AlphaGo Paper Review

The Goal of this AlphaGo paper is to introduce techniques to build a Go AI program to defeat human professional player in the full-sized game of Go. Like many other strong Go programs, AlphaGo is based on Monte Carlo tree search (MCTS) along with policy functions (to reduce its search width) and position evaluations (to reduce its search depth). What makes AlphaGo differed from other Go program is that it uses the Go board position as a 19 x 19 image to be fed into convolutional neural networks to build its policy network and position evaluation network. Technique used in AlphaGo will be introduced a little bit further in the next paragraph. Reviews of its result will be discussed in the last paragraph.

AlphaGo first build its policy network p_π and p_σ to predict the next move of human expert. P_σ is a much stronger version with 57% accuracy rate, p_π is a faster version with only 24.2% accuracy rate but uses only 2 us to select an action, while p_σ takes 3 ms. Next, AlphaGo takes p_σ as the initial state of p_p (another network policy) and uses reinforcement learning to improve p_p's winning rate when playing with previous developed versions of policy network. AlphaGo then used p_p to generate 30 million self-played data and use these data to build the position evaluation network (v_θ) to predict if the current position leads to winning or loosing. Finally, AlphaGo combines them with the MCTS. The tree is traversed by simulation starting from the root state, with a strategy uses p_σ, p_π and v_θ. The algorithm chooses the most visited move after search complete.

AlphaGo defeated Fan Hui, an human professional player, which is believed to be at least a decade away. Not only that, AlphaGo even defeated Lee Sedol, one of the best Go player in the world, in March 2016. This is widely believed as a milestone for building human-level AI program. The fast progressed neural network techniques enable computer to solve many problems which is previously considered hard for computer but easy for human, such as image recognition and speech recognition. By combining with the traditional AI techniques, people believe that AI can replace many human jobs in near future.