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Intelligent Decision Support for Identifying Chronic Kidney Disease Stages:
Machine Learning Algorithms

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ABSTRACT

The decision tree classification algorithm is becoming increasingly important in machine learning (ML) technology. It is being used in a variety of fields to solve extremely complicated issues. DTCA is also utilised in medical health data to identify chronic kidney disorders such as cancer and diabetes utilising computer-aided diagnosis. Deep learning is an intelligent area of machine learning in which neural networks are used to learn unsupervised from unstructured or unlabeled data. For CKD, the DL employed the deep stacked auto-encoder and soft-max classifier techniques. Kidney illness is another condition that can lead to a variety of health problems. Random forest, SVM, C5.0, decision tree classification algorithm, C4.5, ANN, neuro-fuzzy systems, classification and clustering, DSAE, DNN, FNC, MLP are used in this study to predict and identify an early diagnosis of CKD patients using various machine and deep learning algorithms using R Studio and Python Colab software. The many stages of chronic kidney disease are identified in this paper.

KEYWORDS

Chronic Kidney Disease, CKD Stages, Computational Decision Support System, Decision Tree Classification Algorithm, Machine and Deep Learning Algorithms

INTRODUCTION

Chronic kidney disease, or simply CKD, is one of the fastest-growing noncommunicable illnesses, contributing to a significant increase in death and sickness. By 2020, CKD will have affected 803 million people worldwide, with 663 million men and 526 million women (Lakshmanaprabu et al., 2019). It is also a huge public health issue in India, which is home to 17% of the world's population (Ahmed et al., 2014).

About 10% of the adult residents worldwide has chronic kidney disease (CKD), making it one of the top 20 causes of mortality globally. Normal kidney function is disrupted by CKD. The rising

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prevalence of chronic kidney disease necessitates the development of reliable methods for making accurate prognoses at an early stage. The innovation of this work is the creation of a diagnostic system for chronic renal disease (Sivasankar et al., 2019). Cloud computing and Internet of Things environments have lately seen widespread usage in a number of healthcare applications due to their ability to integrate monitoring devices like sensors as well as medical equipment for maintaining tabs on remote patients. Instead of relying on limited storage and processing resources, the huge volume of information formed by healthcare IoT gadgets might be analyzed in a CC context, leading to improved healthcare delivery. Simultaneously, early detection of CKD becomes crucial to drastically lowering mortality rates (Gupta et al., 2022). The problem of significant prognostic variation in chronic disorders affects clinical support systems. Large numbers of people dying from conditions like chronic kidney disease (CKD) are attributed in large part to this lack of knowledge. For this reason, accurate identification of this condition is a major focus area for healthcare providers (Al-Chalabi et al., 2023).

Analytical environments are employing a variety of ways to improve the value of health-related problem prediction by developing and exploring healthcare data records. Data from health-care records is mostly visual, and it comes from a wide range of sources around the world, including sensor equipment, photographs, and text in the form of electronic records. This disparity in data collection and representation methods points to several trials in the handling procedure and analysis of the original data. To analyze various types of documents, a diverse range of procedures is required (Reddy & Aggarwal, 2015). The kidneys' job is to filter blood and pass it through a filter. It removes unnecessary blood and maintains electrolyte and hydration balance. It strains blood and produces urine, which is produced by the kidney's two bean-shaped structures. Every kidney contains a million nephrons (units of measurement).

The kidneys' operations are to pass through a filter of the blood. It eliminates unwanted blood to regulate the stability of electrolytes and fluid. It strains blood, they create urine, which two bean-shaped structure of the kidney. Every one kidney surrounds a million things of unit so-called nephrons (Aditya et al., 2020).

FACTORS OF CKD

The following are some of the factors which lead to CKD, the main cause is diabetes and others are hypertension, smoke, fatness, heart illness, family record, alcohol, and age problem.

Symptoms

Some of the warning sign is listed down, that could be variations to urinary function, plasma in the urine, bulge & pain, severe tiredness and weakness.

Types: Acute and Chronic

- Acute Prerenal Kidney Failure - Suddenly decreases blood flow
- Acute Intrinsic Kidney Failure - Straight injury to the kidney's foundations unexpected damage in kidney
- Chronic Prerenal Kidney Failure - Gradually decreases blood flow
- Chronic Intrinsic Kidney Failure - Direct damage to the kidneys causes a gradual loss in kidney function (Lakshmanaprabu et al., 2019).

CKD is a worldwide health crisis. In 2019, the World Health Organization agree to fifty-eight million deaths and 35 million recognized to chronic kidney disease. The world level 850 million people now predicted to have kidney diseases from many causes, CKD causes at least 2.4 million deaths world wide-reaching per year sixth fastest-growing cause of disease and death. Dialysis is a fashion of life for many patient's pain with kidney sicknesses in India. The medical record of Government of Tamil