

ABSTRACT

Patients with multimorbidity are defined as individuals who suffer from more than one disease simultaneously, making the diagnostic process more complex. This complexity requires a method capable of predicting multiple diseases at the same time, which naturally corresponds to a multi-label classification problem. This study aims to apply the Multi-Label K-Nearest Neighbor (ML-KNN) method to classify diseases in multimorbid patients using a machine learning approach. The large number of diseases to be predicted results in a high-dimensional feature space, highlighting the need for feature selection to improve model efficiency and performance. Therefore, Particle Swarm Optimization (PSO) is employed as a feature selection method to identify an optimal subset of features. In addition, a local search mechanism is integrated into the PSO iterations to address stagnation and enhance the exploration of potentially better feature subsets. The dataset used is patient medical record data based on multimorbidity conditions in 2024-2025 at the ABC Main Clinic consisting of 274 patients. The results demonstrate that the 80%:20% data partition with $k = 3$ and 13 selected features achieves the best performance. The proposed model attains a Hamming loss of 0,0818, with macro-averaged precision, recall, and F1-score of 0,8130, 0,6716, and 0,7185, respectively, as well as micro-averaged precision, recall, and F1-score of 0,8750, 0,8280, and 0,8508.

Keyword: Multimorbidity, Multi-Label Classification, Multi-Label K-Nearest Neighbor, Particle Swarm Optimization