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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 disease in which there is a gradual loss of kidney function over a period of months or years. Predicting this disease is one of the most important issues in the medical field. An automated tool that uses machine learning techniques to determine the condition of a patient's kidneys. This allows doctors to predict chronic kidney disease and provide better treatment. The proposed system can extract the causative features of CKD and automate classification into various stages according to the severity of chronic kidney disease through a machine learning process. The goal is to use machine learning algorithms and medical test record classification algorithms to suggest appropriate dietary plans for CKD patients. Diet recommendations for patients will be given according to potassium zone, which is calculated using blood potassium level to slow down the progression of CKD.

I INTRODUCTION

The healthcare industry produces vast amounts of data that need to be analyzed to reveal hidden information for effective prediction, diagnosis, and decision making. Kidney disease is now a serious 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 filter wastes and excess fluids from your blood, which are then excreted in your 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. Kidney disease also increases the risk of developing heart and blood vessel disease.

The harmful outcomes can be avoided and prevented by early detections, according to researchers conducted. Patient awareness of CKD is gradually increasing, but it is still low. The Global Burden of Disease Study (GBD) 2015 ranks chronic kidney disease as the eighth leading cause of death in India. All over the world, the highest count of patient with diabetes is in India with the projection figure of 57.2 million cases in 2025and also the count of patient with hypertension is expected to double from 2000 to 2025, hence these will make India the reservoir of CKD [1]. The burden of CKD management thus falls largely on primary care providers (PCPs). Hence an accurate, convenient, and automated CKD detection method is important for clinical practice Undiagnosed CKD can be identified, predicting the likelihood that patients will develop chronic disease, and present patient-specific prevention interventions with Machine learning techniques. Healthcare systems can create accurate predictive models that reduce risk and ultimately improve criteria.

Data mining techniques for Classification, clustering, and associations can help you extract knowledge from large amounts of data. Machine learning and data mining techniques together have been the prime factors in determining and diagnosis of various critical diseases. The 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- Stage 1, stage 2 and stage 3, Stage 4, Stage 5. Stage 1 is safe and requires a lenient diet plan to be followed. Whereas stage 2, a potential CKD patient will be given a restricted and strict diet. Keeping the balance of minerals, electrolytes, and liquids inside body will be difficult for stage 3 to 5 patient. Therefore, they have to be under 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 stages of severity, 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.

II RELATED WORKS

Survey Papers

Prediction of Chronic Kidney Disease Using Data Mining Two data mining algorithms called Random Forest Algorithm and Backpropagation Neural Network were used to diagnose and analyze chronic kidney disease and provide the best chronic kidney disease prediction algorithm. Data Source: www.kaggle.com For the prediction of

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chronic kidney disease, we have taken around 24 attributes with 400 records. In that it is found that 155 objects have complete record, and the remaining has missing values and errors. Number of samples: 400 (200 chronic kidney disease, 200 not chronic kidney disease) Number of attributes: 24 (Numeric and nominal) [1].Predicting the stage of kidney disease using data mining algorithms. Here, we unleash medical information and use effective data mining techniques to convey and retrieve invisible details from hospitals and laboratories. The stage of disease hardness and the maximum accuracy of the Multilayer Perceptron (MLP) can be found, the support vector machine stochastic neural network, the radial basis function to find the best algorithm [2]. A Machine Learning Methodology for Diagnosing Chronic Kidney Disease in these we Random Forest achieved that best performance with 99.75% and using UCI machine learning repository. The data set contains 400 sample. Logistic regression, random forest, support vector machine, k-nearest neighbor, naïve Bayes classifier and feed forward Neural network [3]. Performance of data mining techniques to predict in a healthcare case study: chronic kidney failure disease process of developing a huge data file in wellness Management is defined and used in the stream of a medical case study by using three learning designs the main target of the work is to diagnose kidney disease by using various machine learning techniques alike SVM, BNs (Bayesian Networks) [4].

III PROPOSED WORK

Chronic kidney disease (CKD) has become a global health issue and is an area of concern. It is a condition where kidneys become damaged and cannot filter toxic wastes in the body. Our work predominantly focuses on detecting life threatening diseases like chronic kidney disease (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 CKD, then machine learning process can automate the classification of the chronic kidney disease in different stages according to its severity. The goal is to use machine learning algorithms and medical test record classification algorithms to suggest appropriate dietary plans for CKD patients. System uses old data from "UCI Repository" and uses tools such as "Visual Studio" and "SQL Server" to develop application. System is an real time application useful for doctors to identify CKD and related stages and recommending the suitable diet for the patients.

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

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IV METHODOLOGY

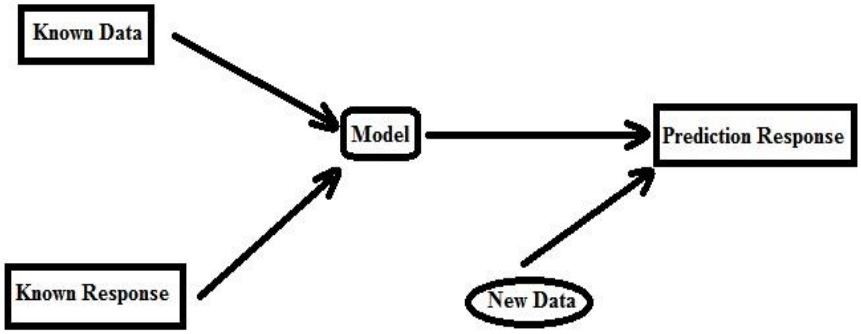
Machine Learning

Machine learning is the process of learning a system based on data. Machine learning is part of data science and uses machine learning algorithms to process data.

Supervised Learning Techniques

This is a predictive model used for tasks involving predicting values using other values in a dataset. Supervised learning has predefined labels. Classifies objects into one of the predefined labels based on their parameters. There are many algorithms for building models in supervised learning, including
ANN, Naive Bayes, Decision Trees, ID3, Random Forests, SVMs, and Regression Techniques. Select the appropriate algorithm for your predictions according to your requirements, labels, parameters, and datasets. This algorithm is used to build a model that makes evidence-based predictions in the presence of uncertainty.

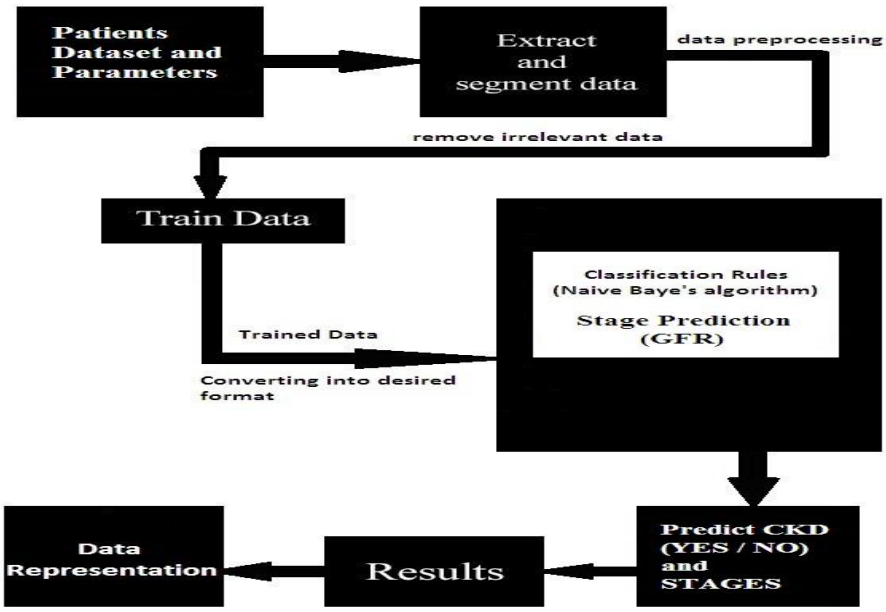
This prediction project uses an efficient and excellent "Bayes classifier or KNN algorithm" for all different parameter sets.It also gives accurate results.



Proposed Model

Classification Rules

Basically, a classification is used to classify each item in a record into one of the predefined classes or groups.
"Bayesian algorithm or ANN" is used to predict CKD stage predictions.



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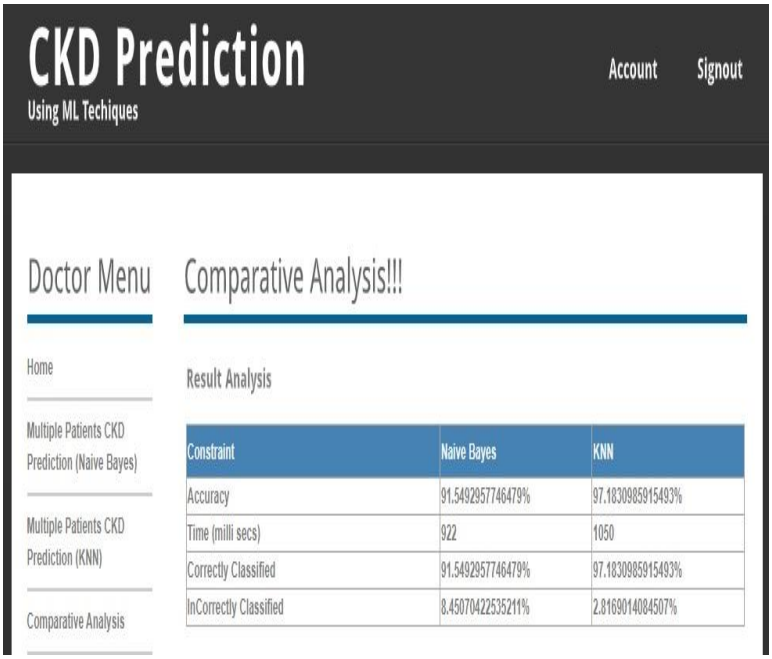
V EXPERIMENT RESULTS

Data Visualization



VI CONCLUSION

This project is a medical application that helps physicians predict CKD disease based on CKD parameters. This is the automation of CKD disease prediction, identifying diseases and their types and complications from clinical databases in an efficient and economical way. This is successfully achieved by applying the naive Bayesian algorithm to the classification. This classification method corresponds to the data mining technique for old CKD patient data.

VII FUTURE ENHANCEMENTS

SMS / Email Module – In the proposed system, the administrator assigns IDs and passwords to doctors and receptionists and communicates manually, so doctors and recipients receive SMS in the future. You can add an SMS / email module as an extension. Or an email with your ID and password.

Query Module-You can add a query module as a future extension of your application. In this case, the application's doctors, receptionists, and administrators can interact with each other.

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