MSc thesis

Master's Programme in Computer Science

Weather classification using Convolutional Neural Networks

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Faculty of Science

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MSc thesis	December 8, 2019	!! Run three times to appear !!

Tiivistelmä — Referat — Abstract

Use this otherlanguage environment to write your abstract in another language if needed.

Topics are classified according to the ACM Computing Classification System (CCS), see https://www.acm.org/about-acm/class: check command `\classification{}`. A small set of paths (1–3) should be used, starting from any top nodes referred to bu the root term CCS leading to the leaf nodes. The elements in the path are separated by right arrow, and emphasis of each element individually can be indicated by the use of bold face for high importance or italics for intermediate level. The combination of individual boldface terms may give the reader additional insight.

ACM Computing Classification System (CCS)
General and reference → Document types → Surveys and overviews
Applied computing → Document management and text processing → Document management → Text editing

Avainsanat — Nyckelord — Keywords

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Algorithms study track

Contents

1 Introduction

1.1 Problem statement and motivation

The following gives some superficial instructions for using this template for a Master's thesis. For guidelines on thesis writing you can consult various sources, for example, the Bachelor thesis template.

The thesis should have an introduction chapter. Other chapters can be named according to the topic. In the end, some summary chapter is needed; see Chapter 11 for an example.

1.2 Structure of thesis

A lot of cool chapters here :))))))

2 Survey of approaches to similar problems

How did the others do

2.1 Non-neural

Some cool old school pixel approaches

2.2 CNN / Pretrained CNN

How did they train their model

2.3 Video

How to use video

3 Neural networks

Yes go through CNN, LSTM, Attention

3.1 Convolutional Neural Networks

CNN VERY COOL THING

3.1.1 Transfer learning

How to transfer learning

3.1.2 ResNets and VGGNets and other architectures

Describe them

3.2 Recurrent Neural Networks

LSTMs extremely cool

3.2.1 Combining in video

Video very cool

3.3 Attention

Attention huh

4 Dataset

Describing our data

4.1 Semi-supervised learning

5 Experiments

Here are our experiments

5.1 Training process

5.1.1 Evaluation criteria

eval

5.1.2 Mixed precision training

16 bit masters

5.2 Image classifiers

Only use images

5.2.1 Only transfer learned classifier

Just a ResNet or something

5.2.2 Image classifier with attention

Add attention to image classifier

5.3 Video classification

5.3.1 LSTM over video

just lstm

5.3.2 Attention over video

Attention over video here

6 Result analysis

Very good models

7 Future work

How to make it better

8 Figures and Tables

8.1 Figures

Figure 8.1 gives an example how to add figures to the document. Remember always to cite the figure in the main text.

Figure 8.1: University of Helsinki flame-logo for Faculty of Science.

8.2 Tables

Table 8.1 gives an example how to report experimental results. Remember always to cite the table in the main text.

Table 8.1: Experimental results.

Experiment	1	2	3
A	2.5	4.7	-11
B	8.0	-3.7	12.6
$A + B$	10.5	1.0	1.6

9 Citations

9.1 Citations to literature

References are listed in a separate .bib-file. In this case it is named `bibliography.bib` including the following content:

```
@article{einstein,
    author =       "Albert Einstein",
    title =        "{Zur Elektrodynamik bewegter K{\"o}rper}. ({German})
        [{On} the electrodynamics of moving bodies]",
    journal =      "Annalen der Physik",
    volume =       "322",
    number =       "10",
    pages =        "891--921",
    year =         "1905",
    DOI =          "http://dx.doi.org/10.1002/andp.19053221004"
}

@book{latexcompanion,
    author    = "Michel Goossens and Frank Mittelbach and Alexander Samarin",
    title     = "The \LaTeX\ Companion",
    year      = "1993",
    publisher = "Addison-Wesley",
    address   = "Reading, Massachusetts"
}

@misc{knuthwebsite,
    author    = "Donald Knuth",
    title     = "Knuth: Computers and Typesetting",
    url       = "http://www-cs-faculty.stanford.edu/%7Eknuth/abcde.html"
}
```

In the last reference url field the code `%7E` will translate into ~ once clicked in the final pdf.

References are created using command `\cite{einstein}`, showing as (**einstein**). Other examples: (**latexcompanion**; **knuthwebsite**).

Citation style can be negotiated with the supervisor. See some options in https://www.sharelatex.com/learn/Bibtex_bibliography_styles.

9.2 Crossreferences

Appendix A on page i contains some additional material.

10 From tex to pdf

In Linux, run `pdflatex filename.tex` and `bibtex filename.tex` repeatedly until no more warnings are shown. This process can be automised using make-command.

11 Conclusions

It is good to conclude with a summary of findings. You can also use separate chapter for discussion and future work. These details you can negotiate with your supervisor.

Appendix A Sample Appendix

usually starts on its own page, with the name and number of the appendix at the top. The appendices here are just models of the table of contents and the presentation. Each appendix Each appendix is paginated separately.

In addition to complementing the main document, each appendix is also its own, independent entity. This means that an appendix cannot be just an image or a piece of programming, but the appendix must explain its contents and meaning.