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Master of Science

# A Very Long and Impressive Thesis Title with a Forced Line Break

Dissertação para obtenção do Grau de Doutor em Informática

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# AGRADECIMENTOS

The acknowledgements. You are free to write this section at your own will. However, usually it starts with the institutional acknowledgements (adviser, institution, grants, workmates,  $\dots$ ) and then comes the personal acknowledgements (friends, family,  $\dots$ ).

«You cannot teach a man anything; you can only help him discover it in himself.» (Galileo)

#### RESUMO

Independentemente da língua em que está escrita a dissertação, é necessário um resumo na língua do texto principal e um resumo noutra língua. Assume-se que as duas línguas em questão serão sempre o Português e o Inglês.

O *template* colocará automaticamente em primeiro lugar o resumo na língua do texto principal e depois o resumo na outra língua. Por exemplo, se a dissertação está escrita em Português, primeiro aparecerá o resumo em Português, depois em Inglês, seguido do texto principal em Português. Se a dissertação está escrita em Inglês, primeiro aparecerá o resumo em Inglês, depois em Português, seguido do texto principal em Inglês.

O resumo não deve exceder uma página e deve responder às seguintes questões:

- Qual é o problema?
- Porque é que ele é interessante?
- Qual é a solução?
- O que resulta (implicações) da solução?

E agora vamos fazer um teste com uma quebra de linha no hífen a ver se a ŁŒZ duplica o hífen na linha seguinte...

Sim! Funciona!:)

Palavra-chave: Palavra-chave 1, Palavra-chave 2, Palavra-chave 3, ...

#### **ABSTRACT**

The dissertation must contain two versions of the abstract, one in the same language as the main text, another in a different language. The package assumes that the two languages under consideration are always Portuguese and English.

The package will sort the abstracts in the appropriate order. This means that the first abstract will be in the same language as the main text, followed by the abstract in the other language, and then followed by the main text. For example, if the dissertation is written in Portuguese, first will come the summary in Portuguese and then in English, followed by the main text in Portuguese. If the dissertation is written in English, first will come the summary in English and then in Portuguese, followed by the main text in English.

The abstract shoul not exceed one page and should answer the following questions:

- What's the problem?
- Why is it interesting?
- What's the solution?
- What follows from the solution?

Keywords: Keyword 1, Keyword 2, Keyword 3, ...

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# Glossário

# **SIGLAS**

DI Department of Computer Science and Informatics

FCT NOVA School of Science and Technology

NOVA NOVA University Lisbon NOVAthesis NOVAthesis LaTeX template

novathesis.cls novathesis.cls class

# Símbolos

CAPÍTULO

#### INTRODUCTION

This work is licensed under the MEX Project Public License v1.3c. To view a copy of this license, visit LaTeXprojectpubliclicense.

### 1.1 The NOVAthesis template

The NOVAthesis LaTeX template (NOVAthesis) was initially directed to the PhD and MSc students thesis at Department of Computer Science and Informatics (DI) of the NOVA School of Science and Technology (FCT) of the NOVA University Lisbon (NOVA), Portugal, but currently (v5.1.5) it supports other degrees and Schools, namely:

- NOVA University Lisbon
  - NOVA School of Science and Technology (FCT-NOVA)
  - NOVA Information Management School (NOVA-IMS)
  - National School of Public Heath (ENSP-NOVA)
  - Faculdade de Ciências Humanas e Sociais (FCSH-NOVA)
- University of Lisbon
  - Instituto Superior Técnico from Universidade de Lisboa (IST-UL)
  - Faculdade de Ciências from Universidade de Lisboa (FC-UL)
- Instituto Politécnico de Lisboa
  - Instituto Superior de Engenharia de Lisboa (ISEL-IPL)
- Instituto Politécnico de Setúbal

- Escola Superior de Saúde (ESS-IPS)
- Escola Superior de Tecnologia do Barreiro (ESTB-IPS)
- Escola Superior de Enfermagem do Porto (ESEP)

The template provides an *easy to use* setting for you to write your thesis/dissertation in MT<sub>F</sub>X:

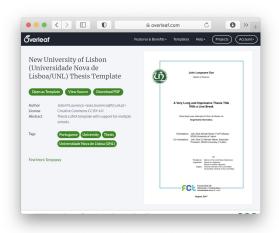
- Select your school;
- Fill your thesis metadata (title, research field, etc) in the file "template.tex";
- Create your thesis/dissertation contents using the files in folder "Chapters"; and
- Process using you favorite MTFX processor (pdfMTFX, XTMTFX or LuaMTFX).

#### 1.2 Getting Started

#### 1.2.1 Using Overleaf

Just access the NOVAthesis LaTeX template in Overleaf and select the green button *Open as Template*.

Please note that the version currently available in Overleaf (v4.1.3) is outdated. A new version will be submitted to Overleaf soon.



#### 1.2.2 Using a Local LTFX Installation

Just access the NOVAthesis LaTeX template

in GitHub, select the green button *Code* and then *download* (or *clone*) the template. You will always get the latest version of the template (currently v5.1.5).

# 1.3 Getting Help

# Please do not send me emails! I will not answer th

#### 1.3.1 Google

Remember, when looking for hints or help, *Google is your best friend*! And if you prefix your Google query with "*LaTeX*", your fist link will most probably direct you to tex.stackexchange.com.



#### 1.3.2 Group Support

To get directed help on the NOVAthesis LaTeX template please join:

- the NOVAtheis Facebook group, or
- the NOVAthesis Google group.

There were huge changes from version 4.x.y to version 5.a.b so, please, **always** state the version number you are using when asking for help.

#### 1.3.3 Reporting Problems

If you just need some help, see above Sections 1.3.1 and 1.3.2.

If you believe *you found a bug* or if *you need some improvement* in the template, please fill an issue in github at https://github.com/joaomlourenco/novathesis/issues.

#### 1.4 Donations

This template is the result of hundreds (yes! *may hundreds*!) of hours of work from the main developer. If you think this template really made you life easier while writing your thesis, please consider **making a donation**. We will keep a list thanking to all the identified donors that identify themselves in the "*Add special instructions to the seller*" box.

#### Donnors 2020

João Carvalho, David Romão, DisplayersereStream, and António Estêvão.

#### Donnors 2019

Jorge Barreto and Raissa Almeida.

#### 1.5 Disclaimer

Although this template is endorsed by the FCT-NOVA and even linked from its web site, this is stil not an official template. This template exists to make your life easier and we do our best to make the NOVAthesis template compliant to the supported Schools' regulations, but in the end of the line you and only you are accountable for both the look and the contents of the document you submit as your thesis/dissertation.

CAPITULO

# THESISDIFCTNL USER'S MANUAL

# 2.1 Introduction

This chapter describes how to use the NOVAthesis LaTeX template (NOVAthesis) and the novathesis.cls class (novathesis.cls) file.

Let's start with some simple suggestions: [6, 10].

CAPÍTULO

# A SHORT LATEX TUTORIAL WITH EXAMPLES

This Chapter aims at exemplifying how to do common stuff with MEX. 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 al-ternative ways for achieving similar results.

- 3.1 Document Structure
- 3.2 Dealing with Bibliogrpahy
- 3.3 Inserting Tables
- 3.4 Importing Images

#### 3.5 Floats, Figures and Captions

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus.

Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

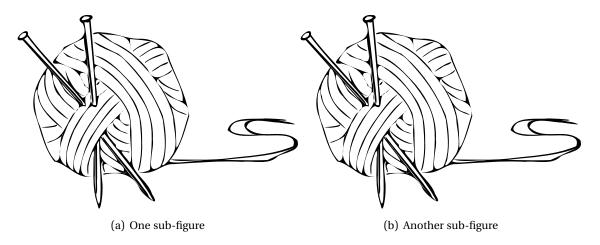


Figura 3.1: A figure with two sub-figures!

#### And this is a small text that references the Figure 3.1 and its Subfigures 3.1(a) and 3.1(b).

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

# 3.6 Text Formatting

# 3.7 Generating PDFs from **MFX**

#### 3.7.1 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 MEX. 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
- \$ pdflatex template

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 bibliographic citations are up-to-date, you must run latex once, then bibtex, and then latex twice.

### 3.7.2 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).

### 3.7.3 Creating Source Files Compatible with both latex and pdflatex

Do not include the extension of the file in the  $\include{a}$  the  $\include{a}$  command. E.g., use  $\include{a}$  sonwman}

and not

\includegraphics{sonwman.eps}.

If you use 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

Para fazer citações, deverá usar-se a chave da referência no ficheiro BibTeX. Se for uma única referência [2], usar um "~" para ligar o \cite{...} à palavra que o precede (...referência~\cite{Artho04}] Caso queira fazer múltiplas citações [7, 8, 6], deverá agrupá-las dentro de um úinico \cite{...}.

Note que o ficheiro de bibliografia pode ter tantas entradas quantas quiser. Apenas aquelas cuja chave seja referenciada no texto é que serão incluidas na listagem de bibliografia.

Footnotes<sup>1</sup> will be numbered and shown in the bottom of the page.

A Tabela 3.1 ilustra alguns conceitos importantes associados à contrução de tabelas:

- i) Não usar linhas verticais;
- ii) A legenda deve ficar por cima da tabela;
- iii) Usar as macros \toprule, \midrule e \bottomrule para fazer a linha horizontal superior, interiores e inferior, respectivamente.

Test	Anomalies	Warnings	Correct	Categories	Missed
[3] Connection	2	2	1	C	1
[1] Coordinates'03	1	4	1	2B, 1C	0
[1] Local Variable	1	2	1	A	0
[1] NASA	1	1	1	_	0
[2] Coordinates'04	1	4	1	3C	0
[2] Buffer	0	7	0	2A, 1B, 2C, 2D	0
[2] Double-Check	0	2	0	1A, 1B	0
[4] StringBuffer	1	0	0	_	1
[9] Account	1	1	1	_	0
[9] Jigsaw	1	2	1	C	0
[9] Over-reporting	0	2	0	1A, 1C	0
[9] Under-reporting	1	1	1	_	0
[5] Allocate Vector	1	2	1	C	0
Knight Moves	1	3	1	2B	0
Total	12	33	10	5A, 6B, 10C, 2D	2

Tabela 3.1: Test results summary.

As figuras a inserir no documento deverão ser de qualidade, preferencialmente em formato vectorial (PDF vectorial) e não em *bitmap* (PNG, JPG, etc). As imagens *bitmap* (Figura 3.2) não escalam bem e têm reflexos negativos na qualidade do seu docuemnto. Pelo contrário, as imagens *vectoriais* Figura 3.3 escalam muito tanto quanto o necessário sem degradar a qualidade da imagem.

Só deve usar *screenshots* se não tive mesmo nenhuma alternativa. Em vez e gerar um *screenshot*, tente usar uma impressora virtual PDF e imprimir para um ficheiro PDF. Regra geral obterá um PDF vetorial. Mesmo que o seu PDF contenha imagens, elas terão sempre qualidade maior ou igual à que obteria com um *screenshot*.

<sup>&</sup>lt;sup>1</sup>This is a simple footnote.

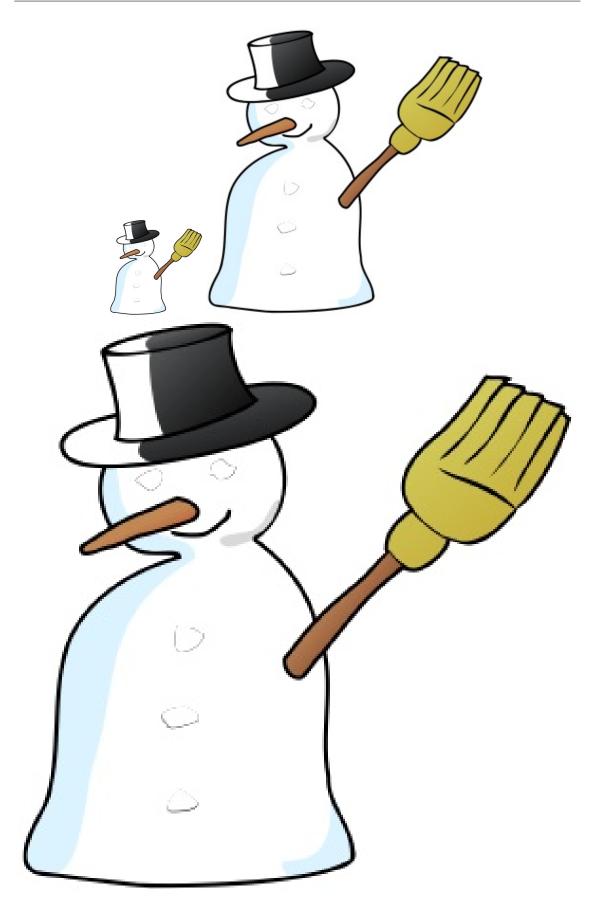


Figura 3.2: Imagem em formato bitmap (JPG)

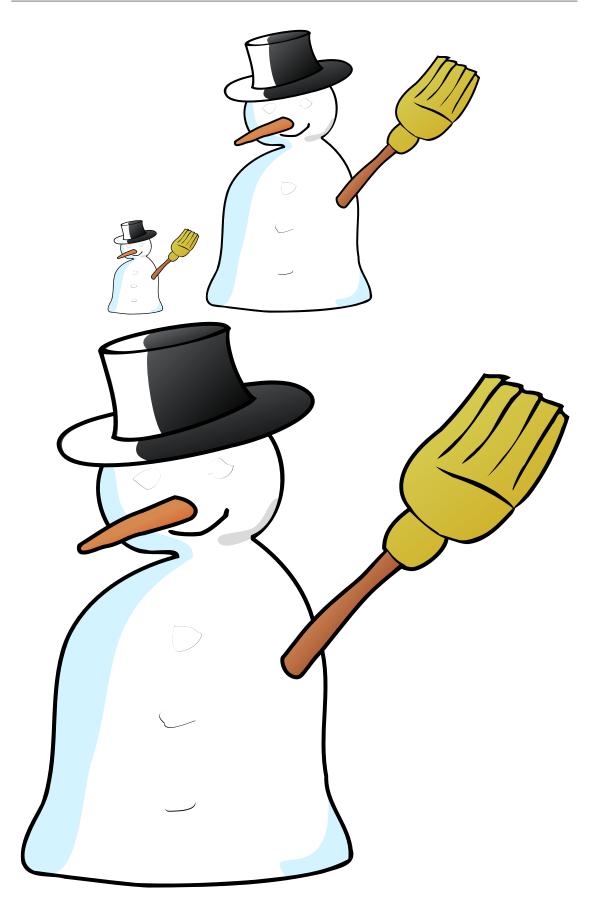


Figura 3.3: Imagem em formato PDF vectorial

Para agregar várias figuras numa única... Poderá assim referenciar o conjunto 3.4, a priemira delas 3.4() ou a segunda 3.4(a).

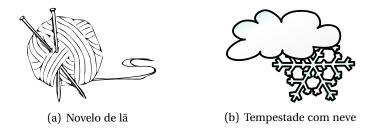


Figura 3.4: Exemplo de utilização de subbottom

Para incluir listagens de código no seu documento, deverá incluir o pacote *listings* e depois usar o ambiente *lstlisting*, como exemplificado na Listagem 3.1.

# Listagem 3.1: Hello World

```
/**

* The HelloWorldApp class implements an application that

* simply prints "Hello World!" to standard output.

*/

class HelloWorldApp {%

public static void main(String[] args) {%

System.out.println("Hello_World!"); // Display the string.

}

}

}
```

# 3.8 Equações

O LaTeX é uma ferramenta poderosa para escrever em estilo matemático. Permite inserir fórmulas no meio do texto como por exemplo esta:  $ax^2 + bx + c = 0$ . Também permite que as fórmulas sejam destacadas numa linha separada e centradas na página

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

ou numeradas

$$aaa$$
 (3.1)

que depois pode ser referida no texto como sendo a equação 3.1

aa

 a
 (3.2)

 b
 (3.3)

 c
 (3.4)

 (3.5)

# **BIBLIOGRAFIA**

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A P Ê N D I C E

# APPENDIX 1 LOREM IPSUM

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A P E N D I C E

# APPENDIX 2 LOREM IPSUM

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ANEXO

# ANNEX 1 LOREM IPSUM

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