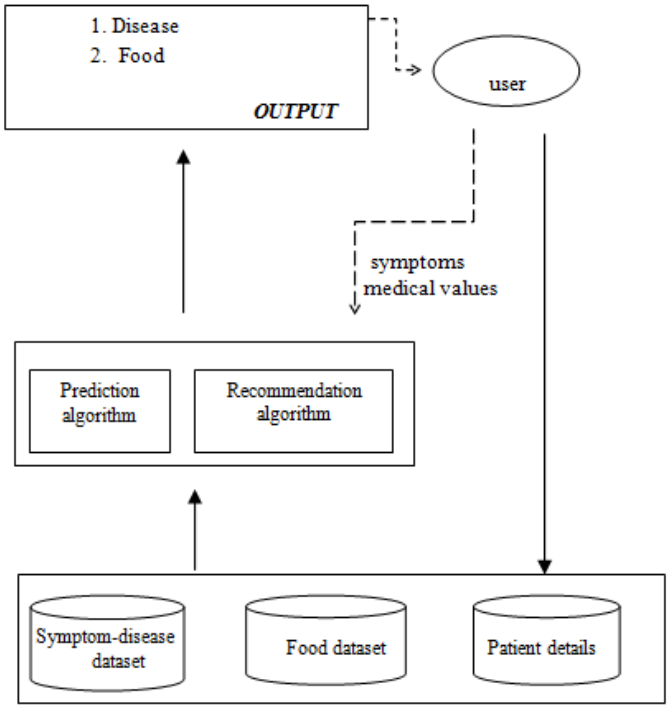

Fig 1:- The architecture of CD-Diet

A. Patient Details

The patient details included their basic information which is required for their authentication.These information is given by the user at the time of their registration.

Other than this, patient need to give information about their sugar level before and after fasting, systole and diastole values in mg/dl and mm HG respectively.

B. Prediction Algorithm

CNN's are an advanced version of deep neural networks. It has the ability to recognize patterns in visual data. CNN's used in natural language translation and sentimental analysis. Recently, it is widely used for text analysis. CNN's are effective models for predicting statistics, modeling. The architecture of CNN used for predicting chronic diseases is illustrated in figure 2. CNN's consists of many hidden layers. The layers which give power to capture patterns are convolution and max-pooling layers. The pooling layer always follows the convolutional

layer which helps to reduce the number of parameters. Pooling is mostly applied together with the frequency domain. The max-pooling offers good results for variability problem. The max-pooling makes the architecture more tolerable to minor differences in positions.

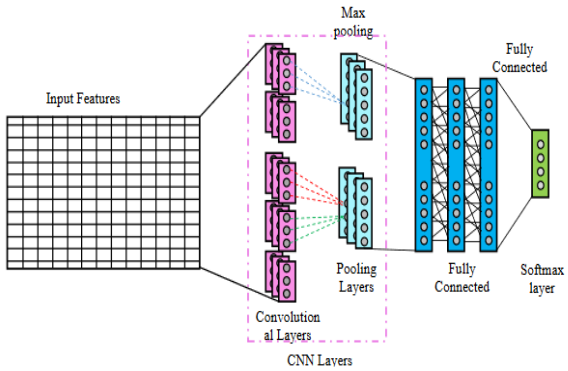

Fig 2:- CNN Architecture

C. Recommendation Algorithm

Fast bully algorithm is an extension of Bully algorithm. Bully algorithm involves dynamically electing a leader or a coordinator form a group of distributed computers. This algorithm costs more because it will generate O(n2) messages for n number of processes. In Bully Algorithm, the coordinator is selected from one among those which is a non failed process with highest process ID number. The reason to accept Fast Bully Algorithm is (i) FBA needs only O(n) message to identify a new coordinator (ii) The response time of FBA is faster than Bully algorithm, also FBA works to regain the position of coordinator immediately if its priority number is greater than the current coordinator. First two points reduces the communication between the web services of WSC in order to get a new master. In mentioned the costs involved in making a Web services call. The fast bully algorithm portrays a clear performance improvement. The other use of this algorithm is that it will retain the real master and slave relationship of web services. Any one of the slave can take up the role of master temporarily and permanent master can regain its control when it is up again. Master Web service doesn't grand all the operations to temporarily elected Master Web services. Few of the messages used in the election procedure are: answer, election, coordinator, Iamup.

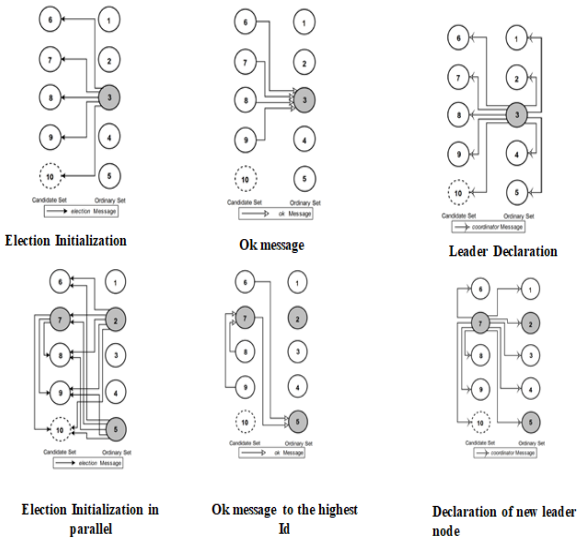

Fig 3:- FAST BULLY Algorithm

When a slave becomes active newly As per the algorithm, if a process raises then it must send IamUp message to any one of the processes or to all the processes to find out the coordinator. This might be not much needed for WSC, as permanent master has the best priority number. When a slave becomes active, we customize FBA to send IamUp message only to permanent master. If permanent master is active then the newly active slave receives the view message to verify the master. Else, the newly active slave sends IamUp message to all remaining slaves, and choose the coordinator based on the received view messages. Considering n as the number of Web services in WSC, this customization minimizes the t number of messages from n^2 to 2 to identify the master. Similarly another customization is also practiced, Instead of sending IamUp message and continuing further by permanent master Web service, we customize FBA to send the coordinator message directly for all slaves. Hence this will reduces the full number of messages from n^3 to n for keeping the position of the master as it is.

V. PERFORMANCE EVALUATION

Approaches	Recall (%)	Specificity (%)	Test Accuracy (%)	AUC
SVM	75.40	77.68	78.89	71.64
Random Forest	76.44	76.96	76.06	76.25
Our Model	77.3	76.87	77.88	76.78

Table 1:- CNN Results

In comparison with other algorithms our model which uses CNN stands out with the test accuracy of 77.88 %.But in compare with SVM Recall, is greater, which makes CNN to stand out well.

Recall is defined as the total number of results which are correctly fetched by our algorithm. Specificity deals with the number of cases algorithm turn out to predict negative results. Specificity is less in compare with other algorithm.

VI. SCREENSHOTS

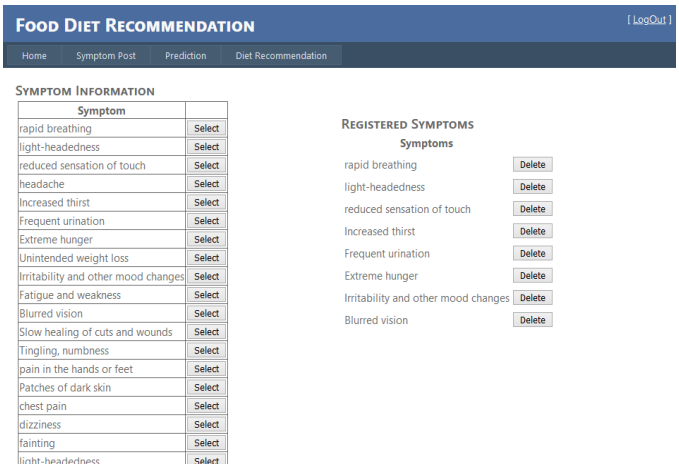

Fig 4

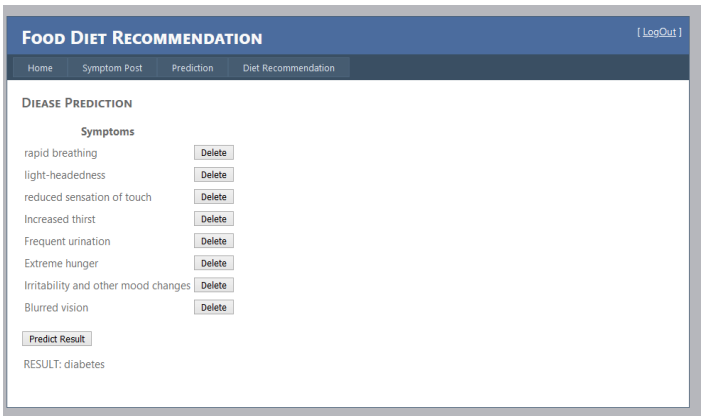

Fig 5

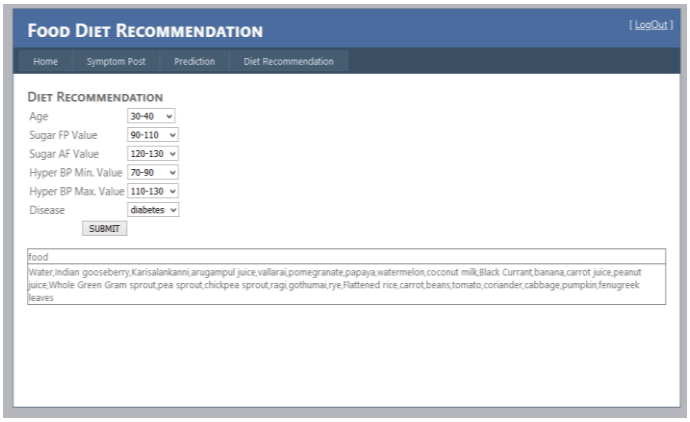

Fig 6

VII. CONCLUSION AND FUTURE WORKS

The CD-Diet system is helpful in predicting disease by using basic symptoms known by the user. It is helpful in the way that CD-Diet let its user that there is a possibility of them suffering from chronic diseases, and also encourages its users to lead a healthy life. It uses CNN and fast bully algorithm with greater accuracy for disease prediction and recommendation. In future our system is extended in the way to save their time and money in such the way that it takes into account about their personal preferences. To add convenience to its users it also recommends hospitals near their locality and other by considering other factors.

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