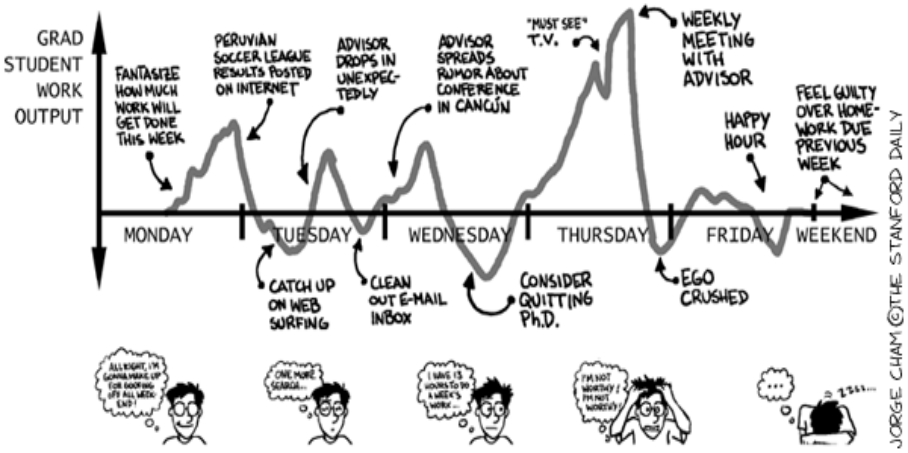
INSTITUTO SUPERIOR DE ENGENHARIA DE LISBOA

Área Departamental de Engenharia de Electrónica e Telecomunicações e de Computadores



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MES, ANO

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β	Second letter of the greek alphabet. 13
α	First letter of the greek alphabet. 13
GCD	Greatest Common Divisor. 13
LCM	Least Common Multiple. 13

Glossário

universal set the set of all things. 12

matrix a rectangular table of elements. 13

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Introduction

This package is distributed under GPLv3 License. If you have questions or doubts concerning the guarantees, rights and duties of those who use packages under GPLv3 License, please read http://www.gnu.org/licenses/gpl.html.

A marginpar note!

A a note in a line by itself.

Please note that

this package and template are not official for ISEL/IPL.

2

ThesisISEL User's Manual

2.1 Introduction

This chapter describes how to use the LaTeX style thesis. This style file is a major rewrite from the most of Universities, which was in turn adapted from a style file from the FCT-UNL (not official version). We aimed at providing an improved visual layout and, simultaneously, a very easy to use template (aka, a LaTeX template for dummies).

The first main rule you must know is that **you must** specify the encoding of your text files. A simple rule of thumb is: if you are using Windows add 'latin1' to the list of package options; if you are using other systems, such as Linux or Mac OSx, add 'utf8' to the list of package options.

2.2 Folder Structure

The template file for writing dissertations in LaTeX is organized into a main directory, a set of files and sub-directories:

ThesisISEL This is the main directory and includes:

(a) **Logo** Directory with Faculty logos;

(b) **sty** Directory will all sty files that help in formatting document;

(c) **Chapters** Directory where to put user files (text and figures);

i. **scripts** Directory with useful bash scripts, e.g., for cleaning all temporary files;

ii. **img** Directory with all images of your thesis;

(d) **alpha-pt.bst** A file with bibliography names in portuguese, e.g., 'Relatório Técnico' e 'Tese de Mestrado' instead of 'Technical Report' and 'Master Thesis'. This file is used automatically if Portuguese is selected as the main language (see below);

(e) **defaults.tex** A file with the main default values for the package (institution name, faculty's logo, degree name and similars);

(f) **personaldataofthesis.tex** A file with the main default values for the package (identification of report as well as the author and juries);

(g) **template.tex** The main file. You should run `LaTeX` in this one. Please refrain from changing the file content outside of the well defined area;

(h) **bibliography.bib** The bib file. An easy way to find to import citation into `bibtex` is select option `Show links to import citation into BibTex` in `Scholar google settings`.

(i) **thesisisel.cls** The `LaTeX` class file for the thesis style. Currently, some of the defaults are stored here instead of `defaults.tex`. This file should not be changed, unless you're ready to play with fire! :)

Again, we would like to recall that all the user `LaTeX` files should be stored in the `ThesisISEL` directory, and all the images in `ThesisISEL/Chapters/img` directory.

Yet another note!

2.3 Package Options

The thesis style includes the following options, that must be included in the options list in the `\documentclass[options]{thesisisel}` line at the top of the `template.tex` file.

The list below aggregates related options in a single item. For each list, the default value is prefixed with a *.

2.3.1 Language Related Options

You must choose the main language for the document. The available options are:

1. ***pt** — The text is written in Portuguese (with a small abstract in English).
2. **en** — The text is written in English (with a small abstract in Portuguese).

The language option affects:

- **The order of the summaries.** At first the abstract in the main language and then in the foreign language. This means that if your main language for the document in english, you will see first the abstract (in english) and then the 'resumo' (in portuguese). If you switch the main language for the document, it will also automatically switch the order of the summaries.
- **The names for document sectioning.** E.g., 'Chapter' vs. 'Capítulo', 'Table of Contents' vs. 'Índice', 'Figure' vs. 'Figura', etc.
- **The type of documents in the bibliography.** E.g., 'Technical Report' vs. 'Relatório Técnico', 'MSc Thesis' vs. 'Tese de Mestrado', etc.

No mater which language you chose, you will always have the appropriate hyphenation rules according to the language at that point. You always get portuguese hyphenation rules in the 'Resumo', english hyphenation rules in the 'Abstract', and then the main language hyphenation rules for the rest of the document. If you need to force hyphenation write inside of `\hyphenation{}` the hyphenated word, e.g. `\hyphenation{op-ti-cal net-works}`.

2.3.2 Class of Text

You must choose the class of text for the document. The available options are:

1. **bsc** — BSc graduation report.
2. **prepmsc** — Preparation of MSc dissertation. This is a preliminary report graduate students at ISEL/IPL must prepare to conclude the first semester of the two-semesters MSc work. The files specified by (a) `\dedicatoryfile` and (b) `\acknowledgmentsfile` are ignored, even if present, for this class of document.
3. **msc** — MSc dissertation.

2.3.3 Printing

You must choose how your document will be printed. The available options are:

1. **oneside** — Single side page printing, and
2. ***twoside** — Double sided page printing.

The article 50th, of Decree-Law No. 115/2013, requires the deposit of a digital copy of doctoral thesis and master's dissertations in a repository that is part of the RCAAP repository[1], `https://www.rcaap.pt`. This deposit aims to preserve scientific work, as well as providing Open Access to scientific production is not restricted object or embargo.

For the reason explained above, we include the option to format your thesis in a way that presents well on screen and/or on paper. But always remember that your work will be stored in the RCAAP portal in electronic format.

The available options are:

1. ***onpaper** — Format your thesis in a way that presents on paper or,
2. **onscreen** — on screen.

2.3.4 Font Size

You must select the encoding for your text. The available options are:

1. **11pt** — Eleven (11) points font size.
2. ***12pt** — Twelve (12) points font size. You should really stick to 12pt...

2.3.5 Text Encoding

You must choose the font size for your document. The available options are:

1. **latin1** — Use Latin-1 (ISO 8859-1) encoding. Most probably you should use this option if you use Windows;
2. **utf8** — Use UTF8 encoding. Most probably you should use this option if you are not using Windows.

[1] Repositórios Científicos de Acesso Aberto de Portugal

2.3.6 Examples

Let's have a look at a couple of examples:

- BSc graduation report, in portuguese, with 11pt size and to be printed one sided (I wonder why one would do this!)
  `\documentclass[bsc,pt,11pt,oneside,latin1]{thesisisel}`
- Preparation of MSc thesis, in portuguese, with 12pt size and to be printed one sided (I wonder why one would do this!). Note that, `pt` is declared by default, so it can be omitted:
  `\documentclass[prepmsc,12pt,oneside,latin1]{thesisisel}`
- MSc dissertation, in english, with 12pt size and to be printed double sided on screen. Note that, `twoside` and `12pt` are declared by default, so it can be omitted:
  `\documentclass[msc,en,utf8,onscreen]{thesisisel}`

The present document is defined according to the following settings:

```
\documentclass[msc,pt,twoside,12pt,a4paper,utf8,onscreen,hyper⌋
 ↪ ref=true,listof=totoc]
 ↪ {thesisisel}
```

2.4 How to Write Using LaTeX

Please have a look at Chapter 3, where you may find many examples of LaTeX constructs, such as sectioning, inserting figures and tables, writing equations, theorems and algorithms, exhibit code listings, etc.

3

A Short LaTeX Tutorial with Examples

This Chapter aims at exemplifying how to do common stuff with LaTeX. We also show some stuff which is not that common! ;)

Please, use these examples as a starting point, but you should always consider using the Big Oracle (aka, Google, your best friend) to search for additional information or alternative ways for achieving similar results.

3.1 Document Structure

In engineering and science, a thesis or dissertation is the culmination of a master's or Ph.D. degree. A thesis or dissertation presents the research that the student performed for that degree. From the student's perspective, the primary purpose of a thesis or dissertation is to persuade the student's committee that he or she has performed and communicated research worthy of the degree. In other words, the main purpose of the thesis or dissertation is to help the student secure the degree. From the perspective of the engineering and scientific community, the primary purpose is to document the student's research. Although much research from theses and dissertations is also communicated in journal articles, theses and dissertations stand as detailed documents that allow others to see what the work was and how it was performed. For that reason, theses and dissertations are often read by other graduate students, especially those working in the research group of the authoring student.

With a thesis or dissertation, the format also encompasses the names of the sections that are expected:

1. Thesis Cover
2. Acknowledgments (if exist)
3. Abstract (Portuguese and English)
4. Index
5. List of Figures
6. List of Tables
7. Nomenclature/List of Abbreviations (if exists)
8. Glossary (if exists)
9. Introduction
10. State-of-the-Art or Related work
11. Proposed method
12. Experiment result
13. Conclusion and Future work
14. References, and
15. Appendix (if exists)

3.1.1 State-of-the-Art

State-of-the-Art (SoTA) is a step to demonstrate the novelty of your research results. The importance of being the first to demonstrate research results is a cornerstone of the research business[1].

Besides demonstrating the novelty of your research results, a SoTA has other important properties:

[1] "Why and how to write the state-of-the-art", by Babak A. Farshchian, May 22, 2007

1. It teaches you a lot about your research problem. By reading literature related to your research problem you will learn from other researchers and it will be easier for you to understand and analyze your problem;
2. It proves that your research problem has relevance;
3. It shows different approaches to a solution;
4. It shows what you can reuse from what others have done.

3.1.2 Related work

In the *Related Works* section, you should discuss briefly about published matter that technically relates to your proposed work[2]

A short summary of what you can include (but not limited to) in the Related Works section:

1. Work that proposes a different method to solve the same problem;
2. Work that uses the same proposed method to solve a different problem;
3. A method that is similar to your method that solves a relatively similar problem;
4. A discussion of a set of related problems that covers your problem domain.

3.2 Glossary and Nomenclature/List of Symbols

Many technical documents use terms or acronyms unknown to the general population. It is common practice to add a glossary to make such documents more accessible. A *glossary* is a nice thing to have in a report and usually very helpful. As you probably can imaging, it is very easy to create in Latex.

As with all packages, you need to load glossaries with `\usepackage`, but there are certain packages that must be loaded before glossaries, if they are required: `hyperref`, `babel`, `polyglossia`, `inputenc` and `fontenc`.

```
\usepackage{glossaries}
\makenoidxglossaries
```

[2] https://academia.stackexchange.com/questions/68164/how-to-write-a-related-work-section-in-computer-science

Once you have loaded `glossaries`, you need to define your terms in the preamble (or, separated file) and then you can use them throughout the document.

Next you need to define the terms you want to appear in the glossary. Again, this must be done in the preamble. This is done using the command

```
\newglossaryentry{<label>}{<key-val list>}
```

The first argument `<label>` is a unique label to allow you to refer to this entry in your document text. The entry will only appear in the glossary if you have referred to it in the document using one of the commands listed later. The second argument is a comma separated `<key>=<value>` list.

Inside the text you just need to use the command `\gls{name}` or `\glspl{name}` (plural name) to call it. For example, the following defines the term 'set' and assigns a brief description. The term is given the label set. This is the minimum amount of information you must give:

```
\newglossaryentry{set} % the label
{ name=set,             % the term
  description={a collection of objects}  % a brief description
}
```

Other example, now the glossary associated with a symbol, universal set:

```
\newglossaryentry{U}   % the label
{ name={universal set}, % the term
  description={the set of all things}  % a brief description
  symbol={\ensuremath{\mathcal{U}}}   % the associated symbol
}
```

Here's a simple example:

```
\usepackage{glossaries}
\newglossaryentry{ex}{name={sample},description={an example}}
\newacronym{svm}{SVM}{support vector machine}
\newacronym{beta}{$\beta$}{Second letter of the greek alphabet}
\newacronym{alpha}{$\alpha$}{First letter of the greek alphabet}
```

```
\begin{document}
Here's my \gls{ex} term. First use: \gls{svm}.
Second use: \gls{svm}.

\textit{I want the \gls{beta} to be listed after the \gls{alpha}}.
\end{document}
```

This produces: *Here's my sample term. First use: support vector machine (SVM).*
Second use: SVM.
I want the Second letter of the greek alphabet (β) to be listed after the First letter of the greek alphabet (α).

Do not use `\gls` in chapter or section headings as it can have some unpleasant side-effects. Instead use `\glsentrytext` for regular entries and one of `\glsentryshort`, `\glsentrylong` or `\glsentryfull` for acronyms. Alternatively use glossaries-extra which provides special commands for use in section headings, such as `\glsfmtshort{<label>}`.

The plural of the word "matrix" is "matrices" not "matrixs", so the term needs the plural form set explicitly:

```
\newglossaryentry{matrix}% the label
{ name=matrix, % the term
  description={a rectangular table of elements},
plural=matrices % the plural
}
```

Given a set of numbers, there are elementary methods to compute its Greatest Common Divisor, which is abbreviated GCD. This process is similar to that used for the Least Common Multiple (LCM).

3.3 Importing Images

3.4 Floats Figures and Tables, and Captions

The tabular environment can be used to typeset tables with optional horizontal and vertical lines. LaTeX determines the width of the columns automatically. The first line

of the environment has the form: `\begin{tabular}[pos]{table spec}`

table spec tells LaTeX the alignment to be used in each column and the vertical lines to insert.

pos can be used to specify the vertical position of the table relative to the baseline of the surrounding text.

The number of columns does not need to be specified as it is inferred by looking at the number of arguments provided. It is also possible to add vertical lines between the columns here.

Some notes are important to followed, such as present in Tabela 3.1:

i) Not defined vertical lines;

ii) The legend must be on top;

iii) Use `\toprule`, `\midrule` and `\bottomrule` to draw horizontal lines.

Tabela 3.1: Table's rules.

Item		
Animal	Description	Price ($)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

There are two ways to incorporate images into your LaTeX document, and both use the graphicx package by means of putting the command `\usepackage{graphicx}` near the top of the LaTeX file, just after the documentclass command.

The two methods are

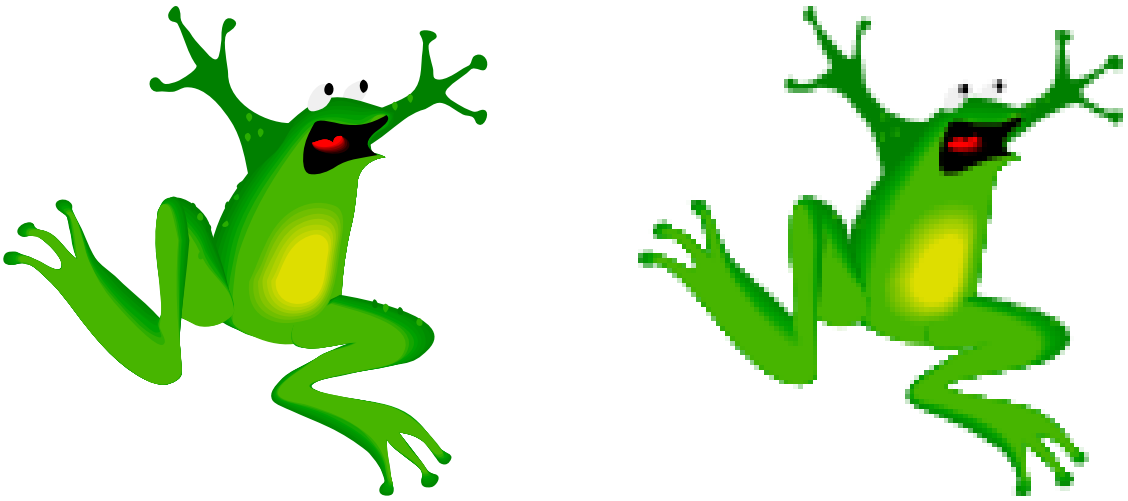
- include only PostScript images (esp. 'Encapsulated PostScript') if your goal is a PostScript document using dvips;
- include only PDF, PNG, JPEG and GIF images if your goal is a PDF document using pdflatex, TeXShop, or other PDF-oriented compiler.

Some PNG images within my LaTeX document. The quality of the image files is sufficient and the result using LaTeX and viewing the resulting DVI file is quite looks good.

To get the best quality of the images in PDF files I'd recommend using vector-based graphics for images. The best format to save images in is .pdf, see Figure 3.1(a). With programs like `Inkscape`, you can draw as you would in MS Paint (and do much more), and because the images are vector-based instead of pixel-based, their quality should be preserved when converting to PDF in any way.

In all cases, each image must be in an individual 1-image file; no animation files or multipage documents.

There are two different ways to place two figures/tables side-by-side. The `subfigure` package provides functionality to arrange figures and tables next to each other, within the usual figure-floating-environment. Subfigure will alphabetically number your subfigures and you have access to the complete reference Figura 3.1 as usual through `\figurename~\ref{fig:subfig1}`, or (a) to the letter only or either Figura 3.1(b) through `\subref{fig:subfig1}` and `\figurename~\ref{fig:ra-raster}`, respectively.



(a) Vectorial (b) Raster

Figura 3.1: Subfigure example with vectorial and no-vectorial images

Using the package listings you can add non-formatted text as you would do with `\begin{verbatim}` but its main aim is to include the source code of any programming language within your document. If you wish to include pseudocode or algorithms see LaTeX/Algorithms_ and_Pseudocode, as Listagem 3.1.

```
59      private static void printSet(Set set) {  // comment
60          int[] elements = set.getElements();
61          System.out.print('{');
62          for (int i = 0; i < elements.length; i++) {
```

```
63              System.out.print(elements[i] + (i == elements.length-1 ?
    "" : ","));
64          }
```

Listagem 3.1: Static method - SetApp

```
1  # comentário
2  square <- function(x) {
3      x^2
4      % |$x^{2}$|
5  }
6
7  # nerv
8  x <- c(1:100)
9  y <- square(x)
```

Listagem 3.2: R-Code (Test).

3.5 Generating PDFs from LaTeX

3.5.1 Generating PDFs with pdflatex

You may create PDF files either by using `latex` to generate a DVI file, and then use one of the many DVI-2-PDF converters, such as `dvipdfm`.

Alternatively, you may use `pdflatex`, which will immediately generate a PDF with no intermediate DVI or PS files. In some systems, such as Apple, PDF is already the default format for `LaTeX`. I strongly recommend you to use this approach, unless you have a very good argument to go for `latex` + `dvipdfm`.

A typical pass for a document with figures, cross-references and a bibliography would be:

```
$ pdflatex template
$ bibtex template
$ pdflatex template (twice)
```

You will notice that there is a new PDF file in the working directory called `template.pdf`. Simple :)

Please note that, to be sure all table of contents, cross-references and bibliography citations are up-to-date, you must run `latex` once, then `bibtex`, and then `latex` twice.

3.5.2 Dealing with Images

You may process the same source files with both `latex` or `pdflatex`. But, if your text include images, you must be careful. `latex` and `pdflatex` accept images in different (exclusive) formats. For `latex` you may use EPS ou PS figures. For `pdflatex` you may use JPG, PNG or PDF figures. I strongly recommend you to use PDF figures in vectorial format (do not use bitmap images unless you have no other choice).

3.5.3 Creating Source Files Compatible with both latex and pdflatex

Do not include the extension of the file in the `\includegraphics` command, use: `\includegraphics{evolution_steps}`, and not:
`\includegraphics{ evolution_steps.png}`.
In the first form, `latex` or `pdflatex` will add an appropriate file extension.

This means that, if you plan to use only `pdflatex`, you need only to keep (preferably) a PDF version of all the images. If you plan to use also `latex`, then you also need an EPS version of each image.

To be included in the sections above

If you are writing only one or two documents and aren't planning on writing more on the same subject for a long time, maybe you don't want to waste time creating a database of references you are never going to use. In this case you should consider using the basic and simple bibliography support that is embedded within `LaTeX`.

`LaTeX` provides an environment called `thebibliography` that you have to use where you want the bibliography; that usually means at the very end of your document, just before the `\end{document}` command. Here is a practical example:

```
\begin{thebibliography}{9}
\bibitem{lamport94}
  Leslie Lamport,
  \emph{\LaTeX: A Document Preparation System}.
  Addison Wesley, Massachusetts,
  2nd Edition,
  1994.
\end{thebibliography}
```

In this document, the bibliography is in a separate document: `bibliography.bib` where information is entered from `https://scholar.google.pt/`, as show Figura 3.2.

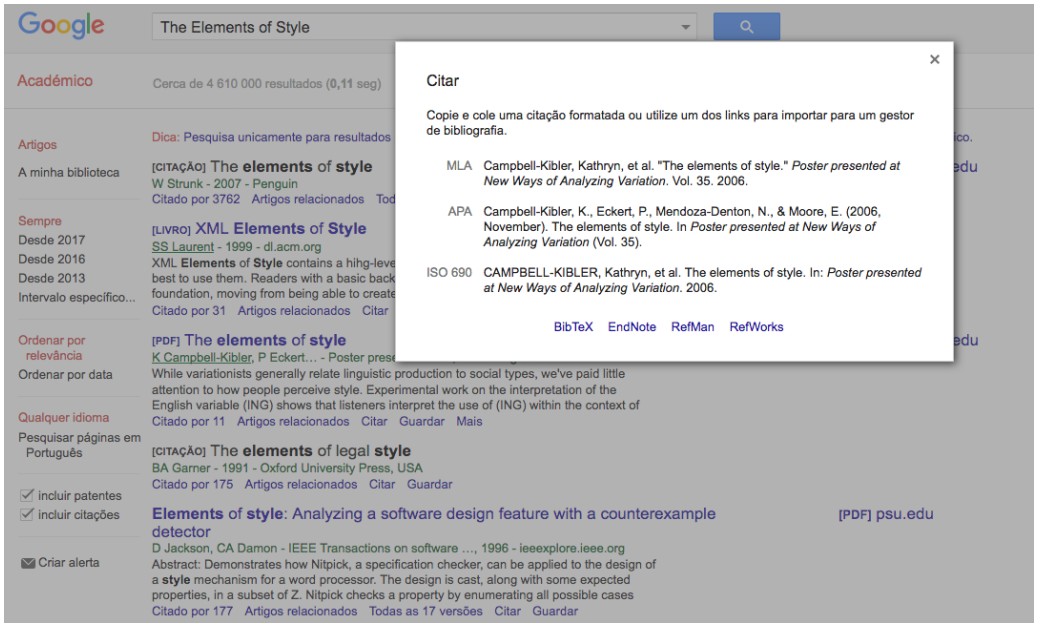


Figura 3.2: Screenshot from Scholar Google

To actually, cite a given document is *very* easy. Go to the point where you want the citation to appear, and use the following: `\cite{citekey}`, where the `citekey` is that of the `bibitem` you wish to cite, e.g `~\cite{lamport94}`. When `LaTeX` processes the document, the citation will be cross-referenced with the bibitems and replaced with the appropriate number citation. The advantage here, once again, is that `LaTeX` looks after the numbering for you.

When a sequence of multiple citations are needed, you should use a single `\cite{}` command. The citations are then separated by commas. Note that you must not use spaces between the citations. Here's an result example [1, 3, 4].

Footnotes are a very useful way of providing extra information to the reader. Usually, it is non-essential information which can be placed at the bottom of the page. This keeps the main body of text concise.

The footnote facility is easy to use: `\footnote{Simple footnote}`[3].

[3]Simple footnote

3.6 Equations

Typesetting mathematics is one of LaTeX's greatest strengths. It is also a large topic due to the existence of so much mathematical notation. It is recommend to read the following document available in Short Math Guide for LaTeX - AMS - American Mathematical Society.

3.7 Page orientation

The default page layout is "portrait", but sometimes it is still useful/necessary to have the whole document or only single pages changed to "landscape". The latter might be due to a large table or figure. If you want to make appear the left side up, better readable on screen, the pdflscape-package will do it: `\usepackage{pdflscape}`

and again:

```
\begin{landscape}
...
\end{landscape}
```

or, `\includepdf[landscape=true,pages={1}]{example.pdf}`

to put the page in "landscape", while the rest will remain in "portrait" orientation. Nevertheless, the header/footer will also be changed in orientation.

Written by Matilde Pós-de-Mina Pato with collaboration of Nuno Datia,
2012 October (1st version)

Written by Matilde Pós-de-Mina Pato,
15 de Junho de 2020 – versão 2.5.3 (last version)

Referências

[1] Gretchen Webster, *The Chicago Manual of Style*, 17th edition. University of Chicago Press, 2017, páginas 400–401, ISBN: 978-0-226-28705-8.

[2] J. Bruin. (fev. de 2011). Newtest: Command to compute new test @ONLINE, URL: http://www.ats.ucla.edu/stat/stata/ado/analysis/.

[3] William Strunk & Richard De A'Morelli, *The Elements of Style: Classic Edition*, 1st edition. Spectrum Ink Publisher.

[4] Donald E. Knuth, *The TeXbook*. Addison-Wesley Publisher, 1984.

Applied Survival Analysis by Hosmer and Lemeshow

Stata Textbook Examples Applied Survival Analysis by Hosmer and Lemeshow [2]

The data files used for the examples in this text can be downloaded in a zip file from the Wiley FTP website or the Stata Web site.

```
# The R package(s) needed for this chapter is the survival package.
# We currently use R 2.0.1 patched version. You may want to make sure
# that packages on your local machine are up to date. You can perform
# updating in R using update.packages() function.

# url: http://www.ats.ucla.edu/stat/r/examples/
# data set is hmohiv.csv.
hmohiv<-read.table("http://www.ats.ucla.edu/stat/r/examples/asa/hmohiv.csv"
    , sep=",", header = TRUE)
attach(hmohiv)
hmohiv

# using the hmohiv data set. To control the type of symbol, a variable
    called psymbol is created.
# It takes value 1 and 2, so the symbol type will be 1 and 2.
psymbol<-censor+1
table(psymbol)

plot(age, time, pch=(psymbol))
```

```
18 legend(40, 60, c("Censor=1", "Censor=0"), pch=(psymbol))
19
20 age1<-1000/age
21 plot(age1, time, pch=(psymbol))
22 legend(40, 30, c("Censor=1", "Censor=0"), pch=(psymbol))
23
24 # Package "survival" is needed for this analysis and for most of the
       analyses in the book.
25 library(survival)
26 test <- survreg( Surv(time, censor) ~ age, dist="exponential")
27 summary(test)
28
29 pred <- predict(test, type="response")
30 ord<-order(age)
31 age_ord<-age[ord]
32 pred_ord<-pred[ord]
33 plot(age, time, pch=(psymbol))
34 lines(age_ord, pred_ord)
35 legend(40, 60, c("Censor=1", "Censor=0"), pch=(psymbol))
```