Scaling Up Asynchronous Stochastic Gradient Descent in Multi-core Machines

ABSTRACT

The abstract goes here.

1. INTRODUCTION

- (Cho) SGD is important for machine learning. Not easy to parallelize SGD because of the nature of "sequential updates".
- (Cho) Hogwild (and other similar algorithms)
- Scalability is an issue when scaling it to many cores (give an example). Explain why.
- Describe our approach.
- Why can we address the scalability issue.
- (Huan) Give some experimental results to show the scalability of our algorithm.
- Paper outline.

2. RELATED WORK (CHO)

Review literature for asynchronous SGD, and other asynchronous updates (coordinate descent). I will write this.

3. BACKGROUND (CHO)

3.1 Memory Models in Multi-core Machines

3.2 Asynchronous Stochastic Gradient Descent

- 1. SGD updates.
- 2. Hogwild algorithm.
- 3. Why it cannot scale up (do we want to explain that Hogwild is better in sparse data but not in dense data)?

4. PROPOSED ALGORITHM

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5. IMPLEMENTATION ISSUES

6. EXPERIMENTAL RESULTS

Setup, data, machine, ...

In this section, we evaluate the empirical performance of our proposed algorithm DASGD with other asynchronous algorithms on multi-core machines. We consider? real datasets: xxx, xxx, and xxx. Detailed information is shown in Table 1.

We compare include the following implementations into comparison:

- 1. DASGD: our proposed method.
- 2. (other variants?)
- 3. HogWild:
- 4. PASSCoDe:

We run all the experiments on a machine with 40 cores and \ldots

We include the following

6.1 Performance on real datasets

Figure: use all 40 cores; maybe only compare our algorithm with HogWild. For each data, show (1) training loss or objective function (2) prediction accuracy.

6.2 Scaling in Number of Cores

Figure: total number of updates vs time

Figure: Scalability (x-axis: seconds \times cores, y-axis: objective function) Use 4, 10, 20, 40 cores. (Maybe for our algorithm and for Hogwild).

7. CONCLUSION AND FUTURE WORK

Table 1: Dataset statistics

Dataset	# training samples	# testing samples	# features	#nonzeros
RCV1	?	?	?	?