KU LEUVEN

FACULTY OF ENGINEERING TECHNOLOGY

GHENT CAMPUS

Title Masterproef

Subtitle (optional)

first name LAST NAME

Promotor(en): My Promotor

Co-promotor(en): My Co-promotor
My company promotor

Master's Thesis submitted to obtain the degree of Master of Science in discipline name specialisationprogramme Engineering Technology

Academic year 2024 - 2025

Preface

Het voorwoord vul je persoonlijk in met een appreciatie of dankbetuiging aan de mensen die je hebben bijgestaan tijdens het verwezenlijken van je masterproef en je hebben gesteund tijdens je studie.

In the preface, you write a personal account with an acknowledgement or expression of gratitude to the people who assisted you in completing your master's thesis and supported you during your studies.

Samenvatting

De (korte) samenvatting, toegankelijk voor een breed publiek, wordt in het Nederlands geschreven en bevat **maximum 3500 tekens**. Deze samenvatting moet ook verplicht opgeladen worden in KU Loket.

Summary

This (short) summary, accessible to a wide audience, is written in English and contains a **maximum of 3500 characters**. This summary must also be uploaded to KU Loket.

Keywords: Enter (more or less) five keywords.

Contents

Acronyms

IoT Internet of Things. 2

LPWAN low-power wide-area network. 2

Chapter 1

Changes w.r.t. the default template

- Changed font from default computer modern to CMBright.
- Verhoogde baseline-skip in de titel. Zodat letters niet tegen elkaar plakken
- Siunitx package auto toegevoegd zie gebruik: `https://github.com/dramco-edu/LaTex/wiki/LaTex-Tips-and-Tricks#using-si-units-numbers-angles-etc`
- Gebruik nu formules inclusief eenheden via het commando:

```
\begin{equation}
 E = m c^2
 \tagaddtext{[\si{\joule}]}
\end{equation}
```

  , which outputs:

$$E = mc^2 \quad \text{[J]} \tag{1.1}$$

- Afkortingen:
  - Internet of Things (IoT)
  - low-power wide-area networks (LPWANs)
  - Internet of Things
  - IoT
  - Internet of Things (IoT)
- `\ce{CO2}` CO_2
- Refs:
  - Figure 1.1
  - Table 1.1
  - Chapter 1

  - Equation (1.1)
  - `\cref{fig:example}` becomes Figure 1.1
  - `\cref{tab:example}` becomes Table 1.1
  - `\cref{ch:introduction}` becomes Chapter 1
  - Equation (1.1)

- numerical citation [**s19030585**]
  - `\cite{callebaut10lorawan}` becomes [1]
  - `\citeauthor{callebaut10lorawan}` becomes Callebaut
  - `\citeauthorref{callebaut10lorawan}` becomes Callebaut [1]
  - `\autocite[chap.~2]{callebaut10lorawan}` becomes [1, chap. 2]
  - `\footcite{callebaut10lorawan}` becomes[1]
  - `\fullcite{callebaut10lorawan}` becomes G. Callebaut, "Lorawan network simulator", *doi*, vol. 10, p. 5281,

- A 45° angle or a 45°.
- It is 17 °C outside.
- 10 000
- 3.45×10^{-4}
- $\mathrm{kg\,m\,s^{-2}}$
- $\mathrm{kg\,m/s^2}$
- 10 %
- 68 kg

[1] 1.

Day	Min Temp	Max Temp	Summary
Monday	11C	22C	A clear day with lots of sunshine. However, the strong breeze will bring down the temperatures.
Tuesday	9C	19C	Cloudy with rain, across many northern regions. Clear spells across most of Scotland and Northern Ireland, but rain reaching the far northwest.
Wednesday	10C	21C	Rain will still linger for the morning. Conditions will improve by early afternoon and continue throughout the evening.

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Table 1.1 Fixed-width columns.

	Treatment A	Treatment B
John Smith	Good response, no side-effects	No response
Jane Doe	–	Good response, no side-effects
Mary Johnson	No response	Good response with side-effects

Figure 1.1: Example JPG

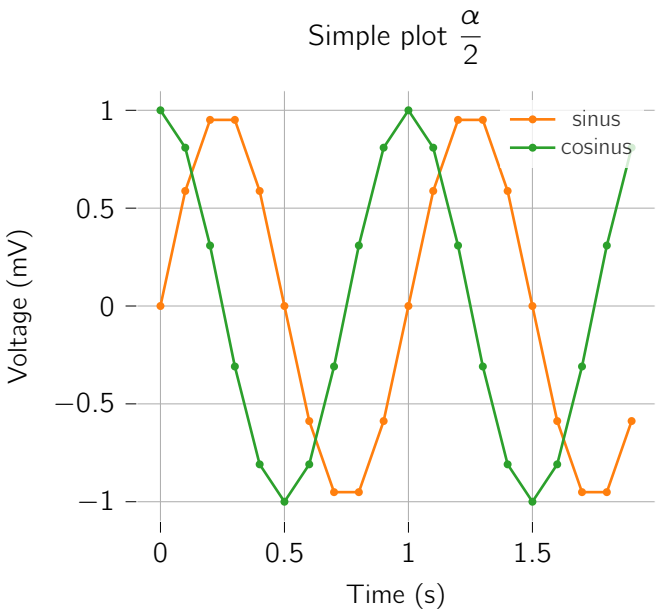

Figure 1.2: Caption

```
import numpy as np

def incmatrix(genl1,genl2):
    m = len(genl1)
    n = len(genl2)
    M = None #to become the incidence matrix
    VT = np.zeros((n*m,1), int)  #dummy variable

    #compute the bitwise xor matrix
    M1 = bitxormatrix(genl1)
    M2 = np.triu(bitxormatrix(genl2),1)

    for i in range(m-1):
        for j in range(i+1, m):
            [r,c] = np.where(M2 == M1[i,j])
            for k in range(len(r)):
                VT[(i)*n + r[k]] = 1;
                VT[(i)*n + c[k]] = 1;
                VT[(j)*n + r[k]] = 1;
                VT[(j)*n + c[k]] = 1;

                if M is None:
                    M = np.copy(VT)
                else:
                    M = np.concatenate((M, VT), 1)

                VT = np.zeros((n*m,1), int)

    return M
```

Listing 1: Minimal working example

Bibliography

[1] G. Callebaut, "Lorawan network simulator", *doi*, vol. 10, p. 5281,

Appendix A

Een aanhangsel

sdfsffqsfsf

Appendix B

Beschrijving van deze masterproef in de vorm van een wetenschappelijk artikel

The thesis should also contain a short scientific article. If you write your thesis in Dutch, you must write the article in English, and vice versa. We advise you to employ the IEEE Manuscript Templates for Conference Proceedings (`https://www.overleaf.com/latex/templates/ieee-conference-template/grfzhhncsfqn`). Compile the article in another project and include the generated pdf file as shown below:

Conference Paper Title*

*Note: Sub-titles are not captured in Xplore and should not be used

1st Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

2nd Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

3rd Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

4th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

5th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

6th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

***Abstract*—This document is a model and instructions for LaTeX. This and the IEEEtran.cls file define the components of your paper [title, text, heads, etc.]. *CRITICAL: Do Not Use Symbols, Special Characters, Footnotes, or Math in Paper Title or Abstract.**

***Index Terms*—component, formatting, style, styling, insert**

I. Introduction

This document is a model and instructions for LaTeX. Please observe the conference page limits.

II. Ease of Use

A. Maintaining the Integrity of the Specifications

The IEEEtran class file is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may note peculiarities. For example, the head margin measures proportionately more than is customary. This measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

III. Prepare Your Paper Before Styling

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections III-A–III-E below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not number text heads—LaTeX will do that for you.

Identify applicable funding agency here. If none, delete this.

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: “Wb/m^2” or “webers per square meter”, not “webers/m^2”. Spell out units when they appear in text: “. . . a few henries”, not “. . . a few H”.
- Use a zero before decimal points: “0.25”, not “.25”. Use “cm^3”, not “cc”.)

C. Equations

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \tag{1}$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1)”, not

Appendix C

Poster

Appendix D

GenAI code of conduct for students

Generative AI (GenAI) assistance tools can be used to generate text, image, code, video, music, or combinations of these. It includes typical tools like (but this list is not limited to): ChatGPT, Google Gemini, MS Copilot, Midjourney, Claude.ai, Perplexity.ai, Dall-E, etc.

Student Information

Student name: first name last name

This form is related to my Master thesis.
Title Master thesis: Title Masterproef Promoter: _____
Daily supervisor: _____

Use of GenAI Assistance

Please indicate with "X" (possibly multiple times) in which way you were using GenAI:

- ☐ I did not use any GenAI assistance tool.
- ☐ I did use GenAI assistance. In this case, specify which ones (e.g., ChatGPT, ...): _____

GenAI Assistance Used As/For

- ☐ MS Copilot
- ☐ Language assistance

☐ Search engine

☐ Literature search

☐ Short-form input assistance

☐ Generating programming code

☐ Generating new research ideas

☐ Generating blocks of text

☐ Other (specify): _____

Code of Conduct for Different Uses

Language Assistant for Reviewing or Improving Texts

This use is similar to using spelling and grammar check tools, and you do not have to refer to the use of GenAI in the text. Be careful:

- Using GenAI tools on texts you did not write yourself to cover up plagiarism (by paraphrasing original texts) is not allowed.

Search Engine for Information or Existing Research

This use is similar to a Google search or checking Wikipedia. If you then write your own text based on this information, you do not have to refer to the use of GenAI in the text. Be careful:

- Be aware that the output of the GenAI tool cannot be guaranteed as a 100% reliable source of information.
- The output may not be entirely correct and is limited due to the databases it uses. Knowledge evolves and may change over time, and it may be that the database of the GenAI tool is not up to date.

Literature Search

This use is comparable to a Google Scholar search. Be careful:

- Be aware that the output is restricted to the database it is built on. After this initial search, look for scientific sources and conduct your own analysis.
- GenAI tools (like ChatGPT) may output no or wrong references. As a student, you are responsible for further checking and verifying the accuracy of references.

Short-form Input Assistance

This use is similar to Google Docs powered by generative language models.

Generating Programming Code

The use of GenAI for coding should be explicitly allowed by the teacher. If used for coding, correctly mention the use of GenAI assistance and cite it.

Generating New Research Ideas

Further verify whether the idea is novel or not. It is likely that it is related to existing work, which should be referenced.

Generating Blocks of Text

Inserting blocks of text without quotes and a reference to GenAI assistance in your report or thesis is not allowed. Be careful:

- When you literally copy elements from a conversation with a GenAI tool, quote them between quotation marks and refer to them according to the specified reference style.
- Describe the use of the GenAI tool (tool name, version, date, etc.) in the method section and optionally add the full conversation as an attachment.

Other

Contact the professor of the course or the promoter of the thesis. Inform also the program director. Motivate how you comply with Article 84 of the exam regulations. Explain the use and added value of ChatGPT or another AI tool.

Further Important Guidelines and Remarks

- GenAI assistance cannot be used related to data or subjects under Non-Disclosure Agreement.
- GenAI assistance cannot be used related to sensitive or personal data due to privacy issues.
- Take a scientific and critical attitude when interacting with GenAI assistance and interpreting its output.
- As a student, you are responsible for complying with Article 84 of the exam regulations: your report or thesis should reflect your own knowledge, understanding, and skills.

Exam Regulations Article 84

"Every conduct individual students display with which they (partially) inhibit or attempt to inhibit a correct judgement of their own knowledge, understanding and/or skills or those of other students, is considered an irregularity which may result in a suitable penalty. A special type of irregularity is plagiarism, i.e., copying the work (ideas, texts, structures, designs, images, plans, codes, ...) of others or prior personal work in an exact or slightly modified way without adequately acknowledging the sources."

Additional Reading

More information about being transparent on the use of GenAI assistance and about citing and referencing GenAI can be found on the student website.

A Few Final Words

If you are uncertain whether or not you should declare your use of AI tools, discuss the matter with your teacher or promoter. It is safer to declare AI use when it is not needed than to withhold that declaration when it is required.

Finally, remember that advanced AI tools are new and that they can do things they could not do until recently. It is important to follow up on the most recent developments in AI technologies and communicate openly with your teachers, assistants, supervisors, and peers.