This is a summary of the article, *"Mastering the game of Go with deep neural networks and tree search".*

The article sets out to discuss the authors' approach in building an Artificial Intelligent (AI) agent, AlphaGo, to play the game of Go.

Go is a popular turned-based deterministic board game played between two players. It is significantly more complex than chess, with an approximate branching factor and depth of 250 and 150, in contrast to chess' 35 and 80.

Due to the complexity of Go, the best AI agents, based on Monte Carlo Tree Search (MCTS) had only achieved a level of good amateur play prior to AlphaGo.

AlphaGo is composed of three convolutional neural networks: two policy networks, which evaluate and prioritize the range of legal moves, and a value network, which estimates the probability that a current state will result in a win.

An initial policy network was trained on a 13-layer network from 30 million positions from human expert games from the KGS Go Server. This network predicted expert moves on a held-out test set with an accuracy of 57.0% using all input features. The best accuracy achieved by existing Go programs was 44.4%. Another smaller policy network was trained, which achieved a lower accuracy of 24.2%, but was 1,500 times faster. Reinforcement Learning (RL) was subsequently applied to improve the policy networks through numerous self-play games. AlphaGo won 80% of games against a version of AlphaGo without RL applied to the policy networks.

The value network initially trained on the KGS dataset exhibited overfitting. This was addressed by further training the value network on 30 million game positions generated from self-play games during RL.

The policy and value networks were combined with an MCTS algorithm that simulates games from the current state based on the policy network. Versions of AlphaGo with value-network-only or policy-network-only models were compared with poorer results.

AlphaGo utilized 48 CPUs and 8 GPUs. A distributed version of AlphaGo ran on 1,202 CPUs and 176 GPUs.

AlphaGo achieved groundbreaking results. It had a win rate of 99.8% against the best existing Go programs. AlphaGo also defeated the European Go champion five games to nil. This was the first time an AI agent defeated a human professional at Go without a handicap.