

Introduction To Optimization

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Introduction

Our aim is to investigate and compare the performances of four different optimization techniques that can be used in training a neural network for the prediction of heart disease. The data involve a lot of attributes related to heart health, whereas the target variable indicates the presence of heart disease. The optimization techniques are Gradient Descent, Randomized Hill Climb, Simulated Annealing, and Genetic Algorithm. Table of Comparison on TEST Set

Method	Accuracy	Sensitivity	Specificity	AUC
Gradient Descent	0.84	0.88	0.79	0.83
Genetic Algorithm	0.55	0.21	0.96	0.58
Simulated Annealing	0.85	0.94	0.75	0.84
Randomized Hill Climbing	0.84	0.89	0.79	0.84

Discussion

The obtained results showed that, in general, the most successful techniques were Simulated Annealing and Gradient Descent for all measures of accuracy, sensitivity, and AUC. Among the two, Simulated Annealing achieved the highest sensitivity and AUC, so it was the best technique applied for this data set. Randomized Hill Climbing was very competitive. Genetic algorithms performed very poorly, particularly in the area of sensitivity and AUC.

These results suggest that classical optimization strategies, such as Gradient Descent and Simulated Annealing, would perform better in training neural networks on such a dataset than more complex methods like Genetic Algorithms.