Chair of Network Architectures and Services
School of Computation, Information, and Technology
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TECHNICAL UNIVERSITY OF MUNICH

SCHOOL OF COMPUTATION, INFORMATION, AND TECHNOLOGY

INFORMATICS

BACHELOR'S THESIS IN INFORMATICS

Link Layer Network Coding in Wireless Networks

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Informatics

Bachelor's Thesis in Informatics

Link Layer Network Coding in Wireless Networks

Link Layer Network Coding in kabellosen Netzwerken

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Date:	September 15, 2016

I confirm that this Bachelor's Thesis is my own work and I have documented all sources and material used.

Garching, September 15, 2016

Location, Date

Signature

Abstract

The first sentence of an abstract should clearly introduce the topic of the paper so that readers can relate it to other work they are familiar with. However, an analysis of abstracts across a range of fields show that few follow this advice, nor do they take the opportunity to summarize previous work in their second sentence. A central issue is the lack of structure in standard advice on abstract writing, so most authors don't realize the third sentence should point out the deficiencies of this existing research. To solve this problem, we describe a technique that structures the entire abstract around a set of six sentences, each of which has a specific role, so that by the end of the first four sentences you have introduced the idea fully. This structure then allows you to use the fifth sentence to elaborate a little on the research, explain how it works, and talk about the various ways that you have applied it, for example to teach generations of new graduate students how to write clearly. This technique is helpful because it clarifies your thinking and leads to a final sentence that summarizes why your research matters.

The text above describes the contents and structure of an abstract. The text by Steve Easterbrook [1] presents the structure of typical abstract for a scientific paper. The abstracts of theses are typically not as space-constraint as scientific papers, therefore, abstracts tend to get longer.

Zusammenfassung

A german abstract is optional, you can choose to write either a german or an english astract or both if you like.

Hier könnte eine deutsche Zusammenfassung der vorliegenden Arbeit stehen. LaTeX kann dank der Umstellung der Sprache in `thesis.tex` eine korrekte deutsche Silbentrennung durchführen.

Contents

List of Figures

List of Tables

Chapter 1

How do I use LaTeX correctly?

This is chapter introduces the features of this template and gives some hints about how to use LaTeX correctly. Section 1.2 introduces citing, Section 1.3 demonstrates the inclusion of pictures, Section 1.4 the creation of tables, and Section 1.5 explains the correct usage of units.

Important note: if you reference a section, chapter, figure or table followed by a number or a letter, it refers to the name of the respective entity and must be capitalized, i.e. this chapter, but Chapter 1.

1.1 How do I write titles?

English titles use a specific form of capitalization that is different from the capitalization of regular texts. A rule of thumb is to capitalize all words except for minor words (e.g., and or or). More specific rules can be found on wikipedia.

Titlecase should be either consistently used or consistently not be used throughout your thesis. Mixing titlecase with non-titlecase should be avoided.

1.2 How do I cite?

Typically, you want to mention the first author (followed by et al. if there is more than one author), which leads to somthing like this: Gallenmüller et al. [2] show in their study ...

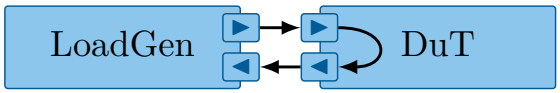

Figure 1.1: This is a nice example of a figure

(a) Subcaption A (b) Subcaption B

Figure 1.2: This is the overall caption of the figure

The sources can be added into `bib/litnew.bib` file in the bibtex format. After adding the bibtex, the sources can be referenced in LaTeX via the `\cite{NameOfSource}` command.

Bibtex-formatted sources can be found in Google Scholar or in dblp. The bibtex sources on dblp are well maintained and tend to have a better quality than those of Google Scholar. However, you should always check the information provided by either search engine.

1.3 How do I include pictures?

You shoud always directly reference all figures in the text of your thesis, e.g. Figure 1.1 shows a grid of numbers. The LaTeX command `\ref{NameOfLabel}` can help you referencing entities like figures (works also with chapters, sections, or tables). To reference figures you need to label them with the command `\label{NameOfLabel}`.

1.3.1 How do I include subpictures?

Figure 1.2 is a figure that contains the two Subfigures 1.2a and 1.2b that can be referenced individually.

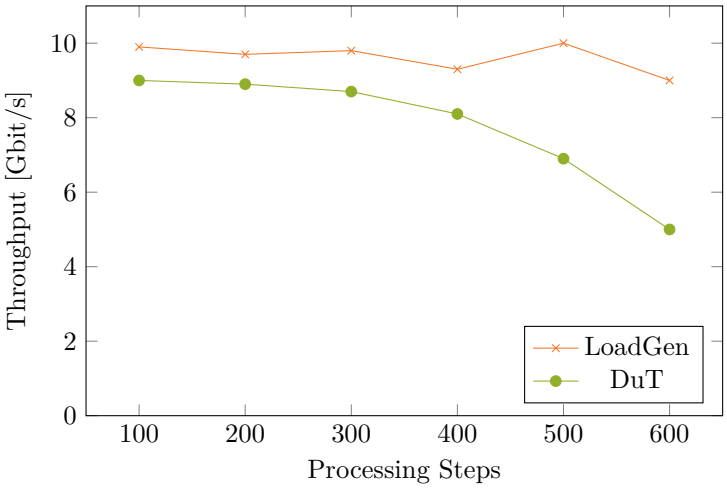

Figure 1.3: This is a nice example of a lineplot

Column A	Column B	Column C
Munich	1.000	2
Garching	100.000	30

Table 1.1: Example of a table created with booktabs

1.3.2 How do I plot data?

Figure 1.3 shows an example of a lineplot created with pgfplots. Pgfplots is a LaTeX package for the creation of many different kinds of plots. One of the main advantages of pgfplots is the easy integration in LaTeX (e.g., the same fonts are used). Other tools often used in reasearch are the python framework mathplotlib or the R language.

Note: The y-axis of a graph should always start a 0. Only in very rare cases a non-zero origin of the y-axis might be justified, however, the reader must be made aware of this unusual y-axis origin.

1.4 How do I create tables?

Table 1.1 is an example of a table. Like any professional table, it does not cointain any vertical lines only horizontal lines. Numberical data should always be right-aligned for easy readability and comparability. Always use the same number of decimals within the same column.

Ethernet	Packet Size	Throughput	Packet Rate
1 GbE	64 B	1 Gbit/s	1.5 Mpacket/s
10 GbE	64 B	10 Gbit/s	14.9 Mpacket/s
100 GbE	64 B	100 Gbit/s	148.8 Mpacket/s

Table 1.2: Maximum throughput and packet rates for Ethernet using a packet size of 64 B (including FCS)

1.5 How do I correctly write down values and units?

The `siunix` package for LaTeX helps you to manage and format units in your document. Table 1.2 shows typical units that may be relevant for theses in the field of computer networks. Further units that may that may come in handy: GHz, MiB, h, min ...

1.6 How do I use acronyms?

Acronyms can be added to `include/acronym.tex`. The first occurrence is written in its long form and in its short form after that. For instance, Personal Computer Memory Card International Association (PCMCIA) is initially printed in its long form, introducing the acronym, and as PCMCIA after that. Section A.2 contains a list of all acronyms used in this thesis.

Chapter 2

Theses guidelines

There department-specific guidelines that describe the formatting rules and general guidelines for handing in your theses at the School of Computation, Information, and Technology.

The Chair for Network Architectures and Services offers additional guidelines for theses.

Chapter A

Appendix

This is the appendix. Remove the appendix if it is empty.

A.1 Appendix section

The appendix can contain different sections.

A.2 List of acronyms

PCMCIA Personal Computer Memory Card International Association, an IO interface designed for laptops.

Bibliography

[1] S. Easterbrook, *How to write a scientific abstract in six easy steps*, Last accessed: Aug 4, 2021. [Online]. Available: https://www.easterbrook.ca/steve/2010/01/how-to-write-a-scientific-abstract-in-six-easy-steps/.

[2] S. Gallenmüller, J. Naab, I. Adam, and G. Carle, "5G URLLC: A Case Study on Low-Latency Intrusion Prevention", *IEEE Commun. Mag.*, vol. 58, no. 10, pp. 35–41, 2020. DOI: 10.1109/MCOM.001.2000467. [Online]. Available: https://doi.org/10.1109/MCOM.001.2000467.