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PERFORMANCE COMPARISON OF GA AND PSO BASED ANN TRAINING ON MEDICAL DATASET

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Artificial Neural Networks have significantly contributed to the analysis of medical data, providing predictive insights for diagnosis and treatment strategies. Regardless of their potential, conventional training approaches for ANNs frequently experience optimization difficulties, characterized by slow convergence rates and the propensity to become confined in local minima. This research performs a comparative analysis of Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) as methods for optimizing the training of ANNs, utilizing three medical datasets: Breast Cancer Wisconsin, Cleveland Heart Disease, and Pima Indian Diabetes. The assessment incorporates vital performance metrics such as accuracy, precision, sensitivity, Mean Square Error (MSE), Mean Absolute Error (MAE), and training efficiency. Data preprocessing was carried out using min-max normalization, and an ANN architecture featuring 20 hidden neurons was created and optimized with MATLAB. GA operates on evolutionary mechanisms such as selection, crossover, and mutation, whereas PSO employs swarm intelligence to facilitate swift and efficient global optimization. The experimental findings reveal that PSO surpasses GA in all datasets, attaining higher accuracy, lower error rates, and considerably faster convergence times. Notably, PSO revealed impressive sensitivity in the Diabetes datasets and consistency in the Breast Cancer and Heart Disease datasets, validating its effectiveness for sophisticated medical diagnoses. On the other hand, despite the effectiveness of GA, it requires increased computational resources as a result of its broad exploratory approaches. This analysis showcases the effectiveness of PSO as a strong and efficient optimization technique for enhancing the training of ANNs in healthcare scenarios. Future studies will aim to refine PSO configurations and broaden its application to a wider range of clinical situations.

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