Heart Smart: A Novel Deep Learning Approach to Improving Heart Disease Diagnosis

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Heart disease is the leading cause of death worldwide (WHO), and experts estimate that half of all heart attacks and strokes occur in people who have not been flagged as ‘at risk'. There is an urgent need to improve the accuracy of heart disease diagnosis. To address this problem, a tool was created to help doctors diagnose heart disease using machine learning. Machine learning is a type of artificial intelligence that teaches the computer to learn from existing data and predict outcomes for future data. The innovation - Heart Evaluation for Algorithmic Risk-reduction and Optimization (HEARO) is a variable-layer deep neural network with the regularization optimization. HEARO's performance is evaluated against logistic regression, a 2-layer neural network, and an unregularized variable-layer deep neural network. Regularization is an effective optimization because it increases the algorithm’s ability to apply its procedure to unfamiliar data. The mathematical method of cross-validation is applied to assess generalization, and Matthews correlation coefficient is computed to evaluate classification outcomes. HEARO uses the Cleveland dataset of patient medical information as input, and outputs a heart disease severity rating from 0-4. This dataset is used because of its public availability that improves the reproducibility of results. HEARO is a contribution to the field because it outperforms published research in this area due to its superior accuracy and is a novel diagnostic method. In the future, HEARO can provide a potentially life-saving tool for doctors to make a more informed diagnosis.

Awards Won:
First Award of $5,000
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Award of $1000 for research in Medicine