

Title: Performance enhancement of machine learning algorithm for breast cancer diagnosis using hyperparameter optimization

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Abstract: Breast cancer is the most fatal women's cancer, and accurate diagnosis of this disease in the initial phase is crucial to abate death rates worldwide. The demand for computer-aided disease diagnosis technologies in healthcare is growing significantly to assist physicians in ensuring the effectual treatment of critical diseases. The vital purpose of this study is to analyze and evaluate the classification efficiency of several machine learning algorithms with hyperparameter optimization techniques using grid search and random search to reveal an efficient breast cancer diagnosis approach. Choosing the optimal combination of hyperparameters using hyperparameter optimization for machine learning models has a straight influence on the performance of models. According to the findings of several evaluation studies, the k-nearest neighbor is addressed in this study for effective diagnosis of breast cancer, which got a 100.00% recall value with hyperparameters found utilizing grid search. k-nearest neighbor, logistic regression, and multilayer perceptron obtained 99.42% accuracy after utilizing hyperparameter optimization. All machine learning models showed higher efficiency in breast cancer diagnosis with grid search-based hyperparameter optimization except for XGBoost. Therefore, the evaluation outcomes strongly validate the effectiveness and reliability of the proposed technique for breast cancer diagnosis.

Keywords: Breast cancer, Machine learning, Hyperparameter optimization, Grid search, Random search, Logistic regression, K-nearest neighbor

DOI: <https://doi.org/10.11591/ijece.v14i2.pp2181-2190>

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