Thesis Title

Author Name

Thesis Title

Research Thesis in Partial Fulfillment of the Requiremenets for the Degree of Doctor of Philosophy

Author Name

Submitted to the Senate of the Technion — Israel Institute of Technology
Shebat, 5779, Haifa, January, 2019

This Research Thesis was Done under the Supervision of Professor Advisor Name, in the Faculty of My Faculty.

List of Publications

Some of the results presented in this thesis have been published or submitted for publication. These are:

- Publication 1.
  Chapter 3 is based on this paper.
- Publication 2.
  Chapter 4 is based on this paper.

The generous financial help of the Technion is gratefully acknowledged.

Acknowledgments

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1 Abstract

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Abbreviations

A1	An abbrevation
A2	Another abbrevation

2 Introduction

This is a template for writing a thesis according to the Technion specifications. Please, however, check with the graduate school website to see if any specifications have changed. This template was written by Boaz Shuval (January 2019).

2.1 Instructions

This template is provided as is. Please check with the Technion graduate school website to see if the guidelines have changed, as they often do. For the latest directions from the graduate school, see: https://graduate.technion.ac.il/graduation/thesis-editing/ (This is the website address circa January 2019).

All files use UTF-8 encoding. Make sure your LaTeX system supports this encoding.

2.1.1 Preparing the Thesis

1. The main.tex file is the main file to be compiled. Place it (with the other thesis files) in the same directory as the `.cls` and `.sty` files provided.
2. The main class is `technionThesis.cls.` It has the the following options:
   - hyperref — Add hyperlinks
   - publist — Add a list of publications in the front pages (update list in thesis-setup.sty)
   - addack — Add an acknowledgments page (only for final version!)
   - advisement — Use "advisement" instead of "supervision" in front pages (a pet peeve of mine)
   - spacepar — Add a blank line between paragraphs
   - firstparindent — Indent the first paragraph of a chapter/section
   - libertine — Use a different selection of fonts, based on libertine, for the English part of the thesis. (See note 4)
3. In the file `technionThesisSetup.sty` you must input your details in the various commands. It is pretty self explanatory.
4. The class loads a number of packages that the class author (Boaz Shuval) uses regularly. It also sets up theorem-style environments. If you know what you're doing, feel free to change things as you see fit. Otherwise, leave this alone.

a) Environments are defined using amsthm. The following environments are available:
   - Theorem-style: theorem, lemma, corollary, proposition, conjecture (Heading in bold, text in italics) These all share consecutive numbering, in the format (chapter.number)
   - Definition-style: definition, example, assumption, condition (Heading in bold, text upright) These are numbered (chapter.number) with their own numbering. Assumption and condition have alphanumeric numbering (A,B,C, etc.)
   - Remark-style: remark, question, discussion (Heading in italics, text upright) These are numbered (chapter.number) with their own numbering. Discussion is unnumbered.
   - Proof environments: proof, IEEEproof. Both have a black square at the proof end.

b) Packages loaded (partial listing):
   - mathtools (which loads amsmath)
   - amsthm, amssymb
   - IEEEtrantools (loads IEEEeqnarray, and also sets the bibliography style)
   - graphicx
   - tikz (including various useful tikz libraries)
   - cleveref (for referring to sections, etc, using `\Cref`, automagically adding the header)
   - stackrel
   - accents (for adding symbols above symbols)
   - xspace (for adding a smart space after a macro command)
   - tabto (add a tabstop for lining things up)
   - algorithm2e (ruled, vlined)
   - url
   - polyglossia (for Hebrew support)
   - longtable (for a table that runs over more than one page; useful for the abstract)
   - booktabs, multirow (for nicer tables)

5. Place all of your own commands in the file `Example/technionThesisMacros.sty`. That is, various `\newcommand` and `\DeclareMathOperator` are defined here. I've defined a few useful ones for you to get started.

6. There are now `.tex` files for you to edit:
   - `abstract.tex` for your abstract in English (200-500 words)
   - `habstract.tex` for your abstract in Hebrew (500-2000 words)
   - `acknowledgments.tex` for your acknowledgments in English
   - `hacknowledgments.tex` for your acknowledgments in Hebrew
   - `introduction.tex` for your introduction chapter
   - `chapfirst.tex` for your first chapter
   - `chapsecond.tex` for your second chapter (add additional chapters as you see fit)
   - `discussion.tex` for your discussion/conclusions chapter
   - `appendix.tex` for your appendix (appendices must appear in their own chapters, and not as part of the main text).

2.1.2 Compilation

Compile using xelatex. If you are using latexmk, you may include in the compilation directory a file called `.latexmkrc` with the following line:

`$pdflatex = 'xelatex --shell-escape %O %S';`

This tells latexmk to use xelatex for compilation, so you need not worry about this. You may also compile this on overleaf (again, use xelatex).

The Hebrew portion of the thesis is based on the polyglossia package. It uses the David CLM font for Hebrew. Thus, you must install the culmus fonts for this to work on your installation.

2.1.3 Be a pal

Please share this template with your friends and colleagues. If you enjoyed using it, consider sending me a note to let me know. If you find a bug, or have asuggestion for improvement, I'd love to know about it.

2.2 Files in this Template

- `technionThesis.cls` — The class file
- `technionThesisSetup.sty` — Setup data fields
- `README.md`
- Inside the Example directory:
  - `abbrev.tex`
  - `abstract.tex`
  - `acknowledgments.tex`
  - `appendix.tex`
  - `chapfirst.tex`
  - `chapsecond.tex`
  - `discussion.tex`
  - `habstract.tex` — Hebrew abstract
  - `hacknowledgments.tex` — Hebrew acknowledgments
  - `introduction.tex`
  - `main.tex` — Main thesis file
  - `mybib.bib`
  - `technionThesisMacros.sty` — Define your macros here

2.3 License

This template is licensed under Creative Commons CC BY 4.0.

A rectangle

Figure 2.1: A very long caption for this figure. It is deliberately very long to illustrate the usefulness of the short caption for the table of figures.

2.4 Notes

1. This template was tested on a mac running macOS 10.13, with TEXLIVE2017. It was also tested on overleaf in January 2019, which also runs TEXLIVE2017.

2. There is a bug when using TEXLIVE2018, which manifests itself in the figure/table numbering. If you encounter this bug, use the memoir package from TEXLIVE2017, instead.

3. The template uses the Memoir package internally. The chapter heading design is a modified version of a design by Vincent Zoonekynd (it is modified from the BlueBox style in `https://ctan.org/pkg/memoirchapterstyles`).

4. If using the libertine option, make sure to use the latest version of newtxmath, available from `https://ctan.org/pkg/newtx` (download the file `newtxmath.sty` to the home directory)

2.5 Version History

31 January 2019: Version 1.0

2.6 A Section

The remainder of this file is a boilerplate example Equations are also fine:

$$f(x) = x + 2,$$

as are numbered equations:

$$g(y) = y. \tag{2.1}$$

Of course, one may refer to a numbered equation such as (2.1).

2.7 Second section

In this section we have a figure.

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3 A Chapter

3.1 First Section

This section has a theorem with its proof.

Theorem 3.1. *The Earth is round.*

Proof: Trivial. ■

It also has a corollary.

Corollary 3.2. *The Earth is not flat.*

Proof: Follows from Theorem 3.1. ■

Note the use of the cleveref package here.

We also cite an article [1] and another article [4].

3.2 Second Section

Lemmas are useful, too.

Lemma 3.3. *Roses are red.*

Proof: Violets are blue. ■

Sometimes, we need an example.

Example 3.1. Table 3.1 demonstrates Lemma 3.3.

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Table 3.1: Long caption (now it is)

color	flower
red	rose
blue	violet
yellow	daisy

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Appendix 3.A First appendix

An appendix.

Appendix 3.B Second appendix

And another.

4 Another Chapter

4.1 First Section

This section has a theorem with its proof. It is closely related to Theorem 3.1 from Chapter 3.

Theorem 4.1. *The Earth is not flat.*

Proof: Trivial. ■

It also has a corollary.

Corollary 4.2. *The Earth is round.*

Proof: Follows from Theorem 4.1. ■

Note (again) the use of the cleveref package here.

4.2 Second Section

This section has a remark.

Remark 4.1. Roses are red. See Lemma 3.3 for an explanation.

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5 Discussion

In this chapter, we discuss the results of this thesis. Of course, we must cite a book on matrices [3] and a book on probability [2]. Note that citations appear in alphabetical order.

5.1 A section

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5.2 Another section

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Sed feugiat. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Ut pellentesque augue sed urna. Vestibulum diam eros, fringilla et, con-

sectetuer eu, nonummy id, sapien. Nullam at lectus. In sagittis ultrices mauris. Curabitur malesuada erat sit amet massa. Fusce blandit. Aliquam erat volutpat. Aliquam euismod. Aenean vel lectus. Nunc imperdiet justo nec dolor.

Etiam euismod. Fusce facilisis lacinia dui. Suspendisse potenti. In mi erat, cursus id, nonummy sed, ullamcorper eget, sapien. Praesent pretium, magna in eleifend egestas, pede pede pretium lorem, quis consectetuer tortor sapien facilisis magna. Mauris quis magna varius nulla scelerisque imperdiet. Aliquam non quam. Aliquam porttitor quam a lacus. Praesent vel arcu ut tortor cursus volutpat. In vitae pede quis diam bibendum placerat. Fusce elementum convallis neque. Sed dolor orci, scelerisque ac, dapibus nec, ultricies ut, mi. Duis nec dui quis leo sagittis commodo.

Aliquam lectus. Vivamus leo. Quisque ornare tellus ullamcorper nulla. Mauris porttitor pharetra tortor. Sed fringilla justo sed mauris. Mauris tellus. Sed non leo. Nullam elementum, magna in cursus sodales, augue est scelerisque sapien, venenatis congue nulla arcu et pede. Ut suscipit enim vel sapien. Donec congue. Maecenas urna mi, suscipit in, placerat ut, vestibulum ut, massa. Fusce ultrices nulla et nisl.

Etiam ac leo a risus tristique nonummy. Donec dignissim tincidunt nulla. Vestibulum rhoncus molestie odio. Sed lobortis, justo et pretium lobortis, mauris turpis condimentum augue, nec ultricies nibh arcu pretium enim. Nunc purus neque, placerat id, imperdiet sed, pellentesque nec, nisl. Vestibulum imperdiet neque non sem accumsan laoreet. In hac habitasse platea dictumst. Etiam condimentum facilisis libero. Suspendisse in elit quis nisl aliquam dapibus. Pellentesque auctor sapien. Sed egestas sapien nec lectus. Pellentesque vel dui vel neque bibendum viverra. Aliquam porttitor nisl nec pede. Proin mattis libero vel turpis. Donec rutrum mauris et libero. Proin euismod porta felis. Nam lobortis, metus quis elementum commodo, nunc lectus elementum mauris, eget vulputate ligula tellus eu neque. Vivamus eu dolor.

A Appendices

A.1 Appendices for Chapter 3

A.1.1 A lovely subsection

Nulla ac nisl. Nullam urna nulla, ullamcorper in, interdum sit amet, gravida ut, risus. Aenean ac enim. In luctus. Phasellus eu quam vitae turpis viverra pellentesque. Duis feugiat felis ut enim. Phasellus pharetra, sem id porttitor sodales, magna nunc aliquet nibh, nec blandit nisl mauris at pede. Suspendisse risus risus, lobortis eget, semper at, imperdiet sit amet, quam. Quisque scelerisque dapibus nibh. Nam enim. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Nunc ut metus. Ut metus justo, auctor at, ultrices eu, sagittis ut, purus. Aliquam aliquam.

Etiam pede massa, dapibus vitae, rhoncus in, placerat posuere, odio. Vestibulum luctus commodo lacus. Morbi lacus dui, tempor sed, euismod eget, condimentum at, tortor. Phasellus aliquet odio ac lacus tempor faucibus. Praesent sed sem. Praesent iaculis. Cras rhoncus tellus sed justo ullamcorper sagittis. Donec quis orci. Sed ut tortor quis tellus euismod tincidunt. Suspendisse congue nisl eu elit. Aliquam tortor diam, tempus id, tristique eget, sodales vel, nulla. Praesent tellus mi, condimentum sed, viverra at, consectetuer quis, lectus. In auctor vehicula orci. Sed pede sapien, euismod in, suscipit in, pharetra placerat, metus. Vivamus commodo dui non odio. Donec et felis.

A.1.2 Another lovely subsection

Etiam pede massa, dapibus vitae, rhoncus in, placerat posuere, odio. Vestibulum luctus commodo lacus. Morbi lacus dui, tempor sed, euismod eget, condimentum at, tortor. Phasellus aliquet odio ac lacus tempor faucibus. Praesent sed sem. Praesent iaculis. Cras rhoncus tellus sed justo ullamcorper sagittis. Donec quis orci. Sed ut tortor quis tellus euismod tincidunt. Suspendisse congue nisl eu elit. Aliquam tortor diam, tempus id, tristique eget, sodales vel, nulla. Praesent tellus mi, condimentum sed, viverra at, consectetuer quis, lectus. In auctor vehicula orci. Sed pede sapien, euismod in, suscipit in, pharetra placerat, metus. Vivamus commodo dui non odio. Donec et felis.

Etiam suscipit aliquam arcu. Aliquam sit amet est ac purus bibendum congue. Sed in eros. Morbi non orci. Pellentesque mattis lacinia elit. Fusce molestie velit in ligula. Nullam et orci vitae nibh vulputate auctor. Aliquam eget purus. Nulla auctor wisi sed ipsum. Morbi porttitor tellus ac enim. Fusce ornare. Proin ipsum enim, tincidunt in, ornare venenatis, molestie a, augue. Donec vel pede in lacus sagittis porta. Sed hendrerit

ipsum quis nisl. Suspendisse quis massa ac nibh pretium cursus. Sed sodales. Nam eu neque quis pede dignissim ornare. Maecenas eu purus ac urna tincidunt congue.

A.2 Appendices for Chapter 4

A.2.1 Yet another lovely subsection

Donec et nisl id sapien blandit mattis. Aenean dictum odio sit amet risus. Morbi purus. Nulla a est sit amet purus venenatis iaculis. Vivamus viverra purus vel magna. Donec in justo sed odio malesuada dapibus. Nunc ultrices aliquam nunc. Vivamus facilisis pellentesque velit. Nulla nunc velit, vulputate dapibus, vulputate id, mattis ac, justo. Nam mattis elit dapibus purus. Quisque enim risus, congue non, elementum ut, mattis quis, sem. Quisque elit.

Maecenas non massa. Vestibulum pharetra nulla at lorem. Duis quis quam id lacus dapibus interdum. Nulla lorem. Donec ut ante quis dolor bibendum condimentum. Etiam egestas tortor vitae lacus. Praesent cursus. Mauris bibendum pede at elit. Morbi et felis a lectus interdum facilisis. Sed suscipit gravida turpis. Nulla at lectus. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Praesent nonummy luctus nibh. Proin turpis nunc, congue eu, egestas ut, fringilla at, tellus. In hac habitasse platea dictumst.

A.2.2 Still a lovely subsection

Vivamus eu tellus sed tellus consequat suscipit. Nam orci orci, malesuada id, gravida nec, ultricies vitae, erat. Donec risus turpis, luctus sit amet, interdum quis, porta sed, ipsum. Suspendisse condimentum, tortor at egestas posuere, neque metus tempor orci, et tincidunt urna nunc a purus. Sed facilisis blandit tellus. Nunc risus sem, suscipit nec, eleifend quis, cursus quis, libero. Curabitur et dolor. Sed vitae sem. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Maecenas ante. Duis ullamcorper enim. Donec tristique enim eu leo. Nullam molestie elit eu dolor. Nullam bibendum, turpis vitae tristique gravida, quam sapien tempor lectus, quis pretium tellus purus ac quam. Nulla facilisi.

Duis aliquet dui in est. Donec eget est. Nunc lectus odio, varius at, fermentum in, accumsan non, enim. Aliquam erat volutpat. Proin sit amet nulla ut eros consectetuer cursus. Phasellus dapibus aliquam justo. Nunc laoreet. Donec consequat placerat magna. Duis pretium tincidunt justo. Sed sollicitudin vestibulum quam. Nam quis ligula. Vivamus at metus. Etiam imperdiet imperdiet pede. Aenean turpis. Fusce augue velit, scelerisque sollicitudin, dictum vitae, tempor et, pede. Donec wisi sapien, feugiat in, fermentum ut, sollicitudin adipiscing, metus.

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