AlphaGo Summary

AlphaGo is a program made for playing Go and also the first program to beat the European Go champion Fan Hui by 5 - 0 in the formal game of Go. The article we summarize here describes how the AlphaGo system works and the innovations which it brought to the field of game playing in Artificial Intelligence.

System's Description: The AlphaGo system works by using a mix of algorithms to increase the system performance and prevent failure.

Algorithms: The AlphaGo match version against Fan Hui used deep convolutional neural networks to perform positional evaluation and Monte Carlo Search Tree to perform the moves search and analyse the best continuation for a certain position of the game.

Neural Networks: They implemented 4 neural networks, three of them were policy networks which describe the most recommended moves to play to feed the Monte Carlo Search, two of those have been trained with SL(Supervised Learning) techniques using data from Go professional Games and the other one have been trained with a RL(Reinforcement Learning) technique using the SL networks as a base, and them improving itself with games played against itself to maximize the winning rate. In the end of the process they use a regression technique to train a value network which gives a value about the move saying if it is most likely to win or not.

Monte Carlo Search Tree: The researchers did alter the basic Monte Carlo Search Tree technique to offer the capability of implement the Deep Convolutional Neural Networks. The Monte Carlo technique offers a search based in the probability of the move to be good, them the AlphaGo infers this probability by the output of the neural networks and them it computes the best way to keep following, giving priority to non visited promising positions, but once these positions have been really well visited it gives priority to not as promising positions but which haven't been well visited.

The Decision Making: AlphaGo uses the Monte Carlo to search the best move continuation and the decision making is based in the position which have been most visited, because it tells that this position had the most promising possible continuations.

The Hardware: The match version of AlphaGo run with 40 threads running the algorithms asynchronously in a computer with 48 CPUs and 8 GPUs.

Results: The AlphaGo performance have been measured against other computers with the match version won 494 out of 495 games (99.8%) against other Go programs, also the win in the Match against Fan Hui by 5 - 0. There also have been built a distributed version of AlphaGo with 1202 CPUs and 176 GPUs running 40 Threads which won 77% of the games against the AlphaGo version running on a single machine.

Reference: Silver D., Huang A., Maddison C. J., Guez A., Sifre L., Driessche G. V. D., Schrittwieser J., Antonoglou I., Panneershelvam V., Lanctot M., Dieleman S., GreweD., Nham J., Kalchbrenner N., Sutskever I., Lillicrap T., Leach M., Kavukcuoglu K, Graepel T. & Hassabis D. (2016) Mastering the game of go with deep neural networks and tree search. *Nature* **529**(7585):484–89.