Shangru Yi
GT - syi73
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Paper Review Week 2
TensorFlow: A system for large-scale machine learning

CS 8803

1 Paper Overview

"TensorFlow: A system for large-scale machine learning", written by Martin Abadi, Paul Barham, et al. from Google Brain, is published in OSDI'16. The desires to construct flexible machine learning system with user friendly interfaces calls for a new design. In order to support large scale model training and sophisticated machine learning methods, TensorFlow, a open source machine learning system based on dataflow graphs to represent computation and shared state [1], is proposed in this paper, with new architecture to support model training in distributed system and various hardware. By unifying the computation and state management in a single programming model, TensorFlow gives users and developers the flexibility to experimenting system schemes. The overall architectures, execution model, and extensibility study for TensorFlow are discussed in this paper, along with a comparison with previous employed system, DistBelief, in google. Moreover, the performance of TensorFlow are evaluated with two realistic tasks, i.e. image classification and language modeling, to show the efficiency of TensorFlow. In general, the contributions of this paper is as follows:

1. A new flexible machine learning system is proposed in this paper, with details about the system design and performance evaluation.

2. The comparison for the proposed machine learning system and previous systems, and realistic world evaluation are included in this paper.

1.1 Problem Summary

Previous machine learning system has disability and hardness to deploy and experiment with new machine learning models. It is hard to define the training model and the architectures of present machine models are hard to extend. Also, the open source platform for machine learning is not user friendly, with heavy user interfaces.

1.2 Related Works

- Dryad: distributed data-parallel programs from sequential building blocks [2].

- Theano: A Python framework for fast computation of mathematical expressions [3].

2 Paper Strengths

The details coverage and comparison structure of this paper are the highlights of this system paper. Instead of merely covering the system design details, the comparison with present systems to illustrate the goodness of the proposed system make it easy to follow. By introducing the architectures and design consideration, it gives clear introduction path. It is great to have a open source system with support from leading technology company. Also, there are some engineering concerns from Google, which is insightful to read. From my present perspective, TensorFlow is really a successful system, especially in terms of neural network for both design and production.

1. The design details and comparison with present systems are well illustrated.

2. The background of this paper gives enough credibility for the strength of this open source machine learning system.

3 Paper Weaknesses

As for the introduction paper for a system that is open source, the overall structures and details of this paper is enough. The realistic evaluations also have enough confidence. It is really hard to critic this paper.

References

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[3] The Theano Development Team, Rami Al-Rfou, Guillaume Alain, Amjad Almahairi, Christof Angermueller, Dzmitry Bahdanau, Nicolas Ballas, Frédéric Bastien, Justin Bayer, Anatoly Belikov, et al. Theano: A python framework for fast computation of mathematical expressions. *arXiv preprint arXiv:1605.02688*, 2016.