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A Generic Real Time Application for CKD and its Stages Prediction

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Abstract - *Chronic kidney disease (CKD) is a type of kidney in which there is gradual loss of kidney function for months or years. Prediction of CKD is one of the most important problems in the field of medicines. So automated tool which will use machine learning techniques to determine the patient's kidney condition that will be helpful to the doctors in the prediction of chronic kidney disease and hence better treatment. The proposed system extracts the features which are responsible for CKD, then the machine learning process can automate the chronic kidney disease in different stages according to its severity. The objective is to use a machine learning algorithm and suggest a suitable diet plan for CKD patients using a classification algorithm on medical test records. Diet recommendations for the patient will be given according to potassium zone which is calculated using blood potassium level to slow down the progression of CKD.*

***Key Words*: Chronic kidney disease, CKD, Kidney, Health care.**

1. INTRODUCTION

The health-care industry is producing copious amounts of data which need to be mined in order to discover hidden information for effective prediction, diagnosis and decision making. Currently, kidney disease has been a crucial problem. It is one of the leading causes of death in India. Chronic Kidney Disease (CKD), is delineated by the gradual loss of kidney function. Kidneys work as filters in our body and removes excess fluids from our blood, which are then excreted through our urine. If this disease gets worse, wastes can accumulate in the blood and can cause difficulties like high blood pressure, anemia, weakening of bones, poor nutritional health and nerve damage. Chronic Kidney Disease also increases the risk of having heart and blood vessel disease. By early detection harmful diseases can be prevented.

The data mining techniques are classification, clustering and association, it helps in extracting knowledge from large amount of data. Machine learning and data mining techniques together have been the prime factors in determining and diagnosis of various critical diseases. Management of diet depends on the current Glomerular Filtration Rate (GFR rate) and the severity of the disease. We will be classifying the disease in five stages- 1, 2 ,3, 4, and 5. Stage 1 is safe and it requires a lenient diet plan.

Whereas in stage 2, a potential CKD patient will be given a strict diet. Keeping the balance of minerals, electrolytes, and liquids inside body will be difficult for stage 3 to stage 5 patients. Therefore, they have to undergo proper dietary guidance.

An important diet for a renal improvement and prevent further harm is essential, which also helps in keeping balance of electrolytes and water in the body. Other than severity of the chronic kidney disease, many other factors will contribute in shaping the diet. The blood potassium level, urea level, calcium level, phosphorous level and so on. In this study, to identify suitable diet plan for a CKD patient the main focus will be on blood potassium level.

1.1 PROPOSED SYSTEM

Chronic kidney disease (CKD) has become a major health issue and it is an area of concern. In this condition kidneys are damaged and cannot function and filter toxic waste. Our work focuses on detecting life threatening Chronic Disease like CKD, using classification algorithms. Proposed system is an automation for chronic kidney disease prediction using classification techniques. The proposed system extracts the features which are responsible for chronic kidney disease, then machine learning process can automate the classification of the chronic kidney disease in different stages according to its severity. The Machine learning algorithm is used to suggest suitable diet plan for CKD patients, using classification algorithm on medical test records.

System uses old data from "UCI Repository" and uses tools such as "Visual Studio" and "SQL Server" to develop application. System is a real time application useful for doctors to identify CKD and related stages and recommending the suitable diet for the patients.

1.2 PARAMETERS LIST

TABLE I TABLE I USED DATA SET

Attribute Name	*Value Range*	*Description*
age	2, .., 90	age
bp	50, ..., 180	blood pressure
sg	1.005,1.010,1.015,1.020,1.025	specific gravity
al	0,1,2,3,4,5	albumin
su	0,1,2,3,4,5	sugar
rbc	2.1, ..., 8	red blood cells
pc	normal,abnormal	pus cell
pcc	present,notpresent	pus cell clumps
ba	present,notpresent	bacteria
bgr	22, ..., 490	blood glucose random
bu	1.5, ..., 391	blood urea
sc	0.4, ..., 76	serum creatinine
sod	4.5, ..., 163	sodium
pot	2.5, ..., 47	potassium
hemo	3.1, ..., 17.8	hemoglobin
pcv	9, ..., 54	packed cell volume
wc	2200,..., 26400	white blood cell count
rc	2.1,..., 8	red blood cell count
htn	yes, no	hypertension
dm	yes, no	diabetes mellitus
cad	yes, no	coronary artery disease
appet	good,poor	appetite
pe	yes, no	pedal edema
ane	yes, no	anemia
class	ckd,notckd	class

2. METHODOLOGY

Machine learning is a process of studying a system based on data. Machine learning is a part of data science where we use machine learning algorithms to process data.

2.1 SUPERVISED LEARNING TECHNIQUE

It's a predictive model used for the tasks where it involves prediction of one value using other values in the data-set. Supervised learning will have predefined labels. It classifies an object based on the parameters to one of the predefined set of labels.

We have many algorithms to build model in supervised learning such as KNN, Naive bayes, Decision Tree, ID3, Random Forest, SVM, Regression techniques etc. Depending of the requirements, parameters, labels and data-set we select the appropriate algorithm for predictions. Algorithm is used to build a model that predicts based on evidence in the presence of uncertainty.

In this project for prediction, we make use to "Bayesian Classifier or KNN algorithm" which is an efficient and works fine for all different sets of parameters. It also generates accurate results.

2.2 CLASSIFICATION RULES

Basically, classification is used to classify each item in a set of data into one of the predefined set of classes or groups. "*Bayesian Algorithm or KNN*" is used to predict CKD. GFR used for Stage Prediction.

3. SYSTEM ARCHITECTURE

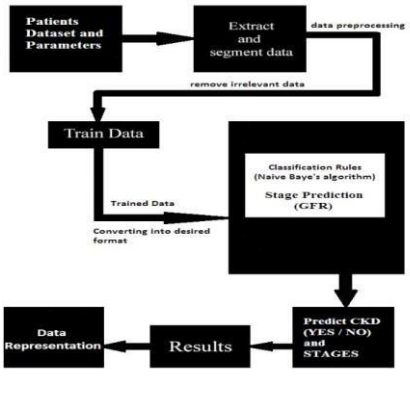

Fig 1: System Architecture

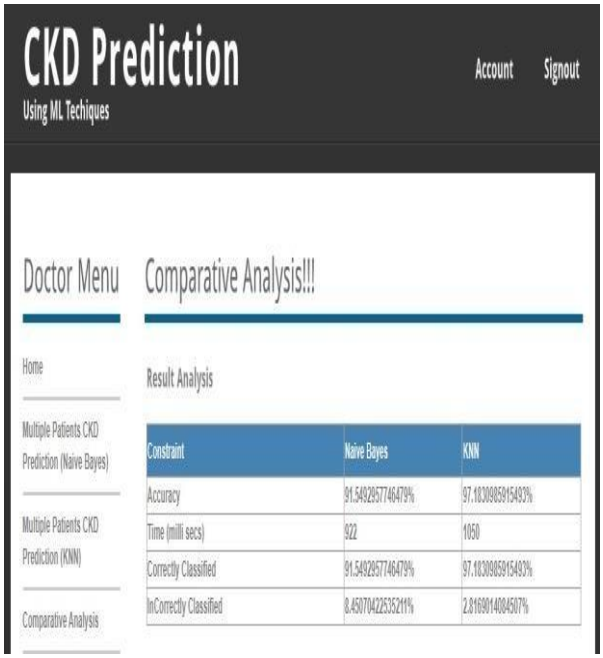

Fig 2: DATA VISUALIZATION

4. FUTURE ENHANCEMENTS

Email/ SMS Module: In the proposed system, admin assigns Id and password to the doctors and receptionists and is intimated manually, so we can add SMS/Email module as a future enhancement where doctors and receptionists receives an SMS or Email regarding the Id and password.

Query Module: we can add the query module as a future enhancement to the application where doctor, receptionist and admin of the application can interact with each other.

5. CONCLUSION

This project is regarding a medical sector, this is an application which helps the medical practitioners in predicting the CKD disease based on the CKD parameters. It is automation for CKD disease prediction and it identifies the disease, its types and complications from the clinical database in an efficient and an economically faster manner. It is successfully accomplished by applying the Naïve Bayes algorithm for classification. This classification technique comes under data mining technology. This algorithm takes CKD parameters as input and predicts the disease based on old CKD patient's data.

6. ACKNOWLEGEMENT

The view of a successful work can be often compared with an ice berg. There are contributions and support of those people hidden under the surface, which are seldom seen. Their ceaseless cooperation, constant encouragement and guidance helps us to keep afloat. We would like to express our sincere gratitude to our Head of the department, Dr. V K Annapurna, Head of the Department, Department of CSE, NIE for her relentless support and encouragement. It gives us immense pleasure to thank our guide Prameela Madambakam, Assistant Professor, Department of CSE, NIE for her valuable suggestions and guidance during the process of the seminar and for having permitted us to pursue work on the subject.

7. REFERENCES

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