AlphaGo

Techniques introduced

AlphaGo introduced a new technique: it's a search tree that is directed by a convolutional neural network. The convolutional neural network has value network and 2 policies networks.

Before this paper, most of the Go computer programs were based on Monte Carlo Tree Search (MCTS) that allow you to search deep without branching by using policies to decide what node select on each level. But those policies were based on experts in the field that had input this systems and creating linear functions. Later refining using weight on those policies as the program is been use more and more.

AlphaGo introduce the usage of deep convolutional neural networks that traditionally were use for image recognition to pass the board position as a 19×19 image and use convolutional layers to construct a representation.

To train the policy networks they combined supervised learning (SL) using experts Go players. This was around 30 millions positions. Later they use reinforced learning (RL) to improved them by letting them play against each other. This policies networks return a set of probability distribution over possible moves. They tested these policies (without any search) obtaining 85% wins vs. one of the other computer systems called Pachi.

Later the trained the Value Network using regression models to approximate the result of the RL policies. The Value network, returns a single value that represent the probability of winning.

The final technique is to search (MCTS) using the combination of the value network + policies networks. It's the combination of both that makes this unique.

Paper results

- AlphaGo achieved a 99.8% winning rate against other Go programs and will 5-0 to the human world champion been a milestone on AI.

- The technique proof the effective use of deep neural networks to resolve problem in combination with other techniques.

- AlphaGo uses self learning component instead of hand-made heuristics. It proof self learning.

- AlphaGo achieved the highness Elo rating of 2890. But the distributed version achieved even a higher number 3140.
- Parallel computing seems key to resolve AI problems.