After beating a group of go masters including Ke Jie, AlphaGo becomes a hot topic these days. Many people think that AlphaGo is invincible and artificial intelligence has been developed to a certain level. Today, we are going to talk about the inside meaning of AlphaGo, including how it works, why it is invincible for human and current situation of AI.

Before we talk about AlphaGo, we first introduce what is machine learning. And before answering this question, we should answer another: what is program. A program is a process. You give it a input X, it returns a output Y. Machine learning is a kind of special program, You give it a series of input X, it returns a program. And for the input X, we call it training set.

The history of machine may be older than you think. Linear regression is one of fundamental model. With a finite set of inputs, it is easy to calculate a linear function to fit all the points. In this example, the training result is y = x. Now given a new input x = 18, we can predict the output is also 18.

But most situations of machine learning are much more complex. They may have multiple input features and output features. And the influence factors may be difficult to model. Inspired from neural networks in animals’ body, a learning model which is also called neural network is proposed. This model is divided into three kinds of layers: input layer, hidden layer and output layer. Each node is fully connected with the nodes in the interfacing layers. Each edge has a weight. They are randomized at the beginning. Using the input data, the weights are adjusted steadily. Eventually, the weights will converge to optimal and we can use it to predict new values.

If we add more hidden layers, this algorithm can almost fit all complex model. And we have a special name for this method: deep learning. With the understanding of how deep learning works, now we turn our sight on AlphaGo.

Firstly, why Go is difficult for AI? Go is a game putting 2 kinds of stones on 381 crosses. The value of a stone is depended on the others and it is hard to compute using mathematical functions. There is no optimal move for this game and some steps may even be inspired by inspiration. The steps human playing this game can be summarized as follows:

Analyze global and local situation.

Find some feasible moves.

Predict a few more steps and choose the best move.

For AlphaGo, it tries to do the same thing. To analyze global and local situation, it uses a value network. And to find feasible moves, it uses a policy network. More specifically,