MCTS guided Genetic Algorithm for optimization of neural network weights

Evaluation Results

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In this report we discuss the evaluation results of the experiment performed. The application of MCTS-GA to optimizing neural network weights to achieve better binary classification accuracy.

In this experiment MCTS-GA was run using UCT for 20 generations (tree depth) with rollouts configured to 10 generations and branching factor 5. The GA was run for 200 generation and the neural net was run for 200 epochs.

The results obtained from primary testing has proven to be positive. The MCTS-GA approach was able to optimize the neural network weights for better classification of the diabetes data and obtained better accuracy results.

The below table shows the accuracy metrics for the different approaches used in the experiment:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Neural Net - SGD | Neural Net -ADAM | Genetic Algorithm | MCTS-GA |
| accuracy | 0.49 | 0.72 | 0.73 | 0.745 |
| recall | 0.42 | 0.73 | 0.77 | 0.78 |

The confusion matrix for the three approaches are as follows:

Chart

Description automatically generated

1. Neural network – ADAM optimizer

Chart

Description automatically generated

1. Genetic Algorithm:

Chart, bar chart

Description automatically generated

1. MCTS-GA

The ROC- AUC curve for the three methods is as shown below:

Chart, line chart

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Conclusion

The experiment confirms the working of MCTS- GA on optimization of neural net weights. The optimization of weights and thus the classification is seen to be better achieved by the MCTS-GA over the genetic algorithm and feedforward neural network approach. Although, the improvement is not large MCTS-GA does run in a comparable time in comparison to the other two techniques. There is scope for improvement of the algorithm discussed here and the representations of different problems are to be tested. In all, we discussed a novel approach that can prove to be a strong and valid technique for optimization techniques in the future.