# ABSTRACT

Improving patient outcomes and facilitating early medical intervention depend on timely and accurate liver disease prediction. In this work, we present ExplaiLiver+, a new multi stage stacking ensemble framework that uses SHAP to combine interpretability of the model with high predictive performance. Robust preprocessing methods such as skewness correction, class balancing with SMOTEENN, feature selection using an ExtraTrees-based approach, and missing value imputation are all integrated into the framework. Four heterogeneous base classifiers—XGBoost, ExtraTrees, LightGBM, and CatBoost—stacked via a logistic regression meta-learner are used in the core ensemble architecture to improve generalization. ExplaiLiver+ outperforms individual baseline models with an AUC of 98.39% and a test accuracy of 94.05%, This study utilizes the ILPD for analysis. SHAP values are employed to illustrate feature importance and provide an explanation of individual predictions in order to guarantee decision-making transparency. The suggested system shows how clinical decision support systems for liver disease detection can be made much more reliable and trustworthy by fusing feature-level explainability with model level ensemble learning.

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