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Optimizing SVM hyperparameters for breast cancer data classification using Hybrid Particle Swarm Optimization

Onumanyi, Adeiza J
Council for Scientific and Industrial Research (CSIR)
Meiring Naude Drive, Pretoria, 0184
Email: Onumanyi@csir.co.za

The classification efficacy of Support Vector Machines (SVMs) heavily relies on hyperparameter selection, and optimizing parameters such as kernel type and regularization is particularly challenging due to the non-convex nature of the SVM objective function. In response to this challenge, we introduce a novel approach, the trailPSO technique, which combines Particle Swarm Optimization (PSO) with Smell Agent Optimization (SAO) to achieve a balance between exploration and exploitation. The trailPSO algorithm is applied to optimize SVM hyperparameters, resulting in the trail PSOSVM model. We assess the performance of trailPSOSVM by employing it to classify breast cancer datasets, revealing superior outcomes compared to conventional methods. Notably, the proposed approach attains 100% accuracy with zero errors, showcasing its ability to identify optimal hyperparameter settings for enhanced classification accuracy and robustness. This study is part of an ongoing efforts towards extending the trailPSO algorithm for sentiment analysis and addressing imbalanced datasets in the realm of natural language processing.