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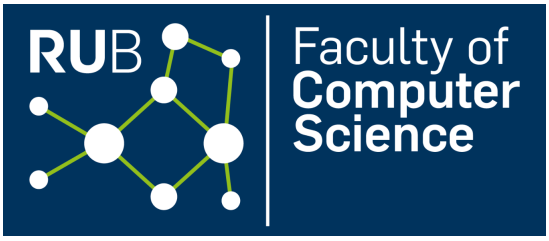
Bachelor/Master's Thesis – July 18, 2024
Chair of Artificial Intelligence and Formal Methods.

Supervisor: Name of or first examiner
Advisor: Name(s) of your other advisers



Abstract

How can I improve my scientific writing skills?

- https://www.zfw.rub.de/sz/
- http://www.cs.joensuu.fi/pages/whamalai/sciwri/sciwri.pdf
- https://www.student.unsw.edu.au/writing
- https://www.sydney.edu.au/content/dam/students/documents/learning-resources/learning-centre/writing-a-thesis-proposal.pdf

Official Declaration

Hereby I declare, that I have not submitted this thesis in this or similar form to any other examination at the Ruhr-Universität Bochum or any other institution or university.

I officially ensure, that this paper has been written solely on my own. I herewith officially ensure, that I have not used any other sources but those stated by me. Any and every parts of the text which constitute quotes in original wording or in its essence have been explicitly referred by me by using official marking and proper quotation. This is also valid for used drafts, pictures and similar formats.

I also officially ensure that the printed version as submitted by me fully confirms with my digital version. I agree that the digital version will be used to subject the paper to plagiarism examination.

Not this English translation, but only the official version in German is legally binding

Eidesstattliche Erklärung

Ich erkläre, dass ich keine Arbeit in gleicher oder ähnlicher Fassung bereits für eine andere Prüfung an der Ruhr-Universität Bochum oder einer anderen Hochschule eingereicht habe.

Ich versichere, dass ich diese Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Die Stellen, die anderen Quellen dem Wortlaut oder dem Sinn nach entnommen sind, habe ich unter Angabe der Quellen kenntlich gemacht. Dies gilt sinngemäß auch für verwendete Zeichnungen, Skizzen, bildliche Darstellungen und dergleichen.

Ich versichere auch, dass die von mir eingereichte schriftliche Version mit der digitalen Version übereinstimmt. Ich erkläre mich damit einverstanden, dass die digitale Version dieser Arbeit zwecks Plagiatsprüfung verwendet wird.

Date	Insert your name here

Erklärung

Als öffentlich finanzierte Forscher wollen wir durch die Veröffentlichung dieser Arbeit einen Beitrag zur Forschungsgemeinschaft leisten, damit andere Forscher dieses Wissen nutzen und weiterentwickeln können. Ich bin damit einverstanden, dass meine Dissertation dauerhaft und öffentlich gespeichert wird. Sie kann dann z. B. von Google Scholar indexiert werden, so dass sie von anderen Forschern gefunden und referenziert werden kann.

Consent

As publicly funded researchers, we aim to contribute to the research community by publishing this work, so other researchers can use and further develop this knowledge. I agree that my thesis will be permanently and publicly stored. It can then be indexed by, for instance, Google Scholar so that it can be found and referenced by other researchers.

Date	Insert your name here

Contents

1 Introduction

Always start a chapter with a short but informative text about the following sections Point out the relevance of the sections and create interconnections between them Never ever just write a single sentence here Furthermore, you are strongly advised to respect the hints given in this template

1.1 Motivation

What is the motivation to deal with this subject? Why is this topic interesting and relevant from research perspective? Which interesting problems do you expect?

Do not abbreviate "e. g." within a sentence, always write "for example" However, within in parentheses you are allowed to abbreviate and use, e. g., and, i. e., as shown here: with a comma right before and after it In addition to that, ensure correct spacing by using `\,` in between

1.2 Related Work

List related work *and* the result of this work. What is the relevance of this work concerning your thesis? If necessary, *emphasize* some words in your text, for example words like *not* or *and* are sometimes crucial for understanding.

Hint: Do not manually cite author names, use `\citeauthor{Newsome:05:DTA}`, for example, "Newsome and Song". It takes also care if multiple authors are used, for example, `\citeauthor{AviramSSHDSVAHD16}` becomes "Aviram et al.". You could also get the full list of authors by using the command `\citeauthor*{AviramSSHDSVAHD16}` ("Aviram, Schinzel, Somorovsky, Heninger, Dankel, Steube, Valenta, Adrian, Halderman, Dukhovni, Käsper, Cohney, Engels, Paar, and Shavitt") but this should only be used in rare cases.

Similarly, use `\citeyear{Newsome:05:DTA}` to get the year ("2005").

Tools: We do not make any strict guidelines regarding the tools that can be used to manage the related work. You can freely choose your own methodology and tools.

According to our experience, the following tools can be used as a starting point to find relevant papers:

- Search Engines: Google Scholar, Web of Science, ACM Digital Library, IEEE-Explore, and *{Search Engine} + {Conference name} proceedings*
- Management Tools: Citavi, Zotero, Mendeley, and JabRef.

1.3 Contribution

When writing the Introduction section of your thesis, it is important to include a contributions subsection where you can directly state the key results and contributions of your work. Unlike a novel or thriller, your thesis is not meant to keep the reader in suspense. It is important to declare your results and key contributions directly in the introduction.

One common mistake is to hide the interesting parts of your work in the introduction, hoping to build suspense and keep the reader engaged. This is not necessary in academic writing. Instead, you should clearly state your key results and contributions so that readers can understand the significance of your work right from the start.

The contributions subsection should provide a clear and concise summary of what you have achieved in your research. You should highlight the new knowledge or insights that your work has contributed to the field, as well as any practical applications or implications. This is an opportunity to convince readers that your work is important and worth their time.

Remember that the contributions subsection should not be overly technical or detailed. Its purpose is to provide a high-level overview of your work and its significance, not to get into the nitty-gritty of your research methods or results. Keep your writing clear and concise, focusing on the key contributions that your work has made to the field.

1.4 Organization of this Thesis

Please give a general overview on how your thesis is divided into sections and chapters ...

2 Background

The Background chapter of your thesis is an important part of your work, providing your readers with the necessary context and information to understand the problem you are addressing. To write a good Background chapter, it is important to remember that you should only describe the background that is necessary for your readers to know. You don't need to explain everything that you cover during the thesis's processing time.

One common mistake is to provide a lengthy description of official standards. This is not necessary as your readers can look them up themselves. Another common mistake is to provide extensive translations or transcriptions of official documents. It is usually enough to refer to the source material and provide a systematized overview of its content.

The key to writing a good Background chapter is its shortness. Keep in mind that this chapter should only provide the minimum information needed to understand your thesis's research question. This includes explaining any relevant background theories, prior research, and current state of the field. You should also describe any important terms or concepts that readers may not be familiar with.

A good way to approach the Background chapter is to think about it as an introduction to the problem you are addressing. This means providing enough context for readers to understand the importance of your research question and why it is worth investigating. Remember to keep your writing clear and concise, focusing on the key points that will help readers understand the background of your work.

3 Implementation

3.1 Duties and Agreements

To successfully write your thesis, you should definitely respect some rules. They are explained in the following sections.

3.1.1 Rules for Students

At the beginning of your thesis, estimate the complexity of the work you are going to have. Take into account that you will have problems with certain aspects of your thesis that will consume a lot of time. Consider times for recreation and delays you can not influence, for instance, asking your supervisor, waiting for orders to be shipped, complex problems during the implementation phase, and so on ...

For some students it is a good idea to agree upon a rough plan (with their supervisor) on how to make progress on their thesis and what goals to achieve. Milestones might help to control your progress. If you fail to meet a milestone in time, contact your supervisor on why this happened or when to expect it to be fulfilled.

If you have a problem, try to solve it on your own twice over. Some things just take time. In case you fail to solve it on your own, write an email to your supervisor and tell him/her about your problem and what you did to solve it. Make an appointment if necessary. Please do not jump right into his office, supervisors have other stuff to do, too.

For quotations, either use “quotation” or “quotation”. For some words, you should use a tilde to link them, for example, when referring to chapter 5 you should use it. Or use chapter 5. This prevents words from being separated by a line break or some other rare circumstances. Use BibTeX within your thesis and learn the different citation options [4, 2].

One last piece of advice. Do not try to attend courses in parallel to your thesis. You should take this seriously and not think that writing a thesis is done quickly.

3.1.2 Rules for Supervisors

"With great power comes great responsibility" `:-)`

- It is very important, that if you want specific things to be done that you send these important instructions by mail. Your student might be in a moment of confusion when telling him/her.
- Attend the "Colloquium" and give your student the feeling, that this is important to you, too.
- Offer your students the opportunity to talk to you right after the "Colloquium". While discussing things, tell your student to write down the results of this discussion and tell him/her to send you this summary by mail to ensure (if necessary), you did not talk at cross purposes.
- Last but not least: Please be gentle to your students `:-)`

3.2 Hints on Typesetting

To get this template running, we recommend using either Overleaf for online compilation or VSCode and Remote Containers.

3.2.1 Structuring Text, English Hints

Another text about the following sections ...

3.2.1.1 Text

Always try to structure your text in a manner that makes sense. Either use indentations, itemize or enumeration environments.

This sentence will have an indentation at the beginning. Now an enumeration starts:

1. One.
2. Two.
3. Three.

Sometimes you do not want an indentation. Use the `noindent` command in such a case.

One Is the first number.

Two Is the second number.

Glossary Use the glossary package for acronyms. In addition, the glossay package can help you to avoid typing the same word in different ways. For example students tend to mix-up the writing of the word *User-Agent* in different ways: user-agent, User-Agent, user agent, User agent. This inconsistency can be avoided by just using the glossary entry: User-Agent (UA).

3.2.1.2 English Hints

- Use an active voice and avoid using passive wherever possible.
- *Always* use the present tense (especially when you refer to content that occurs later in your text). For example:
  - *wrong*: The next chapter *will* explain ...
  - *correct*: The next chapter explains ...
- Either use American English or British English, but do not mix (e. g. summarize vs. summarise, analyze vs. analyse, ...). American English is preferred.
- Do not use filler words.
  - omit: "some kind of" and others ...
- Never use a comma before "that".
- For enumerations, always use a comma before "and": "...module 1, module 2, and module 3.".
- The title of your thesis is capitalized except for words like and, or, with, the, a ...
- *Always* address the reader using the third person: "As one can see from ..." and not "As you can see ...".
- All tables, figures have to be explained very briefly in the text itself.
- Always use correct quantifications:
  - *wrong*: ...a small amount of runs ...
  - *correct*: ...at most three runs ...
- Never use "I". Depersonalize your sentences or use "we" if necessary.

- Read *The Elements of Style* by William Strunk, Jr., which is for example available at `http://www.crockford.com/wrrrld/style.html`. The (short) book provides an overview of typical errors and helps you to significantly improve your English.

3.2.1.3 General Hints

- Use non-breaking small space for some abbreviation
  - z. B.
  - u. a.
  - e. g.
- Use a non-breaking space just before references, parentheses and so which shall not begin at the beginning of a new line. This sentence will not break here (and here).
- Did you notice the overfull horizontal box (hbox)? You should avoid these! Underfull boxes are not that bad. But only fix them when most of the section, paragraph etc is ready. Otherwise you have to fix them more than once. You can tell LaTeX when to break a word if it does not do it correctly. Just put a \- at the corresponding position in the world. Vertical overfull boxes (vbox) occur if the document uses `\flushbottom` instead of `\raggedbottom`. That way, LaTeX ensures that each page ends with the last sentence in the last line (except for the final line in a section). To enforce this, LaTeX sometimes has to add extra vertical space between, e. g., paragraphs. Overfull vertical boxes are hard to fix, as additional content needs to be added or even has to be removed sometimes. Keep in mind that any changes to the type area (Satzspiegel) might produce many additional over- or underfull boxes (and of course it will fix other boxes).
- Read `ftp://ftp.dante.de/tex-archive/info/german/l2tabu/l2tabu.pdf`. Really, read it.
- You can find many more good information at `http://www.dante.de/CTAN/info/lshort/german/l2kurz.pdf`
- The KomaScript guide is very useful: `ftp://ftp.dante.de/pub/tex/macros/latex/contrib/koma-script/scrguide.pdf`

3.2.2 Formulas, Figures, Tables, Definitions

3.2.2.1 Formulas

Using the method shown in Table XX for all three functions yields.

$$f_a^4 = \texttt{0x2C79} = \mathrm{abc} + \mathrm{ac} + \mathrm{ad} + \mathrm{bc} + \mathrm{a} + \mathrm{b} + \mathrm{d} + 1 \tag{3.1}$$

$$f_b^4 = \texttt{0x6671} = \mathrm{abd} + \mathrm{acd} + \mathrm{bcd} + \mathrm{ab} + \mathrm{ac} + \mathrm{bc} + \mathrm{a} + \mathrm{b} + \mathrm{d} + 1 \tag{3.2}$$

$$f_c^5 = \texttt{0x7907287B} = \mathrm{cde} + \mathrm{abde} + \mathrm{ade} + \mathrm{de} + \mathrm{abce} + \mathrm{bce} + \mathrm{ce} + \mathrm{be} + \mathrm{bcd} + \mathrm{acd} + \mathrm{bd} + \mathrm{d} + \mathrm{bc} + \mathrm{ab} + \mathrm{b} + 1 \tag{3.3}$$

When typesetting formulas, pay special notice on constants, variables, and units:

$$\mathcal{F}_\omega\{x(t)\} = \int_{-\infty}^{\infty} x(t)\ \mathrm{e}^{-\mathrm{j}\omega t}\,\mathrm{d}t \qquad \text{(Fourier-Transformation)}$$

The use of constants, variables and units is explained by "Rohde & Schwarz" in their famous document "Der korrekte Umgang mit Größen, Einheiten und Gleichungen" [3]. These rules are in compliance with ISO-31. Consequently, always typeset the following in italics:

- Variables like k, x, ...
- Functions like $f(x)$,...
- Physical constants like c_0, ...
- Indices that are variables or physical units, like $a_{i,j}$ or c_V.

3.2.2.2 Fontawesome

In case you need some extra symbols, we recommend using Fontawesome , , .

3.2.2.3 Figures

Figures and tables are important to explain things. Here are some rules that apply, when using figures:

- Whenever possible use vector graphics (eps, pdf, svg, ...) instead of bitmap graphics (jpg, gif, ...).

- All figures should have the same font and size (do not scale them or the size will change) and "style" (line strength, arrow heads, ...).
- Some employees of the chair need all figures in `.eps`. However, do *not* convert your `.jpg` and `.png` to `.eps`, instead use a *wrapper* program to wrap these file types into the `.eps` format. As a consequence, you are forced to use `latex` to typeset your document instead of `pdflatex`. Appropriate wrapper programs can be found here:
  - Windows: click
  - Linux/Mac: click
- **Always** try to use your own figures, so you do not run into copyright problems and it is easier for us, to reuse these figures for papers. You might want to have a look at these tools to create your own figures:
  - Windows: MS Visio (available via MSDNAA), Graphviz, Gnuplot ...
  - Linux: xfig/jfig, IPE, Graphviz, Gnuplot ...
  - Mac: IPE, Graphviz, Gnuplot, OmniGraffle (commercial, academic licensing available) ...

There are many possibilities on how to include figures, here is just one example on how to do it. In case you need further assistance, please google for `l2picfaq`.

3.2.2.4 Tables

There are many possibilities on how to create and include tables. From a typographic point of view, *one should avoid any vertical lines*, cf. Table 3.1.

Table 3.1: Captions for tables are *always above* the table and give a short but informative description of the table. Always use full sentences here and end them with a full stop.

		Component	
Amount[a]	Price	Description	Role
23	1.234 $	good stuff	important
multirow example the other row	x	y	XXX
42	43.123,13[b]	good stuff	important

[a] This is a footnote inside a table, you need a minipage for this to work.
[b] This is another footnote inside a table.

3.2.3 Glossaries

The `glossaries` package in LaTeX allows you to create glossaries and lists of acronyms in your document. This is particularly useful in academic writing, where it is important to ensure consistency in the use of terminology.

To create an acronym using `glossaries`, you first need to define it using the `newacronym` command. For example, `\newacronym{ua}{UA}{User-Agent}` defines the acronym "UA" with the corresponding expansion "User-Agent".

To create a glossary entry, you can use the `newglossaryentry` command. For example, `\newglossaryentry{xss}{name={XSS}, description={Cross-Site-Scripting ...}}` creates a glossary entry with the label "xss", the name "XSS", and the description "Cross-Site-Scripting...".

To reference an acronym or glossary entry in your text, you can use the `gls` command. For example, `The \gls{sso} system enables...` will produce "The Single Sign-On (SSO) system enables...".

Glossaries are important in academic writing because they help ensure consistency in the use of terminology. By defining acronyms and glossary entries up front, students can ensure they are using the correct terminology throughout their thesis. This helps to prevent variations such as "Single Sign-On", "Single-Sign-On", or "Single-Sign On", which can be confusing for readers and detract from the clarity of the writing.

3.2.4 Listings

3.2.4.1 Listings

We recommend using the minted package for code highlighting.

```
1 def myFunction(param):
2         return param + 1
3
4 myFunction(5)
```

You should thoroughly document your code using comments and (best case) by using a documentation system like Doxygen. Please ask your supervisor for additional rules (e. g. which repository system to use, etc.). Regularly commit your changes and backup your data!

4 Results

It is **current best practices** to provide a brief overview on your most interesting results in the beginning.

	Browser	XSS	SQLi	CSRF	Clickjacking
	Firefox	○	●	●	●
	Chrome	●	○	●	●
	Safari	●	●	○	●

Table 4.1: Write a short message that everyone should understand, e.g., "All browsers were found vulnerable (●) to Clickjacking" instead of simply writing "Evaluation results.". Also describe what the symbols mean.

5 Conclusion

Writing a good conclusion is an essential part of any academic work. It is your final chance to leave a lasting impression on the reader and make sure that your work is remembered for its contribution to the field. While many students may be tempted to simply summarize their results in the conclusion, this approach is often too simplistic and fails to provide the reader with any real insight or understanding of the significance of your work.

To write a good conclusion, it is important to not only summarize your results but also to explain what the reader can learn from your thesis. This means highlighting the key insights and contributions that your work has made to the field. What have you discovered that is new and important? What have you contributed to the existing body of knowledge? How does your work relate to other studies in the field?

In addition to highlighting your contributions, a good conclusion should also identify areas for future work. What questions remain unanswered? What new avenues of research have been opened up by your work? What are the key challenges that need to be addressed in order to make further progress in the field?

By providing these insights and identifying future directions for research, your conclusion will not only leave a lasting impression on the reader but also provide a valuable resource for future scholars looking to build on your work. Remember, a good conclusion is not just a summary of your results but a thoughtful reflection on the significance of your work and its contribution to the field.

List of Figures

List of Tables

Bibliography

[1] Nimrod Aviram, Sebastian Schinzel, Juraj Somorovsky, Nadia Heninger, Maik Dankel, Jens Steube, Luke Valenta, David Adrian, J. Alex Halderman, Viktor Dukhovni, Emilia Käsper, Shaanan Cohney, Susanne Engels, Christof Paar, and Yuval Shavitt. "DROWN: Breaking TLS Using SSLv2". In: *25th USENIX Security Symposium, USENIX Security 16, Austin, TX, USA, August 10-12, 2016*. Ed. by Thorsten Holz and Stefan Savage. USENIX Association, 2016, pp. 689–706. URL: `https://www.usenix.org/conference/usenixsecurity16/technical-sessions/presentation/aviram`.

[2] J. Newsome and D. Song. "Dynamic Taint Analysis for Automatic Detection, Analysis, and SignatureGeneration of Exploits on Commodity Software". In: *Symposium on Network and Distributed System Security (NDSS)*. 2005.

[3] Rohde & Schwarz. *Der korrekte Umgang mit Größen, Einheiten und Gleichungen*. URL: `http://www.rohde-schwarz.de/ps/rus/tools/show_8437_document/Der_korrekte_Umgang.pdf`.

[4] Y. Xie, F. Yu, K. Achan, R. Panigrahy, G. Hulten, and I. Osipkov. "Spamming Botnets: Signatures and Characteristics". In: *ACM SIGCOMM Computer Communication Review* 38.4 (2008).

A Appendix (e.g. Code)

The Appendix section is useful to provide additional information that does not necessarily contribute to the main work of the thesis. However, it may still be relevant to explain some background information or provide additional details of your experiments.

The same rules as for the main text apply here as well. Always introduce a section, describe figures and tables, and reference them in the descriptions.