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Research Article

Diagnosis of Chronic Kidney Disease Using Artificial Neural Network

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Abstract—Not Detecting Disease at early stage is one of the biggest threats and results in loss of lives. The detection of disease at the right stage paves way for proper diagnosis and medications, for pathologist and doctors to support their decisions. Machine learning being implemented in all domains for better results, applying ML in medical field plays a major role in diagnosing diseases and recommendation of medication for the diagnosed disease. . The main objective is to present an effective approach for the chronic kidney disease(CKD) diagnosis using artificial neural network (ANN), by filling the missing values of the dataset using mean, mode and median of attributes. Further, trained Neural Network classifier to evaluate the detection performances on separate test dataset. A simple web based, prediction of CKD using user input is developed.

Keywords: Machine learning, chronic disease, diagnosis, ANN

1. Introduction

Chronic kidney disease (persistent kidney disease) is wherein the kidneys receives broken or deep neural community to filter blood and so the waste fluids that frameproduces stay inside, which in addition reasons different fitness problems. Blood enables the frame organs to characteristic better, consequently, it's miles very vital to have it smooth and pure;if our kidneys will now no longer paintings it turns into a prime concern. This harm takes place over many years. More the harm, much less the kidneys characteristic and consequently makes the frame unhealthy. It is turning into a prime risk with inside the developing and undeveloped countries.Its foremost purpose for incidence is sicknesses like diabetes, excessive blood-pressure. Other risking instances inflicting persistent kidney sickness encompass coronary heart sickness, obesity,and a own circle of relatives records of persistent kidney disease. Its medicinal drugs that are dialysis or kidney transplant are very pricey and so we want an early detection. In the United States (US), approximately 117,000 sufferers advanced end-level renal disease (ESRD)requiring dialysis, whilst extra than 663,000 usual sufferers have been on dialysis in2013. 5.6% of the full scientific finances changed into spent for ERDS in 2012 that's approximately$28 billion. In India, CKD is giant amongst 800 in keeping with million populations and ESRD is 150–two hundred in keeping with million populations.Hybrid Modified cuckoo search-neural community in persistent kidney disease classification had given a better accuracy however they have now no longer defined the records preprocessing steps. A modified SVM changed into used to growth the better accuracy. They have said records processing and classification of guide vector gadget and used a random woodland instead. In this project, the maximum outstanding elements with bias (parameters) as given are: Blood-Pressure, Serum Creatine, Pack Cell Volume, Hypertension Factors, and Anemia Factors are considered. Using K-nearest neighbor and the system propose uses deep artificial neural community which may be extra robust for a large quantity of records. Performance of KNN could degrade inside crease in size of dataset and additionally it now and again receives biased for a few attributes. Therefore, many algorithms like naive Bayes, Support Vector Machine (SVM), and Artificial Neural Network have contributed in its recognition. From this we're going to awareness on deepneural community. A deep neural community is a computational version primarily based totally functions supplied through the organic neural networks.

2. Proposed design

In the proposed system datasets are pre-processed by data mining statistical techniques. To fill the missing values of dataset we have used the Filling of missing values using mean, mode and median three different statistical methods like mean, median and mode. These values are calculated only for the missing value attributes. For the nominal attributes, we have taken mode and median and for the numerical type of attributes we have taken the mean of the values. After pre-processing of the dataset, data is divided into two sections i.e training and testing. Then training of the classifier is done by training data with target classes and after classifier training, separate testdata is fed into trained classifier. A web interface has been developed and fed as input tthe ANN

system.

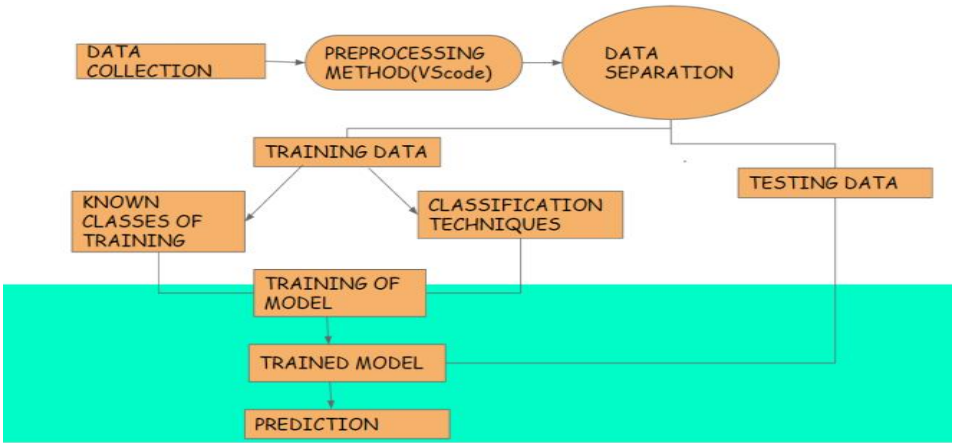

Fig1 Proposed System

3. Methodology

The interconnections of the nodes are known as synapses. Each connection has a weight associated with it.The weights of every connection get up to date for that reason after every generation of the computational method with inside the hidden layers. These days the ANNs are broadly used for the motive of prognosis of diseases. Due to is wide studying abilities and fault tolerance, it's miles maximum famous in clinical prognosis. One of the maximum famous systems of networks used is the feed forward community (FFN). In FFN the passing of records or facts is authorized handiest with inside the head path from one node with inside the modern layer to 1 or extra nodes with inside the subsequent layer. A lower back propagation neural community is a kind that is used with inside the type method to categorize among a character who's inflamed and the only who's not.

The dataset used for the prognosis and prediction of continual kidney sickness is 100 percent valid records accrued from numerous distinct actual sufferers over a length of time. The dataset is received from the UCI repository of datasets. The records set include statistics of four hundred distinct sufferersbeneath 25 distinct attributes.

Table1 Dataset

	Attribute	**Representation**	**Information Attribute**	**Description**
	Age	Age	Numerical	Years
	Blood Pressure	Bp	Numerical	Mm/Hg
	Specific Gravity	Sg	Nominal	1.005,1.010,1.015, 1.020, 1.025
	Albumin	Al	Nominal	0,1,2,3,4,5
	Sugar	Su	Nominal	0,1,2,3,4,5
	Red Blood Cell	Rbc	Nominal	Normal, Abnormal
	Pus Cell	Pc	Nominal	Normal, Abnormal
	Pus Cell Clumps	Pcc	Nominal	Present, Not Present
	Bacteria	Ba	Nominal	Present, Not Present
0	Blood Glucose Random	Bgr	Numerical	mgs/dl
	Blood Urea	Bu	Numerical	mgs/dl

1				
2	Serum Creatinium	Sc	Numerical	mgs/dl
3	Sodium	So	Numerical	mEq/L
4	Potassium	Pot	Numerical	mEq/L
5	Hemoglobin	hemo	Numerical	Gms
6	Packed Cell Volume	Pcv	Numerical	cells
7	White Blood cell Count	Wc	Numerical	Cells/cumm
8	Red Blood Cell count	Rc	Numerical	Millions/cmm
9	Hypertension	Htn	Nominal	Yes,No
0	Diabetes Mellitus	Dm	Nominal	Yes,No
1	Coronary Artery Disease	Cad	Nominal	Yes,No
2	Appetite	appet	Nominal	Good,Poor
3	Pedal Edema	Pe	Nominal	Yes,No
4	Anemia	Ane	Nominal	Yes,No
5	Class	Class	Nominal	CKD, NotCKD

4. Result & discussion

First we collect input details from the user such as age, blood pressure, specific gravity, red blood cell count, hypertension, albumin level etc. Then from the details obtained we determine if the user has chronic kidney disease or not with an accuracy comparison model. A web UI for users to provide the details, and predict the Chronic Kidney Disease has been shown in below figure:

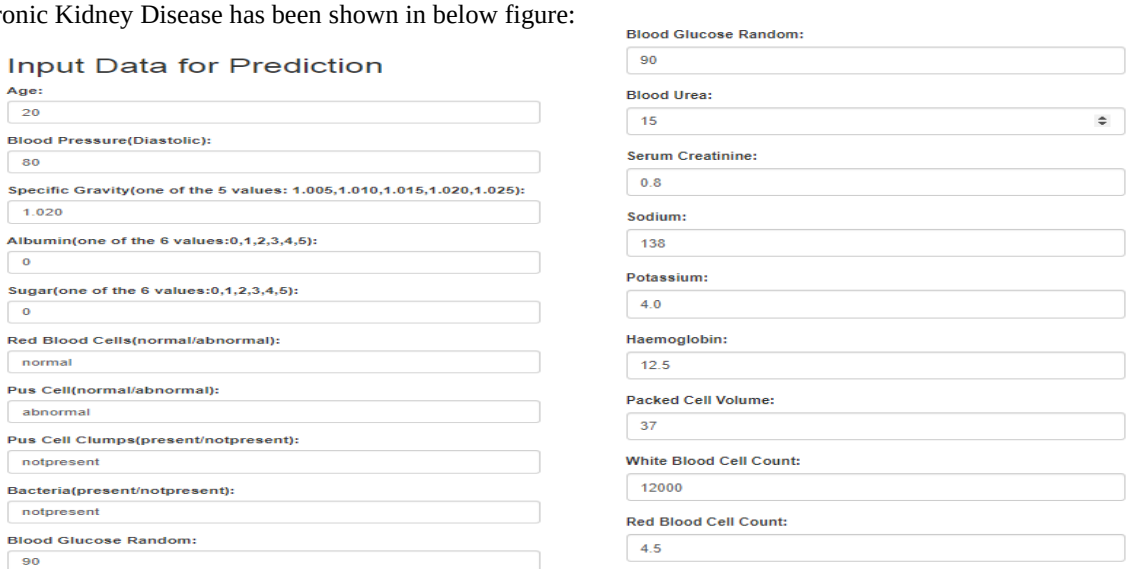

Fig 2: Input Details by the User

Fig 3: Input Details by the User

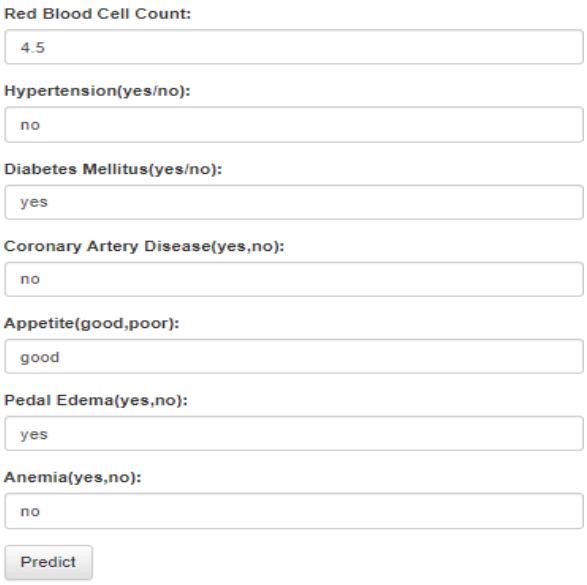

Fig 4: Input Detail by the User

In Fig 2, 3 and 4, we get the input details from the user. The details that are collected from the person is age, hemoglobin level, packed cell volume, white blood cell count, red blood cell count, blood urea etc.

This details given by the user is then studied and predicted if the user has chronic kidney disease or not. And the accuracy comparison of the models is also given.

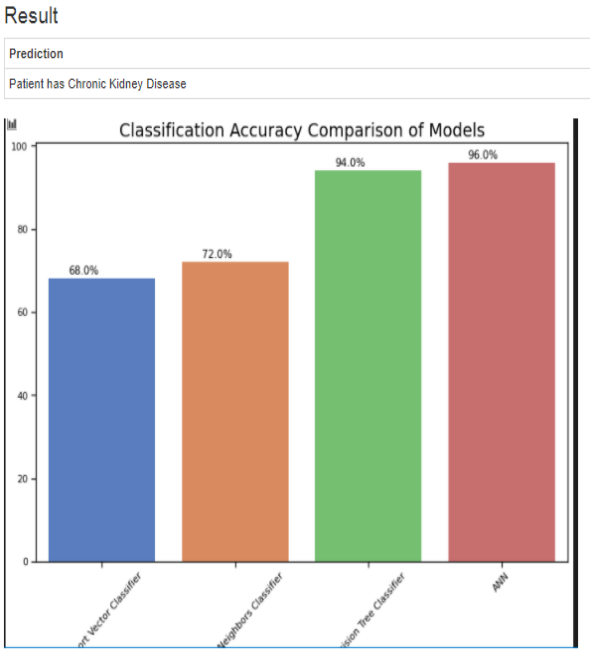

Fig 5: Predicted Result

In Fig 5, the result is printed which is the comparison between the three machine learning classifier and artificial neural network. In this comparison, artificial neural network has more accuracy and less execution time. This also predicts if a person has chronic kidney disease or not.

5. Conclusion

This system has been developed for predicting the chronic kidney disease using ANN, with an accuracy rate of 96.0 per cent. Thus it can be used as one of the suggesting tools with high accuracy for the medical approaches. The system can be implemented in Medical Institutions for providing an automated system that helps the medical recommendations, that reducing more medical errors.This can be further developed as an mobile application which can be used by the common people to test if they have chronic kidney disease or not.

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