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PERFORMCE ANALYSIS OF MACHINE LEARNING CLASSIFER FOR PREDECTING CHRONIC KIDNEY DISEASE

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ABSTRACT:

Chronic Kidney Disease is a silent condition. Signs and symptoms of CKD, if present, are generally not specific in nature and unlike several other chronic diseases (such as congestive heart failure and chronic obstructive lung disease), they do not reveal a clue for diagnosis or severity of the condition. Early detection and treatment can often keep chronic kidney disease from getting worse. CKD is a progressive condition that results in significant morbidity and mortality. Because of the important role the kidneys play in maintaining homeostasis, CKD can affect almost every body system. Early recognition and intervention of CKD is essential to slow disease progression, to maintain quality of life and improve outcomes. CKD can also be defined as damage to kidney or Glomerular Filtration Rate (GFR) < 60 mL/min/1.73 m2 for 3 months or more, irrespective of the cause a result, kidney damage.Our aim is to develop a CNN model for Classification of CKD.

Keywords: CKD, CNN, GFR, lung disease.

I INTRODUCTION

Chronic Kidney Disease (CKD) is considered as an important threat for the society with respect to the health in the present era. Chronic kidney disease can be detected with regular laboratory tests, and some treatments are present which can prevent development, slow disease progression, reduce complications of decreased Glomerular Filtration Rate(GFR) and risk of cardiovascular disease, and improve survival and quality of life. CKD can be caused due to lack of water consumption, smoking, improper diet, loss of sleep and many other factors. This disease affected 753 million people globally in 2016 in which 417 million are females and 336 million are males. Majority of the time the disease is detected in its final stage and which sometimes leads to kidney failure. The existing system of diagnosis is based on the examination of urine with the help of serum creatinine level. Many medical methods are used

for this purpose such as screening, ultrasound method. In screening, the patients with hypertension, history of cardiovascular disease, disease in the past, and the patients who have relatives who had kidney disease are screened. This technique includes the calculation of the estimated GFR from the serum creatinine level, and measurement of urine albumin-to-creatinine ratio (ACR) in a first morning urine specimen. This paper focuses on machine learning techniques like ACO and SVM by minimizing the features and selecting best features to improve the accuracy of prediction.

Blood pressure is increased due to fluid overload and production of vasoactive hormones created by the kidney via the renin–angiotensin system, increasing the risk of developing hypertension and heart failure. People with CKD are more likely than the general population to develop atherosclerosis with consequent cardiovascular disease, an effect that may be at least partly mediated by uremic toxins.People with both CKD and cardiovascular disease have significantly worse prognoses than those with only cardiovascular disease.

Urea accumulates, leading to azotemia and ultimately uremia (symptoms ranging from lethargy to pericarditis and encephalopathy). Due to its high systemic concentration, urea is excreted in eccrine sweat at high concentrations and crystallizes on skin as the sweat evaporates ("uremic frost").

Potassium accumulates in the blood (hyperkalemia with a range of symptoms including malaise and potentially fatal cardiac arrhythmias). Hyperkalemia usually does not develop until the glomerular filtration rate falls to less than 20–25 mL/min/1.73 m2, when the kidneys have decreased ability to excrete potassium. Hyperkalemia in CKD can be exacerbated by acidemia (which leads to extracellular shift of potassium) and from lack of insulin.

II LITERATURE SUEVEY

[J. Snegha, 2020][10] proposed a system that uses various data mining techniques like Random Forest algorithm and Back propagation neural Network. Here they compare both of the algorithm and found that Back Propagation algorithm gives the best result as it uses the supervised learning network called feedforward neural network. [Mohammed Elhoseny, 2019] described a system for CKD in which it uses Density based feature selection with ACO. The system uses wrapper methods for feature selection.

[Baisakhi Chakraborty, 2019][9] proposed development of CKD prediction system using machine learning techniques such as K-Nearest Neighbor, Logistic Regression, Decision Tree, Random Forest, Naïve Bayes, Support Vector Machine and Multi-Layer Perceptron Algorithm. These are applied and their performance are compared to the accuracy, precision, and recall results. Finally, Random forest is chosen to implement this system.

[Arif-Ul-Islam, 2019] proposed a system in which prediction of disease is done using Boosting Classifiers, Ant-Miner and J48 Decision Tree. The aim of this paper is two fold that is, analyzing the performance of boosting algorithms for detecting CKD and deriving rules illustrating relationships among the attributes of CKD. Experimental results prove that the performance of AdaBoost was less that of LogitBoost by a fraction.

[S.Belina V, 2018] proposed a system that uses extreame learning machine and ACO for CKD prediction. Classification is done using MATLAB tool and ELM has few constraints in the optimization. This technique is an improvement under the Sigmoid additive type of SLFNs. [Siddheshwar Tekale, 2018][8] described a system using machine learning which uses Decision tree SVM techniques. By comparing two techniques finally concluded that SVM gives the best result. Its prediction process is less time consuming so that doctors can analyze the patients within a less time period.

[Nilesh Borisagar, 2017] described a system which uses Back Propagation Neural Network algorithm for prediction. Here Levenberg, Bayesian regularization, Scaled Conjugate and resilient back propagation algorithm are discussed. Matlab R2013a is used for the implementation purpose. Based on the training time, scaled conjugate gradient and resilient back propagation are found more efficient than Levenberg and Bayesian regularization.

[Guneet Kaur, 2017][7] proposed a system for predicting the CKD using Data Mining Algorithms in Hadoop. They use two data mining classifiers like KNN and SVM. Here the predictive analysis is performed based upon the manually selected data columns. SVM classifier gives the best accuracy than KNN in this system.

6.Early Prediction of Chronic Kidney Disease Using Deep Belief

Network (2021). It uses modified Deep Belief Network (DBN) as classification algorithm to predict the kidney related diseases and the Softmax as activation function and the Categorical Cross-entropy as a loss function. dataset is used from UCI's machine learning database and perform preprocessing to handle the missing values. The proposed model achieves better performance, comparing with the existing models, with accuracy 98.52%. So, the proposed model presents proper predictor and classifier for CKD.

7.A two-stage neural network prediction of chronic kidney disease (2021). This model predict based on the two stage neural network. which is a combination of the feature screening method in the ultra-high dimensional framework and deep learning approach. The proposed approach is able to assist to detect the stage of CKD and identify potentially useful biomarkers. The performance is still limited because of the lack of models in dealing with ultra-high dimensional datasets.

8.Chronic Kidney Disease Prediction using Neural Network and ML models(2022). Hybrid model, SVM, KNN(K-Nearest Neighbor), regression tree. Numerical data is used. predict the disease using a hybrid model and make the prediction more efficient.But it only predict on the old records of a CKD patient.

9.Prediction, Progression, and Outcomes of Chronic Kidney Disease in Older Adults(2022).Based on the DNN model.The model shows the Prediction, Progression, and Outcomes of Chronic Kidney Disease in Older Adults.But it slows the progression of CKD in HIV patients, particularly when proteinuria is present

10.Prediction of Chronic Kidney Disease - A Machine Learning Perspective (2022). Based on artificial neural network, C5.0, Chi-square Automatic interaction detector, logistic regression, linear SVM with penalty L1 & with penalty L2 and random tree. Along with accuracy, precision, recall, F-measure, area under the curve and GINI coefficient have been computed.But it requires high time consumption.

11.Intelligent Diagnostic Prediction and Classification Models for Detection of Kidney Disease (2022) This model has an excellent feature-based prediction model for detecting kidney disease. Various machine learning algorithms, including k-nearest

neighbors algorithm (KNN), artificial neural networks (ANN), support vector machines (SVM), naive bayes (NB), and others, as well as Re-cursive Feature Elimination (RFE) and Chi-Square test feature-selection techniques were used exercised the prediction models with Recursive Feature Elimination (RFE) and Chi-Square test feature selection techniques.But in this the hybrid approach was very low.

12.A Machine Learning Methodology for Diagnosing Chronic Kidney Disease (2022). The proposed CKD diagnostic methodology is feasible in terms of data imputation and samples diagnosis. After unsupervised imputation of missing values in the data set by using KNN imputation, This model is applicable for only small dataset.

13.Chronic kidney disease prediction using machine learning techniques (2022). Models used for prediction are random Forest (RF), support vector machine (SVM) and decision tree (DT). The data used is collected from the UCI Repository with 400 data sets with 25 attributes. the practical aspects of data collection and highlights the importance of incorporating domain knowledge extra tree classifier and random forest classifier gives high accuracy with minimal bias to the attributes. Feature selection was not accurate and this model gives the less performance.

EXISTING SYSTEM

Prediction of chronic kidney using Machine learning techniques is not suitable for all the problems. On ultra sound images the machine learning models give the less accurate result. Diagnosing of chronic kidney diseases is generally invasive(Risk) because mostly diagnosing of chronic kidney disease will be done based on the numerical data. It diagnosis based on the blood pressure and urnie test.By using these numerical data of patient record the diagnosis of chronic kidney disease take place.A large space is required for complete dataset.Large computation time(time-consuming) because numerical dataset mostly have the noisy data and missing values it takes the time for normalization.

PROPOSED SYSTEM:

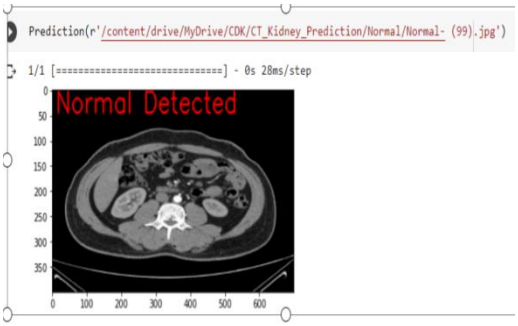
To summarize the previous CKD prediction models ,we find that most of them suffering from either the method used to impute missing values has a limited application range or relatively low accuracy.Therefore in this work, we propose a methodology to extend

application range of the ckd diagnostic models. At the same time,The accuracy model is further improved.The contributions of the proposed work is neural networks for filtering of image and classification of CKD. Input-Labelled Ultrasound images Pre-processing-for refining image data, such as removing distortion, so that it may be utilized to process data more effectively.The images is passed through a stack of convolutional layers.

III METHODOLOGY

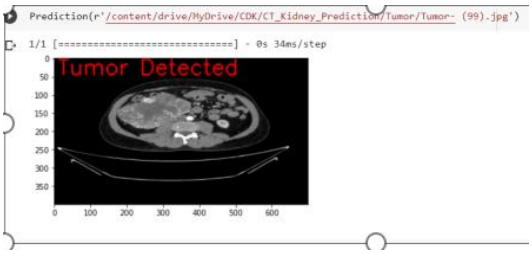
Our proposed model will detect the chronic kidney disease using the CNN model and its layers. The system will analyze the ultrasound images of kidney, Based on the analysis the system will detect whether the kidney has effected with disease or not. The system would trained by those ultrasound images of kidney according to that training process the model will detect chronic kidney disease in to four categories.The image we given to the system if it is detected that image is normal then model will show Normal Detect on the image we given. The will process will same like other three categories (stone,cyst,normal).In this way our proposed model will detect the chronic kidney disease using deep learning.

Test case 1: Result:Correct Input: Normal Expected Output: Normal Actual Output:Normal

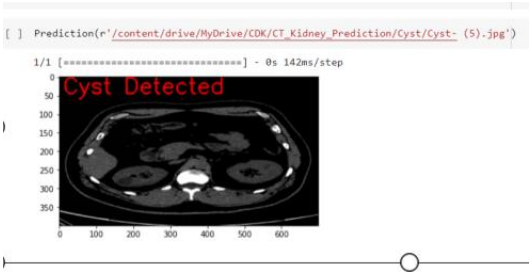


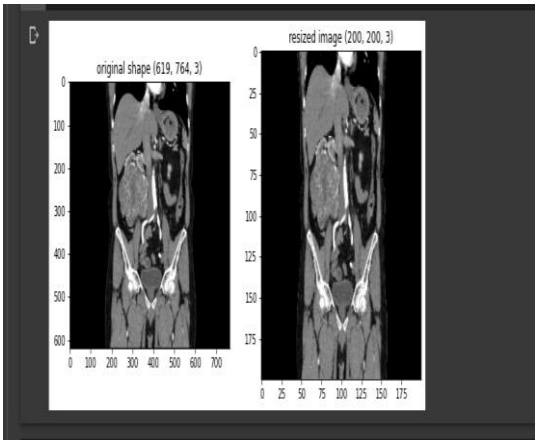
Test case 2: Result:Correct Input: Stone Expected Output: Stone Actual Output:Stone

Test case 3: Result:Correct Input: Tumor Expected Output: Tumor Actual Output: Tumor



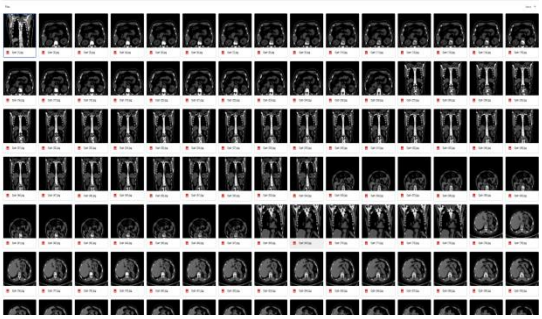
Test case 4: Result:Correct Input: cyst Expected Output: cyst Actual Output: cyst



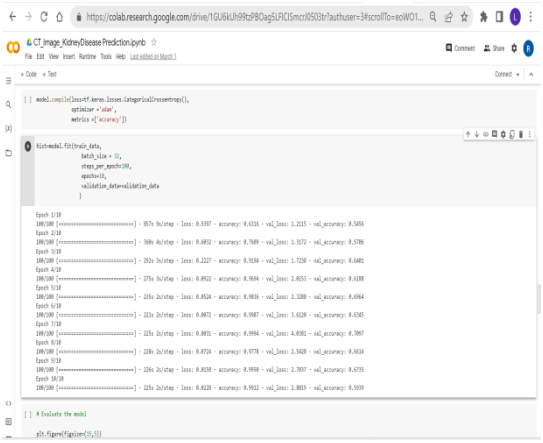


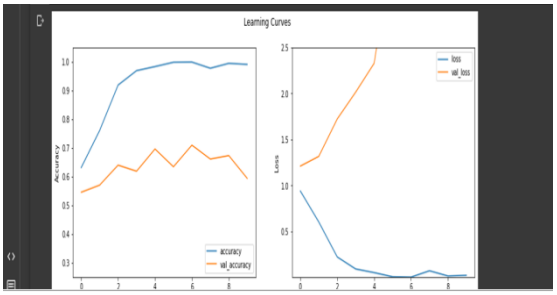
SCREEN SHOTS

Test data:



Training Result





CONCLUSION

Chronic kidney disease develops indolently, with many patients diagnosed late and a specific cause never established in a significant number of patients. It has various multi-system complications, significantly impairing the quality of life and shortening the life span of victims. Thus the prevention and early detection of chronic kidney disease is of utmost importance. Therefore we developed a deeplearning model to detect the kidney disease in early stage and we got the accuracy of 96 per.

REFERANCES

1. Fadil Iqbal1, Aruna S. Pallewatte2, Janaka P. Wansapura, “Texture Analysis of Ultrasound Images

of Chronic Kidney Disease", 2017 International Conference on Advances in ICT for Emerging Regions (ICTer): 299 – 303.

2. Chi Hu1 , Xiaojun Yu1*, Qianshan Ding2 , Zeming Fan1 , Zhaohui Yuan1 ,Juan Wu1and Linbo Liu3, "Cellular-Level Structure Imaging with Micro-optical Coherence Tomography (μOCT) for Kidney Disease Diagnosis", 2019 the 4th Optoelectronics Global Conference.

3. Ahmad Amni Johari Mohd Helmy Abd Wahab Aida Mustapha , "Two-Class Classification: Comparative Experiments for Chronic Kidney Disease", 2019 4th International Conference on Information Systems and Computer Networks (ISCON) GLA University, Mathura, UP, India. Nov 21-22, 2019.

4. Rahul Gupta1 , Nidhi Koli2 , Niharika Mahor3 , N Tejashri4, "Performance Analysis of Machine Learning Classifier for Predicting Chronic Kidney Disease", 2020 International Conference for Emerging Technology (INCET) Belgaum, India. Jun 5-7, 2020.

5. 1 Akash Maurya,2 Rahul Wable,3 Rasika Shinde ,4 Sebin John ,5 Rahul Jadhav, 6 Dakshayani.R, "Chronic Kidney Disease Prediction and Recommendation of Suitable Diet plan by using Machine Learning", 2019 International Conference on Nascent Technologies in Engineering (ICNTE 2019).

6. Dr. Uma N Dulhare Professor, CSED, MJCET Hyderabad, India Uma.dulhare@mjcollege.ac.in Mohammad Ayesha PG Student, CSED, MJCET Hyderabad, India. "Extraction of Action Rules for Chronic Kidney Disease using Naïve Bayes Classifier", 978-1-5090-0612-0/16/$31.00 ©2016 IEEE.

7. Yedilkhan Amirgaliyev Institute of Information and Computing Technologies (IICT), Almaty, Kazakhstan amir_ed@mail.ru Shahriar Shamiluulu Faculty of Engineering and Natural Sciences, Suleyman Demirel University, Kazakhstan shahriar.shamiluulu@sdu.edu.kz Azamat Serek Faculty of Engineering and Natural Sciences, Suleyman Demirel University, Kazakhstan. "Analysis of Chronic Kidney Disease Dataset by Applying Machine Learning Methods".

8. Mubarik Ahmad, Vitri Tundjungsari, Dini Widianti, Peny Amalia, Ummi Azizah Rachmawati, "Diagnostic Decision Support System of

Chronic Kidney Disease Using Support Vector Machine".

9. Sheng-Min Chiu1* , Feng-Jung Yang2 , Yi-Chung Chen3 , Chiang Lee1, "Deep learning for Etiology of Chronic Kidney Disease in Taiwan", 2nd IEEE Eurasia Conference on IOT, Communication and Engineering 2020.

10. S. Ramya and Dr. N. Radha, "Diagnosis of Chronic Kidney Disease Using Machine Learning Algorithms", International Journal of Innovative Research in Computer and Communication Engineering, Volume 4, Issue 1, January 2016, pp 813-820.