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Bachelor Thesis Cognitive Science

Title of thesis

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Abstract

In machine learning, stochastic gradient descent is a widely used optimization algorithm, used to update the parameters of a model after a minibatch of data has been observed, in order to improve the model's predictions. It has been shown to converge much faster when the condition number (i.e. the ratio between the largest and the smallest eigenvalue) of ... is closer to 1. A preconditioner reduces the condition value. In this thesis I present my implementation of the probabilistic preconditioning algorithm proposed in [de Roos and Hennig, 2019]. I use DeepOBS as a benchmarking toolbox, examining the effect of this kind of preconditioning on various optimizers and test problems. The results...

the abstract,
citing!

cite

Zusammenfassung

Abstract auf
Deutsch

Acknowledgments

If you have someone to Acknowledge ;)

Aaron, Filip

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Chapter 1

Introduction

What is this all about?

Chapter 2

Fundamentals and Related Work

2.1 Deep learning

2.1.1 Artificial Neural Networks

Minibatched

2.1.2 Regularization

2.1.3 Automatic Differentiation

2.1.4 Stochastic Gradient Descent

2.2 Something about Probabilistic things

2.3 Preconditioning

Condition number vs Spectral Radius

The PROBLEM:

Up until now, there was no easy way to make use of preconditioning in a noisy setting, such as minibatched deep learning. I present an implementation of Filips Algorithm in an easy-to-use python class and demonstrate the algorithm's strengths and weaknesses.

2.4 Benchmarking

There are no standard established benchmarking protocols for new optimizers. It isn't even clear what measures to consider, or how they are to be mea-

sured. As a result, nobody knows which optimizers are actually good. And some bad optimizers will seem good. DeepOBS is a solution to this problem, standardizing a protocol, providing benchmarks and standard test problems.

2.5 Related Work

in which other ways has this problem been addressed?
(What even is the problem?)

Chapter 3

Implementation

High-Level
to low-level
details

3.1 Overview

3.2 Realization of the Test problems

3.3 Technical details

The experiments were run on the TCML cluster at the University of Tübingen. A Singularity container was set up on Ubuntu 16.4 LTS with python 3.5, pytorch (version) and DeepOBS (see Appendix for Singularity recipe). Computation was distributed over the compute nodes using the workload manager Slurm.

Chapter 4

Experiment

4.1 Results

4.2 Analysis

4.3 Discussion

Chapter 5

Conclusion

Appendix A

An appendix

Here you can insert the appendices of your thesis.

Bibliography

[de Roos and Hennig, 2019] de Roos, F. and Hennig, P. (2019). Active probabilistic inference on matrices for pre-conditioning in stochastic optimization. *arXiv preprint arXiv:1902.07557*.

Selbstständigkeitserklärung

Hiermit versichere ich, dass ich die vorliegende Bachelorarbeit selbständig und nur mit den angegebenen Hilfsmitteln angefertigt habe und dass alle Stellen, die dem Wortlaut oder dem Sinne nach anderen Werken entnommen sind, durch Angaben von Quellen als Entlehnung kenntlich gemacht worden sind. Diese Bachelorarbeit wurde in gleicher oder ähnlicher Form in keinem anderen Studiengang als Prüfungsleistung vorgelegt.

Tübingen, 11. August 2019

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