

University of Tübingen  
Faculty of Science  
Department of Computer Science

# Master Thesis Bioinformatics

**Title of thesis**

First Name and Surname

Date

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*Title of thesis*

Master Thesis Bioinformatics

University of Tübingen

Thesis period: dd.mm.yyyy – dd.mm.yyyy

## **Abstract**

Write here your abstract.

## **Acknowledgements**

Write here your acknowledgements.

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# List of Abbreviations

<b>BLAST</b>	Basic Local Alignment Search Tool
...	...



# Chapter 1

## Introduction

Start with a comprehensive introduction about the questions of your thesis.

In general, the introduction should include:

- An introduction to the general topic and motivation of your thesis
  - *Why is your thesis relevant?*
- A background and/or related work section
  - *What other research has been done on the topic?*
  - *What question remained unanswered that you intend to tackle in your thesis?*
  - This can become an extra chapter
- Short overview of the structure of the thesis
  - Example: This thesis is structured as follows: First a background on XXX is introduced in the following background chapter (or the following section). In chapter 2 the developed algorithm to analyse ... is presented, followed by a comprehensive description of the used data or material. The results are given in chapter 3. A discussion and short outlook conclude this thesis.

The following help newbies in  $\LaTeX$  to learn about sections, math equations and much more.

### 1.1 Quick $\LaTeX$ Tutorial

In this section you get a short overview on how to include sections, figures, tables and math equations into a  $\LaTeX$  document, as well as to reference

**Table 1.1:** Example table with a long legend so that you can see that the line spacing has been reduced in the legend. The font should also be slightly smaller. This makes the whole environment look more compact.

Column 1	Column 2	Column 3	Column 4
xxx1111	xxxxxxx2222222	xxxxxxx333333	xxxxxxx4444
...	...	...	...

these. In addition you will learn how you can manipulate fonts and create bullet points.

### 1.1.1 Including and referencing non-text elements

In  $\LaTeX$  you can add sections (`\section{<title>}`), subsections (`\subsection{<title>}`) and subsubsections (`\subsubsection{<title>}`) by using the respective command. If a section has a very long title, you can add a short title to the command that will appear in you Table of Content instead of the long title: `\section[<short_title>]{<long_title>}`.

By adding the `\label{}` command after a section command you can reference the section within the text. Use the `\ref{}` command for this; e.g. if you want to reference the  $\LaTeX$  tutorial section use the command `\ref{sec:latex}`, this would look like this in text: In section 1.1, some  $\LaTeX$  basics are explained.

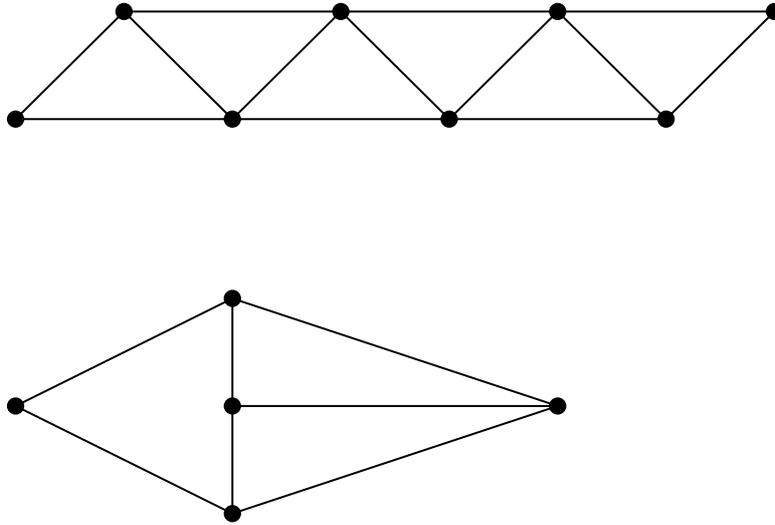
If you want to remove the numbering before a section title, add an asterics to the command (`\subsubsection*{<title>}`). This will then look like the following (note that these sections will not appear in you List of Content):

#### Including Figures

This is how you include a figure in  $\LaTeX$ . Of course you can also reference figures, again use the `\ref{}` command. Figure 1.1 is an example on how a figure could look like. Make sure that figures only appear at the top or bottom of a page.

#### Including Tables

Similarliy to figures, tables can be added to the thesis. In Table 1.1 you see how this can be done. To reference tables you use the same command as for sections or figures. Make sure again as with figures that tables only appear at the top or bottom of a page. Also note that the caption of tables is at the top (i.e., above) of the actual table.



**Figure 1.1:** Describe the most important aspects of your figure in the caption.  
Chordal Graphs

### Including Math Equations

In L<sup>A</sup>T<sub>E</sub>X, you have two possibilities to include mathematical equations. First, you can add in-text equations. E.g. the formula used to calculate the average of a set of values is  $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$ . For this, you put two \$ signs around the equation.

In other cases, the formula might get too big to have it within the text. For these cases, you use a math environment. In a math environment, you can add a label to a formula (e.g. eq. 1.1 is the formula to calculate the density of the normal distribution):

$$g(x) = \frac{1}{2\pi\sigma} \cdot e^{-\frac{(x-\mu)^2}{2\sigma^2}} \quad (1.1)$$

If you need a multi-line math environment use the `flalign` environment (e.g. in eq. 1.2). The formulas are aligned at the position where you put the `&` sign within each line.

$$f(x) = (a + b)^2 \quad (1.2)$$

$$= a^2 + 2ab + b^2 \quad (1.3)$$

By adding an asterisk to the environment command (i.e. `equation*` and `flalign*`, respectively), you remove the numbering of the equations.

## Citations

Last but definitely not least, you learn how to include citations to your thesis. The information for each citation is added to the `mylit.bib` file in BibLaTeX format. If you then want to add a citation to your text, you do this with the `\cite{}` command. You put the citation keys (specified in the `mylit.bib` file) in your command. This can be done with only one citation key [1], but you can also put multiple citation keys in the command [2, 3]. Depending on the citation style you specified in `thesis.tex`, the citations appear within the text.

### 1.1.2 Font Manipulation and Listing

There are many possibilities to manipulate font appearances in L<sup>A</sup>T<sub>E</sub>X. To emphasise a word or expression you can write them *cursive* or **bold**. You can also change the font size using different commands, e.g. `small` or `large`. You can also capitalise all LETTERS in a word.

To include a list, use the `itemize` environment:

- This gives you a list with bullet points
  - If you want to include sub-items you have to create an environment within the environment
- ...

If the list should be enumerated, you can use the `enumerate` environment instead:

1. The items have numbers
  - (a) Again, if you need to include sub-items, you have to create a second environment within the first
2. ...

Good Luck with your Thesis!

# Chapter 2

## Material and Methods

The goal of this chapter is to introduce the specific approach that was followed during the thesis. It should include:

- The description of the data used in the thesis
- An outline and explanation of the software/ pipeline/ algorithm/ etc. developed in the thesis
- If specific paradigms/ tools/ visualisations are used, these should also be explained here
- The (statistical) analyses performed



# Chapter 3

## Results

In this chapter which also could be more than one chapter, depending on the nature of the thesis, the results of the thesis are presented. Make sure you illustrate your results with appropriate figures and tables, but do not discuss the results here. This should be done in a separate discussion chapter.



# Chapter 4

## Discussion

Of course very important! You need to discuss the informatics as well as bio part of your thesis topic.

This section should include the following:

- Short summary of the aim of the study
- Discussion of the results
- Contextualisation of the results/ Putting the results into context (that was set in the introduction)
- You can also discuss limitations of your thesis and formulate an outlook for future/ follow-up research (Outlook can become an extra chapter.)
- Finally, you can add a short conclusion of the main findings/ take aways of the thesis

Take your time for writing the discussion, besides the introduction chapter it is the most important chapter of your thesis.

Also do not subsection the discussion too heavily.

At least 5 pages.



# Appendix A

## Further Tables and Figures

This section can include additional figures, tables et cetera that were not included in the main thesis. This can be very large figures or tables, or tabs and figs that provide additional information that are nice to know but not curcial for the main course of the thesis.



# Bibliography

- [1] G. Saake, I. Schmitt, and C. Türker. *Objektdatenbanken — Konzepte, Sprachen, Architekturen*. Bonn: International Thomson Publishing, 1997.
- [2] K. Schwarz, C. Türker, and G. Saake. *Specifying Advanced Transaction Models as Transaction Closures with Special Transaction Dependency Combinations*. Preprint 5. Fakultät für Informatik, Universität Magdeburg, Feb. 1998.
- [3] C. Türker, S. Conrad, and G. Saake. “Dynamically Changing Behavior: An Agent-Oriented View to Modeling Intelligent Information Systems”. In: *Foundations of Intelligent Systems, Proc. of the 9th Int. Symposium on Methodologies for Intelligent Systems, ISMIS’96, Zakopane, Poland*. Ed. by Z. W. Raś and M. Michalewicz. Vol. 1079. Lecture Notes in Artificial Intelligence. Berlin: Springer-Verlag, June 1996, pp. 572–581.



# Selbständigkeitserklärung

Hiermit versichere ich, dass ich die vorliegende Masterarbeit selbständig und nur mit den angegebenen Hilfsmitteln angefertigt habe und dass alle Stellen, die dem Wortlaut oder dem Sinne nach anderen Werken entnommen sind, durch Angaben von Quellen als Entlehnung kenntlich gemacht worden sind. Diese Masterarbeit wurde in gleicher oder ähnlicher Form in keinem anderen Studiengang als Prüfungsleistung vorgelegt.

Ort, Datum

Unterschrift