ABSTRACT

Polycystic Ovary Syndrome (PCOS) is a complex hormonal disorder that affects women of childbearing age and is often difficult to diagnose early. The main challenge in PCOS diagnosis using machine learning lies in data imbalance and limited model interpretability. This study aims to analyze important features in PCOS diagnosis by comparing two machine learning algorithms, namely Random Forest and XGBoost. Both models are combined with data imbalance handling technique Synthetic Minority Over-sampling Technique (SMOTE) and Shapley Additive Explanations (SHAP) model interpretation method. The dataset used comes from the Kaggle platform, consisting of 541 patient data and 45 clinical features. The research process includes data preprocessing, data exploration, model training with GridSearchCV and Stratified K-Fold Cross-Validation, model performance evaluation using accuracy, precision, recall, and F1-score metrics, and result interpretation with SHAP. The results show that the XGBoost model with the combination of SMOTE and SHAP provides the best performance in the classification and interpretation of PCOS diagnosis features. Follicle No. (R), Hair growth (Y/N), and Skin darkening (Y/N) emerged as the most influential features consistently. This approach provides an accurate and medically understandable picture, thus supporting a more transparent and effective diagnosis process.

Keywords — Explainable AI, PCOS, Random Forest, SHAP, XGBoost