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From Data to Diagnosis: AIs Role in CKD Risk Stratification

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Objectives : Artificial Intelligence (AI) is transforming healthcare, offering new possibilities for predictive analytics and clinical decision-making. Chronic kidney disease (CKD) is a growing public health burden in India, driven by rising diabetes and hypertension rates. This study investigates the application of AI-driven natural language processing (NLP) for analyzing clinical notes from electronic health records (EHRs) to improve early detection and risk stratification of CKD. Our goal is to develop an AI model that assists nephrologists in identifying high-risk patients by extracting structured insights from unstructured clinical data.
Methods : Clinical notes were sourced from nephrology department of a tertiary care hospital , covering records up to December 31, 2024. Preprocessing included text normalization, tokenization, and feature extraction using NLP techniques. A multilabel text classification model, utilizing a convolutional neural network (CNN) within the Keras framework, was implemented to predict CKD risk. The model was trained on annotated datasets and validated against expert-labeled cases. Performance was assessed using precision, recall, and F1-score.
Results : The AI model achieved a precision of 59%, recall of 91%, and an F1-score of 72% for CKD classification. The CNN-based ensemble approach significantly enhanced prediction accuracy and risk stratification. Notably, the model successfully identified high-risk patients, demonstrating its potential for early intervention and improved clinical decision-making.
Conclusions : This AI-driven model effectively processes unstructured clinical data, generating real-time alerts for potential CKD cases and supporting early diagnosis. Its application in resource-limited settings across India could help mitigate CKD progression through timely interventions. Future research will integrate additional clinical parameters, demographic factors, and real-world patient outcomes to refine predictive accuracy and drive AI-powered public health solutions.