A SMART TELEMEDICINE AND REMOTE MONITORING SYSTEM FOR CHRONIC DISEASE MANAGEMENT USING RANDOM FOREST

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ABSTRACT

Chronic Kidney Disease (CKD) is a significant global health concern, characterized by a gradual decline in kidney function over time. One of the major challenges in CKD management is the lack of noticeable symptoms during the early stages, which often leads to delayed diagnosis and treatment. Early detection is essential to slow the progression of the disease and improve patient outcomes. In recent years, the increasing availability of healthcare data, especially pathology reports, has opened new avenues for predictive analytics using machine learning (ML) techniques. This research proposes a Smart Telemedicine and Remote Monitoring System designed to support chronic disease management, particularly for CKD patients. The core of the system leverages the Random forest algorithm, a robust and scalable gradient boosting framework, to predict CKD risk using patient pathology data. To ensure the reliability of the proposed approach, we compare the performance of Random forest with other established machine learning models including Light Gradient Boosting Machine (LightGBM), Logistic Regression, and Support Vector Machine (SVM). The comparison is based on key evaluation metrics such as accuracy, precision, recall, and F1-score. The results of this study demonstrate that Random forest outperforms the alternative models in terms of predictive accuracy, showcasing its potential for real-world healthcare applications. The system enables continuous remote monitoring of patient health, providing timely alerts and decision support for healthcare providers. Ultimately, this approach aims to enhance early diagnosis, reduce hospital visits, and support personalized treatment planning for patients suffering from chronic diseases like CKD.