

## An Original Computer Go Program : Maru (version 6)

Maru is an original computer go program which have developed since 2016. Maru uses a deep convolutional neural network, but it is not a clone program of any other computer go programs such as AlphaGo. Maru has following features.

1. A search algorithm for decision making is Mini-Max instead of MCTS.
2. Moves are decided by not only value predictions but also territory (ownership) predictions.

In addition, this version focuses on the architecture of deep convolutional neural networks. Some new ideas are adopted in order to improve the performance.

1. A loss function for a policy network is binary cross entropy, not softmax cross entropy. The policy network in Maru can recommend several moves, and widths of search trees are controlled by the number of moves recommended by the policy network.
2. Spatial Attention Layer (SAL) are inserted into residual blocks. SAL is a newly developed (and not published) technique which combines signals in separated places. SAL improves performances of deep convolutional neural networks in computer go programs (ex: Recall of a policy network (10 blocks, 128 filters) is improved from 0.760 to 0.785).

The deep convolutional neural network was trained by using LeelaZero datasets (about 2.5 million games). But, evaluations have not done yet, so the performance is unknown.

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