Research Review

For the past years, artificial intelligence and machine learning technologies are developing very fast. The most famous example is AlphaGo from Google, which has defeated all the best human Go players in the world, and the latest AlphaGo Zero has defeated previous version of AlphaGo in a dominant way. In this report, I will mainly talk about three developments of AI search and planning, which is parallelism, neural network, and fuzzy systems.

Nowadays parallel/high-performance computing is applied in all areas, from financial market prediction to numerical simulations of weather forecast. Numerous parallel methods and packages are developed for the purpose of parallel computing in different scenarios. In scientific computing, MPI/OpenMP are often used on CPU based parallel computing and OpenACC/CUDA are often used on GPU based parallel computing. As for the development of technologies like big data and machine learning, packages like Spark, MapReduce and TensorFlow. The key idea of parallel computing is to distribute the computation to multiple processing units and collect the results at the end, in this way the computation burden can be distributed and computation efficiency will be largely improved. (KELLY, 2014)

With the development of parallel computing, it gives us a possibility to deploy neural networks on AI search and planning. NNs are concerned with processing the information by a learning process and by adaptively responding to inputs in accordance with a learning rule. These powerful models are composed of many simulated neurons or simple computational units that are connected in such a way that they are able to learn in a manner similar to how human brains learn. This distributed architecture makes NNs particularly appropriate for solving nonlinear problems and input–output mapping problems. (SHERIF ISHAK, 2007) The neural network can be used for traffic prediction and transportation planning, which can help companies save a large cost.

When handling real life problems, we often meet the situations where the answers are binary, yes or no, right or wrong. The analysis must deal with uncertainty that handled by probability theory, which there is no clear-cut decision criteria. In order to solve these questions, fuzzy sets theory is introduced. The fuzzy set theory allows the elements in the set can be assessed with aid of a membership function which valued in the interval between 0 and 1, and later only take values 0 or 1. This kind of techniques has been largely used in logistic regression and classification techniques. This theory is useful in analyzing qualitative or descriptive information and modeling a system whose properties are known or expressed only in natural language. There are many areas in which fuzzy set theory can be applied; they include inference, control, classification, decision making, and optimization. (KIKUCHI, 2007) Fuzzy sets can be combined with neural network and they can be easily trained. The hybrid model has very good stability and convergence, and can be used to optimize strategic planning, path analysis, decision-making process, etc.

Artificial intelligence has been developing very fast and the techniques mentioned above are only a small part of it. I believe in the next ten to twenty years, more advanced techniques will be developed and our life will be very different at that time.

Bibliography

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