Abstract

This document describes some of the fundamentals of scientific work. It provides an overview of the structure and procedures involved in creating internships, seminars, bachelor’s and master’s theses.

Contents

1 Introduction 2

2 External Form 2
   2.1 Text Layout ................................................. 2
       2.1.1 Text Image ........................................... 2
       2.1.2 Scripture ............................................. 3
       2.1.3 Embellishments ....................................... 3
   2.2 Formalities ................................................ 3
       2.2.1 Pictures and Tables .................................. 3
       2.2.2 Lists .................................................. 3
       2.2.3 Numbering ............................................ 4
       2.2.4 References to Literature ............................. 4

3 Inner Form 5
   3.1 Introduction ............................................... 5
   3.2 State of the Art .......................................... 5
   3.3 Concept .................................................... 5
   3.4 Implementation ........................................... 5
1 Introduction

Sooner or later every student has to do a written preparation, at the latest the bachelor thesis. At the university, such writings should conform to a specific form that has been proven and accepted in the scientific environment.

In the following, various aspects of scientific work will be examined. In addition, there is a small introduction to the, included in the package, \LaTeX{}template.

2 External Form

The external form of a scientific work depends heavily on the recipient. Some form requirements tend to be based on good correctability (e.g. by exorbitant margins and line spacing) rather than good readability and form. The author of this manual does not pretend to have found the wisdom final conclusion, at least \LaTeX{}.

\LaTeX{} is widely used in the university environment and is suitable for all types of documents, including slides. The good presets make it possible for a layman to create an at least visually appealing document. The author is convinced that it is worthwhile to deal with \LaTeX{}, but it is not obligatory to pretend.

The following explanations usually describe things as a matter of course, but experience shows that these too should be executed explicitly again.

2.1 Text Layout

2.1.1 Text Image

It's about what would be visible if all the text were replaced by black bars. It is therefore necessary to determine the sidecut (simplified margins), paragraph spacing, paragraph indents and line spacing. \LaTeX{} has very good specifications for English text (yes, there are other typographic rules), for German texts there are the following adjustments (which look good in English texts).

Paragraphs should be formatted in block justification. For this to work well, automatic hyphenation is recommended (which is active in \LaTeX{} by default). The line spacing should be single-line. Paragraphs are separated by a space (\textbackslash{}\texttt{parskip}). At its beginning may be a first line indent (\textbackslash{}\texttt{parindent}).
The sidecut is a science in itself. LaTeX users can rely on the `typearea` package, which sets up margins using best practices. It is important to know that headers and footers as well as space for marginal notes are taken into account.

### 2.1.2 Scripture

Scripture consists of many facets. The biggest decision will probably concern the font. As a rule of thumb, one can say that for all printed documents, a serif font (as in this document) is preferable. On paper, this reads very pleasant. For screen-optimized documents, however, you should use a sans-serif typeface (for example, Arial or Helvetica).

For highlighting, it is recommended to use the macro `\emph`. This highlights the text depending on the environment. Italic in non-italics, non-italic in italic parts of the text.

### 2.1.3 Embellishments

Embellishments such as colors or jewelery fonts should be used sparingly (if at all). At least when it comes to cost-effective black and white printing, colors are lost and replaced by screened gray tones, which are often not easy to read.

### 2.2 Formalities

#### 2.2.1 Pictures and Tables

Pictures and tables are often the means of choice to clarify matters better. In scientific works, all pictures and tables (with very few exceptions) have a number and appear in the respective list of figures or tables.

The following applies to labeling: Tables have table headers, pictures have captions. In LaTeX, this is achieved simply by having the `\caption` macro come before or after the content.

Since in LaTeX images and tables are preferably placed in flow environments, ie the sentence system itself decides where the image ultimately appears, all images and tables must be anchored in the text. This means that there is a reference in the text for each such object, as for example with Table 1. If the content does not fill the whole page, it should be centered.

#### 2.2.2 Lists

Contents, illustrations, tables and abbreviations come before the actual content, bibliography and index behind the content.
2.2.3 Numbering

Everything, including the preceding directories, gets a roman numbering. In the provided template, the macros `\mainmatter`, `\mainmatter` and `\backmatter` provide this. These are only available in the document class `book`. The main part and everything following is numbered normally Arabic.

2.2.4 References to Literature

References to literature, whether to indicate verbatim quotations or simply to provide further information, have a variety of possibilities. As for so much, there is a standard in Germany, the “DIN ISO 690: 2013-10”. In principle, however, the form of the source is quite free and should ultimately only ensure that

1. the reader realizes that this is not the idea of the author
2. further literature is specified directly and does not have to be laboriously searched.

There is a bibliography in the template. For citation, the macro `\cite` is used, which receives a key from the literature database file as a parameter.
3 Inner Form

Here is a brief outline of which parts a scientific work consists of.

3.1 Introduction

The introduction serves to introduce the topic. Here should be presented to everyone understandable, what’s going on. It’s about giving an idea of what the author has done in this work.

At the end of the introduction a rough overview of the structure of the work should be given.

3.2 State of the Art

In science, so also in computer science we stand “on the shoulders of giants” [McG+09]. Since it would be presumptuous to have thought up everything yourself, there is usually a detailed description of the basics for each work. This finds its place in this chapter.

3.3 Concept

After all the basics have been introduced, this chapter serves to convey the ideas that are at work. This is about pure concepts that initially have nothing to do with the implementation reality. The theory is usually more comprehensive than the final implementation.

3.4 Implementation

With the concept idea from the previous chapter, this chapter describes the actual implementation. It’s not so much about printing a lot of code than explaining the limitations of implementing it. Also, difficulties in implementation and how they were bypassed can be explained.

3.5 Results

Every job usually has results. These can be measurement series, proofs and much more. In this chapter the results are presented and discussed. Mostly the implementation is not perfect and shows weaknesses in peripheral areas. Here is the place to show this.
3.6 Summary & Outlook

The summary is often the first thing to read after the title of a work. It should be a short (about one page) overview of what has been achieved without getting lost in details.

In the result chapter maybe weaknesses of the implementation or the concept were pointed out. In the outlook, solutions can now be identified that could not be implemented in the course of processing. Well-founded solution concepts should be developed. Furthermore, subsequent work in adjacent areas can be proposed.

3.7 Appendix

Attached are the things that have no place in the work. Here you may find detailed algorithm descriptions. But even results that would otherwise be superfluous in the work, for example because they show the same as the rest, can be accommodated here.

References