

# This is the Title of my Thesis

Your Name

August 2014

PROJECT / MASTER THESIS

Department of Production and Quality Engineering

Norwegian University of Science and Technology

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Supervisor 2: Professor Fingal Olsson

## **Preface**

Here, you give a brief introduction to your work. What it is (e.g., a Master's thesis in RAMS at NTNU as part of the study program xxx and...), when it was carried out (e.g., during the autumn semester of 2021). If the project has been carried out for a company, you should mention this and also describe the cooperation with the company. You may also describe how the idea to the project was brought up.

You should also specify the assumed background of the readers of this report (who are you writing for).

Trondheim, 2012-12-16

(Your signature)

Ola Nordmann

## Acknowledgment

I would like to thank the following persons for their great help during ...

If the project has been carried out in cooperation with an external partner (e.g., a company), you should acknowledge the contribution and give thanks to the involved persons.

You should also acknowledge the contributions made by your supervisor(s).

O.N.

(Your initials)

## **Summary and Conclusions**

Here you give a summary of your work and your results. This is like a management summary and should be written in a clear and easy language, without many difficult terms and without abbreviations. Everything you present here must be treated in more detail in the main report. You should not give any references to the report in the summary – just explain what you have done and what you have found out. The Summary and Conclusions should be no more than two pages.

You may assume that you have got three minutes to present to the Rector of NTNU what you have done and what you have found out as part of your thesis. (He is an intelligent person, but does not know much about your field of expertise.)

# Contents

|                                                               |          |
|---------------------------------------------------------------|----------|
| Preface . . . . .                                             | i        |
| Acknowledgment . . . . .                                      | ii       |
| Summary and Conclusions . . . . .                             | iii      |
| <b>1 Approaches for Detecting Robots</b>                      |          |
| <b>in Social Media</b>                                        | <b>2</b> |
| 1.1 Introduction . . . . .                                    | 2        |
| 1.2 Definition and History of Social Bots . . . . .           | 2        |
| 1.3 Why is Bot Detection in Social Media Important? . . . . . | 3        |
| 1.4 Social Bot Detection Approaches . . . . .                 | 4        |
| 1.4.1 Based on Social Network Information . . . . .           | 4        |
| 1.4.2 Based on Crowd-Sourcing . . . . .                       | 5        |
| 1.4.3 Based on Machine Learning Methods . . . . .             | 5        |
| 1.5 Summary and Outlook . . . . .                             | 5        |
| <b>2 Equations, etc</b>                                       | <b>6</b> |
| 2.1 Simple Equations . . . . .                                | 6        |
| 2.2 Including Figures . . . . .                               | 8        |
| 2.3 Including Tables . . . . .                                | 9        |
| 2.4 Copying Figures and Tables . . . . .                      | 9        |
| 2.5 References to Figures and Tables . . . . .                | 11       |
| 2.6 A Word About Font-encoding . . . . .                      | 11       |
| 2.7 Plagiarism . . . . .                                      | 11       |

|                                                |           |
|------------------------------------------------|-----------|
| <i>CONTENTS</i>                                | 1         |
| <b>3 Summary</b>                               | <b>13</b> |
| 3.1 Summary and Conclusions . . . . .          | 13        |
| 3.2 Discussion . . . . .                       | 13        |
| 3.3 Recommendations for Further Work . . . . . | 14        |
| <b>A Acronyms</b>                              | <b>15</b> |
| <b>B Additional Information</b>                | <b>16</b> |
| B.1 Introduction . . . . .                     | 16        |
| B.1.1 More Details . . . . .                   | 16        |
| <b>Bibliography</b>                            | <b>17</b> |
| <b>Curriculum Vitae</b>                        | <b>18</b> |

# Chapter 1

## Approaches for Detecting Robots in Social Media

### Management Summary

This is the management summary blablabla mhmhm...

### 1.1 Introduction

Software robots are often called bot. <- muss hier irgendwie rein

### 1.2 Definition and History of Social Bots

This section will introduce the term social bot formally and give a short overview about the beginning and the development of this topic.

In order to be able to discuss social media bot detection, we need a clear understanding of what social bots actually are. For that, we use the definition given by Ferrara et al. in their article The Rise of Social Bots:

"A social bot is a computer algorithm that automatically produces content and interacts with humans on social media, trying to emulate and possibly alter their behavior." [\[4\]](#)

The root of social bots, or just bots how we will sometimes call them here as well, can probably be found in the Turing test, developed by Alan Turing in 1950 [6]. It involves three parties, two of which are human and one is a computer program. While one human is having a conversation with the software, it is the task of the other human to identify the program. If he is not able to do so, the software is passing the Turing test. This led to the development of a lot of so called chatbots, which just aimed to appear as human as possible in a conversation.

A rather famous and often cited example for such a chatbot is ELIZA, introduced by Joseph Weizenbaum 1966 in [8]. It mimicked a psychotherapist and showed that – at least some kind of – communication between a human and a computer is possible.

Since then, a lot of things have changed. Today, bots are a lot more than bare entertainment or proof of concept. With the triumph of the Internet and especially social networks like Facebook and Twitter, the possible use cases for social bots have increased dramatically. While they were initially mostly used to simply post content, today they are able to credibly interact with each other and even humans [2, 5]. As we will see in the next section, nowadays bots are used to spread messages, for marketing and a lot more.

### 1.3 Why is Bot Detection in Social Media Important?

- Information flood -> need to get the message through
- influence political mood
- marketing
- false information (boston marathon: cassa 2013)
- seem fame
- stock exch..

—> section "engineered social tampering" and following in the rise of social bots!!

+ Key Challenges in Defending Against Malicious Socialbots [1]



## 1.4 Social Bot Detection Approaches

In this chapter we want to introduce several techniques for detecting social bots. Based on Ferrara et al. [4] we distinguish between three detection approach classes.

The first category of detection approaches is based on social network information. They are also called graph-based, since they map users and their relations into a graph and then try to identify bots in the hereby obtained social network by means of graph theory.

Afterwards we will discuss crowd-sourcing based social bot detection approaches. They use actual humans to detect bots, assuming that the human ability to notice details in communication will make this an easy task.

The last category we want to elaborate on are detection approaches based on machine learning. Mechanisms that make use of this approach try to observe behavioral patterns that are typical for social bots. Since these patterns are encoded in so called patterns, this approach is also known as feature-based [4].

In the following sub sections, we will go into detail about each of these three approaches and illustrate them using real detection systems.

### 1.4.1 Based on Social Network Information

A term that is often used in combination with detection of bots by using social networks is sybil or the sybil attack, which was presented as a threat to distributed systems by John R. Douceur in [3]. In the specific context of social media platforms, when conducting a sybil attack, an attacker creates a large amount of fake identities in a system to the point where these identities make up a considerable fraction of the systems whole user based. When this is achieved, the attacker can influence the whole system and control its contents to a certain degree. A sybil, sybil node or sybil account is therefor simply one of the fake entities or, depending on the attack architecture, a social bot. It is not hard to see that social bot detection can, more specifically, be viewed as a defense against the sybil attack.

The general proceeding of social network based bot detection approaches is rather simple. They map the social platform they aim to defend into a social graph, where a node is corresponding to a user and an edge between two nodes exists if there is a specific kind of relation-

ships between the two respective users on the platform. The nodes can be hereby partitioned in sybil nodes and non-sybil nodes, respectively legitimate users. The goal of the detection approach is now, to identify whether a given node is a sybil or not. [7]

An Analysis of Social Network-Based Sybil Defenses

SoK: The Evolution of Sybil Defense via Social Networks

#### **1.4.2 Based on Crowd-Sourcing**

#### **1.4.3 Based on Machine Learning Methods**

wie misuse based ids!

### **1.5 Summary and Outlook**

# Chapter 2

## Equations, Figures, and Tables

The content of Chapter 2 will vary with the topic of your thesis. This chapter only gives guidance to some technical aspects of  $\text{\LaTeX}$ .

**Remark:** If you want a shorter chapter or section title to appear in the Table of Contents and in the headings of the chapter, you just include the short title in square brackets before the title of the chapter/section. Example:

```
\section[Short Title]{Long Title}
```

.

### 2.1 Simple Equations

Mathematical symbols and equations can be written in the text as  $\lambda$ ,  $F(t)$ , or even  $F(t) = \int_0^t \exp(-\lambda x) dx$ , or as displayed equations

$$F(t) = \int_0^t \exp(-\lambda x) dx \tag{2.1}$$

The displayed equations are automatically given equation numbers – here (2.1) since this is the first equation in Chapter 2. Note that you can refer to the equation by referring to the “label” you specified as part of the equation environment.

You can also include equations without numbers:

$$F(t) = \sum_{i=1}^n \binom{n}{i} \sin(i \cdot t)$$

## More Advanced Formulas

Long formulas that cannot fit into a single line can be written by using the environment `align` as

$$F(t) = \sum_{i=1}^n \sin(t^{n-1}) - \sum_{i=1}^n \binom{n}{i} \sin(i \cdot t) \quad (2.2)$$

$$+ \int_0^\infty n^{-x} e^{-\lambda x^t} dt \quad (2.3)$$

In some cases, you need to write ordinary letters inside the equations. You should then use the commands

`\textrm` and/or `\mathrm`

The first command returns the normal text font and will be scaled automatically, while the second command will be scaled according to the use.

$$\text{MTTF} = \int_0^\infty R_{\text{avg}}(t) dt$$

Please consult the  $\text{\LaTeX}$  documentation for further details about mathematics in  $\text{\LaTeX}$ .

## Definitions

If you want to include a definition of a term/concept in the text, I have made the following macro (see in `ramsstyle.sty`):

✎ **Reliability:** The ability of an item to perform a required function under stated environmental and operational conditions and for a stated period of time.



Figure 2.1: This is the logo of NTNU (rotated 15 degrees).

When text is following directly after the definition, it may sometimes be necessary to end the definition text by the command

```
\newline
```

I have not included this in the definition of the `defin` environment to avoid too much space when there is not a text-block following the definition.

## 2.2 Including Figures

If you use pdf $\LaTeX$  (as recommended), all the figures must be in pdf, png, or jpg format. We recommend you to use the pdf format. Please place the figure files in the directory **fig**. Figures are included by the command shown for Figure 2.1. Please notice the “path” to the figure file written by a *forward* slash (/). You should not include the format of the figure file (pdg, png, or jpg) – just write the “name” of the figure.

Each figure should include a unique *label* as shown in the command for Figure 2.1. You can then refer to the figure by the *ref* command. Notice that you can scale the size of the figure by the option `scale=k`. You may also define a specific width or height of the figure by replacing the scale options by `width=k` or `height=k`. The factor `k` can here be specified in mm, cm, pc, and many other length measures. You may also give `k` as a fraction of the width of the text or of the height of the text, for example, `width=0.45\textwidth`. If you later change the margins of the text, the figure width will change accordingly. As illustrated in Figure 2.1, you may also rotate the figure – and also do many other things (please check the documentation of the package `graphicx` – it is available on your computer, or you may find it on the Internet).

In  $\LaTeX$  all figures are floating objects and will normally be placed at the top of a page. This is the standard option in all scientific reports. If you insist on placing the figure exactly where you

Table 2.1: The degree of newness of technology.

| Experience with the<br>operating condition | Level of technology maturity |                                                      |                    |
|--------------------------------------------|------------------------------|------------------------------------------------------|--------------------|
|                                            | Proven                       | Limited field history or not<br>used by company/user | New or<br>unproven |
| Previous experience                        | 1                            | 2                                                    | 3                  |
| No experience by company/user              | 2                            | 3                                                    | 4                  |
| No industry experience                     | 3                            | 4                                                    | 4                  |

declare the figure, you may include the command `[h]` (here) immediately after `\begin{figure}`. If you will force the figure to be located either at the top or bottom of the page, you may alternatively use `[t]` or `[b]`. For more options, check the documentation.

Large figures may be included as a *sidewaysfigure* as shown in Figure 2.2:<sup>1</sup>

## 2.3 Including Tables

$\LaTeX$  has a lot of different options to include tables. Only one of them is illustrated here.

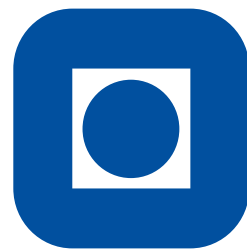
**Remark:** Notice that figure captions (Figure text) shall be located *below* the figure – and that the caption of tables shall be *above* the table. This is done by placing the `\caption` command beneath the command `\includegraphics` for figures, and above the command `\begin{tabular*}` for tables.

## 2.4 Copying Figures and Tables

In some cases, it may be relevant to include figures and tables from from other publications in your report. This can be a direct copy or that you retype the table or redraw the figure. In both cases, you should include a reference to the source in the figure or table caption. The caption might then be written as: *Figure/Table xx: The caption text is coming here [?]*.

In other cases, you get the idea from a figure or table in a publication, but modify the figure/table to fit your purpose. If the change is significant, your caption should have the following format: *Figure/Table xx: The caption text is coming here [adapted from ?]*.

<sup>1</sup>You can use a similar command for large tables.



**NTNU – Trondheim**  
Norwegian University of  
Science and Technology

Figure 2.2: This is the logo of NTNU.

## 2.5 References to Figures and Tables

Remember that all figures and tables shall be referred to and explained/discussed in the text. If a figure/table is not referred to in the text, it shall be deleted from the report.

## 2.6 A Word About Font-encoding

When you press a button (or a combination of buttons) on your keyboard, this is represented in your computer according to the *font-encoding* that has been set up. A wide range of font-encodings are available and it may be difficult to choose the “best” one. In the template, I have set up a font-encoding called UTF-8 which is a modern and very comprehensive encoding and is expected to be the standard encoding in the future. Before you start using this template, you should open the Preferences ->Editor dialogue in TeXworks (or TeXShop if you use a Mac) and check that encoding UTF-8 has been specified.

If you use only numbers and letters used in standard English text, it is not very important which encoding you are using, but if you write the Norwegian letters æ, ø, å and accented letters, such as é and ä, you may run into problems if you use different encodings. Please be careful if you cut and paste text from other word-processors or editors into your  $\text{\LaTeX}$  file!

### Warning

If you (accidentally) open your file in another editor and this editor is set up with another font-encoding, your non-standard letters will likely come out wrong. If you do this, and detect the error, be sure *not* to save your file in this editor!!

This is not a specific  $\text{\LaTeX}$  problem. You will run into the same problem with all editors and word-processors – and it is of special importance if you use computers with different platforms (Windows, OSX, Linux).

## 2.7 Plagiarism

Plagiarism is defined as “use, without giving reasonable and appropriate credit to or acknowledging the author or source, of another person’s original work, whether such work is made up of



code, formulas, ideas, language, research, strategies, writing or other form”, and is a very serious issue in all academic work. You should adhere to the following rules:

- Give proper references to all the sources you are using as a basis for your work. The references should be give to the original work and not to newer sources that mention the original sources.
- You may copy paragraphs up to 50 words when you include a proper reference. In doing so, you should place the copied text in inverted commas (i.e., “Copied text follows ...”). Another option is to write the copied text as a quotation, for example:

Birnbaum’s measure of reliability importance of component  $i$  at time  $t$  is equal to the probability that the system is in such a state at time  $t$  that component  $i$  is critical for the system.

? ]

# **Chapter 3**

## **Summary and Recommendations for Further Work**

In this final chapter you should sum up what you have done and which results you have got. You should also discuss your findings, and give recommendations for further work.

### **3.1 Summary and Conclusions**

Here, you present a brief summary of your work and list the main results you have got. You should give comments to each of the objectives in Chapter 1 and state whether or not you have met the objective. If you have not met the objective, you should explain why (e.g., data not available, too difficult).

This section is similar to the Summary and Conclusions in the beginning of your report, but more detailed—referring to the various sections in the report.

### **3.2 Discussion**

Here, you may discuss your findings, their strengths and limitations.

### **3.3 Recommendations for Further Work**

You should give recommendations to possible extensions to your work. The recommendations should be as specific as possible, preferably with an objective and an indication of a possible approach.

The recommendations may be classified as:

- Short-term
- Medium-term
- Long-term

# **Appendix A**

## **Acronyms**

**FTA** Fault tree analysis

**MTTF** Mean time to failure

**RAMS** Reliability, availability, maintainability, and safety

# **Appendix B**

## **Additional Information**

This is an example of an Appendix. You can write an Appendix in the same way as a chapter, with sections, subsections, and so on.

### **B.1 Introduction**

#### **B.1.1 More Details**

# Bibliography

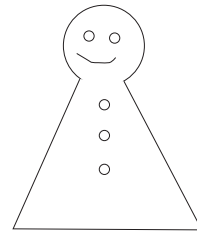
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# Curriculum Vitae

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---



Your picture

## Language Skills

Describe which languages you speak and/or write. Specify your skills in each language.

## Education

- School 1
- School 2
- School 3

## Computer Skills

- Program 1

- Program 2
- Program 3

## **Experience**

- Job 1
- Job 2
- Job 3

## **Hobbies and Other Activities**