Google, DeepMind Researchers (2016, Jan. 28). "Mastering the game of Go with deep neural networks and tree search." Nature, 484-489.

In the feature article "Mastering the game of Go with deep neural networks and tree search" (2016), Google's DeepMind researchers report on AlphaGo, a computer program they developed that is the first to reach professional level of play in the game of Go. The article states that Go is the most difficult perfect information game for AI programs to master due to large amount of possible moves and difficulty evaluating good moves from bad. Without a computer powerful enough to search all possible moves, other strategies such as Monte Carlo tree search (MCTS) were developed to find good moves to play. Prior to AlphaGo, the strongest computer Go programs were based MCTS.

In an effort to surpass the performance of existing MCTS based computer Go programs, the researchers at Google's DeepMind developed a new search algorithm that utilizes advances in the field of deep learning to train 'value' and 'policy' networks with supervised and reinforcement learning. The first stage of training uses supervised learning and convolutional neural networks to train a policy network to predict human expert moves based on a given board state. The second stage of training further evolves the policy network by playing the game of Go against past versions of itself through a method called reinforcement learning. In the final stage a value network is trained to predict the outcome of a game given a certain game state if both players use the same policy network. The article explains how these networks are combined in Monte Carlo tree search in a novel way to choose an intelligent move.

Alpha was the first Go program to beat a professional human player, and was also evaluated to be the best computer Go program developed to date. The article further states the problems presented by the game of Go are complex enough to be representative of other

seemingly unsolvable problems faced by humanity. For this reason, the DeepMind team hopes

the discoveries explained in this article will lead to breakthroughs in other domains in the same

way Monte Carlo tree search has since being introduced.