IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

CHRONIC KIDNEY DISEASE DETECTION AND PERFORMANCE EVALUATION OF TRAINED MODEL USING MODIFIED CONVOLUTION NEURAL NETWORK

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ABSTRACT

Chronic kidney disease includes conditions that damage your kidneys and decrease their ability to keep you healthy by filtering wastes from your blood. If kidney disease worsens, wastes can build to high levels in your blood and make you feel sick. The main necessity of this project is Diabetes and high blood pressure are the primary causes of Chronic Kidney Disease (CKD). The main objective of this project is to create a deep neural network modified cnn architecture with necessary number of layers required and compare its performance to that of other contemporary machine learning existing accuracy .so to train the model more accurately the several number of data augmentation and Preprocessing techniques are used and finally after training using the modified architecture performance evaluation is done and model file is created to predict the test data and other than that the proposed system is executed with contour plotting technique for affected image to know the severity level in percentage.

Keywords: Clinical judgement, Medical expertise, Chronic Kidney Disease and Database

1. INTRODUCTION

Chronic kidney disease (CKD) is a long-term condition in which the kidneys gradually lose function over time. The kidneys are responsible for filtering waste and excess fluids from the blood, and when they become damaged, they are unable to perform this function effectively. The most common causes of CKD are high blood pressure and diabetes, which can damage the kidneys over time. Other factors that can contribute to CKD include smoking, obesity, family history of kidney disease, and certain medications. Symptoms of CKD may include fatigue, loss of appetite, muscle cramps, swollen feet and ankles, and difficulty sleeping. However, many people with CKD may not experience any symptoms until the disease is in its later stages. Treatment for CKD focuses on managing symptoms and slowing the progression of the disease. This may involve lifestyle changes, such as maintaining a healthy diet and exercising regularly, as well as medications to control blood pressure and blood sugar levels. In severe cases, dialysis or kidney transplant may be necessary. Chronic kidney disease (CKD) can be detected and diagnosed using a variety of methods, including blood tests, urine tests, and imaging studies. Recently, there has been growing interest in using machine learning techniques, such as convolutional neural networks (CNNs), to improve the accuracy and efficiency of

CKD detection. CNNs are a type of deep learning algorithm that are particularly well-suited to image recognition tasks. In the context of CKD detection, CNNs can be trained to analyze medical images, such as ultrasound or MRI scans of the kidneys, to identify signs of kidney damage or disease. To develop a CNN-based CKD detection system, a large dataset of kidney images must first be collected and labeled with information about the patient's clinical status (e.g. whether or not they have CKD).

The CNN is then trained on this dataset, learning to recognize patterns and features in the images that are associated with CKD. Once trained, the CNN can be used to analyze new kidney images and make predictions about the presence or absence of CKD. The accuracy of the CNN can be further improved by fine-tuning the model on new data, or by incorporating additional clinical and demographic information about the patient. While CNNs hold promise as a tool for improving CKD detection and diagnosis, it is important to note that these algorithms are not a substitute for medical expertise and clinical judgement. Healthcare professionals must still interpret and evaluate the results of any diagnostic test or imaging study in the context of the patient's overall clinical picture. Computed tomography (CT) imaging is a powerful tool for detecting and diagnosing kidney disease, including chronic kidney disease (CKD). CT scans use X-rays to create detailed images of the kidneys and surrounding tissues, allowing healthcare professionals to identify signs of kidney damage or disease. Recent research has explored the use of machine learning algorithms, such as convolutional neural networks (CNNs), to improve the accuracy and efficiency of kidney disease detection using CT images. To develop a CNN-based kidney disease detection system, a large dataset of CT images must first be collected and labeled with information about the patient's clinical status (e.g. whether or not they have CKD). The CNN is then trained on this dataset, learning to recognize patterns and features in the images that are associated with kidney disease. Once trained, the CNN can be used to analyze new CT images and make predictions about the presence or absence of kidney disease. The accuracy of the CNN can be further improved by fine-tuning the model on new data, or by incorporating additional clinical and demographic information about the patient. While CNNs hold promise as a tool for improving kidney disease detection using CT images, it is important to note that these algorithms are not a substitute for medical expertise and clinical judgment. Healthcare professionals must still interpret and evaluate the results of any diagnostic test or imaging study in the context of the patient's overall clinical picture.

2. LITERATURE REVIEW

PREDICTION OF CHRONIC KIDNEY DISEASE - A MACHINE LEARNING PERSPECTIVE

Chronic Kidney Disease is one of the most critical illness nowadays and proper diagnosis is required as soon as possible. Machine learning technique has become reliable for medical treatment. With the help of a machine learning classifier algorithms, the doctor can detect the disease on time. For this perspective, Chronic Kidney Disease prediction has been discussed in this article. Chronic Kidney Disease dataset has been taken from the UCI repository. Seven classifier algorithms have been applied in this research such as artificial neural network, C5.0, Chi-square Automatic interaction detector, logistic regression, linear support vector machine with penalty L1 & with penalty L2 and random tree. The important feature selection technique was also applied to the dataset. For each classifier, the results have been computed based on (i) full features, (ii) correlation-based feature selection, (iii) Wrapper method feature selection, (iv) Least absolute shrinkage and selection operator regression, (v) synthetic minority over-sampling technique with least absolute shrinkage and selection operator regression selected features, (vi) synthetic minority over-sampling technique with full features. From the results, it is marked that LSVM with penalty L2 is giving the highest accuracy of 98.86% in synthetic minority over-sampling technique with full features. Along with accuracy, precision, recall, F-measure, area under the curve and GINI coefficient have been computed and compared results of various algorithms have been shown in the graph. Least absolute shrinkage and selection operator regression selected features with synthetic minority over-sampling technique gave the best after synthetic minority over-sampling technique with full features. In the synthetic minority over-sampling technique with least absolute shrinkage and selection operator selected features, again linear support vector machine gave the highest accuracy of 98.46%. Along with machine learning models one deep neural network has been applied on the same dataset and it has been noted that deep neural network achieved the highest accuracy of 99.6%.",

CHRONIC KIDNEY DISEASE DETECTION USING MACHINE LEARNING TECHNIQUE

chronic kidney disease is a disorder that disables normal kidney function. The WHO has shown that CKD is a serious disease, ranked as one of the top twenty causes of death. It is recognized that2 million people worldwide suffer from kidney failure and the number of patients diagnosed with CDK continues to expand at a rate of 5-7% annually. late diagnosis of this disease is a life-threatening problem, which, often occurs in remote areas due to the lack of specialized medical personnel, in addition to the high cost of diagnosis. This paper aims at early detection of CDK using machine learning algorithms Artificial Neural Network, Support Vector Machine, and k-Nearest Neighbor. The importance of AI is reflected in the importance of identifying these typically fatal ailments. This study looks at a data set consisting of 400 samples and 13 features. The three classification techniques were evaluated by applying them to the data. The results show that the ANN classifier achieved the best accuracy at 99.2%.",

DETECTION OF CHRONIC KIDNEY DISEASE AND SELECTING IMPORTANT PREDICTIVE ATTRIBUTES

Chronic kidney disease (CKD) is a major public health concern with rising prevalence. In this study we consider 24 predictive parameters and create a machine learning classifier to detect CKD. We evaluate our approach on a dataset of 400 individuals, where 250 of them have CKD. Using our approach, we achieve a detection accuracy of 0.993 according to the F1-measure with 0.1084 root mean square error. This is a 56% reduction of mean square error compared to the state of the art (i.e., the CKD-EPI equation: a glomerular filtration rate estimator). We also perform feature selection to determine the most relevant attributes for detecting CKD and rank them according to their predictability. We identify new predictive attributes which have not been used by any previous GFR estimator equations. Finally, we perform a cost-accuracy tradeoff analysis to identify a new CKD detection approach with high accuracy and low cost.",

KIDNEY DISEASE DIAGNOSIS BASED ON MACHINE LEARNING

Many patients around the world lose their lives due to chronic diseases, but they are difficult to be diagnosed in a short time. We used data samples from Indian patients with kidney disease to investigate chronic disease. Correlation between each kidney disease index and the patient's condition showed the importance of personal physical information. Then we compared the prediction results by using Logistic Regression model and BP neural network model on these data set to diagnose the incidence of kidney disease. After testing, we found that the prediction accuracy, recall, and F1 score obtained by the Logistic Regression algorithm are less than the performance of these indicators obtained by the BP neural network on the prediction performance. It can be seen that the BP neural network can be more effective in making a diagnosis of kidney disease. Identification of kidney diseases can be more efficient with artificial intelligence through this method of machine learning, which has promoted the development of medical and health fields.",

CHRONIC KIDNEY DISEASE PREDICTION USING MACHINE LEARNING TECHNIQUES

Early diagnosis and characterization are the important components in determining the treatment of chronic kidney disease (CKD). CKD is an ailment which tends to damage the kidney and affect their effective functioning of excreting waste and balancing body fluids. Some of the complications included are hypertension, anemia (low blood count), mineral bone disorder, poor nutritional health, acid base abnormalities, and neurological complications. Early and error-free detection of CKD can be helpful in averting further deterioration of patient's health. These chronic diseases are prognosticated using various types of data mining classification approaches and machine learning (ML) algorithms. This Prediction is performed using Random Forest (RF) Classifier, Logistic Regression (LR) and K-Nearest Neighbor (K-NN) algorithm and Support Vector Machine (SVM). The data used is collected from the UCI Repository with 400 data sets with 25 attributes. This data has been fed into Classification algorithms. The experimental results show that K-NN, LR, SVM hands out an accuracy of 94%, 98% and 93.75% respectively. The RF classifier gives out a maximum accuracy of 100%",

3. SYSTEM DESIGN

3.1 OBJECTIVE

Chronic kidney disease includes conditions that damage your kidneys and decrease their ability to keep you healthy by filtering wastes from your blood. If kidney disease worsens, wastes can build to high levels in your blood and make you feel sick. You may develop complications like high blood pressure, anemia (low blood count), weak bones Kidney disease also increases your risk of having heart and blood vessel disease. These problems may happen slowly over a long time. Early detection and treatment can often keep chronic kidney disease from getting worse. So the main involvement given to the project is to identify the chronic kidney diseases as soon as in initial stage.

3.2 EXSISITNG SYSTEM:

This project presents the Adaptive Hybridized Deep Convolutional Neural Network (AHDCNN) for the early prediction and diagnosis of Chronic Kidney Disease (CKD). A deep learning system is used for identifying the distinctive subtypes of lesions from CT images in renal cancer. The collected data will initially be analyzed and the missing value will be replaced by the median value estimate. Different features associated with kidney disease are determined from the noise free data and fed in the classifier implemented to identify variations in kidney patterns.

3.3 PROPOSED SYSTEM:

The proposed system is implemented using Deep learning convolution neural network algorithm to train and classify the Chronic kidney diseases and more over the proposed system also uses OpenCV frame work with several preprocessing techniques are applied to enhance the trained data and the data is send to developed CNN architecture here the proposed system uses three convolution layers and two hidden layers and after training the model file is created and finally the testing process is done to predict the chronic kidney diseases the affected region is detected using contour method .

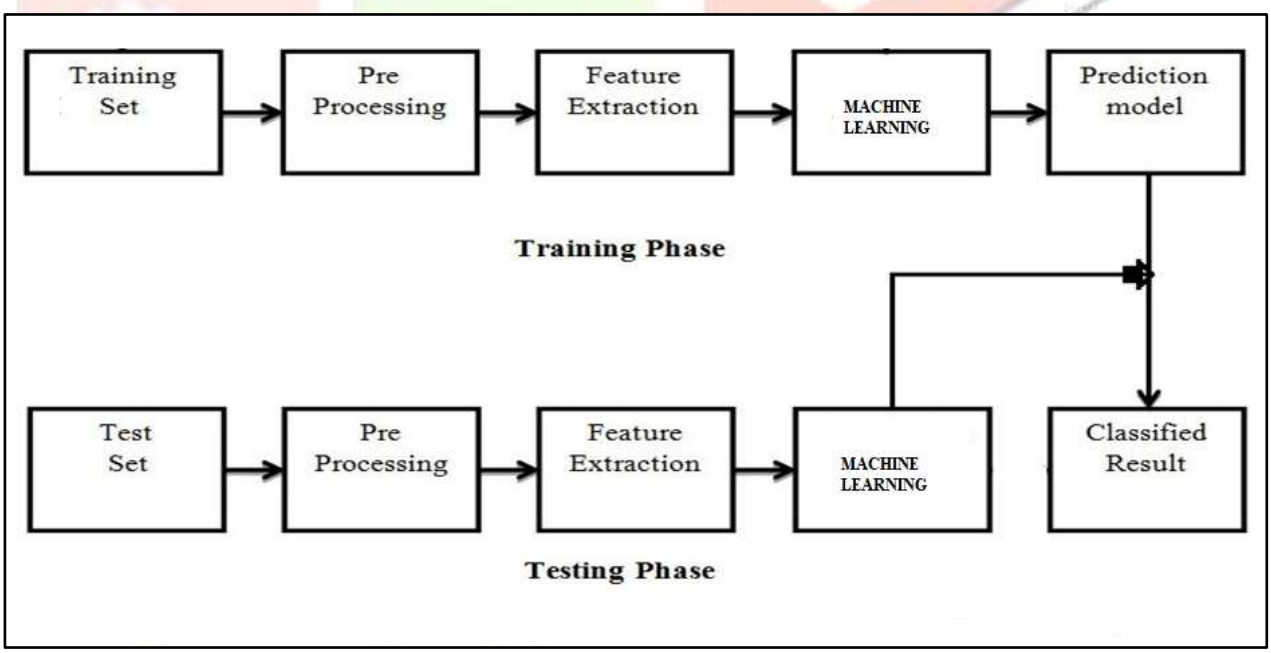

FIG: 1 BLOCK DIAGRAM

4. RESULTS & CONCLUSION

In conclusion, convolutional neural networks (CNNs) hold promise as a tool for improving the accuracy and efficiency of kidney disease detection, including chronic kidney disease (CKD), using medical imaging such as CT scans. To develop a CNN-based kidney disease detection system, a large dataset of labeled medical images is required, along with clinical and demographic information about the patients. The CNN is then trained to recognize patterns and features in the images that are associated with kidney disease. Once trained, the CNN can be used to analyze new medical images and make predictions about the presence or absence of kidney disease. The accuracy of the CNN can be further improved by fine-tuning the model on new data. However, it is important to note that these algorithms are not a substitute for medical expertise and clinical judgment. Healthcare professionals must still interpret and evaluate the results of any diagnostic test or imaging study in the context of the patient's overall clinical picture. Further research and development are needed to optimize the use of CNNs in kidney disease detection and diagnosis, but the potential benefits of this technology are significant and could lead to earlier and more accurate detection of kidney disease, and better outcomes for patients.

5. REFERENCES

1. "Prediction of Chronic Kidney Disease - A Machine Learning Perspective", IEEE Access Rama Al-Momani, Ghada Al-Mustafa, Razan Zeidan, Ahmed Alkhayyat,"Chronic Kidney Disease Detection Using Machine Learning Technique",2022 5th International Conference on Engineering Technology and its Applications (IICETA)
2. Asif Salekin, John Stankovic,"Detection of Chronic Kidney Disease and Selecting Important Predictive Attributes",2016 IEEE International Conference on Healthcare Informatics (ICHI)
3. Bo Wang,"Kidney Disease Diagnosis Based on Machine Learning",2020 International Conference on Computing and Data Science (CDS)
4. G Nandhini, J Aravinth,"Chronic kidney disease prediction using machine learning techniques",2021 International Conference on Recent Trends on Electronics Information Communication & Technology (RTEICT)
5. Maithili Desai,"Early Detection and Prevention of Chronic Kidney Disease",2019 5th International Conference On Computing Communication Control and Automation (ICCUBEA)
6. Haya Alasker, Shatha Alharkan, Wejdan Alharkan, Amal Zaki, Lala Septem Riza,"Detection of kidney disease using various intelligent classifiers",2017 3rd International Conference on Science in Information Technology (ICSITech)
7. Bhavya Gudeti, Shashvi Mishra, Shaveta Malik, Terrance Frederick Fernandez, Amit Kumar Tyagi, Shabnam Kumari,"A Novel Approach to Predict Chronic Kidney Disease using Machine Learning Algorithms",2020 4th International Conference on Electronics Communication and Aerospace Technology (ICECA)
8. H. Muthukrishnan, V. Sneharathna, Jeevanantham Arumugam, A. Panneerselvam, K Lalitha., D. Vinothini,"Machine Learning for Chronic Kidney Disease Detection",2022 Fifth International Conference on Computational Intelligence and Communication Technologies (CCICT)
9. Faisal Arafat, Thaharim Khan, Atanu Das Bapon, Md. Ibrahim Khan, Sheak Rashed Haider Noori,"A Deep Learning Approach to Predict Chronic Kidney Disease in Human",2021 IEEE 12th Annual Information Technology Electronics and Mobile Communication Conference (IEMCON)
10. D. Pavithra,R. Vanithamani,"Chronic Kidney Disease Detection from Clinical Data using CNN",2021 IEEE International Conference on Distributed Computing VLSI Electrical Circuits and Robotics (DISCOVER)