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(57) Abstract :

In the area of medical data analysis, one of the most difficult problems to solve is determining the probability of a patient having a disease. Death rates can be lowered by the early detection of diseases and the constant monitoring of patients by physicians. Unfortunately, diseases cannot always be detected accurately, and a doctor cannot be in touch with a patient 24/7. Clinical outcomes and efficiency in healthcare can be significantly improved by using machine learning to diagnose chronic diseases early and accurately. This project introduces a multi-disease prediction system that predicts diabetes, heart disease, and Parkinson's disease with a single CatBoost model, eliminating the complexity of managing multiple models. The system compares and assesses the performance of CatBoost with Random Forest and XGBoost based on critical metrics like accuracy, precision, recall, F1- score, and specificity. For all models tested, CatBoost invariably reported the best accuracy at 97.06% for diabetes, 93.44% for heart disease, and 94.87% for Parkinson's disease, outperforming both Random Forest and XGBoost across all three cases. The model is assisted by preprocessing methods such as SMOTE for class imbalance and ANOVA-based feature selection. An end-user interface based on Streamlit enables users to enter health parameters and obtain real-time predictions. In addition, the app offers users with detailed symptom descriptions and cautionary advice for each sickness. This efficient, high-performance solution shows the effectiveness of having a single, powerful model such as CatBoost handle multi-disease prediction, with a value add in user education and consumer-friendly diagnostics.

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