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Comparison of Different Machine Learning Algorithms with Regards to Task Efficiency

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The current issue with the state of machine learning is that there are a plethora of algorithms readily available. This can make choosing the right algorithm a tedious task. Neural networks, random forests, and decision trees are a few of the most common, and they all excel at different tasks. Maximizing efficiency is a common objective in many projects, and if machine learning users are able to choose the algorithm which will be most efficient at their chosen task, achieving this objective will be much easier. The purpose of this project was to run different machine learning algorithms on a variety of tasks and compare the results in terms of efficiency and accuracy. The expected results were that the neural network will outperform the random forest algorithm in most complex scenarios, but the random forest may be more efficient if the task is simple enough for it to complete in a procedural manner. The tasks ranged from a simple solved game (Tic-Tac-Toe), a classification task (Wheat type) and an image classification task (Clothing). In each task, all algorithms were trained for comparable amounts of time with similarly sized training data sets. This allowed for comparisons to be made. The random forest algorithm performed better on a simple solved game, and a simple image classifier; however, the neural network performed better when the dataset was bigger in a classification test. This means that when a task is simple with less data, random forests tend to outperform neural networks; however, as task complexity increases along with data size, neural networks begin to outperform random forests. These results are significant because as researchers go forward in efforts to utilize machine learning in other areas of science, they will be able to better select the algorithms that are best optimized for their chosen task.

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I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).