# ABSTRACT

Polycystic Ovary Syndrome (PCOS) is a common hormonal disorder among women of reproductive age, affecting fertility and metabolic health. This condition can increase the risk of type II diabetes, gestational diabetes, weight gain, unwanted hair growth, and various other complications. The use of machine learning can be a solution for early detection to prevent complications caused by PCOS. Several previous studies have proven that machine learning methods, such as Random Forest, Decision Tree, Support Vector Machine, and Adaboost, are effective in predicting PCOS. However, these models remain suboptimal due to low sensitivity and specificity, which leads to errors in detecting positive cases (false negatives) and negative cases (false positives). In machine learning, various types of ensemble learning, such as bagging, boosting, and stacking, can be used to improve the performance of predictive models. This study proposes an Ensemble Learning method to enhance accuracy, sensitivity, specificity, precision, recall, and F1-score by combining Random Forest and Artificial Neural Network (ANN) as base models within a stacking framework using Logistic Regression as the meta-learner. Patient data, both with and without PCOS, were analyzed to compare the performance of the Random Forest, ANN, and ensemble learning models using Stacking, Bagging, and Boosting methods with evaluation metrics such as accuracy, sensitivity, specificity, precision, recall, and F1-score. The selection of ANN and RF as base models is based on experimental results showing that ANN has high sensitivity (96,30%), making it effective in accurately detecting individuals with PCOS, while RF has high specificity (98,18%), which is effective in identifying individuals without PCOS. The study results show that the Ensemble Learning model with the stacking method achieved sensitivity, specificity, precision, recall, F1-score, and accuracy of 96,30%, 96,36%, 92,86%, 96,30%, 94,55%, and 96,34%, respectively, making it superior to individual models and a more effective choice for predicting PCOS. A sensitivity value of 96,30% means that the model can identify 96,30% of all individuals who truly have PCOS, while a specificity value of 96,36% indicates that the model can correctly classify 96,36% of individuals who do not have PCOS. This approach is expected to contribute to the development of more accurate and reliable diagnostic technology to support the early detection of PCOS.

**Keywords**: Polycystic Ovary Syndrome, *Random Forest*, Artificial Neural Network, Stacking, Prediction, *Ensemble Learning*