

ABSTRACT

Chronic Kidney Disease (CKD) is a gradual and usually asymptomatic condition which often goes undetected in early stages, especially in resource-constrained healthcare environments. This paper introduces Echoes of the Hidden Filter, an interpretable ensemble learning model that can be used for proactive CKD prediction. The method combines Random Forest, XGBoost, Support Vector Machines, and Artificial Neural Networks as a hybrid stacking and majority-vote ensemble with strong performance over a wide range of patient populations. For the purpose of increasing clinical trust, the model uses SHAP and LIME for global and local interpretability to identify prominent biomarkers like eGFR, creatinine, and cystatin-C in personal predictions. On a real-world CKD dataset with missing values and class imbalance, we have used regression-based imputation, variance-thresholding, and dynamic SMOTE balancing. Experimental outcomes show that the ensemble outperforms individual classifiers at all times for accuracy, precision, recall, and F1-score. By combining interpretability with predictive performance, the framework proposed closes the loop between black-box AI and clinical usability, presenting a scalable approach to population-level CKD screening.