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Hyperparameter Optimization for Disease Detection and Analysis

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Abstract: *The heart is crucial for living organisms, and detecting heart-related diseases necessitates accurate and precise monitoring. Cardiovascular disease is the primary cause of mortality across the world. Machine learning can assist in predicting heart disease survivors by converting large amounts of healthcare data into valuable insights for decision-making. This is a critical challenge in clinical data analytics. Various studies have identified important attributes that have a significant impact on predicting heart disease survivors. Machine learning can assist in uncovering these crucial attributes and assist healthcare professionals in anticipating a patient's survival and then adapting their care plan appropriately. As such, machine learning has great potential to improve patient outcomes and reduce healthcare costs associated with heart disease. Machine learning systems have shown potential in predicting and detecting cardiovascular disease (CVD) at an early stage, which can help mitigate mortality rates. Several research studies have utilized various machine learning techniques to identify CVD and determine the severity level of patients, yielding promising results. These approaches have the potential to assist healthcare professionals in improving patient outcomes and reducing the burden of CVD on society. This study proposes a method to address imbalance distribution in predicting patient status using the Synthetic Minority Oversampling Technique (SMOTE). Six machine learning (ML) classifiers were used and Hyperparameter Optimization (HPO) was employed to find the best hyperparameters. The results show that the proposed method improved the performance of the ML classifiers in detecting patient status. The findings suggest that the proposed approach could provide a valuable tool for improving diagnostic accuracy in medical applications. The model proposed in the study can assist doctors in identifying a patient's heart disease status, leading to early intervention and prevent mortality related to heart disease. By using this model, doctors can provide timely treatment and reduce the risk of heart disease-related complications. Implementing the model can help improve patient outcomes and reduce healthcare costs associated with heart disease management.*

Keywords: ML-Machine Learning, CVD-Cardiovascular Disease, SMOTE- Synthetic Minority Oversampling Technique, HPO-Hyperparameter Optimization

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