A LaTeX template for writing theses

Master Thesis

at the Chair of Technical Information Systems
(Friedrich-Alexander University of Erlangen-Nuremberg)

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Declaration of Authorship

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Nürnberg, 17th February 2021

Firstname Middlename Lastname

Contents

Figures

Tables

Listings

Abstract

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

1   Introduction

This LaTeX template has been developed by the Westfälische Wilhelms-Universität (WWU) and adapted by the Chair of Digital Industrial Service Systems at the FAU to match the FAU corporate design. `00_thesis.tex` is the master file.

It was originally build by Jan Betzing and Dominik Lekse and draws from the DBIS template by Till Haselmann and Florian Stahl, as well as from the IS template by Stephan Dlugosz. The adaption to FAU was done by Matthias Stierle. The adaption to the Chair of Technical Information Systems was done by Zhou Gui.

This document is work-in-progress and provides instructions on how to use the template. It does not give advices on scientific writing.

Please feel free to contribute to this template.

TODO

- Configuration switch for having \chapter{} begin on a new page

- Replace `kvoptions` with `pgfkeys`

2   Elements

This chapter gives examples on what you can do with this template. It's just a brief overview. Please consult the common sources on how to write sicentific documents and documents with LaTeX.

2.1   Structure

This template provides three structural levels that appear in the table of contents, viz., `\chapter`, `\section`, and `\subsection`. Chapters will always start on a new page. Additionally, you can use `\subsubsection` and `\paragraph` as non-hierarchical means to structure your thesis.

2.1.1   Lists

You can use the default LaTeX functions for writing lists, viz., `\enumerate` for numbered lists and `\itemize` for bullet point lists. Again, the `\subsubsection` and `\paragraph` can be used as structural elements, e.g., when listing definitions of terms.

2.1.2   Footnotes

Footnotes are contiguously numbered throughout the whole document. Use the `\footnote{text}` command. They appear on the page their reference is on [1]. Footnotes have to be placed without whitespace behind the word and within the sentence boundaries, i.e., before the period.

2.1.3   ToDo-Notes

You can use ToDo notes using the `\todo{text}` command. Please make sure to remove any ToDo notes before handing in your thesis!

ToDo: Remove me before publishing

2.2   Formatting Text

LaTeX provides `\textit{text}` for *italics*, `\textbf{text}` for **bold face**, `\texttt{text}` for `typewriter`, `\textsc{text}` for SMALL CAPS, `\underline{text}` for underline. Additionally, the template provides `\texthl{text}` for highlighted text. Please remove any highlighted text before handing in your thesis!

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[1]   This is an exemplary footnote.

Please use the \enquote{text} command for "direct quotes".

2.2.1 Colors

This template comes with the colors defined in the Corporate Design of the FAU. Tab. 1 lists the color names. You can apply them to text by using the \textcolor{color name}{text} command.

Color Name	Result
fau-grey	Exemplary Text and 0123456789
fau-red	Exemplary Text and 0123456789
fau-blue	Exemplary Text and 0123456789
fau-cyan	Exemplary Text and 0123456789
fau-orange	Exemplary Text and 0123456789
fau-green	Exemplary Text and 0123456789

Table 1 Colors defined by the template

2.3 Figures

The figure environment is wrapped around images. These images should either be included as PDF-file via \includegraphics, or created via *TikZ/PGF*. For included images, make sure to use high-resolution images, preferably vector images.

Figures float, i.e., they do not necessarily appear at exact the same position you have defined them. Make sure to set a *caption* and an optional *label* as figure parameters.
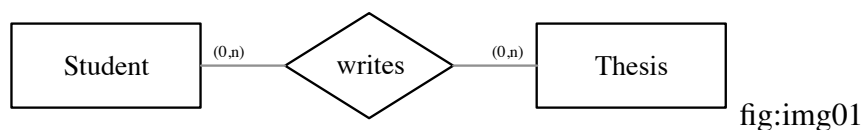

fig:img01

Figure 1 Relationship of students and theses

2.3.1 Subfigures

Sometimes it might be handy to contrast figures, i.e., by placing them next to each other. The template uses the *subcaption* package to provide subfigures. The following example contains two figures, where each subfigure has its own \label and \caption. Additionally, the whole

figure has its own *caption* and *label*. That means, you can reference subfigures fig. 2a and fig. 2. Only the whole figure will be listed in the table of figures.

Subfigures are not limited to images, but may also include listings or tables. Fig. 2 shows a sample database query expressed in Structured Query Language (SQL) (fig. 2a) and as query plan in relational algebra (fig. 2b).
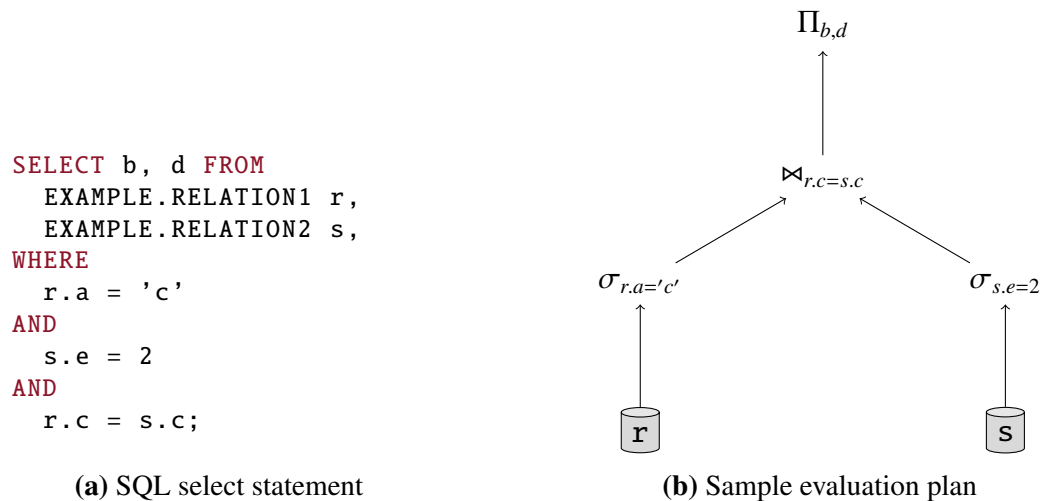
$$\Pi_{b,d}$$

```
SELECT b, d FROM
    EXAMPLE.RELATION1 r,
    EXAMPLE.RELATION2 s,
WHERE
    r.a = 'c'
AND
    s.e = 2
AND
    r.c = s.c;
```

$\bowtie_{r.c=s.c}$

$\sigma_{r.a='c'}$ $\sigma_{s.e=2}$

r   s

(a) SQL select statement   **(b)** Sample evaluation plan

Figure 2   Exemplary use of subfigures

2.4   Listings

You can use listings to typeset source code. This template uses the *listings* package. Wrap code inside the `lstlisting` environment and set the *language* (e.g., Java, SQL), *caption*, and optional *label* parameters. If the source code highlighting highlights the wrong keywords or misses keywords, use the *deletekeywords* resp. *morekeywords* parameters. Consult the package documentation for further information.

```java
public class Euclid {

  public static int gcd(int p, int q) {
    if (q == 0) return p;
    else return gcd(q, p % q);
  }

}
```

Listing 1   Euclid's GCD algorithm implemented in Java

2.5   Algorithms

Some users might require specifying algorithms. This template uses the *algorithm*, *algorithmicx*, and *algopseudocode* packages. Consult the respective manuals for further information. Algorithms do not appear in a table at the beginning of the document, i.e., there is no list of algorithms.

Algorithm 1 Euclid's GCD algorithm in pseudocode

Require: nonnegative integer a, nonnegative integer b
  function EUCLID(a, b)
    if $b = 0$ **then**   ▷ comment
      return a;
    else
      return EUCLID($b, a \mod b$);

2.6   Acronyms and Abbreviations

This template provides comprehensive support for acronyms and abbreviations. The template uses the *glossaries* package. Please do only define abbreviations and symbols that are uncommon. That means, common abbreviations such as "e.g. " or "i.e. " should not be listed. Abbreviations and symbols are sorted automatically by their label.

2.6.1   Common Abbreviations

Please note that each full stop in a common abbreviation should be followed by a non-breaking space. This template comes with a variety of macros for common abbreviations, that can be used throughout your theses. The macros differ for English and German theses. Please see the tables below.

Command	Result
\apprx	approx.
\as	a.s.
\cf	cf.
\eg	e.g.
\Eg	E.g.
\esp	esp.
\etal	et al.
\fig	fig.
\Fig	Fig.
\ie	i.e.
\Ie	I.e.
\iid	i.i.d.
\p{4711}	p. 4711
\pf{4711}	p. 4711 f.
\pp{11--47}	pp. 11–47
\resp	resp.
\sect	sec.
\tab	tab.
\Tab	Tab.
\viz	viz.
\wrt	w.r.t.

Table 2   Common abbreviation macros for English theses

Command	Result	Command	Result
\aaO	a. a O.	\oE	o. E.
\Abb	Abb.	\oEdA	o. E. d. A.
\bspw	bspw.	\OEdA	O. E. d. A.
\bzgl	bzgl.	\oV	o. V.
\bzw	bzw.	\OV	O. V.
\ca	ca.	\resp	resp.
\dgl	dgl.	\S{123}	S. 123
\dsgl	dsgl.	\Sf{123}	S. 123 f.
\dh	d. h.	\Sff{123}	S. 123 ff.
\etc	etc.	\siehe	s. o.
\eV	e. V.	\sog	sog.
\evtl	evtl.	\sS{123}	s. S. 123
\fs	f. s.	\sSf{123}	s. S. 123 f.
\gdw	g. d. w.	\sSff{123}	s. S. 123 ff.
\ggf	ggf.	\stu	st. u.
\hc	h. c.	\su	s. u.
\iAllg	i. Allg.	\Tab	Tab.
\iBa	i. B. a.	\tw	t. w.
\idR	i. d. R.	\ua	u. a.
\ieS	i. e. S.	\etal	et al.
\inkl	inkl.	\uae	u. ä.
\insb	insbes.	\uAe	u. Ä.
\Prof	Prof.	\uiv	u. i. v.
\Dr	Dr.	\usw	usw.
\PD	PD.	\uU	u. U.
\Ing	Ing.	\va	v. a.
\iV	i. V.	\vgl	vgl.
\iW	i. W.	\Vgl	Vgl.
\iwS	i. w. S.	\vs	v. s.
\Nr{123}	Nr. 123	\zB	z. B.
\nW	n. W.	\zT	z. T.
\oa	o. a.	\zz	zz.
\oAe	o. Ä.	\zzgl	zzgl.
\oae	o. ä.		

Table 3 Common abbreviation macros for German theses

2.6.2 Custom Abbreviations

Custom abbreviations are defined in the `acronyms.tex` file, using the
`\newacronym[longplural={<long plural>}, shortplural={<short plural>}]`
`{<label>}{<short>}{<long>}` command. The *longplural* and *shortplural* parameters are
optional. The abbreviations are sorted by their labels. The label is furthermore used to refer-
ence the abbreviations in your text. You can do so using commands listed in tab. 4. In most
cases, you just use \gls{<label>}. On the first occurrence, the full version is displayed, e.g.,
Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU). Afterwards, the short version will
be displayed, e.g., FAU.

You pluralize your abbreviation by adding a `pl` to the resp. command. This will add a small
s to the abbreviation, e.g., CDs. Tab. 4 shows custom short and long plural versions of the
abbreviation KMU. You might need this esp. for more complex German abbreviations that do
not have a "s" plural form.

Command	Result
\gls{<label>}	\acrfull on first occurence, \acrshort otherwise
\glspl{<label>}	\acrfullpl on first occurence, \acrshortpl otherwise
\acrshort{<label>}	KMU
\acrshortpl{<label>}	KMUen
\acrlong{<label>}	Kleines und Mittleres Unternehmen
\acrlongpl{<label>}	Kleine und Mittlere Unternehmen
\acrfull{<label>}	Kleines und Mittleres Unternehmen (KMU)
\acrfullpl{<label>}	Kleine und Mittlere Unternehmen (KMUen)

Table 4 Commands for printing abbreviations

Only referenced abbreviations will be added to the list of abbreviations.

2.6.3 Symbols

If required, you can define symbols in the `symbols.tex` file, using the
`\addsymboltolist{<symbol>}{<label>}{<name>}` command. The symbols are sorted by
their labels. Please note, regardless of using the symbols in the text, all symbols defined in the
symbols file will be output to the list of symbols.

2.7 Citations and Bibliography

This template uses BibTeX for bibliographies. It comes with the MISQ style that takes care of proper formating and sorting of your references. Of course, you have to maintain a clean `.bib` file that caters all necessary attributes. References will appear in the alphabetical order of the surname of the first author. In case of several works by the same author, they are sorted by year.

Citing in the text is done with the \citep[<before>][<after>]{<citekey>} command. Citations without parenthesis are done with \cite{<citekey>}. You can reference authors with \citeauthor{<citekey>}. However, we suggest typesetting authors in SMALL CAPS, e.g., **?** is one father of Business Process Management (BPM).

Exemplary citations

- BPM is an integral management paradigm for building and running effective and efficient organizations (**??**).

- A holistic approach to BPM goes beyond process modeling and workflow management systems (**?**, p. 530).

- See **?** for a comprehensive review on BPM best practices.

- **?** lists organizational capabilities for BPM (cf. **?**, p. 9 f.), while VOM BROCKE et al. give principles of good BPM (cf. **?**, pp. 530–546).

- Two authors are automatically divided by an "and" in English or an "und" in German, e.g., (**?**).

- "BPM can provide a solid set of capabilities essential to master contemporary and future challenges" (**?**, p. 534).

3   Compiling the document

In order to generate a PDF-file from your TEX-file you have to run the following commands. We assume you have a master file `00_thesis.tex` that you want to typeset.

```
pdflatex 00_thesis
pdflatex 00_thesis
makeglossaries 00_thesis
bibtex 00_thesis
pdflatex 00_thesis
pdflatex 00_thesis
```
Listing 2   Commands to compile this document

Alternatively, you can use your favorite task runner. This thesis comes with a *Grunt* file to kick-start your LaTeXwriting.

When running, Grunt will monitor your thesis and on file changes, the PDF-file is automatically rebuild using the commands from listing 2.

Please make sure to have node.js and the Node Package Manager (NPM) installed. Now you can open a command prompt at the document root and run the commands in listing 3.

```
# Install Grunt via npm (use sudo on Unix-based OS)
npm install -g grunt-cli

# Install Grunt plugins / dependencies
npm install

# Run the Grunt listener
grunt
```
Listing 3   Installing and running Grunt

3.1   Known Issues

Under some configurations on Windows machines, the `makeglossaries` command silently fails, which results in empty lists of accronyms and symbols. Same goes for the implicitly called `makeindex` command. In this case, you have to install `Perl`[2] on your machine.

---

[2]   https://www.perl.org/get.html

Appendix

A Some Appendix Section

Appendices provide only two structural levels, viz., `\section`, and `\subsection`.

The numbering of figures, listings, tables, and footnotes is not reset. Thus, it continues as usual in the appendix.

A.1 Some Appendix Subsection

Suspendisse vitae elit. Aliquam arcu neque, ornare in, ullamcorper quis, commodo eu, libero. Fusce sagittis erat at erat tristique mollis. Maecenas sapien libero, molestie et, lobortis in, sodales eget, dui. Morbi ultrices rutrum lorem. Nam elementum ullamcorper leo. Morbi dui. Aliquam sagittis. Nunc placerat. Pellentesque tristique sodales est. Maecenas imperdiet lacinia velit. Cras non urna. Morbi eros pede, suscipit ac, varius vel, egestas non, eros. Praesent malesuada, diam id pretium elementum, eros sem dictum tortor, vel consectetuer odio sem sed wisi.