



CLASSIFYING KIDNEY DISEASE USING AI: A REVOLUTIONARY APPROACH TO EARLY DETECTION

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Abstract

Kidney disease is a major public health issue that often remains undiagnosed until it reaches advanced stages. Early detection plays a crucial role in reducing complications and improving patient outcomes. This paper presents an intelligent system for early detection and classification of kidney disease using Artificial Intelligence (AI) techniques. Both Machine Learning (ML) and Deep Learning (DL) models are employed to analyze clinical and health-related data to identify patterns associated with kidney dysfunction. A web-based application developed using the Django framework allows healthcare professionals and individuals to input patient data and obtain predictive results along with risk assessment. The proposed system aims to improve diagnostic accuracy, reduce human error, and support timely medical intervention.

Keywords: Kidney Disease, Artificial Intelligence, Machine Learning, Deep Learning, Early Detection, Classification

1.Introduction

Kidney disease, also known as renal disease, affects millions of people worldwide and poses a serious threat to public health. In many cases, symptoms appear only in later stages, making early diagnosis challenging. Traditional diagnostic methods rely heavily on laboratory tests and the expertise of medical professionals, which can be time-consuming and prone to human error.

With recent advancements in Artificial Intelligence, machine learning techniques have shown promising results in medical diagnosis. AI-based systems can analyze large volumes of medical data efficiently and assist in early detection of diseases. This study focuses on developing an AI-powered system for early detection and classification of kidney disease to support healthcare decision-making.

2.Existing System

The existing kidney disease diagnosis process mainly depends on manual evaluation and laboratory test results. The major limitations of the existing system include:

- Dependence on doctors' experience
- Time-consuming diagnostic procedures
- Late detection of kidney disease
- Lower accuracy in early-stage diagnosis

These challenges highlight the need for an automated and intelligent diagnostic system.

3.Proposed System

The proposed system utilizes Artificial Intelligence and Machine Learning techniques to overcome the limitations of the existing system. Key features of the proposed system include:

- Automated kidney disease classification
- Early and accurate disease detection
- Faster diagnosis process
- Reduced human error

By leveraging ML and DL algorithms, the system learns from historical medical data and provides reliable predictions.

4.Methodology

4.1 Data Collection

The kidney disease dataset is collected from medical records or publicly available datasets. The dataset contains clinical attributes relevant to kidney health.

4.2 Data Preprocessing

Data preprocessing is performed to improve data quality. This includes handling missing values, removing irrelevant attributes, and normalizing data to ensure consistency.

4.3 Feature Selection

Important medical features related to kidney disease are selected to enhance model performance and reduce computational complexity.

4.4 Model Training and Evaluation

Machine learning and deep learning models are trained using the processed dataset. The models are evaluated using performance metrics such as accuracy, precision, and recall.

5. System Modules

Data Input Module:

Allows users to enter patient medical data

Data Preprocessing Module:

Cleans and prepares data for analysis

Feature Selection Module:

Identifies relevant features

Classification Module:

Applies AI models to classify kidney disease

Result and Prediction Module:

Displays prediction results and risk levels

6. Results and Discussion

The experimental results demonstrate that the proposed AI-based system achieves higher accuracy in detecting kidney disease compared to traditional methods. The system effectively identifies early-stage kidney disease, enabling timely medical intervention.

7. Conclusion

This paper presents an AI-based approach for early detection and classification of kidney disease. By integrating machine learning and deep learning techniques with a web-based application, the system provides accurate and efficient diagnostic support. The proposed system has the potential to assist healthcare professionals in making informed decisions and improving patient outcomes.

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