

TITLE

SUBTITLE

Master Thesis

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Abstract

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Abbreviations

GAN Generative Adversarial Network

MAE Mean Absolute Error

1 Introduction

This \LaTeX template has been developed by the University of Münster and adapted by the Chair of Digital Industrial Service Systems. The file `main.tex` is the master file.

It was originally built 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 and maintained by Sebastian Dunzer. The IDEA Lab version was adapted and is maintained by Johanna Müller.

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.

2 Template Features

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 scientific documents and documents with \LaTeX .

2.1 Structure

This template provides three structural levels that appear in the table of contents: `\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 continuously numbered throughout the 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. Ad-

¹ This is an exemplary footnote.

ditionally, the template provides `\texthl{text}` for highlighted text. Please remove any highlighted text before handing in your thesis!

Please use the `\enquote{text}` command for “direct quotes”.

2.2.1 Colours

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

Table 1 Colours defined by the template

| 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 |

2.3 Figures and Tables

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. Please use `\caption[Short Caption]{Long Caption.}` for shortening the amount of text in the figures and tables lists. Tables should have their captions above and figures below. All tables and figures should be referenced in the text.



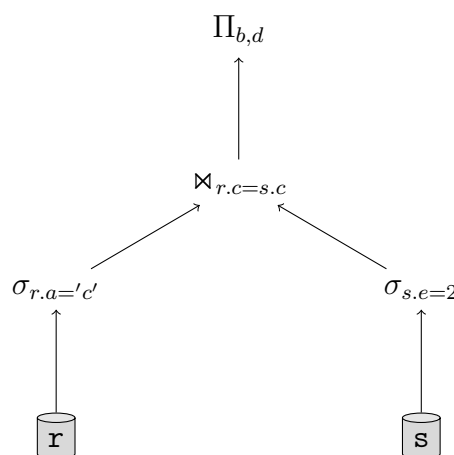
Figure 1 Relationship of students and theses, visualised as graph.

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 Figure 2a and Figure 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. Figure 2 shows a sample database query expressed in SQL (Figure 2a) and as query plan in relational algebra (Figure 2b).

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

(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.

```
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 Equations

All equations should be referenced in the text, in case they are not embedded in text. The following equation,

$$\text{MSE}(\mathbf{X}, \mathbf{X}') = \frac{1}{nm} \sum_{i=1}^n \sum_{j=1}^m (\mathbf{X}_{ij} - \mathbf{X}'_{ij})^2, \quad (2.1)$$

is embedded in text. The next one needs to be referenced with Eq. 2.2.

$$\text{MSE}(\mathbf{x}, \mathbf{y}) = \frac{1}{n} \sum_{i=1}^n (\mathbf{x}_i - \mathbf{y}_i)^2. \quad (2.2)$$

Please do not forget to explain the variables of the equations.

2.6 Algorithms

Some users might require specifying algorithms. This template uses the *algorithm*, *algorithmicx*, and *algpseudocode* 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( $b, a \bmod b$ );

```

2.7 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.

2.7.1 Custom Abbreviations

Custom abbreviations are defined in the `config/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 reference the abbreviations in your text. You can do so using commands listed in Table 2. In most cases, you just use `\gls{<label>}`. On the first occurrence, the full version is displayed, e.g., Mean Absolute Error (MAE). Afterwards, the short version will be displayed, i.e., MAE.

You pluralise your abbreviation by adding a `p1` to a command. This will add a small `s` to the abbreviation, e.g., Generative Adversarial Networks (GANs). Table 2 shows custom short and long plural versions of the term and abbreviation “GAN”. You might need this esp. for German abbreviations that do not have a “s” plural form.

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

Table 2 Commands for printing abbreviations

| Command | Result |
|---|---|
| <code>\gls{<label>}</code> | <code>\acrfull</code> on first occurrence, <code>\acrshort</code> otherwise |
| <code>\glspl{<label>}</code> | <code>\acrfullpl</code> on first occurrence, <code>\acrshortpl</code> otherwise |
| <code>\acrshort{<label>}</code> | GAN |
| <code>\acrshortpl{<label>}</code> | GANs |
| <code>\acrlong{<label>}</code> | Generative Adversarial Network |
| <code>\acrlongpl{<label>}</code> | Generative Adversarial Networks |
| <code>\acrfull{<label>}</code> | Generative Adversarial Network (GAN) |
| <code>\acrfullpl{<label>}</code> | Generative Adversarial Networks (GANs) |

2.7.2 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.

2.8 Citations and Bibliography

This template uses BibTeX for bibliographies. It comes with the APA style that takes care of proper formatting and sorting of your references. Of course, you have to maintain a clean `library.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 `\citet{<citekey>}`.

Exemplary citations

- Business Project Management (BPM) is an integral management paradigm for building and running effective and efficient organizations (Hammer, 2015; vom Brocke et al., 2014).
- A holistic approach to BPM goes beyond process modeling and workflow management systems (vom Brocke et al., 2014, p.530).
- A conference citation (Rozinat et al., 2008).

- See vom Brocke et al. (2014) for a comprehensive review on BPM best practices.
- Hammer (2015) lists organisational capabilities for BPM (cf. Hammer, 2015, pf.9), while vom Brocke et al. (cf. 2014, pp.530–546) give principles of good BPM.
- Two authors are automatically divided by an ampersand, e.g., (Becker & Kahn, 2011).
- “BPM can provide a solid set of capabilities essential to master contemporary and future challenges” (vom Brocke et al., 2014, p.534).

3 Compiling the document

To generate a PDF-file from your T_EX-file on your own Latex distribution you need to run the following commands. We assume you have a master file `main.tex` that you want to typeset.

```
pdflatex main
pdflatex main
makeglossaries main
bibtex main
pdflatex main
pdflatex main
```

Listing 2 Commands to compile this document

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.

References

- Becker, J., & Kahn, D. (2011). The Process in Focus. In J. Becker, M. Kugeler, & M. Rosemann (Eds.), *Process management: A guide for the design of business processes* (2nd ed., pp. 1–13). Springer.
- Hammer, M. (2015). What is Business Process Management? In J. Vom Brocke & M. Rosemann (Eds.), *Handbook on business process management 1* (2nd ed.). Springer.
- Rozinat, A., Wynn, M., van der Aalst, W., ter Hofstede, A., & Fidge, C. (2008). Workflow Simulation for Operational Decision Support Using Design, Historic and State Information. *Proceedings of the 6th International Conference Business Process Management (BPM)*, 196–211. https://doi.org/10.1007/978-3-540-85758-7_16
- vom Brocke, J., Schmiedel, T., Recker, J., Trkman, P., Mertens, W., & Viaene, S. (2014). Ten Principles of Good Business Process Management. *Business Process Management Journal*, 20(4), 530–548. <https://doi.org/10.1108/BPMJ-06-2013-0074>

Appendices

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 consetetur odio sem sed wisi.

Declaration of Academic Integrity

I hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly attributed. Where I have quoted from the work of others, the source is always given. I am aware that the thesis in digital form can be examined for the use of unauthorised aid and in order to determine whether the thesis as a whole or in parts may amount to plagiarism. I am aware that a false assurance fulfils the elements of fraud in accord with § 10 and § 13 ABM-PO/TechFak and will result in the consequences proclaimed there. This paper was not previously presented to another examination board and has not been published.

CITY, 31st May 2023

AUTHOR