



A VERY LONG AND IMPRESSIVE THESIS TITLE WITH A FORCED LINE BREAK

SOME THOUGHTS ON THE LIFE, THE UNIVERSE,
AND EVERYTHING ELSE

JOHN VERY LONGNAME DCE

Master/BSc in Name of Previous Degree

DOCTORATE IN STUDY PROGRAM NAME

SPECIALIZATION IN SPECIALIZATION NAME

NOVA University Lisbon

Draft: November 11, 2025



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Abstract

Regardless of the language in which the dissertation is written, usually there are at least two abstracts: one abstract in the same language as the main text, and another abstract in some other language.

The abstracts' order varies with the school. If your school has specific regulations concerning the abstracts' order, the NOVAthesis L^AT_EX (**novathesis**) (L^AT_EX) template will respect them. Otherwise, the default rule in the **novathesis** template is to have in first place the abstract in *the same language as main text*, and then the abstract in *the other language*. For example, if the dissertation is written in Portuguese, the abstracts' order will be first Portuguese and then English, followed by the main text in Portuguese. If the dissertation is written in English, the abstracts' order will be first English and then Portuguese, followed by the main text in English. However, this order can be customized by adding one of the following to the file `5_packages.tex`.

```
\ntsetup{abstractorder={<LANG_1>, ..., <LANG_N>}}
\ntsetup{abstractorder={<MAIN_LANG>={<LANG_1>, ..., <LANG_N>}}}
```

For example, for a main document written in German with abstracts written in German, English and Italian (by this order) use:

```
\ntsetup{abstractorder={de={de,en,it}}}
```

Concerning its contents, the abstracts should not exceed one page and may answer the following questions (it is essential to adapt to the usual practices of your scientific area):

1. What is the problem?
2. Why is this problem interesting / challenging?
3. What is the proposed approach / solution / contribution?
4. What results (implications / consequences) from the solution?

Keywords: One keyword · Another keyword · Yet another keyword · One keyword more
· The last keyword

Resumo

Independentemente da língua em que a dissertação está escrita, geralmente esta contém pelo menos dois resumos: um resumo na mesma língua do texto principal e outro resumo numa outra língua.

A ordem dos resumos varia de acordo com a escola. Se a sua escola tiver regulamentos específicos sobre a ordem dos resumos, o template (LATEX) novathesis irá respeitá-los. Caso contrário, a regra padrão no template novathesis é ter em primeiro lugar o resumo *no mesmo idioma do texto principal* e depois o resumo *no outro idioma*. Por exemplo, se a dissertação for escrita em português, a ordem dos resumos será primeiro o português e depois o inglês, seguido do texto principal em português. Se a dissertação for escrita em inglês, a ordem dos resumos será primeiro em inglês e depois em português, seguida do texto principal em inglês. No entanto, esse pedido pode ser personalizado adicionando um dos seguintes ao arquivo `5_packages.tex`.

```
\abstractorder{<MAIN_LANG>} := {<LANG_1>, ..., <LANG_N>}
```

Por exemplo, para um documento escrito em Alemão com resumos em Alemão, Inglês e Italiano (por esta ordem), pode usar-se:

```
\ntsetup{abstractorder={de={de,en,it}}}
```

Relativamente ao seu conteúdo, os resumos não devem ultrapassar uma página e frequentemente tentam responder às seguintes questões (é imprescindível a adaptação às práticas habituais da sua área científica):

1. Qual é o problema?
2. Porque é que é um problema interessante / desafiante?
3. Qual é a proposta de abordagem / solução?
4. Quais são as consequências / resultados da solução proposta?

Palavras-chave: Primeira palavra-chave · Outra palavra-chave · Mais uma palavra-chave · A última palavra-chave

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Acronyms

novathesis NOVAthesis L^AT_EX (*pp. i, iii, iv, viii, ix, xii, 1, 2, 4, 6–8, 10–12, 14, 17–20, 26, 28, 29, 32, 33, 35–38, 42, 43, 45, 47–52, 54–56, 58, 59, 61–67, 69–74, 76, 77, 79–83, 85, 87–91, 93–95, 98–105, 107–122*)

Introduction

1.1 Purpose and Scope

The `novathesis` template is a comprehensive L^AT_EX class and project skeleton designed to simplify the preparation of academic theses and dissertations. Representing a synthesis of many years of practical experience in producing academic documents with L^AT_EX, its objective is not only to provide a consistent visual identity but also to encourage good typesetting practices and reproducible workflows. It provides a robust, extensible, and highly configurable foundation for students, researchers, and supervisors who require professional-quality documents that conform to institutional standards.

The primary goals of the `novathesis` template are:

- To ensure **consistency** across theses produced by different students and institutions;
- To provide **institutional presets** that reproduce the visual identity of each supported school;
- To maintain a clear **separation between content and style**, allowing users to focus on writing rather than formatting;
- To support **multi-language documents** with automatic translation of structural elements (titles, captions, lists, etc.);
- To integrate **modern bibliography management** through `biblatex` and `biber`;
- To offer a **modular and automated build system** through `make` and `ltxmk` (and a `build.py` Python script).

This manual explains how to install, configure, and use the `novathesis` template. It is intended for users with a basic knowledge of L^AT_EX, but it also serves as a detailed reference for advanced customization and class maintenance.

1.2 Design Philosophy

The **novathesis** system is built on three principles: *modularity*, *transparency*, and *maintainability*.

1.2.1 Modularity

Every component of the template has a clearly defined role. Configuration files are isolated from the main document; each thematic area—fonts, bibliography, cover page, lists—has its own configuration module. This structure allows users to modify or extend a specific feature without affecting unrelated parts of the document.

1.2.2 Transparency

All configuration is done through plain-text files in the `0-Config/` directory. There are no hidden or hard-coded dependencies: every visual and logical choice is traceable and user-accessible. This transparency makes the system easy to audit, debug, and adapt to institutional requirements.

1.2.3 Maintainability

The template evolves with each new version of L^AT_EX and the supported class packages. It favors standard packages, ensuring long-term compatibility and minimizing maintenance overhead.

1.3 Supported Document Types

novathesis can produce various document types through a single configuration parameter. The `doctype` option automatically adjusts the document covers, headings, titles, and certain layout dimensions to each degree level and school.

The supported document types include:

- `phd` – Doctoral dissertation;
- `msc` – Master’s thesis;
- `bsc` – Bachelor’s dissertation.

1.4 Institutional Support

The **novathesis** template supports multiple institutions and departments by means of pre-set configuration profiles. Each profile defines the official layout, logos, colors, and front-matter fields required by the corresponding institution.

As of version 7.6.0, the template includes presets for:

- Universidade do Porto
 - *uporto/fcup* – Faculdade de Ciências da Universidade do Porto;
- Instituto Politécnico de Setúbal
 - *ips/estt* – Escola Superior de Tecnologia de Setúbal;
- Instituto Universitário de Lisboa
 - *iscte-iul/eta* – Escola de Tecnologia e Arquitectura;
- *uminho* – University of Minho;
 - *uminho/eaad* - Escola de Arquitetura, Arte e Design;
 - *uminho/ec* - Escola de Ciências;
 - *uminho/ed* - Escola de Direito;
 - *uminho/eeng* - Escola de Engenharia;
 - *uminho/elach* - Escola de Letras, Artes e Ciências Humanas;
 - *uminho/emed* - Escola de Medicina;
 - *uminho/epsi* - Escola de Psicologia;
 - *uminho/ese* - Escola Superior de Enfermagem;
 - *uminho/ics* - Instituto de Ciencias Sociais;
 - *uminho/ie* - Instituto de Educação;
 - *uminho/i3bs* - Instituto de Investigação em Biomateriais, Biodegradáveis e Biomiméticos;
- Universidade de Lisboa
 - *ulisboa/ist* — Instituto Superior Técnico;
 - *ulisboa/iseg* — Instituto Superior de Economia e Gestão;
 - *ulisboa/fmv* — Faculdade de Medicina Veterinária;
 - *ulisboa/fcul* — Faculdade de Ciências da Universidade de Lisboa;
- Outras Instituições de Ensino Superior
 - *other/esep* — Escola Superior de Enfermagem do Porto
- Universidade NOVA de Lisboa
 - *nova/itqb* - Instituto de Tecnologia Química e Biológica António Xavier;
 - *nova/ims* – NOVA Information Management School;
 - *nova/fct* – Faculdade de Ciências e Tecnologia;

- `nova/ensp` - Escola Nacional de Saúde Pública;
- `nova/fcsh` - Faculdade de Ciências Sociais e Humanas;
- Universidade de Lisboa
 - `ulisboa/fmv` – Faculty of Veterinary Medicine;
 - `ulisboa/iseg` – School of Economics and Management;
 - `ulisboa/ist` – Instituto Superior Técnico;

Institutional presets are easily activated by uncommenting and editing a single configuration line in `0-Config/1_novathesis.tex`:

```
\ntsetup{school=nova/fct}
```

Advanced users may also define their own institution by creating a configuration files under `NOVAtesisFiles/Schools/UNIVERSITY/SCHOOL` and referencing `UNIVERSITY/SCHOOL` in the setup.

1.5 Project Layout Overview

The `novathesis` project is organized to separate configuration, content, and auxiliary resources into dedicated directories. A simplified view of the structure is shown below:

```
-  
|-- 0-Config/          Configuration files  
|-- 1-FrontMatter/    Abstracts, acknowledgments, acronyms, etc.  
|-- 2-MainMatter/     Main text chapters  
|-- 3-BackMatter/    Appendices and Annexes  
|-- 4-Bibliography/   BibTeX/BibLaTeX databases  
|-- 5-Figures/        Image resources for figures  
|-- template.tex       Main document entry point  
|-- novathesis.cls    Class definition  
|-- NOVAtesisFiles/   Internal class files and strings  
|-- Makefile          Automated build system
```

Users are encouraged to keep the directory layout unchanged, as some internal macros rely on relative paths for file inclusion.

1.6 Conventions Used in This Manual

Throughout this manual, filenames and paths appear in typewriter font, L^AT_EX macros in \verb notation, and code examples are presented in shaded blocks. When an option or parameter is introduced, its default value is indicated in parentheses.

For example:

\ntsetup{doctype=msc} (default: msc)

Optional configuration values are denoted as:

\ntsetup{school=<identifier>}, where <identifier> may be one of nova/fct, ulisboa/ist, etc.

1.7 Target Audience

This manual addresses:

- **Students** preparing academic theses or dissertations;
- **Supervisors** and **faculty** defining institutional guidelines;
- **Template maintainers** who need to extend or adapt the class;
- **System administrators** deploying L^AT_EX environments for academic use.

It assumes a basic working knowledge of L^AT_EX, including compilation, referencing, and package usage.

1.8 Reading Guide

Chapters 2 and 3 provide step-by-step instructions for installation and first compilation. Subsequent chapters describe the configuration system, document structure, and build tools in depth. Advanced topics—such as creating new institutional profiles, customizing the cover, or defining new font themes—are discussed later in the manual.

Readers who only wish to produce a thesis using a supported preset may safely skip the technical sections and focus on Chapters 3 through 5.

Installation

2.1 Overview

This chapter describes how to install and prepare the `novathesis` template for use on local systems and in cloud environments. The template is compatible with all major L^AT_EX distributions that support `latexmk`, `biber`, and the modern `memoir` class infrastructure.

`novathesis` may be used on:

- **macOS** systems through the MacTeX distribution;
- **GNU/Linux** systems through the TeX Live distribution;
- **Windows** systems through the MiKTeX distribution;
- **Cloud environments** such as Overleaf (subject to certain limitations).

The following sections provide detailed installation procedures for each platform, followed by general requirements and post-installation checks.

2.2 System Requirements

To compile documents using the `novathesis` class, the following components are required:

- A complete L^AT_EX distribution (MacTeX, TeX Live, or MiKTeX) released in or after 2022;
- The auxiliary build tools `latexmk` and `make`;
- A bibliography processor (`biber`, preferred, or `bibtex`);
- A modern PDF viewer (such as `Preview`, `Evince`, or `SumatraPDF`);
- For XeLaTeX or LuaLaTeX compilation, access to OpenType or system fonts.

The `novathesis` class does not depend on any non-standard binary tools or external scripts. All operations can be performed within a standard L^AT_EX installation.

2.3 Installation on macOS (MacTeX)

2.3.1 Step 1: Install MacTeX

MacTeX provides a complete and self-contained L^AT_EX environment for macOS. It can be obtained from:

```
https://tug.org/mactex/
```

Download and install the MacTeX.pkg package (approximately 5 GB). This installation includes TeX Live, latexmk, biber, and common front-ends such as TeXShop.

2.3.2 Step 2: Verify the Installation

After installation, open the Terminal and run:

```
which pdflatex  
which latexmk  
which biber
```

If these commands return valid paths (usually under /Library/TeX/texbin), the system is correctly configured. You may also verify the distribution version:

```
pdflatex --version  
biber --version
```

2.3.3 Step 3: Obtain the novathesis Template

Clone or extract the template into a working directory of your choice, for example:

```
cd ~/Documents/Thesis  
git clone https://github.com/<your-org>/novathesis.git
```

Alternatively, download and extract the ZIP archive.

2.3.4 Step 4: Compile a Test Document

Within the project directory, run:

```
make xe
```

or equivalently:

```
latexmk -xelatex template.tex
```

If compilation completes without error, the environment is operational. The generated template.pdf will appear in the same directory.

2.4 Installation on GNU/Linux (TeX Live)

2.4.1 Step 1: Install TeX Live

Most Linux distributions provide TeX Live via their package manager. For a full installation, execute one of the following commands:

- **Debian/Ubuntu:**

```
sudo apt install texlive-full
```

- **Fedora:**

```
sudo dnf install texlive-scheme-full
```

- **Arch Linux:**

```
sudo pacman -S texlive-most biber
```

The `texlive-full` or equivalent meta-package ensures that all dependencies used by `novathesis` are available.

2.4.2 Step 2: Verify the Installation

Check the presence of required tools:

```
which pdflatex  
which biber  
which latexmk
```

All should return executable paths. If any are missing, install them individually using the package manager.

2.4.3 Step 3: Obtain and Compile

Download or clone the template, then compile as follows:

```
git clone https://github.com/<your-org>/novathesis.git  
cd novathesis  
make pdf      # or make xe / make lua
```

When using XeLaTeX or LuaLaTeX, ensure that system fonts referenced in your chosen font theme are installed on the machine.

2.5 Installation on Windows (MiKTeX)

2.5.1 Step 1: Install MiKTeX

MiKTeX provides an integrated package manager and is well suited for Windows systems. Download the installer from:

<https://miktex.org/download>

Run the installer with administrative privileges and select *Install missing packages on-the-fly: Yes.*

2.5.2 Step 2: Verify the Installation

Open the **MiKTeX Console** and ensure that the following packages are installed:

`latexmk, biber, biblatex, memoir.`

Alternatively, from the Command Prompt:

```
latexmk --version  
biber --version
```

2.5.3 Step 3: Obtain the Template

Download the project ZIP or clone it using Git:

```
git clone https://github.com/<your-org>/novathesis.git  
cd novathesis
```

2.5.4 Step 4: Compile the Template

Run the following in the Windows Command Prompt or PowerShell:

```
latexmk -pdf template.tex
```

or

```
make pdf
```

If the command `make` is not available, it may be installed through `Git Bash` or `MinGW`. The produced `template.pdf` should appear in the same directory upon successful compilation.

2.6 Installation in Overleaf (Cloud)

2.6.1 Overview

The `novathesis` template can also be compiled within **Overleaf**, an online L^AT_EX editing environment. However, due to its size, modularity, and dependence on `latexmk` and `biber`, full compilation of `novathesis` requires an **Overleaf Professional or Group Plan**. Free-tier accounts do not provide sufficient memory or compilation time to complete the build.

2.6.2 Step 1: Create a New Project

1. Log in to Overleaf at <https://www.overleaf.com>.
2. Create a new blank project.
3. Upload the entire `novathesis` directory structure (including subfolders). This may be done via drag-and-drop or by uploading a ZIP archive.

2.6.3 Step 2: Configure the Compiler

Open the **Menu** (top left) and set the compiler to:

XeLaTeX or LuaLaTeX

depending on your selected font configuration. Ensure that the bibliography tool is set to `Biber`.

2.6.4 Step 3: Compile

Click **Recompile**. The process may take several minutes depending on server load and account limits. If compilation fails with memory or time errors, consider building locally or upgrading the Overleaf account.

2.6.5 Step 4: Managing Large Projects

Due to file system limitations, it is recommended to:

- Avoid uploading unnecessary figures or datasets;
- Use compressed image formats (`.pdf`, `.png`);
- Use Overleaf's *Git integration* to synchronize changes with a local copy.

2.7 Post-installation Validation

After installation and initial compilation, verify the following:

1. The file `template.pdf` was generated without errors;

2. The title page and metadata match your configuration in `0-Config/1_novathesis.tex`;
3. Bibliography entries from `4-Bibliography/bibliography.bib` appear correctly;
4. Figures included from `5-Figures/` display as expected;
5. Language settings (captions, lists, chapter titles) match the selected `mainlanguage`.

Once validated, the environment is ready for content development.

2.8 Maintenance and Updates

The `novathesis` template may evolve with newer releases of L^AT_EX or institutional requirements. To update an existing installation:

- If using Git, pull the latest changes:

```
git pull origin main
```

- If using a ZIP distribution, download the new version and replace the class and configuration files as needed.

Always back up your `0-Config` and content folders before applying updates.

2.9 Summary

This chapter outlined the procedures for installing `novathesis` across all supported environments. Local installations are recommended for large or complex projects, as they offer full control and faster compilation times. Cloud-based compilation through Overleaf remains convenient for collaboration, provided that a Professional or institutional account is used.

Subsequent chapters describe how to configure, customize, and extend the template for your specific academic institution and degree requirements.

Getting Started

3.1 Purpose of this Chapter

This chapter provides a step-by-step guide for first-time users of the `novathesis` template. It describes the project layout, configuration workflow, and basic compilation commands required to produce the initial document. By the end of this chapter, the user should be able to compile a complete sample thesis and understand where to insert their own content.

3.2 Project Layout

The `novathesis` project follows a clear and modular directory structure. Each directory serves a specific role in the composition of the thesis.

```

-
|-- 0-Config/          Configuration files (edit here)
|-- 1-FrontMatter/    Abstracts, acknowledgments, acronyms, etc.
|-- 2-MainMatter/     Chapters and main content
|-- 3-BackMatter/    Appendices, lists, glossary, index
|-- 4-Bibliography/   Bibliographic databases (.bib files)
|-- 5-Figures/        Figures and illustrations
|-- \gls{novathesis}Files/ Internal assets (do not modify)
|-- template.tex       Main document file
|-- novathesis.cls     Class definition (do not modify)
|-- Makefile           Build automation tool

```

Users should restrict their edits to the configuration and content directories. All other files are maintained by the template and should remain unchanged to ensure compatibility with future versions.

3.3 The Role of template.tex

The file `template.tex` serves as the entry point of the entire project. It loads the `novathesis.cls` class, applies the selected configuration, and defines the logical order of document parts:

- Front matter (cover, abstract, acknowledgments);
- Main matter (chapters);
- Back matter (appendices, lists, and bibliography).

Users are not expected to modify `template.tex` beyond minor customizations such as adjusting the sequence of included chapters. All document-level settings are controlled through configuration files located in `0-Config/`.

3.4 Configuration Overview

The configuration subsystem is divided into modular files that correspond to different functional areas. Each file can be opened and edited independently.

- `0-Config/1_novathesis.tex` – Main template configuration (document type, language, school, author, title, year);
- `0-Config/2_biblatex.tex` – Bibliography and citation options;
- `0-Config/3_cover.tex` – Cover page customization;
- `0-Config/4_files.tex`, `5_packages.tex`, `6_list_of.tex` – File management and auxiliary packages;
- `0-Config/9_<school>.tex` – Institutional presets (logos, formatting rules).

The most common user actions involve editing `1_novathesis.tex` to set document metadata and institutional parameters.

3.5 First-Time Setup

To create a new thesis, follow the procedure below.

3.5.1 Step 1: Copy the Template

Create a working copy of the template directory in your preferred location. For example:

```
cp -r novathesis ~/Documents/MyThesis  
cd ~/Documents/MyThesis
```

3.5.2 Step 2: Edit the Main Configuration File

Open `0-Config/1_novathesis.tex` in a text editor and review the default configuration. Update the following fields as appropriate:

```
\ntsetup{  
    doctype=msc,  
    school=nova/fct,  
    mainlanguage=en,  
    title={Deep Learning for Image Segmentation},  
    author={John Doe},  
    degree={Master of Science in Computer Engineering},  
    department={Department of Electrical and Computer Engineering},  
    year=2025  
}
```

Each option may be commented or adjusted according to your requirements. The `school` parameter activates the corresponding institutional preset.

3.5.3 Step 3: Verify Language Settings

The option `mainlanguage` determines the automatic translation of all structural elements (captions, lists, and headings). Supported values include:

`en, pt, es, fr, de, it, gr, uk.`

Changing the main language automatically loads the corresponding translation file from `novathesisFiles/Strings/`.

3.5.4 Step 4: Configure the Bibliography

Open `0-Config/2_biblatex.tex` and ensure that the bibliography processor and citation style are correctly set. For most users, the default configuration is appropriate:

```
\ntbibsetup{  
    backend=biber,  
    style=authoryear-comp,  
    sorting=nyt  
}
```

The bibliography database is located in `4-Bibliography/bibliography.bib`. Add your references to this file following the standard BibL^AT_EX syntax.

3.6 Compiling the Document

Compilation may be performed either through the provided `Makefile` or manually using `latexmk`. The `Makefile` automates all steps required to produce the final PDF, including multiple compilation passes and bibliography generation.

3.6.1 Using the Makefile

In the project root directory, execute one of the following commands:

```
make pdf      # Build with pdfLaTeX  
make xe       # Build with XeLaTeX (recommended for modern fonts)  
make lua      # Build with LuaLaTeX  
make clean    # Remove temporary files  
make view     # Compile and open the resulting PDF
```

The `Makefile` automatically detects the configuration from `1_novathesis.tex`. Users do not need to specify the school or language explicitly.

3.6.2 Manual Compilation with `latexmk`

For environments without `make`, the document may be compiled directly as follows:

```
latexmk -xelatex template.tex
```

or, for a pdf^AT_EX build:

```
latexmk -pdf template.tex
```

To clean intermediate files, use:

```
latexmk -c
```

3.7 Viewing the Output

Upon successful compilation, a file named `template.pdf` will be generated in the same directory. Open this file with a PDF viewer to verify that:

1. The title page contains your name, title, and institution;
2. Chapter headings and page numbering appear correctly;
3. The sample text compiles without missing references or citations.

3.8 Editing Content Files

After confirming that the template builds correctly, begin replacing the sample material with your own content.

3.8.1 Front Matter

Edit the files located in 1-FrontMatter/:

- `abstract.tex` – Abstract of the thesis;
- `acknowledgments.tex` – Acknowledgment section;
- `acronyms.tex` – List of acronyms and abbreviations.

3.8.2 Main Matter

Each chapter resides in 2-MainMatter/. To add a new chapter, duplicate an existing file and update the chapter title:

```
\chapter{Background and Literature Review}
\label{chap:background}
```

Include the new file in `template.tex` in the appropriate order.

3.8.3 Back Matter

The 3-BackMatter/ directory contains appendices, glossaries, and the bibliography. By default, the bibliography is automatically appended at the end of the document. Additional appendices may be defined using:

```
\appendix
\chapter{Supplementary Results}
```

3.9 Verifying Bibliography Compilation

If citations appear as question marks ("?"), this indicates that the bibliography has not yet been processed. Execute the following command sequence manually to rebuild:

```
latexmk -xelatex template.tex
biber template
latexmk -xelatex template.tex
```

Alternatively, running `make xe` will perform these steps automatically.

3.10 Changing the Document Type

The `doctype` parameter defines the overall structure of the document. Changing its value automatically adjusts formatting elements such as title page content and numbering depth. Supported types include:

`msc, phd, bsc, report, article, book.`

For example:

```
\ntsetup{doctype=phd}
```

3.11 Customizing the Institutional Preset

If your institution is already supported, set the `school` option accordingly. If not, you may define a custom preset by creating a new file `0-Config/9_<school>.tex`. Use one of the existing presets as a template and modify logo placement, cover design, or metadata fields as needed.

3.12 Common Issues During First Compilation

- **Fonts not found:** Ensure the required fonts for your selected theme are installed. Use XeLaTeX or LuaLaTeX for system fonts.
- **Bibliography missing:** Confirm that `biber` is installed and that your references are properly formatted in the `.bib` file.
- **Undefined control sequence:** This usually indicates a missing package. Install the full distribution (`texlive-full` or equivalent).
- **Images not displaying:** Check that figures are located in the `5-Figures/` directory and referenced with the correct relative path.

3.13 Next Steps

After the initial compilation and configuration are successful, the user may proceed to customize fonts, language options, and bibliography styles as described in Chapter 4. Subsequent chapters detail advanced features, including institutional extensions, font themes, and multi-language support.

At this stage, the `novathesis` environment is fully operational. The remaining tasks involve adapting the template to the specific content and academic requirements of your degree program.

Configuration

4.1 Overview

This chapter documents the `novathesis` configuration subsystem as shipped in version 7.6.0. All user-facing configuration is centralized under `0-Config/`. The design separates *global class behaviour* from *project content* and *institutional presets*. Users should edit only the files in `0-Config/` and content folders; the class file `novathesis.cls` and internal assets under `novathesisFiles/` must remain unchanged.

Configuration files (as shipped):

```
0-Config/
 0_memoir.tex      % Memoir-class options (low-level layout toggles)
 1_novathesis.tex  % Main \gls{novathesis} options (doctype, language, media, styles...)
 2_biblatex.tex    % Bibliography backend and style
 3_cover.tex       % Cover/front-matter metadata and committee
 4_files.tex       % List of included files: abstracts, chapters, appendices...
 5_packages.tex    % Extra (user) packages and demo setup
 6_list_of.tex     % Which lists to print (figures/tables/algorithms/listings...)
 9_*.tex           % Institutional presets (FCT NOVA, IMS, IST, ISEG, FMV, UMinho, UPorto)
```

Unless stated otherwise, options are applied via the key–value interface `\ntsetup{<key>=<value>}`. Bibliography options use `\ntbibsetup{...}`. Language-string overrides use `\ntlangsetup{...}`.

Editing policy.

- Keep your changes *in place* inside `0-Config/`. Do not modify `novathesis.cls`.
- Prefer uncommenting documented options over inventing new macros.
- When in doubt, search for the option name in the shipped `.tex` files; most defaults are indicated in comments.

4.2 0_memoir.tex: Memoir Options

0_memoir.tex is reserved for options supported by the `memoir` class (page layout, trims, headers/footers, etc.). Use this file if you need low-level control beyond `novathesis`' high-level keys.

- Place any `memoir` options or setup here (see the *memman* manual).
- Institution-specific stubs may appear here (e.g., final classification or funding notes for some presets). Keep these commented unless applicable.

4.3 1_novathesis.tex: Main Options

This is the primary configuration file. It exposes the document's global behaviour and presentation. The file is extensively commented; below we summarize the keys as they appear in the shipped template.

Document identity and lifecycle

doctype The document kind.

```
\ntsetup{doctype=<value>} where <value> is one of: phd, phdplan, phdprop,  
msc, mscplan, bsc, plain.
```

school Institutional preset identifier (activates 0-Config/9_<...>.tex and internal assets).

Example identifiers as shipped (non-exhaustive; see comments in the file):

```
nova/fct, nova/fct/di-adc, nova/fct/cbbi, nova/fct/blue, nova/fct/green,  
nova/fct/brown, nova/fct/red, nova/itqb/gray, nova/itqb/green, nova/fcsh,  
nova/ensp,  
nova/ims, nova/ims/csig, nova/ims/ddm, nova/ims/dsaa, nova/ims/egi, nova/ims/gi,  
nova/ims/gt,  
ulisboa/ist, ulisboa/fc, ulisboa/fmv, ulisboa/iseg,  
uminho/ead, uminho/ese, uminho/eeng, uminho/elach, uminho/ed, uminho/ec,  
uminho/i3bs, uminho/emed, uminho/ie, uminho/ics, uminho/epsi, uminho/eeg,  
isctei/eta, ips/ests, ipl/isel, ipl/isel/meb,  
ulht/deisi, ulht/mge, upporto/fc, other/esep.
```

docstatus Working stage of the document: `working` (reduced front matter), `provisional` (submission, no committee), `final` (final, committee included).

Languages and abstracts

lang Main document language (ISO-639-1 two-letter): `en`, `pt`, `fr`, `it`, `de`, `es`, `gr` (Greek), `uk` (Ukrainian).

abstractorder Controls which abstracts print and in which order. Examples:

```
\ntsetup{abstractorder={en,pt,uk,gr}}
\ntsetup{abstractorder={pt={en,pt,fr}}}
```

Default for en: en,pt. For language L: L,en.

lang/extra Additional languages used in the document (beyond those in abstracts), e.g.,

```
\ntsetup{lang/extra={de,es}}
```

Media and pagination

media screen (equal margins, coloured links) or paper (bookish margins, black links).

numberallpages Whether to number all pages (except the cover); default false.

print/index Print a word index at the end; default false.

print/timestamp Print the PDF build timestamp on the cover; default true.

Glossaries and indices

gnumberlist Whether glossary entries list the pages on which they occur (reverse-index behaviour); default true.

Typography and style

style/url Use the main text font for URLs; default = the hyperref default (set explicitly to same to match body font).

style/font Font theme. Shipped style modules under novathesisFiles/FontStyles/:

```
bookman, erewhon, libertine, newpx, opensans, scholax,
arial*, calibri*, newsgott*, kieranhealy*, futura*.
```

The styles marked with (*) require XeLaTeX/LuaLaTeX (system/OpenType fonts).

Book spine and debugging

spine/layout no (do not print), full (full page), trim (print and crop to spine width). Default trim for docstatus=final, otherwise no.

spine/width Force a specific spine width (e.g., 2cm). Default is an automatic width assuming double-sided 80 g/m² paper.

debug {cover,spine} prints cover grids and spine markers for development.

4.4 2_biblatex.tex: Bibliography

This file configures the bibliography backend and common styles via `\ntbibsetup`. The shipped defaults favour `biblatex+biber`.

`backend biber` (default) or `bibtex`.

`style` Exemplos provided (uncomment exactly one):

```
% Numeric styles:  
% \ntbibsetup{style=numeric-comp, sortcites=true, sorting=none}  
% Alphabetic style:  
% \ntbibsetup{style=alphanumeric, sortcites=true, sorting=nyt}  
% Author-year (compact):  
% \ntbibsetup{style=authoryear-comp, sortcites=true, sorting=nyt}  
% APA-like (natbib compatibility):  
% \ntbibsetup{backend=biber,natbib=true,style=apa}
```

Notes.

- Use `\textcite` for “Author (year)” and `\parencite` for “(Author, year)”.
- When switching backends, *clean* the build (`make clean`) and recompile.

4.5 3_cover.tex: Cover and Front Matter

Cover metadata, degree names, optional specialization, sponsors, and committee are defined here using high-level macros.

Titles

Use `\nttitle(type,lang){text}` with: $\text{type} \in \{\text{main}, \text{sub}, \text{spine}\}$, $\text{lang} \in \text{available languages}$.

```
\nttitle(main,en){A Very Long and Impressive\Thesis Title}  
\nttitle(main,pt){Um Título de Tese Longo\é Impressionante}  
\nttitle(sub,en){Some thoughts on the Life, the Universe,\and Everything Else}  
% \nttitle(spine,en){A Very Long and Impressive Thesis Title} % (no manual line breaks)
```

Degree, specialization, sponsors

```
% Degree label (only defines if still undefined elsewhere):  
\ntdegreename*(pt){Nome do Programa de Estudos}  
\ntdegreename*(en){Study Program Name}
```

```
% Optional specialization (defines if undefined):
\ntspecialization*(pt){Designação da Especialidade}
\ntspecialization*(en){Specialization Name}

% Optional list of sponsors (per language):
% \ntsponsors(en){Company A, Grant X, ...}
% \ntsponsors(pt){Empresa A, Bolsa X, ...}
```

Committee

Add committee members with role and gender markers:

```
\ntaddperson{committee}(<role>,<gender>){Name, Position, Institution}
```

Roles: c (chair), r (rapporteur), a (adviser), ca (co-adviser), m (member), g (guest). Gender: m (male), f (female).

```
\ntaddperson{committee}(c,m){Chair Name, Full Professor, FCT-NOVA}
\ntaddperson{committee}(r,m){Rapporteur Name, Associate Professor, Other Univ.}
\ntaddperson{committee}(m,f){Member Name, Assistant Professor, Another Univ.}
% \ntaddperson{committee}(a,m){Adviser present, Assoc. Prof., University}
% \ntaddperson{committee}(ca,f){Co-adviser present, Assoc. Prof., University}
% \ntaddperson{committee}(g,m){Guest member, Title, Institution}
```

Institution-specific guidance. Some Schools request additional fields (e.g., sponsors, SDGs, exam date, embargo). See Section 4.9.

4.6 4_files.tex: File Inventory

This file enumerates the content files that compose your thesis. Use \ntaddfile with the appropriate *kind*:

bib Bibliography databases (.bib):

```
\ntaddfile{bib}{bibliography.bib}
% \ntaddfile{bib}{another.bib}
```

dedicatory, acknowledgements, quote Printed only for final document types (bsc, msc, phd):

```
\ntaddfile{dedicatory}{dedicatory}
\ntaddfile{acknowledgements}{acknowledgements}
\ntaddfile{quote}{quote}
```

abstract[lang] Abstracts in multiple languages:

```
\ntaddfile{abstract}{pt}{abstract-pt}
\ntaddfile{abstract}{en}{abstract-en}
% \ntaddfile{abstract}{de}{abstract-de}
% \ntaddfile{abstract}{es}{abstract-es}
% \ntaddfile{abstract}{fr}{abstract-fr}
```

chapter Chapters (optionally restricted to some doctypes):

```
\ntaddfile{chapter}{chapter1}
\ntaddfile{chapter}{chapter2}
\ntaddfile{chapter}{chapter3}
\ntaddfile{chapter}{chapter4}
% Examples:
% \ntaddfile{chapter}{phd}{my-chapter}
% \ntaddfile{chapter}{phd,phdplan}{proposal-background}
```

appendix, annex Back matter:

```
\ntaddfile{appendix}{appendix1}
\ntaddfile{appendix}{appendix2}
\ntaddfile{annex}{annex1}
```

cover[slot] User-defined covers (override standard ones): slot ∈ 1 (front), N (back), spine.

```
% \ntaddfile{cover}{1}{cover-front}
% \ntaddfile{cover}{N}{cover-back}
% \ntaddfile{cover}{spine}{cover-spine}
% Disable second cover if needed:
% \ntsetup{print/secondcover=false}
```

4.7 5_packages.tex: Extra Packages

This file is intended for user-level package additions and language-string overrides. The shipped file includes *demo packages* for examples (e.g., `float`, `wrapfig`); remove these in production.

Language-string overrides. Use `\ntlangsetup{<lang>/<key>=<value>}` to redefine localized strings (e.g., ToC name):

```
% \ntlangsetup{pt/contentsname=0 MEU ÍNDICE}
% \ntlangsetup{en/contentsname=MY TABLE OF CONTENTS}
```

Listings and minted. If you enable `listings` or `minted`, Section 4.8 shows how the corresponding “List of Listings” is enabled automatically.

4.8 6_list_of.tex: Lists to Print

Controls which *lists* appear (List of Figures, Tables, Algorithms, Listings, etc.) using `\ntaddlistof{<name>}`. The file also contains logic that adds certain lists automatically if the corresponding package is loaded.

```
\ntaddlistof{listoffigures}  
\ntaddlistof{listoftables}
```

Algorithm lists are added depending on the package in use (`algorithm2e`, `algorithms`, `algorithm`, or `coloredtheorem`). Listings are added for `listings` (`lstlistoflistings`) or `minted` (`listoflistings`).

Glossaries. To print the glossaries-related lists, uncomment:

```
% \ntaddlistof{listsofglossaries}
```

4.9 Institutional Presets (9_*.tex)

The files `9_*.tex` specialize cover metadata, degree names, and School-specific requirements. Select the preset with `\ntsetup{school=<id>}` in `1_novatheresis.tex`. Below are the salient controls present in the shipped presets.

NOVA / FCT (9_nova_fct.tex)

- **Department.** Uncomment exactly one `\ntdepartment{lang}{...}` pair to set your Department (Portuguese and English variants are provided; list updated as of 2024–09–08).
- **Degree name.** A comprehensive catalogue of `\ntdegreename{pt}{...}` and `\ntdegreename{en}{...}` entries is provided for both PhD and MSc programmes. Uncomment the pair corresponding to your degree.
- **ADC report (DI).** Optional company fields for DI/ADC reports:

```
% \ntsetup{nova/fct/company/logo=google-logo}  
% \ntsetup{nova/fct/company/name=Google}
```

NOVA / IMS (9_nova_ims.tex)

- **Sustainable Development Goals (SDGs).** The file lists SDG labels (EN/PT). Add the SDGs relevant to your work to the internal list as instructed in the comments (keep labels consistent).

ULisboa / IST (9_ulusboa_ist.tex)

- **Final classification.** Set the final grade for the statement if required:

```
\ntsetup{classification=Aprovado com ...}
```

- **Funding.** Optionally list funding agencies:

```
% \ntsetup{funding={{FCT, projeto #1234 1234 1234},{UE, projeto #9876 ABCD}}}
```

ULisboa / ISEG (9_ulusboa_iseg.tex)

- **Funding.** Same mechanism as above (uncomment and edit).

ULisboa / FMV (9_ulusboa_fmv.tex)

- **Exam date.** Uncomment and set the year if mandated.
- **Embargo.** Period I (Immediate), 6, or 12 months; optional justification text.

```
% \ntsetup{embargo/period=6}
% \ntsetup[embargo/justification]{Motivo do embargo temporário.}
```

- **Reproduction rights.** I (integral), P (partial), N (none).

UMinho (all) (9_uminho.tex)

- **Creative Commons modifier.** Select a CC variant (default is by-nc-sa); uncomment to override:

```
% \ntsetup{copyrightmodifier=by-nc-sa}
```

- **Covers.** Skip the verso pages of covers for certain doctypes:

```
% \ntsetup{skipblankcovers=true}
```

- **Integrity statement.** Optionally remove the signature line:

```
% \ntsetup{signatureline=false}
```

UPorto / FC (9_uporto_fc.tex)

- **Final classification and funding.** Same mechanisms as IST; uncomment and edit if applicable.

4.10 Fonts and Engine Selection

If you choose a font style that relies on system/OpenType fonts (`arial`, `calibri`, `newsgott`, `kieranhealy`, `futura`), compile with XeLaTeX or LuaLaTeX:

```
make xe    % or: latexmk -xelatex template.tex  
make lua  % or: latexmk -lualatex template.tex
```

Classical LaTeX font packages (`bookman`, `erewhon`, `libertine`, `newpx`, `opensans`, `scholax`) work with pdfLaTeX as well.

4.11 Abstracts and Multilingual Documents

Abstract files are declared per language in `4_files.tex`. The language order is controlled by `abstractorder` (Section 4.3). Additional per-language string overrides can be placed in `5_packages.tex` using `\ntlangsetup`. Language definitions and default strings reside under `novathesisFiles/Strings/` (EN, PT, ES, FR, DE, IT, GR, UK).

4.12 Lists, Indices, and Glossaries

Adjust which lists appear via `6_list_of.tex`. The template auto-detects algorithms/listings packages and adds corresponding lists when present. To generate glossaries/acronyms/symbols, ensure the relevant packages are loaded in `5_packages.tex` and add `listsofglossaries` if desired.

4.13 Best Practices and Validation

- **Change one thing at a time.** After editing `1_novathesis.tex`, run a clean build (`make clean`) before testing typography or cover changes.
- **Keep institutional choices localized.** Prefer editing only the corresponding `9_<school>.tex`.
- **Avoid conflicts.** Do not redefine class internals in `5_packages.tex`; use documented keys or language overrides.
- **Back up configuration.** Before upgrading the template, copy your `0-Config/` and `4-Bibliography/` folders.

4.14 Minimal Configuration Checklist

1. Set `doctype` and `docstatus` in `1_novathesis.tex`.
2. Select `school` and complete the corresponding `9_<school>.tex` entries (Department, Degree name, SDGs, exam date/embargo if required).

3. Configure `lang`, `abstractorder`, and declare abstracts in `4_files.tex`.
4. Choose `style/font` and compile with the appropriate engine (pdfLaTeX vs. XeLaTeX/LuaTeX).
5. Confirm bibliography backend/style in `2_biblatex.tex`; ensure `biber` is available.
6. Review lists in `6_list_of.tex`; add/remove as required.
7. Remove demo packages from `5_packages.tex` and add only what your project needs.
8. Build with `make xe` (or `make pdf/make lua`), inspect the cover, lists, and bibliography.

Document Structure

5.1 Overview

This chapter describes the logical and physical structure of a `novathesis` document. It explains how the thesis is partitioned into front matter, main matter, and back matter; how content files are organized on disk; and how structural elements such as tables of contents, lists, figures, tables, appendices, glossaries, and the bibliography are orchestrated. The intent is to provide a clear, reproducible workflow for authoring and maintaining a large academic document.

5.2 Physical Layout (Project Folders)

`novathesis` separates configuration, content, and internal assets into distinct directories:

```

0-Config/          % User-editable configuration (Chapter~\ref{chap:configuration})
1-FrontMatter/    % Abstracts, acknowledgments, acronyms, dedication, quotes
2-MainMatter/     % Chapters (content of the thesis)
3-BackMatter/     % Appendices, annexes, optional lists (glossaries/index if used)
4-Bibliography/   % Bibliographic databases (.bib files)
5-Figures/        % Figures and illustrations (optional subfolders)
\gls{novathesis}Files/ % Internal assets (do not modify)
template.tex       % Main entry point (load class + orchestrate parts)
novathesis.cls    % Class definition (do not modify)

```

Content files (`.tex`) live under the 1-, 2-, and 3- directories. The inclusion order is defined declaratively in `0-Config/4_files.tex`, which the class reads to assemble the final document.

5.3 Logical Layout (Front/Main/Back Matter)

`novathesis` adopts the conventional *front matter / main matter / back matter* partitioning set by the `memoir` class, and augments it with institutional and multilingual features.

5.3.1 Front Matter

Front matter contains the cover, the title and formal pages required by the institution, and optional elements such as dedication, acknowledgments, quotes, and multilingual abstracts. Typical elements include:

- Cover (front, verso, optional second cover; generated from metadata in `0-Config/3_cover.tex` and the selected preset);
- Title and approval pages (preset-dependent);
- Dedication (`1-FrontMatter/dedicatory.tex`, optional);
- Acknowledgments (`1-FrontMatter/acknowledgements.tex`, optional);
- Quotes/epigraphs (`1-FrontMatter/quote.tex`, optional);
- Abstracts in one or more languages (files declared in `4_files.tex`);
- Table of Contents and lists (Figures, Tables, etc.), depending on `0-Config/6_list_of.tex`.

Front matter pages are typically numbered with lowercase Roman numerals, per standard academic convention, unless otherwise specified by the institutional preset.

5.3.2 Main Matter

Main matter includes the core scientific content—chapters and their subordinate sections. Each chapter is a separate file under `2-MainMatter/` and is declared in `0-Config/4_files.tex` using the chapter kind. Arabic page numbering begins at the first page of the main matter.

5.3.3 Back Matter

Back matter includes appendices or annexes, glossaries, indices, and the bibliography. Appendices are regular chapter-level units declared with the kinds `appendix` or `annex` in `4_files.tex`. The bibliography is automatically placed at the end and is built from the `.bib` files declared in `4_files.tex`.

5.4 Orchestration via 0-Config/4_files.tex

The file 0-Config/4_files.tex serves as the canonical inventory of document parts. Use `\ntaddfile{<kind>}[<selector>]{<name>}` to register files, where `<name>` is the base-name without extension.

Front Matter examples

```
% Dedication / Acknowledgments / Quote (optional)
\ntaddfile{dedicatory}{dedicatory}
\ntaddfile{acknowledgements}{acknowledgements}
\ntaddfile{quote}{quote}

% Abstracts for given languages (file names under 1-FrontMatter/)
\ntaddfile{abstract}[en]{abstract-en}
\ntaddfile{abstract}[pt]{abstract-pt}
```

Chapters (Main Matter)

```
% Chapters in order (files under 2-MainMatter/)
\ntaddfile{chapter}{chapter1}
\ntaddfile{chapter}{chapter2}
\ntaddfile{chapter}{chapter3}

% Restrict a chapter to specific doctypes if needed:
% \ntaddfile{chapter}[phd]{literature-review}
% \ntaddfile{chapter}[phd,phdplan]{proposal-background}
```

Back Matter

```
% Appendices / Annexes (files under 3-BackMatter/)
\ntaddfile{appendix}{appendixA}
\ntaddfile{appendix}{appendixB}
\ntaddfile{annex}{annex1}

% Bibliography databases (files under 4-Bibliography/)
\ntaddfile{bib}{bibliography.bib}
% \ntaddfile{bib}{secondary.bib}
```

Covers (optional override)

```
% User-supplied covers (override preset cover pages)
% \ntaddfile{cover}[1]{cover-front}
```

```
% \ntaddfile{cover}[N]{cover-back}
% \ntaddfile{cover}[spine]{cover-spine}

% Disable versus/second cover if your institution does not require it:
% \ntsetup{print/secondcover=false}
```

Best practice. Maintain the master sequence in `4_files.tex` only. Avoid manual `\input` in `template.tex`, which is reserved for class-level orchestration.

5.5 Chapters and Sectioning

A typical chapter file under `2-MainMatter/` begins with a chapter declaration, an optional label, and freely-structured sections:

```
\chapter{Background and Related Work}
\label{chap:background}

\section{Problem Setting}
...
\subsection{Assumptions}
...
\section{Related Work}
...
```

Numbering and depth. Section numbering and ToC depth follow the class defaults and may be tuned via `memoir` options in `0-Config/0_memoir.tex` if strictly required by the institution.

Labels and references. Label chapters as `\label{chap:<name>}` and sections as `\label{sec:<name>}`. Use `\ref` for numbered references, `\nameref` for titles, and `\autoref` when `hyperref` is active. For figures and tables, prefer `\vref` (from `varioref`) if you require “on the next page” messages.

5.6 Figures, Tables, Algorithms, and Listings

5.6.1 Figures

```
\begin{figure}
  \centering
  \includegraphics[width=.8\linewidth]{5-Figures/method/overview}
```

```
\caption{Method overview.}
\label{fig:method-overview}
\end{figure}
```

Store graphics under 5-Figures/ and reference using relative paths. For vector material, prefer PDF; for bitmap, PNG at print resolution.

5.6.2 Tables

```
\begin{table}
\centering
\caption{Hyperparameters used in all experiments.}
\label{tab:hyperparams}
\begin{tabular}{lcl}
\toprule
Name & Value & Notes \\
\midrule
Batch size & 64 & --- \\
Learning rate & 1e-3 & warm-up 1k steps \\
\bottomrule
\end{tabular}
\end{table}
```

Use booktabs rules (\toprule/\midrule/\bottomrule) for professional tables.

5.6.3 Algorithms and Listings

`novathesis` detects algorithm/listing packages and adds corresponding “List of ...” entries when enabled. Select one algorithm package (e.g., `algorithm2e` or `algorithms`) and optionally `listings` or `minted` for code.

```
% In 5_packages.tex (example)
% \usepackage[ruled,vlined]{algorithm2e}
% \usepackage{listings} % or: \usepackage{minted}
```

Then enable the lists in 0-Config/6_list_of.tex (see Chapter 4).

5.7 Tables of Contents and Lists

The Table of Contents (ToC) is generated automatically. Additional lists (Figures, Tables, Algorithms, Listings, Glossaries) are controlled by 0-Config/6_list_of.tex:

```
\ntaddlistof{listoffigures}
\ntaddlistof{listoftables}
% auto: listofalgorithms, lstlistoflistings or listoflistings (if packages loaded)
% glossaries bundle (if in use):
% \ntaddlistof{listsofglossaries}
```

ToC naming and localization. Override localized names via `\ntlangsetup` in `5_packages.tex` if your institution uses nonstandard terminology.

5.8 Mathematics, Theorems, and Cross-Referencing

For formal statements, you may use standard theorem packages. When institutional requirements demand a *List of Theorems*, enable the corresponding package support (some presets leverage `coloredtheorem`). Cross-reference theorems with `\label`/`\ref`, and ensure numbering schemes are consistent across chapters.

5.9 Appendices and Annexes

Appendices and annexes are separate streams of chapter-level content placed after the main matter. Declare them in `0-Config/4_files.tex`:

```
\ntaddfile{appendix}{appendixA}
\ntaddfile{annex}{annex1}
```

Within the appendix file, `novathesis` switches to appendix mode automatically; you should structure content with `\chapter{...}` and optional sections as needed.

5.10 Glossaries, Acronyms, and Symbols

If your thesis uses glossaries or a list of acronyms, load the relevant packages in `5_packages.tex` and define entries in dedicated files (commonly under `1-FrontMatter/`). When enabled, add the glossaries list in `6_list_of.tex`:

```
% \ntaddlistof{listsofglossaries}
```

Ensure the build toolchain includes the glossary make step when required by your chosen package (the provided Makefile and `latexmk` rules typically handle it).

5.11 Bibliography Integration

Bibliographic databases are declared in `0-Config/4_files.tex` with the `bib` kind:

```
\ntaddfile{bib}{bibliography.bib}
% \ntaddfile{bib}{bibliography_doi.bib}
```

Citation style and backend settings are defined in 0-Config/2_biblatex.tex. Use `\textcite`, `\parencite`, and related commands consistently. The bibliography renders at the end of the back matter as part of the class' standard sequence.

5.12 Language and Multi-Abstract Handling

Abstracts are per-language files declared in 4_files.tex. The order in which abstracts appear is governed by `abstractorder` in 1_novathesis.tex (see Chapter 4). Localization of structural strings (captions, list titles, ToC labels) is automatic based on the main language; override specific strings using `\ntlangsetup`.

5.13 Cover, Second Cover, and Spine

Covers and spine are generated from metadata in 0-Config/3_cover.tex and the selected institutional preset. If institutional rules require a second cover, it is produced automatically; disable it if not needed:

```
% 0-Config/4_files.tex (override behaviour if allowed by your School)
% \ntsetup{print/secondcover=false}
```

User-supplied cover pages may be injected via the `cover` kind (Section 5.4). Spine layout can be toggled and dimensioned through the keys documented in Chapter 4.

5.14 Common Structural Variations

- **Proposal / Plan Documents** (`doctype=phdplan`, `mscplan`): restrict included chapters via the optional selector in 4_files.tex (e.g., include only background and methodology).
- **Articles or Reports** (`doctype=article`, `plain`): keep the structure minimal—front matter, a single main file, and the bibliography; remove redundant lists in 6_list_of.tex.
- **Bilingual Documents**: declare multiple abstracts; set `lang/extralang` for additional localized strings; ensure figure/table captions meet the main language rules unless your program mandates bilingual captions.

5.15 Quality Assurance Checklist

Before sharing drafts with supervisors or submitting to institutional repositories, verify:

1. **Sequencing:** `4_files.tex` lists all parts in the intended order.
2. **Labels:** every float and structural unit has a unique, descriptive `\label`.
3. **References:** no unresolved references (??) or citations (??).
4. **Lists:** only the required lists are enabled (Figures/Tables/Algorithms/Listings/Glossaries).
5. **Appendices:** numbering and headings conform to institutional rules.
6. **Language:** abstract order and ToC/labels reflect the main language and institutional policy.
7. **Cover:** metadata, committee, sponsors/funding (if applicable) are accurate and consistent.

5.16 Summary

`novathesis` enforces a clean separation between configuration and content while adhering to academic structuring conventions. Define content files in `0-Config/4_files.tex`, keep chapter files modular under `2-MainMatter/`, and allow the class to assemble front matter, lists, back matter, and bibliography in a predictable sequence. Following the practices outlined in this chapter ensures maintainability and compliance with institutional requirements.

Makefile and Build System

6.1 Overview

`novathesis` provides a fully automated build environment based on the `Makefile` utility. It abstracts the complexity of multiple L^AT_EX compilation passes, bibliography generation, and auxiliary file management into a simple and predictable command-line interface. This design ensures reproducible builds across platforms and enables integration with continuous integration (CI) pipelines, local scripts, and Overleaf's `latexmk` backend.

The build system is compatible with:

- macOS (via MacTeX);
- GNU/Linux (via TeX Live);
- Windows (via MiKTeX with `make` from Git Bash or MinGW);
- Overleaf (via its internal `latexmk` environment).

6.2 Build Philosophy

Compiling a `novathesis` project involves several coordinated steps:

1. Reading configuration and metadata from `0-Config/`;
2. Running `latexmk` to perform multiple L^AT_EX passes automatically;
3. Running the appropriate bibliography backend (`biber` or `bibtex`);
4. Producing a fully consistent PDF output with all references and lists resolved.

The `Makefile` shipped with `novathesis` encapsulates these steps under descriptive targets. It also provides cleanup, packaging, and debugging utilities for maintenance and distribution.

6.3 Primary Build Targets

All commands below should be executed from the root of the `novathesis` project, in a terminal or command prompt that supports `make`.

`make pdf` Compiles using **pdfL^AT_EX**. Suitable when all fonts are provided by standard L^AT_EX packages and when no OpenType system fonts are required.

`make xe` Compiles using **XeLaTeX**. Recommended for most users, particularly when the selected font theme requires system or OpenType fonts (see Section 4.10). XeLaTeX supports full Unicode and multilingual typesetting.

`make lua` Compiles using **LuaLaTeX**. Functionally equivalent to XeLaTeX in most cases, but with finer control of microtypography and font rendering.

`make view` Builds the document using the default engine (typically XeLaTeX) and opens the resulting PDF in the system's viewer. On Linux, this uses the `xdg-open` utility; on macOS, `open`; on Windows, `start`.

`make clean` Removes all auxiliary build files (`.aux`, `.bb1`, `.bcf`, `.log`, `.out`, etc.) while keeping the PDF output. Use this to force a fresh rebuild.

`make clean-all` Performs a deep clean by removing *all* auxiliary files, intermediate PDFs, and temporary data (including glossaries, listings, and `biber` caches). Recommended before switching compilation engines or bibliography backends.

`make help` Prints a concise list of available targets and a short description of each, directly from the Makefile.

`make dry-run` Simulates the build process, printing which School preset, mode, and engine would be used without performing any compilation. Useful for validating configuration discovery.

`make zip` Packages the entire project (excluding temporary files) into a clean ZIP archive suitable for submission or distribution. The ZIP includes configuration, class files, and content, but excludes the `template.pdf` output.

Default target. Running `make` without arguments executes `make pdf` by default, unless redefined in the file's header.

6.4 Advanced Targets and Variables

The Makefile accepts several environment variables that can override automatic detection.

`ENGINE` Forces a specific compilation engine. Example:

```
make ENGINE=xelatex
```

SCHOOL Overrides the school preset inferred from 0-Config/1_novathesis.tex. Example:

```
make SCHOOL=nova/fct
```

MODE Switches between build modes (`working`, `provisional`, `final`). Example:

```
make MODE=final
```

BIBER Path to the `biber` executable, if non-standard. Example:

```
make BIBER=/usr/local/texlive/2025/bin/x86_64-linux/biber
```

When any of these variables are provided, the Makefile exports them to the `latexmk` process, ensuring consistent behaviour across all steps.

6.5 Integration with `latexmk`

6.5.1 Purpose of `latexmk`

`latexmk` automates multi-pass compilation by invoking the compiler until all cross-references, bibliographies, and glossaries are resolved. `novathesis` relies on `latexmk`'s dependency detection and log parsing capabilities to eliminate the need for manual rebuilds.

6.5.2 Internal Workflow

A typical `make xe` invocation performs the following internal steps:

1. Run `latexmk -xelatex -interaction=nonstopmode template.tex`;
2. Detect `biber` or `bibtex` usage via log analysis;
3. Execute `biber template` (if `backend=biber`);
4. Re-run `latexmk` as many times as needed for stable cross-references;
5. Copy or rename the resulting `template.pdf`.

All these steps are idempotent and may be repeated without risk of data loss.

6.5.3 Overriding `latexmk` Options

If your environment requires special compiler flags (for example, enabling shell escape for `minted` or `gnuplot`), set them through the `LATEXMKOPTS` variable:

```
make xe LATEXMKOPTS="--shell-escape"
```

The class does not enable shell escape by default for security reasons.

6.6 Parallel Compilation and Continuous Integration

6.6.1 Parallel Builds

`make` can execute independent rules concurrently when invoked with `-j`. Although individual targets are sequential by design, this can accelerate multi-engine builds, for instance:

```
make -j3 pdf xe lua
```

6.6.2 Continuous Integration Pipelines

For reproducible builds in CI (e.g., GitHub Actions, GitLab CI), define the following minimal pipeline step:

```
- name: Build \gls{novathesis}
  run: |
    sudo apt install texlive-full biber make
    make xe
```

Ensure that your pipeline image includes sufficient disk space (typically >5 GB for `texlive-full`).

6.7 Using the Makefile on Windows

Windows users must ensure that `make` is available in the PATH. It is typically bundled with `Git for Windows` or `MinGW`. Run the commands from `Git Bash` or `MinGW64 Shell`:

```
make pdf
make clean
```

If `make` is not available, the same results can be obtained using `latexmk` directly:

```
latexmk -xelatex template.tex
biber template
latexmk -xelatex template.tex
```

6.8 File and Directory Naming Conventions

The Makefile and class expect:

- no spaces in directory or file names;
- all chapter and figure file names in lowercase with hyphens or underscores;
- the main file named `template.tex`.

These conventions ensure that relative paths resolve correctly across different operating systems.

6.9 Common Compilation Scenarios

6.9.1 First Compilation

1. Configure the template (see Chapter 3);
2. Run `make xe`;
3. Verify that `template.pdf` is generated successfully.

6.9.2 Switching Font Engines

If you change the `style/font` key in `1_novathesis.tex` to a theme requiring system fonts, clean and rebuild with XeLaTeX or LuaLaTeX:

```
make clean  
make xe
```

6.9.3 Bibliography Errors

If citations appear unresolved, clean intermediate bibliography files and rebuild:

```
make clean  
make xe
```

This re-triggers biber or bibtex as required.

6.10 Troubleshooting the Build System

- **“File not found” errors:** Verify that paths in `0-Config/4_files.tex` correspond to existing files without extensions.
- **Fonts missing:** Ensure required fonts are installed (especially for `opensans`, `calibri`, `futura`, etc.) and rebuild with XeLaTeX or LuaLaTeX.

- **Biber not found:** Confirm that `biber` is installed and available in PATH. Run `which biber` (Unix) or `where biber` (Windows).
- **Glossary not appearing:** If using glossaries, run `make clean-all` followed by `make xe` to ensure the glossaries auxiliary files are rebuilt.
- **Inconsistent page numbering:** Ensure the front matter sequence in `4_files.tex` matches institutional requirements; the class manages transitions automatically.

6.11 Packaging and Distribution

Use the `make zip` target to produce a portable archive for submission or backup. This rule gathers the following components:

- All user files under `0-Config/`, `1-`, `2-`, `3-`, `4-`, and `5-Figures/`;
- The class file `novathesis.cls`;
- The Makefile itself;
- The license file.

It automatically excludes:

- Intermediate files (`.aux`, `.log`, `.bbl`, `.blg`, etc.);
- The compiled PDF;
- Local editor files (e.g., `.DS_Store`, `.synctex.gz`).

The resulting ZIP can be submitted directly to institutional repositories or shared with collaborators.

6.12 Extending the Build System

The Makefile is designed for clarity and ease of extension. Common customizations include:

- Adding a new target for glossaries regeneration:

```
glossaries:  
    make clean  
    make xe LATEXMKOPTS="--shell-escape"
```

- Creating a `draft` target that enables the `working` mode:

```
draft:  
make MODE=working xe
```

- Adding an `upload` target to push the generated PDF to a remote repository or Overleaf via Git.

When editing the Makefile, preserve the default targets and comment structure for maintainability.

6.13 Build Reproducibility and Archival Practices

Reproducibility is a key principle of `novathesis`. To ensure consistent builds across environments:

- Record the TeX distribution version (e.g., TeX Live 2025) and `novathesis` version (e.g., 7.6.0) in your thesis' metadata.
- Archive the final `.pdf`, `.bib`, and `0-Config/` folder together in institutional repositories.
- Use `make zip` for a clean and deterministic snapshot of the build state.

6.14 Summary

The `novathesis` Makefile and build system provide a robust, cross-platform environment that automates all steps of document compilation. By relying on standardized tools such as `latexmk` and `biber`, it ensures that any user—regardless of platform—can reproduce identical results using the same configuration and class version. Proper use of the Makefile not only simplifies day-to-day compilation but also guarantees that submitted documents are consistent, traceable, and compliant with institutional formatting policies.

Advanced Customization

7.1 Overview

This chapter describes advanced customization techniques for users who wish to adapt `novathesis` to new institutions, modify visual design elements, or introduce new structural and typographic conventions. These procedures assume familiarity with L^AT_EX, class options, and the overall configuration workflow presented in previous chapters.

All customization should be performed in a controlled and modular manner to preserve upgradeability and maintain compliance with institutional or publisher guidelines.

7.2 Principles of Safe Customization

- **Never edit core files.** Do not modify `novathesis.cls` or files inside `novathesisFiles/`. Instead, override behaviour through configuration keys, macros, or new files under `0-Config/`. This ensures that future updates of the template can be applied without losing local changes.
- **Preserve the class API.** `novathesis` provides stable interfaces for customization, such as:

```
\ntsetup{...}, \ntbibsetup{...}, \ntlangsetup{...}, \ntaddfile{...}
```

Use these rather than redefining lower-level commands.

- **Use version control.** Keep your customized template in a Git repository. Tag stable build versions, and note the class version (e.g., 7.6.0) in your README and thesis metadata.

7.3 Adding a New Institutional Preset

Institutions not currently included in the official presets can be supported by creating a new configuration file under `0-Config/` following the established naming convention.

7.3.1 Step 1: Create the Preset File

Copy an existing preset, such as `0-Config/9_nova_fct.tex`, and rename it according to the pattern:

`0-Config/9_<institution>.tex`

For example, to create a preset for the University of Coimbra's Faculty of Science and Technology:

`0-Config/9_ucoimbra_fctuc.tex`

7.3.2 Step 2: Define Metadata

Inside the new file, define:

- Department(s) or School(s);
- Degree names (in Portuguese and English);
- Institution name, logos, and optional color palette;
- Specific keys for examination, embargo, or signatures, if applicable.

Example:

```
% University of Coimbra - Faculty of Science and Technology (FCTUC)

% Department (PT/EN)
\ntdepartment(pt){Departamento de Engenharia Informática}
\ntdepartment(en){Department of Informatics Engineering}

% Degree names (PT/EN)
\ntdegreename(pt){Engenharia Informática}
\ntdegreename(en){Informatics Engineering}

% University and faculty labels
\ntsetup{
    schoolname/pt = {Faculdade de Ciências e Tecnologia},
    schoolname/en = {Faculty of Science and Technology},
    university/pt = {Universidade de Coimbra},
    university/en = {University of Coimbra}
}
```

7.3.3 Step 3: Assign a School Identifier

The file name corresponds to the identifier used in `1_novathesis.tex`. For the above example:

```
\ntsetup{school=ucoimbra/fctuc}
```

The class will automatically search for a file named `0-Config/9_ucoimbra_fctuc.tex` and apply its contents.

7.3.4 Step 4: Add Logos (Optional)

Place institutional logos in the folder `novathesisFiles/Logos/` following the same naming pattern:

```
\gls{novathesis}Files/Logos/ucoimbra_fctuc.pdf
```

Then reference them in your preset file:

```
\ntsetup{
  logo/front = ucoimbra_fctuc,
  logo/back  = ucoimbra_fctuc_small
}
```

7.3.5 Step 5: Test and Validate

Compile with:

```
make xe
```

Verify that:

- The institution and degree names appear correctly on the cover;
- The logo is positioned and scaled appropriately;
- Fonts, margins, and colors adhere to institutional branding guidelines.

Tip: Preserve the original style of other presets (structure, naming, comments) to ensure forward compatibility.

7.4 Customizing the Cover Page

Cover customization is one of the most common advanced modifications. `novathesis` provides several mechanisms for defining your own cover design.

7.4.1 High-Level Metadata Control

Most visual elements can be controlled through `0-Config/3_cover.tex`:

- Title and subtitle (`\nttitle(main,<lang>)` and `\nttitle(sub,<lang>)`);
- Degree name (`\ntdegreename`);
- Specialization (`\ntspecialization`);
- Sponsors (`\ntsponsors`);
- Committee (`\ntaddperson{committee}(role,gender){...}`).

7.4.2 Overriding the Default Layout

If your institution demands a fully custom design, define your own cover file and include it via `4_files.tex`:

```
\ntaddfile{cover}[1]{cover-front}
```

Create `cover-front.tex` in the project root or under `3-BackMatter/`, and include any custom layout you wish using standard L^AT_EX primitives or graphics.

```
\begin{titlepage}
  \centering
  \includegraphics[width=5cm]{\gls{novathesis}Files/Logos/ucointbra_fctuc}
  \vfill
  {\Huge\bfseries My Custom Cover Design}
  \vfill
  {\large Author: John Doe\\[1em]
   Supervisor: Prof.\ Jane Smith}
  \vfill
  {\normalsize Coimbra, 2025}
\end{titlepage}
```

7.4.3 Adding a Custom Spine or Back Cover

To add custom spine or back covers, declare:

```
\ntaddfile{cover}[spine]{cover-spine}
\ntaddfile{cover}[N]{cover-back}
```

Disable the default second cover if required:

```
\ntsetup{print/secondcover=false}
```

7.5 Defining a New Font Theme

Font themes reside under `novathesisFiles/FontStyles/` and are selected via `style/font` in `1_novathesis.tex`. Each theme is implemented as a small package defining font families, scaling, and optional microtypography adjustments.

7.5.1 Step 1: Copy an Existing Font Style

Duplicate one of the existing files, for example:

```
\gls{novathesis}Files/FontStyles/newpx.sty
```

and rename it:

```
\gls{novathesis}Files/FontStyles/mycustomfont.sty
```

7.5.2 Step 2: Define the Font Families

Inside your new style file, load the desired packages or system fonts. For example:

```
% My custom font style
\ProvidesPackage{FontStyles/mycustomfont}

\RequirePackage{fontspec} % required for XeLaTeX/LuaLaTeX

\setmainfont{Roboto Slab}
\setsansfont{Open Sans}
\setmonofont{Inconsolata}
```

7.5.3 Step 3: Reference It in the Configuration

In `1_novathesis.tex`, set:

```
\ntsetup{style/font=mycustomfont}
```

and compile using XeLaTeX or LuaLaTeX.

7.5.4 Step 4: Test Typography

Ensure that all elements (headings, captions, math, tables) are rendered correctly. If mathematical symbols appear mismatched, consider using `unicode-math` and loading a math font compatible with your text font.

7.6 Extending Language Support

`novathesis` supports several languages natively (EN, PT, ES, FR, DE, IT, GR, UK). To add a new language, create a new file under:

```
\gls{novathesis}Files/Strings/<lang>.tex
```

The file should define localized strings for all keys in the default English version:

```
\ntlangsetup{
    <lang>/contentsname=Índice,
    <lang>/figuresname=Figuras,
    <lang>/tablesname=Tabelas,
    <lang>/chaptername=Capítulo,
    ...
}
```

Once created, set `mainlanguage=<lang>` in `1_novathesis.tex` and recompile.

7.7 Defining Custom Metadata Fields

Institutions occasionally require additional metadata fields (e.g., embargo justification, research line, funding codes). `novathesis` allows the creation of custom key–value pairs through `\ntsetup`:

```
\ntsetup{project/code=UIDP/05037/2025}
\ntsetup{research/line=Artificial Intelligence and Systems}
```

These fields can then be printed in covers or statements using:

```
\ntprint{project/code}
\ntprint{research/line}
```

Best practice. Prefix custom keys with a unique namespace (e.g., `project/`, `grant/`) to avoid name collisions with future class updates.

7.8 Overriding Language Strings

To modify localized labels without editing class files, use the `\ntlangsetup` macro in `0-Config/5_packages.tex`. Examples:

```
\ntlangsetup{en/contentsname=TABLE OF CONTENTS}
\ntlangsetup{pt/contentsname=ÍNDICE}
\ntlangsetup{en/listfigurename=FIGURES}
\ntlangsetup{pt/listfigurename=FIGURAS}
```

Recompile to verify that headings and captions reflect the updated names.

7.9 Custom Commands and Environments

Users may define new macros or environments for repetitive content. These should be placed in `5_packages.tex` after the package imports to ensure proper scope.

```
% Example: Highlight command  
\newcommand{\highlight}[1]{\textbf{\color{novaBlue}#1}}
```

```
% Example: Definition environment  
\newtheorem{definition}{Definition}[chapter]
```

Avoid redefining core `novathesis` commands (`\nt...`) or `memoir` internals unless you fully understand their interaction.

7.10 Changing the Page Layout

The low-level layout settings (margins, binding correction, page style) are governed by the `memoir` class. `novathesis` exposes these controls in `0-Config/0_memoir.tex`.

Example:

```
% Adjust text block and margins  
\setlrmarginsandblock{3.5cm}{3cm}{*}  
\setulmarginsandblock{3cm}{3cm}{*}  
\checkandfixthelayout
```

Headers and footers:

```
\makepagestyle{nova}  
\makeoddhead{nova}{\thechapter.\~\leftmark}{\thepage}  
\makeevenhead{nova}{\thepage}{\thechapter.\~\rightmark}  
\pagestyle{nova}
```

All such adjustments should be documented and approved by your institution before final submission.

7.11 Custom Colors and Branding

`novathesis` uses color definitions from the institutional presets located in `novathesisFiles/Colors/`. To define your own palette, copy an existing file and modify it:

```
% mycolors.sty
\ProvidesPackage{Colors/mycolors}
\definecolor{novaBlue}{RGB}{0,84,160}
\definecolor{accentGray}{RGB}{150,150,150}
```

Then select it in your preset file:

```
\ntsetup{style/colors=mycolors}
```

Use these colors consistently across figures and typography for a coherent institutional identity.

7.12 Incorporating External Packages

Packages not included in the default distribution can be loaded in 0-Config/5_packages.tex. Ensure compatibility with `memoir` and `novathesis` macros.

Example: Adding `todonotes` and `siunitx`

```
\usepackage[colorinlistoftodos,prependcaption,textsize=tiny]{todonotes}
\usepackage{siunitx}
\sisetup{detect-all, range-phrase=--, range-units=single}
```

Package conflicts. Avoid loading packages that redefine structural commands (`titlesec`, `geometry`, `fancyhdr`) as these are already managed by `memoir`.

7.13 Integrating Code and Data

For projects requiring code listings or data tables:

- Use `listings` or `minted` for source code (see Chapter 5.6);
- Place scripts under a subfolder (e.g., `code/`) and refer to them with relative paths;
- For reproducible figures, integrate `pgfplots` or `tikz` code directly into your L^AT_EX files.

When using `minted`, compile with shell escape enabled:

```
make xe LATEXMKOPTS="--shell-escape"
```

7.14 Version Control and Template Updates

To ensure long-term maintainability:

- Keep the entire `novathesis` directory under version control (e.g., Git);
- Commit configuration and content changes incrementally;
- Tag each submission or milestone build with the `novathesis` version used;
- Before updating the class to a new release, back up your `0-Config/` and `4-Bibliography/` folders.

If you modify internal macros for a new feature, store the patch separately and avoid changing the main class file. Submit improvements upstream if they may benefit other users.

7.15 Checklist: Safe Customization Practices

1. Keep all local edits within `0-Config/` and user content directories.
2. Avoid modifying `novathesis.cls` and `novathesisFiles/`.
3. Create new presets and font styles instead of altering shipped ones.
4. Use `\ntsetup` and related macros to define new fields.
5. Always test after modifying cover layouts or fonts.
6. Maintain version control for full reproducibility.
7. Document all customizations in your project README.

7.16 Summary

Advanced customization of `novathesis` allows users to adapt the template to virtually any academic institution or publication format while preserving the underlying architecture. By following the structured methods described in this chapter—creating new presets, defining font and color themes, extending metadata, and introducing localized elements—users can achieve full visual and structural compliance without compromising compatibility or maintainability. All modifications should remain confined to configuration files, ensuring that the core class remains stable and upgrade-safe.

Multi-language Support

8.1 Overview

`novathesis` provides comprehensive multilingual capabilities, enabling users to produce theses in one or more languages with full localization of structural elements such as titles, captions, and lists. Language management is built upon the standard `babel` and `polyglossia` frameworks, depending on the selected engine, and integrates seamlessly with the class configuration system.

This chapter describes how to configure document languages, define multilingual abstracts, manage localized metadata, and ensure consistent formatting across all language sections. It also outlines advanced techniques for bilingual and multilingual theses.

8.2 Supported Languages

`novathesis` includes predefined string sets for the following languages:

EN (English), PT (Portuguese), ES (Spanish), FR (French), DE (German), IT (Italian), GR (Greek), UK (Ukrainian).

Each language provides localized labels for chapter titles, lists of figures and tables, appendices, and cover-page elements. Additional languages can be defined by creating a new file in `novathesisFiles/Strings/` (see Chapter 7.6).

8.3 Language Architecture

`novathesis` distinguishes between three levels of language configuration:

Main Language — Governs the language of the entire document, including headings, captions, and the main body text.

Abstract Languages — Defines the set of languages in which abstracts are provided.

Extra Languages — Enables occasional translations, quotations, or bilingual text fragments within the document.

All language behavior is controlled by the `\ntsetup` keys in `0-Config/1_novathesis.tex`.

8.4 Setting the Main Language

The main document language is selected using the `mainlanguage` key:

```
\ntsetup{mainlanguage=pt}
```

Accepted values correspond to the two-letter ISO codes listed above. This determines:

- The default hyphenation and typographic conventions;
- Localization of structural strings (chapter, figure, table, appendix, etc.);
- The order and naming of automatically generated lists and tables of contents;
- The primary language for front-matter metadata and cover elements.

Example: English Thesis

```
\ntsetup{mainlanguage=en}
```

The entire document, including chapter headings and captions, will appear in English.

8.5 Adding Secondary and Abstract Languages

To include additional languages (typically for abstracts), declare them as a comma-separated list in the `abstractorder` key:

```
\ntsetup{abstractorder={pt,en}}
```

This example generates two abstracts: first in Portuguese, then in English. Each abstract must have a corresponding file declared in `0-Config/4_files.tex`:

```
% 0-Config/4_files.tex
\ntaddfile{abstract}{pt}{abstract-pt}
\ntaddfile{abstract}{en}{abstract-en}
```

Automatic Localization. Each abstract automatically uses the correct localized title (“Resumo”, “Abstract”, etc.) and follows the typographic conventions of its respective language.

Example: Bilingual Abstract Files.

```
% 1-FrontMatter/abstract-pt.tex
\begin{abstract}
Este trabalho analisa a aplicação de algoritmos de aprendizagem automática
em séries temporais financeiras. Foram exploradas técnicas supervisionadas
e não supervisionadas com foco na previsibilidade e estabilidade.
\end{abstract}
```

```
% 1-FrontMatter/abstract-en.tex
\begin{abstract}
This work analyzes the application of machine learning algorithms
to financial time-series data. Both supervised and unsupervised
approaches were explored, emphasizing predictability and stability.
\end{abstract}
```

8.6 Localized Metadata

`novathesis` allows most metadata fields to be defined in multiple languages using the same `\ntsetup` interface. The class automatically selects the version corresponding to the current language context.

Example: Thesis Title and Keywords.

```
\nttitle(main,pt){Análise de Dados Climáticos}
\nttitle(main,en){Climate Data Analysis}

\ntkeywords(pt){Meteorologia, Modelação, Previsão}
\ntkeywords(en){Meteorology, Modelling, Forecasting}
```

When generating the front matter and covers, `novathesis` will automatically display the correct titles and keywords for each language context.

Optional subtitles. Subtitles can also be defined per language:

```
\nttitle(sub,pt){Modelos Estatísticos e Aprendizagem Automática}
\nttitle(sub,en){Statistical Models and Machine Learning}
```

8.7 Changing Language within the Document

Occasionally, users may need to insert text or quotations in a language other than the main one. The command `\foreignlanguage` may be used directly:

```
\foreignlanguage{pt}{A aprendizagem automática é uma área em rápido crescimento.}
```

This ensures correct hyphenation and punctuation rules for the inserted text. In XeLaTeX and LuaLaTeX, `novathesis` automatically selects the appropriate font encodings through `fontspec`.

8.8 Multilingual Captions and Cross-References

Captions for figures and tables follow the current language context automatically. When working in a mixed-language document, use `\selectlanguage{<code>}` to enforce specific localization before a float environment.

```
\selectlanguage{en}
\begin{figure}
  \centering
  \includegraphics[width=0.7\linewidth]{5-Figures/sample}
  \caption{Example of a multilingual caption.}
\end{figure}

\selectlanguage{pt}
\begin{figure}
  \centering
  \includegraphics[width=0.7\linewidth]{5-Figures/sample}
  \caption{Exemplo de legenda multilingue.}
\end{figure}
```

8.9 Bilingual Theses

Some institutions require bilingual theses, where the abstract, keywords, and sometimes chapter titles appear in two languages. `novathesis` supports this through the coordinated use of the `mainlanguage` and `abstractorder` keys.

8.9.1 Recommended Configuration

```
\ntsetup{
  mainlanguage=en,
  abstractorder={pt,en},
  lang/extra={pt}
}
```

This configuration produces an English thesis with Portuguese as a secondary language for abstracts and optional quotations.

8.9.2 Localized Lists and Captions

All “List of ...” elements (Figures, Tables, Glossaries) automatically use the language of the main document. To provide translated captions or headings, redefine only the necessary strings via `\ntlangsetup`:

```
\ntlangsetup{pt/listfigurename=Lista de Figuras}
\ntlangsetup{pt/listtablename=Lista de Tabelas}
```

8.10 Defining a New Language

If your thesis requires a language not shipped with `novathesis`, follow these steps:

1. Create a new file in `novathesisFiles/Strings/`, named after the language code, e.g.,

```
\gls{novathesis}Files/Strings/sv.tex
```

for Swedish.

2. Copy the structure of an existing file (e.g., `en.tex`) and translate all values:

```
\ntlangsetup{
    sv/chaptername=Kapitel,
    sv/contentsname=Innehåll,
    sv/figuresname=Figurer,
    sv/tablesname=Tabeller,
    sv/appendixname=Bilaga
}
```

3. Update `1_novathesis.tex`:

```
\ntsetup{mainlanguage=sv}
```

4. Compile using XeLaTeX or LuaLaTeX (required for Unicode languages).

8.11 Right-to-Left (RTL) Languages

For languages such as Arabic or Hebrew, XeLaTeX and LuaLaTeX provide native right-to-left text rendering through `polyglossia`. `novathesis` detects and configures `polyglossia` automatically when an RTL language is selected as the main language.

Example:

```
\ntsetup{mainlanguage=he}
```

Ensure that the fonts chosen in `1_novathesis.tex` support the corresponding script, for example:

```
\setmainfont{Amiri}
\setsansfont{Scheherazade New}
```

8.12 Multilingual Bibliography

The bibliography system supports multilingual entries through `biblatex`. Each entry can include language tags:

```
@book{example2024,
  author    = {M. Silva},
  title     = {Introdução à Modelação},
  year      = {2024},
  language   = {portuguese}
}
```

Automatic Localization. When the `babel` package is active, bibliography headings and reference labels are automatically translated according to the main document language.

To print the bibliography in multiple languages, load `biblatex` with the `autolang=other` option in `2_biblatex.tex`:

```
\ntbibsetup{
  backend=biber,
  autolang=other
}
```

8.13 Best Practices for Multilingual Documents

1. Define the main language first; add secondary ones only as required.
2. Maintain one abstract file per language, clearly named.
3. Do not mix multiple languages in a single paragraph; switch context explicitly.
4. Use XeLaTeX or LuaLaTeX for Unicode and OpenType font compatibility.
5. Verify that hyphenation patterns and quotation marks are correct in each language.
6. Ensure that all metadata fields (titles, keywords, degree name) have corresponding translations.

7. Check the cover page output for correct accent rendering.

8.14 Common Issues and Solutions

Accented characters not displaying. Ensure all files are UTF-8 encoded and that the selected fonts support the necessary characters.

Wrong language on cover or abstract. Verify that only one instance of each `\nttitle(main,<lang>)` or `\ntdegreename(<lang>)` pair is active. If multiple definitions are provided for the same language, the last one will take precedence.

Hyphenation errors or mixed punctuation. Confirm that the correct main language is set in `1_novathesis.tex` and that the proper language package (`babel` or `polyglossia`) is loaded automatically by the class.

8.15 Summary

`novathesis` provides robust, flexible multilingual capabilities that cover every aspect of academic document preparation—from abstracts and metadata to captions, covers, and bibliography. By combining institutional presets with standard `LATEX` language mechanisms, users can prepare bilingual or multilingual theses effortlessly, without modifying the core class. Adhering to the configuration principles described in this chapter ensures linguistic accuracy, typographic consistency, and full compliance with institutional submission standards.

Bibliography and Citation Management

9.1 Overview

The management of bibliographic references is a critical aspect of any academic thesis. `novathesis` integrates the `biblatex` package with the `biber` backend, offering a modern, flexible, and language-aware citation system. This configuration provides full control over reference styles, multilingual support, and compliance with institutional formatting guidelines.

This chapter explains how to define, cite, and format bibliographic data within the `novathesis` environment, including examples of both numeric and author–year citation schemes.

9.2 Bibliography Architecture in `novathesis`

Bibliographic configuration in `novathesis` is defined across three primary components:

1. The global `biblatex` setup in `0-Config/3_bibliography.tex`;
2. The bibliography database files (`.bib`) stored in `4-Bibliography/`;
3. The bibliography inclusion command in `3-BackMatter/appendices.tex` or `main.tex`.

The system automatically manages language localization, label formatting, and cross-references between citations and bibliography entries.

9.3 Default Configuration

By default, `novathesis` loads the following settings:

```
\usepackage[
    backend=biber,
    style=authoryear,
```

```
citestyle=authoryear,  
sorting=nyt,  
maxbibnames=99,  
giveninits=true,  
isbn=false,  
url=true,  
doi=true,  
eprint=true  
]{biblatex}  
  
\addbibresource{4-Bibliography/references.bib}
```

This configuration produces an author–year citation style compliant with most academic standards at NOVA University Lisbon.

Main Features.

- Full UTF-8 support for multilingual references;
- Automatic hyperlinking to citations and DOIs;
- Compact author lists with initials for first names;
- Sorting by name, year, and title;
- Automatic handling of et al. abbreviations.

9.4 Bibliography Database Structure

Each entry in a .bib file follows the standard BibTeX syntax:

```
@article{smith2024energy,  
author    = {John Smith and Maria Silva},  
title     = {Renewable Energy Forecasting with Neural Networks},  
journal   = {Journal of Sustainable Energy},  
year      = {2024},  
volume    = {18},  
number    = {2},  
pages     = {55--72},  
doi       = {10.1234/jse.2024.0182}  
}
```

Files may contain any number of entries, grouped by type (@article, @book, @inproceedings, etc.). It is best practice to maintain a single, consolidated file such as references.bib.

Recommended Encoding. Always save .bib files in UTF-8 encoding to ensure compatibility with non-English characters.

9.5 Adding and Managing Bibliography Files

To include multiple bibliography databases, use:

```
\addbibresource{4-Bibliography/books.bib}  
\addbibresource{4-Bibliography/articles.bib}
```

Relative paths are recommended for portability. Avoid absolute paths or spaces in filenames.

9.6 Citation Commands

`novathesis` supports all standard biblatex citation commands.

Author–Year Style.

According to `\textcite{smith2024energy}`, forecasting accuracy improves...
`\parencite{smith2024energy}`

Output:

According to Smith and Silva (2024), forecasting accuracy improves... (Smith and Silva, 2024)

Numeric Style. If the numeric style is preferred, change the `style` and `citestyle` options:

```
\usepackage[backend=biber,style=numeric,citestyle=numeric]{biblatex}
```

Then use:

```
\cite{smith2024energy}
```

Additional Commands.

`\textcite{}` — author name in text, year in parentheses;

`\parencite{}` — full citation in parentheses;

`\citeauthor{}` — author name only;

`\citeyear{}` — year only;

`\fullcite{}` — full bibliographic entry inline.

9.7 Printing the Bibliography

The bibliography is printed automatically at the end of the document. To include it manually, add the following command in the appropriate section:

```
\printbibliography[heading=bibintoc,title={References}]
```

This ensures the bibliography appears in both the document and the table of contents. The title will be localized according to the document language.

9.8 Language and Localization

`novathesis` automatically adapts citation labels and reference titles to the current document language. The `babel` or `polyglossia` package ensures correct translation of terms such as “editor”, “volume”, “accessed on”, etc.

Example.

```
\selectlanguage{portuguese}
\printbibliography[title={Referências Bibliográficas}]
```

Multilingual Documents. When compiling multilingual theses, each bibliography entry retains its original language, while field labels are translated dynamically.

9.9 Institutional Citation Styles

Different faculties within NOVA University may specify preferred citation styles. `novathesis` includes preconfigured styles for:

- `authoryear` — default (APA-like);
- `numeric-comp` — compressed numeric citations;
- `ieee` — IEEE-style numeric citations for engineering;
- `chicago-authordate` — humanities and social sciences.

To switch styles, modify:

```
\usepackage[backend=biber,style=ieee]{biblatex}
```

Institutional Presets. Some presets (e.g., FCT, NOVAIMS) apply their own style automatically via the `school` key in `1_novathesis.tex`.

9.10 Managing DOIs, URLs, and Access Dates

`biblatex` automatically formats DOIs and URLs as hyperlinks when `hyperref` is active.

Example.

```
url      = {https://doi.org/10.1234/abcd.2024},  
urldate= {2024-10-03},
```

To hide URLs or DOIs in printed versions:

```
\AtEveryBibitem{\clearfield{url}\clearfield{doi}}
```

9.11 Bibliography in Appendices or Separate Sections

If a thesis contains multiple bibliographies (e.g., one per chapter or appendix), use:

```
\printbibliography[heading=subbibliography,title={Chapter 2 References},segment=2]
```

This requires enabling segmented bibliographies in `biblatex`:

```
\usepackage[refsegment=chapter]{biblatex}
```

9.12 Customizing the Bibliography Layout

Formatting of the bibliography list can be customized through `biblatex` options and `novathesis` configuration files.

Changing Font or Spacing.

```
\setlength\bibitemsep{0.8\baselineskip}  
\renewcommand*\bibfont{\small}
```

Adding a Separator Line.

```
\defbibheading{bibintoc}{%  
 \section*{\#1}\markboth{\#1}{\#1}\vspace{0.5cm}\hrule\vspace{1cm}}
```

9.13 Integration with Cross-Referencing

All citation commands are fully compatible with the `hyperref` and `cleveref` systems. When clicking on a citation, readers are directed to the corresponding entry in the bibliography section. Back-references (from bibliography to text) can be enabled with:

```
\usepackage[backref=true]{biblatex}
```

This feature is particularly useful in long documents or institutional reviews.

9.14 Compiling the Bibliography

Standard Workflow. `novathesis` compiles the bibliography automatically when using the `Makefile`. To compile manually:

```
xelatex template.tex  
biber template  
xelatex template.tex  
xelatex template.tex
```

Overleaf. Overleaf automatically detects `biber` as the backend. However, in some cases, users must manually set the bibliography tool to “Biber” under the project’s Compiler settings. For large bibliographies, note that the free Overleaf tier may exceed processing limits.

9.15 Validation and Troubleshooting

Common Issues.

- **Undefined citations:** Re-run `biber` after the first L^AT_EX compilation.
- **Character encoding errors:** Ensure .bib files are UTF-8 encoded.
- **Duplicate entries:** Each citation key must be unique across all databases.
- **Incorrect sorting:** Adjust the `sorting` option (e.g., `nyt`, `ynt`, or `none`).

Debugging. Use the following commands to inspect bibliography logs:

```
biber --debug template  
cat template.blg
```

9.16 Best Practices

1. Maintain a single master .bib file under version control;
2. Always include a DOI or URL when available;
3. Use sentence case for titles unless required otherwise;
4. Keep citation keys descriptive (e.g., `lastnameYYYYkeyword`);
5. Verify consistency in author name spelling across entries;
6. Test the bibliography under both screen and print modes.

9.17 Summary

novathesis offers a modern and extensible bibliography management system based on `biblatex` and `biber`, ensuring consistency, multilingual adaptability, and compliance with institutional citation standards. By following the configuration and best practices outlined in this chapter, authors can produce clean, fully linked bibliographies that integrate seamlessly with the thesis structure and metadata system.

Figures, Tables, and Illustrations

10.1 Overview

Figures, tables, and other illustrations play a central role in academic writing. `novathesis` provides a coherent framework for managing these visual elements while preserving typographic consistency, institutional compliance, and full cross-referencing capabilities.

This chapter describes how to include, format, and reference figures and tables in `novathesis`, as well as how to control float placement, numbering, and captioning. It also covers best practices for image quality, reproducibility, and accessibility.

10.2 Float Management in L^AT_EX

`novathesis` inherits its float management from the `memoir` class, which extends the standard L^AT_EX float system. Floats are environments that contain non-text elements (figures, tables, algorithms, etc.) that can move to the most suitable position in the layout.

Common environments include:

`figure`, `table`, `sidewaysfigure`, and `longtable`.

Each float consists of three key components:

- the content (e.g., an image or tabular data);
- a caption (`\caption{...}`);
- an internal label (`\label{...}`) for referencing.

10.3 Including Figures

Figures are stored in the directory `5-Figures/`. Supported formats include `.pdf`, `.png`, and `.jpg`. Vector formats (`.pdf` or `.eps`) are recommended for line art and diagrams; raster formats (`.png`) are preferred for screenshots or photographs.

Basic Example.

```
\begin{figure}[htbp]
  \centering
  \includegraphics[width=0.75\linewidth]{5-Figures/example}
  \caption{Illustration of the main experimental setup.}
  \label{fig:setup}
\end{figure}
```

Float placement options. [htbp] stands for:

- h — here (current position);
- t — top of page;
- b — bottom of page;
- p — separate page for floats.

Multiple options can be combined, e.g., [ht].

Referencing figures.

As shown in Figure~\ref{fig:setup}, the apparatus is mounted vertically.

Cross-references automatically include the localized prefix (“Figure”, “Figura”, etc.).

10.4 Subfigures

For composite figures, `novathesis` supports both the `subcaption` and `subfig` packages. Subfigures should be placed side by side and given individual labels.

Example using `subcaption`.

```
\begin{figure}[t]
  \centering
  \begin{subfigure}[b]{0.45\linewidth}
    \includegraphics[width=\linewidth]{5-Figures/sample-a}
    \caption{Training accuracy.}
    \label{fig:accuracy}
  \end{subfigure}
  \hfill
  \begin{subfigure}[b]{0.45\linewidth}
    \includegraphics[width=\linewidth]{5-Figures/sample-b}
    \caption{Validation loss.}
  \end{subfigure}
\end{figure}
```

```
\label{fig:loss}
\end{subfigure}
\caption{Model performance during training.}
\label{fig:training}
\end{figure}
```

Subfigures are labeled (a), (b), etc., and can be cross-referenced individually:

See Figures~\ref{fig:accuracy} and~\ref{fig:loss}.

10.5 Tables

Tables present structured data and should be placed using the `table` environment. Use `booktabs` for professional-quality horizontal rules; avoid vertical lines whenever possible.

Example Table.

```
\begin{table}[htbp]
\centering
\caption{Comparison of algorithm performance metrics.}
\label{tab:results}
\begin{tabular}{lccc}
\toprule
\textbf{Model} & \textbf{Accuracy} & \textbf{Precision} & \textbf{Recall} \\
\midrule
Model~A & 0.91 & 0.89 & 0.88 \\
Model~B & 0.93 & 0.92 & 0.90 \\
Model~C & 0.87 & 0.85 & 0.84 \\
\bottomrule
\end{tabular}
\end{table}
```

Referencing.

The results summarized in Table~\ref{tab:results} confirm...

10.6 Long and Wide Tables

For tables extending over multiple pages, use the `longtable` package:

```
\begin{longtable}{lrr}
\caption{Dataset Summary} \\
```

```
\toprule
Feature & Mean & Std. Dev. \\
\midrule
\endfirsthead
\caption{(continued)} \\
\toprule
Feature & Mean & Std. Dev. \\
\midrule
\endhead
Temperature & 22.3 & 3.4 \\
Pressure & 101.3 & 2.5 \\
... & ... & ... \\
\bottomrule
\end{longtable}
```

For wide tables, use `adjustbox` or `resizebox` to scale the content to the page width:

```
\resizebox{\textwidth}{!}{
\begin{tabular}{lccccc}
...
\end{tabular}
}
```

10.7 Figures and Tables in Landscape Mode

Wide figures or tables can be rotated using the `sidewaysfigure` or `sidewaystable` environments provided by the `rotating` package.

Example.

```
\begin{sidewaystable}
\centering
\caption{Correlation matrix for all parameters.}
\label{tab:correlation}
\begin{tabular}{lcccc}
...
\end{tabular}
\end{sidewaystable}
```

10.8 Lists of Figures and Tables

`novathesis` automatically generates the “List of Figures” and “List of Tables” if they are enabled in `0-Config/6_list_of.tex`.

Example.

```
% Enable lists
\ntaddlistof{figures}
\ntaddlistof{tables}
```

These lists appear in the front matter, after the table of contents, and are localized according to the document language.

10.9 Numbering and Labeling Conventions

By default, figures and tables are numbered consecutively within each chapter:

Figure 2.1, Figure 2.2, ...
Table 3.1, Table 3.2, ...

This convention ensures consistent cross-referencing. If sequential numbering throughout the document is preferred, modify the following in `0-Config/0_memoir.tex`:

```
\counterwithout{figure}{chapter}
\counterwithout{table}{chapter}
```

10.10 Image Quality and Resolution Guidelines

- Vector formats (PDF, EPS) are preferred for plots, diagrams, and line art.
- Raster images should be at least 300 dpi for print and 150 dpi for digital display.
- Avoid scaling up low-resolution images.
- For consistent typography, use the same font families in figures and the main text.

Color Management. `novathesis` provides predefined institutional colors (see Chapter [7.11](#)). Use them consistently in all charts to maintain visual identity.

10.11 Generating Figures with TikZ and PGFPlots

`novathesis` includes full support for `tikz` and `pgfplots`. These packages allow programmatic generation of publication-quality graphics.

Example.

```
\begin{figure}[h]
    \centering
    \begin{tikzpicture}
        \begin{axis}[ xlabel=Epoch, ylabel=Accuracy, grid=both]
            \addplot coordinates {(1,0.72) (2,0.81) (3,0.87) (4,0.91)};
            \addlegendentry{Training}
        \end{axis}
    \end{tikzpicture}
    \caption{Training accuracy over epochs.}
    \label{fig:tikz-example}
\end{figure}
```

Externalization. For large projects, enable figure caching to reduce compilation time:

```
\usetikzlibrary{external}
\tikzexternalize[prefix=tikz/]
```

10.12 Code Listings as Figures

When code needs to be displayed, use the `listings` or `minted` package. Both can be styled to match `novathesis` formatting.

Example using `listings`.

```
\begin{figure}[h]
    \centering
    \begin{lstlisting}[language=Python,caption={Example Python script.},label={lst:python}]
def add(a, b):
    return a + b
    \end{lstlisting}
\end{figure}
```

Example using `minted`.

```
\begin{listing}[h]
    \inputminted[fontsize=\small,frame=single]{python}{code/example.py}
    \caption{Example Python code.}
    \label{lst:minted}
\end{listing}
```

When using `minted`, remember to compile with:

```
make xe LATEXMKOPTS="--shell-escape"
```

10.13 Captions and Descriptive Text

Best practices.

- Every figure and table must include a descriptive caption.
- Captions should be concise, but self-contained.
- Avoid using abbreviations that are not defined in the text.
- Place figure captions *below* figures and table captions *above* tables.

Font and spacing. Captions inherit typographic settings from `novathesis` defaults. They can be adjusted in `0-Config/0_memoir.tex`:

```
\captionnamefont{\bfseries}
\captiontitlefont{\small}
\setlength{\abovecaptionskip}{10pt}
\setlength{\belowcaptionskip}{10pt}
```

10.14 Institutional Style Compliance

Many institutions prescribe specific rules for figure and table formatting, including caption alignment, numbering, or placement. `novathesis` allows these parameters to be tuned through configuration files:

- Caption language and numbering are controlled by `mainlanguage` in `1_novathesis.tex`;
- Caption format and justification can be changed in `0-Config/0_memoir.tex`;
- List generation (Figures/Tables) is controlled via `0-Config/6_list_of.tex`;
- Institutional color consistency should follow `style/colors` in `1_novathesis.tex`.

Before submission, verify compliance with your institution's thesis guidelines or formatting manual.

10.15 Troubleshooting Common Float Issues

Figure or table appears in the wrong place. This is normal in L^AT_EX; floats move automatically. Add the option `[H]` from the `float` package to enforce fixed placement, but use sparingly.

Figures extend beyond margins. Reduce `width` or use `\resizebox{\textwidth}{!}{...}`.

List of Figures or Tables missing. Ensure they are declared in `0-Config/6_list_of.tex` and that each figure or table includes a caption.

Subfigures misaligned. Ensure consistent `width` assignments and include `\centering` inside each subfigure.

10.16 Summary

The `novathesis` float system, based on the `memoir` class, provides a robust and consistent framework for managing figures, tables, and other visual elements. By following the conventions and configuration mechanisms described in this chapter, users can ensure clear, professional, and institution-compliant presentation of all illustrative material in their theses.

Equations, Algorithms, and Mathematical Formatting

11.1 Overview

Mathematical notation, algorithms, and formal expressions are critical components of technical and scientific writing. `novathesis` inherits the powerful mathematical capabilities of L^AT_EX and extends them through the `amsmath`, `amsthm`, and `algorithm` packages. This chapter explains how to typeset equations, define theorem environments, and present algorithms in a clear and consistent manner aligned with institutional standards.

11.2 Mathematics Packages in `novathesis`

The following packages are preloaded by default:

- `amsmath`, `amssymb`, and `amsfonts` — core AMS packages for advanced mathematical typesetting;
- `mathtools` — an extension of `amsmath` providing enhanced alignment and tagging;
- `siunitx` — formatting of physical units and numerical quantities;
- `bm` — bold math symbols;
- `algorithm`, `algorithmicx`, and `algpseudocode` — for presenting pseudocode algorithms.

Users may load additional math packages in `0-Config/5_packages.tex` as needed, provided they are compatible with `memoir`.

11.3 Inline and Display Equations

Equations may appear inline or as separate numbered displays.

Inline Example.

The energy is defined by $E = mc^2$.

Display Example.

```
\begin{equation}
E = mc^2
\label{eq:energy}
\end{equation}
```

Referencing Equations.

As shown in Equation~\ref{eq:energy}, energy and mass are equivalent.

Cross-references automatically include the localized label (“Equation”, “Equação”, etc.).

11.4 Aligning Equations

For systems of equations or multi-line derivations, use the `align` or `aligned` environments from `amsmath`.

Example.

```
\begin{align}
a^2 + b^2 &= c^2 \label{eq:pythagoras} \\
E &= mc^2 \label{eq:einstein}
\end{align}
```

Each line may be independently numbered and referenced.

Suppressing Numbers. Add the `\nonumber` command or use the `align*` environment to omit numbering:

```
\begin{align*}
x' &= Ax + Bu \\
y &= Cx + Du
\end{align*}
```

11.5 Equation Numbering and Formatting

By default, `novathesis` numbers equations sequentially within each chapter:

(2.1), (2.2), ...

To number equations continuously throughout the document, modify `0-Config/0_memoir.tex`:

```
\counterwithout{equation}{chapter}
```

Custom Equation Format. For institutions requiring specific numbering formats (e.g., section-based), redefine:

```
\numberwithin{equation}{section}
```

11.6 Multiline Equations

For long expressions, use `multiline` or `split`:

```
\begin{multiline}
f(x) = x^3 + 2x^2 + 3x + 5 \\
+ 7x^{-1} + 9x^{-2}
\end{multiline}
```

This environment breaks equations automatically across multiple lines while maintaining alignment and numbering.

11.7 Matrices and Vectors

Matrices are supported through `amsmath` environments.

Example.

```
\begin{equation}
A =
\begin{bmatrix}
a_{11} & a_{12} & a_{13} \\
a_{21} & a_{22} & a_{23}
\end{bmatrix}
\end{equation}
```

Alternate Bracket Styles. `pmatrix` for parentheses, `vmatrix` for determinants, and `Bmatrix` for braces are all available.

11.8 Units and Numerical Formatting

Use the `siunitx` package for consistent typesetting of physical quantities and units.

Examples.

```
\SI{3.6}{\meter\per\second}
\SI{9.81}{\meter\per\square\second}
\SIrange{0}{100}{\celsius}
```

`siunitx` automatically applies proper spacing and typography between numbers and units.

11.9 Theorem, Lemma, and Definition Environments

Formal statements such as theorems, lemmas, and definitions can be declared using `amsthm`. `novathesis` does not predefine them, allowing institutions to apply their own naming conventions.

Example Definition. Add in `0-Config/5_packages.tex`:

```
\newtheorem{theorem}[Theorem]{Theorem}[chapter]
\newtheorem{lemma}[theorem]{Lemma}
\theoremstyle{definition}
\newtheorem{definition}[theorem]{Definition}
```

Then, in the main text:

```
\begin{theorem}[Pythagoras]
For any right triangle,  $a^2 + b^2 = c^2$ .
\end{theorem}
```

Each theorem will be numbered per chapter (e.g., Theorem 2.1).

Proof Environment. Use the standard `\begin{proof} ... \end{proof}` block, which automatically appends a Q.E.D. symbol.

11.10 Algorithm Presentation

Algorithms are formal representations of computational procedures or workflows. `novathesis` provides two methods for including them:

- As pseudocode environments using `algorithm` and `algpseudocode`;
- As standard floats using `algorithmicx`.

Example.

```
\begin{algorithm}[htbp]
\caption{Gradient Descent Optimization}
\label{alg:gradient}
\begin{algorithmic}[1]
\State Initialize  $\theta \leftarrow \theta_0$ 
\For{$t = 1$ \textbf{to} $T$}
    \State Compute gradient  $g_t = \nabla_{\theta} J(\theta_t)$ 
    \State Update parameters  $\theta_{t+1} = \theta_t - \eta g_t$ 
\EndFor
\end{algorithmic}
\end{algorithm}
```

The [1] option enables line numbering for pseudocode clarity. Refer to the algorithm as:

As shown in Algorithm~\ref{alg:gradient}, parameters converge iteratively.

Styling Algorithms. Adjust appearance in 0-Config/5_packages.tex:

```
\floatname{algorithm}{Algorithm}
\renewcommand{\listalgorithmname}{List of Algorithms}
```

11.11 Equations within Algorithms

Mathematical expressions may be embedded directly within pseudocode lines:

```
\State  $w_{i+1} = w_i - \eta \frac{\partial L}{\partial w_i}$ 
```

Ensure consistent symbol usage between text, equations, and pseudocode for readability.

11.12 Special Mathematical Symbols

amssymb provides additional symbol libraries:

```
\mathbb{R}, \mathbb{N}, \forall, \exists, \nabla, \partial, \in, \subset.
```

For bold vectors or matrices, use:

```
\bm{v}, \bm{A}
```

Avoid using \mathbf for Greek letters; use \bm instead.

11.13 Equation Spacing and Alignment Standards

novathesis automatically manages inter-equation spacing consistent with institutional standards. To adjust spacing manually:

```
\setlength{\abovedisplayskip}{12pt}
\setlength{\belowdisplayskip}{12pt}
```

For alignment in theorems or proofs, use the `alignat` environment for precise column control.

11.14 Mathematical Fonts and Typography

The choice of math font family depends on the selected font theme (see Chapter 7.5). When using XeLaTeX or LuaLaTeX, `unicode-math` can be loaded to access OpenType math fonts such as Latin Modern Math or XITS Math.

Example.

```
\usepackage{unicode-math}
\setmathfont{XITS Math}
```

This approach ensures typographic harmony between text and mathematical symbols.

11.15 Multi-line Proofs and Derivations

For formal derivations spanning multiple steps, use `align` with text annotations:

```
\begin{align}
f(x) &= (x + a)^2 \\
&= x^2 + 2ax + a^2 \nonumber \\
&\text{where \$a\$ is a constant.}
\end{align}
```

Text inserted via `\text` ensures consistent font and spacing.

11.16 Notation Consistency

- Use italic letters for scalar variables (x, y, z);
- Use bold lowercase letters for vectors (\mathbf{x});
- Use bold uppercase letters for matrices (\mathbf{A});

- Reserve calligraphic capitals (\mathcal{L}) for sets or functionals;
- Avoid mixing notations unless required by discipline-specific standards.

11.17 Common Errors and Remedies

Equation exceeds margin. Use `\resizebox`, `multiline`, or break long expressions manually.

Undefined symbol. Ensure the relevant package (e.g., `amssymb`) is loaded.

Mismatched brackets. All math delimiters must be properly paired; use `\left` and `\right` for automatic sizing.

Incorrect alignment in systems. Use `align` instead of manual spacing with `&`.

11.18 Best Practices

1. Always label important equations for cross-referencing.
2. Keep equations centered and consistent in font size.
3. Define notation in the first chapter or a dedicated section.
4. Avoid excessive inline formulas; use display equations for clarity.
5. Align related equations using `align` or `aligned`.
6. Maintain typographic uniformity across equations, tables, and text.

11.19 Summary

`novathesis` provides a comprehensive environment for mathematical typesetting and algorithm presentation. By leveraging `amsmath`, `amsthm`, and `algorithmicx`, authors can produce professional-quality mathematical content consistent with academic and institutional standards. Following the best practices and configuration techniques in this chapter ensures clarity, reproducibility, and typographic harmony across all formal and computational content.

Cross-Referencing, Indexes, and Glossaries

12.1 Overview

Accurate cross-referencing and terminology management are essential to the clarity and navigability of any academic thesis. `novathesis` provides an integrated framework for managing internal references, hyperlinks, acronyms, glossaries, and indexes. This system is built upon standard L^AT_EX packages—`hyperref`, `cleveref`, and `glossaries`—and is configured to operate automatically in both printed and digital versions of the document.

This chapter explains how to define and reference document elements, generate glossaries and acronym lists, and produce subject indexes.

12.2 Internal Cross-References

All document elements (chapters, sections, figures, tables, equations, algorithms, etc.) can be cross-referenced using `\label` and `\ref`.

Basic Usage.

```
\section{Introduction}
\label{sec:intro}
...
As explained in Section~\ref{sec:intro}, the motivation for this study...
```

Labels should follow a structured prefix convention:

`chap:`, `sec:`, `fig:`, `tab:`, `eq:`, `alg:`, etc.

This naming scheme avoids conflicts and improves searchability.

12.3 The `cleveref` Package

`novathesis` preloads `cleveref`, which automatically formats references with appropriate names and numbering. It also handles ranges and multiple references.

Example.

As seen in `\cref{fig:setup,tab:results}`, the experimental conditions were identical.

Output:

As seen in Figures 2.1 and 2.2, the experimental conditions were identical.

Ranges.

See `\crefrange{eq:first}{eq:last}` for the full derivation.

Capitalization. Use `\Cref` (capital “C”) at the start of a sentence:

`\Cref{sec:methodology}` provides the full description of the approach.

Localization. Reference names (“Figure”, “Table”, “Equation”, etc.) are automatically translated according to the document language (see Chapter 8).

12.4 Hyperlinks and PDF Metadata

`novathesis` loads the `hyperref` package with configuration consistent with institutional requirements. All cross-references, table-of-contents entries, and URLs become clickable in the generated PDF.

Default PDF Properties. The class automatically sets:

- `pdfauthor`, `pdftitle`, `pdfsubject`, and `pdfkeywords`;
- Link colors depending on the selected build mode (`media=screen` or `media=paper`);
- Bookmarks and document structure for all major headings.

Media Modes.

```
\ntsetup{media=screen} % colored links  
\ntsetup{media=paper} % black links for print
```

Customizing Colors. If necessary, override in `0-Config/5_packages.tex`:

```
\hypersetup{  
    linkcolor=blue,  
    citecolor=darkgray,  
    urlcolor=navy  
}
```

Referencing URLs and DOIs.

```
\url{https://novathesis.github.io}
\href{https://doi.org/10.1234/abcd}{DOI: 10.1234/abcd}
```

12.5 Acronyms and Abbreviations

`novathesis` integrates the `glossaries` package to manage acronyms and abbreviations. Acronyms are defined once and automatically expanded upon first use.

Defining Acronyms. Add entries in `1-FrontMatter/acronyms.tex`:

```
\newacronym{ml}{ML}{Machine Learning}
\newacronym{ai}{AI}{Artificial Intelligence}
```

Using Acronyms.

```
\gls{ml} models are a subset of \gls{ai} systems.
```

The first occurrence prints the full form followed by the abbreviation: “Machine Learning (ML) models are a subset of Artificial Intelligence (AI) systems.” Subsequent uses display only the short form.

Plural and Capitalized Forms.

```
\glspl{ml}      % plural form
\Gls{ai}        % capitalized form
\Glspl{ai}      % capitalized plural
```

List of Acronyms. Enable in `0-Config/6_list_of.tex`:

```
\ntaddlistof{acronyms}
```

This list will appear in the front matter.

12.6 Glossaries

Glossaries are used to define technical terms or symbols. Each entry includes a key, a name, and a description.

Example. Add definitions to 1-FrontMatter/glossary.tex:

```
\newglossaryentry{entropy}{
    name=Entropy,
    description={A measure of disorder or randomness in a system}
}
\newglossaryentry{overfitting}{
    name=Overfitting,
    description={Modeling noise instead of the underlying relationship}
}
```

Use terms in the text:

```
\gls{entropy} is a fundamental concept in thermodynamics.
```

Printing the Glossary. At the end of the document, add:

```
\printglossaries
```

or enable the automatic inclusion in 0-Config/6_list_of.tex:

```
\ntaddlistof{glossaries}
```

12.7 Generating Glossaries

When compiling locally, the Makefile automatically invokes the `makeglossaries` command. If run manually:

```
makeglossaries template
latexmk -xelatex template.tex
```

Ensure that the glossary definitions are placed in separate files (e.g., `acronyms.tex`, `glossary.tex`) and that they are included through 0-Config/4_files.tex.

Overleaf Limitation. Overleaf's free tier does not support the `makeglossaries` executable. Either upgrade to a paid account or generate the glossary locally and upload the resulting `.gls` and `.glo` files manually.

12.8 Multiple Glossaries

The `glossaries` package supports multiple glossary types (e.g., symbols, nomenclature, abbreviations). Declare new types in 0-Config/5_packages.tex:

```
\newglossary[symg]{symbols}{sym}{sbl}{List of Symbols}
```

Then define entries:

```
\newglossaryentry{alpha}{  
    type=symbols,  
    name={\ensuremath{\alpha}},  
    description={Learning rate in optimization algorithms}  
}
```

Printing.

```
\printglossary[type=symbols]
```

12.9 Indexes

An index provides a comprehensive alphabetical list of topics, authors, or keywords referenced throughout the document. `novathesis` integrates the standard `makeidx` and `imakeidx` packages.

Enabling Indexing. In `0-Config/5_packages.tex`, uncomment:

```
\makeindex
```

Creating Entries. Mark terms for indexing using:

```
\index{machine learning}  
\index{artificial intelligence!supervised learning}
```

Nested entries use the “!” separator.

Printing the Index. Add the following at the end of the document or enable it in `0-Config/6_list_of.tex`:

```
\printindex
```

Building the Index. If not managed automatically, run:

```
makeindex template  
latexmk -xelatex template.tex
```

12.10 Nomenclature and Symbols

For technical documents requiring a list of symbols or nomenclature, reuse the glossary mechanism or employ the `nomencl` package.

Example with `nomencl`.

```
\usepackage{nomencl}
\maketonomenclature

\nomenclature{$E$}{Energy (J)}
\nomenclature{$m$}{Mass (kg)}
\nomenclature{$c$}{Speed of light (m/s)}

\printnomenclature
```

Compile with:

```
makeindex template.nlo -s nomencl.list -o template.nls
```

12.11 Cross-Referencing Best Practices

- Always assign meaningful label names reflecting the element type;
- Place `\label` immediately after the `\caption` command in floats;
- Use `\cref`/`\Cref` instead of manual “Figure `\ref`” combinations;
- Verify that every reference resolves after two compilation passes;
- Avoid duplicating labels across different environments;
- For equations, use short and descriptive labels (e.g., `eq:navier-stokes`);
- Regularly clean auxiliary files (`make clean`) to remove stale references.

12.12 Common Issues and Remedies

“Label(s) may have changed.” This message is informational; recompile once more to synchronize references.

“Undefined references” or “???” in output. Ensure that `\label` names match their `\ref` usage exactly (case-sensitive).

Glossary not generated. Run `makeglossaries template` manually, then recompile.

Acronym list empty. Ensure that acronyms are defined before first use and that the list is included in `0-Config/6_list_of.tex`.

Broken hyperlinks in Overleaf. Recompile using XeLaTeX or LuaLaTeX; ensure that `hyperref` is not redefined by another package.

12.13 Summary

novathesis integrates comprehensive cross-referencing, hyperlinking, glossary, and index systems that operate seamlessly across languages and compilation modes. By defining clear labels, consistent acronyms, and structured glossaries, authors ensure that readers can navigate the document effectively and that institutional standards for cross-referencing and terminology management are satisfied. All such mechanisms function automatically within the **novathesis** workflow, requiring only minimal configuration.

Printing, Submission, and Archiving

13.1 Overview

The final stage of thesis preparation involves generating the definitive document for submission, publication, and long-term preservation. `novathesis` provides explicit mechanisms for producing print-ready and digital versions, ensuring typographic consistency, metadata accuracy, and compliance with institutional and archival standards.

This chapter explains how to configure and verify the output mode, prepare the thesis for submission, and archive all necessary files for institutional repositories and digital libraries.

13.2 Output Modes and Media Configuration

`novathesis` distinguishes between several build and media modes that govern hyperlink appearance, color usage, watermarking, and inclusion of draft marks. These modes are defined in the configuration file `0-Config/1_novathesis.tex`.

Example.

```
\ntsetup{
    mode=final,
    media=screen
}
```

`mode` — controls internal settings such as watermark visibility and compilation strictness:

- `working` — for drafting, includes TODO notes and colored boxes;
- `provisional` — for near-final review, without watermark but with colored links;
- `final` — for official submission; disables all draft features.

`media` — determines color profile and link appearance:

- screen — colored hyperlinks, optimized for digital reading;
- paper — black hyperlinks, optimized for grayscale printing.

Command-Line Override. Modes may also be set during compilation:

```
make MODE=final MEDIA=paper xe
```

13.3 Verifying the Final Document

Before printing or submission, confirm the following:

1. All front matter elements (title page, abstracts, acknowledgments) are present and updated;
2. No visible TODO notes or draft indicators remain;
3. Hyperlinks are functional and appear as black (for print) or colored (for digital);
4. Table of contents, lists of figures/tables, and bibliography are complete;
5. Fonts are embedded, and the PDF complies with institutional requirements.

Run a full clean build to remove temporary files and regenerate all references:

```
make clean-all  
make xe
```

13.4 Printing Configuration

Paper Size and Margins. `novathesis` defaults to A4 paper (210 mm × 297 mm), the standard for European academic submissions. Margins are defined in `0-Config/0_memoir.tex` and follow institutional standards (usually 2.5 cm inner, 3.0 cm outer, 2.5 cm top and bottom). To adjust:

```
\settrimmedsize{297mm}{210mm}{*}  
\settrims{0pt}{0pt}  
\settypeblocksize{220mm}{145mm}{*}  
\setlrmargins{*}{*}{1.2}  
\setulmargins{*}{*}{1.2}  
\checkandfixthelayout
```

Color Policy. When printing, use the `media=paper` option to ensure all text, hyperlinks, and references are rendered in black and gray scale. Institutional print shops may require 100% black output for certain submissions.

Duplex Printing. The template supports duplex (double-sided) printing by default, with mirrored margins. For single-sided printing, disable in `0-Config/1_novathesis.tex`:

```
\ntsetup{twoside=false}
```

13.5 Digital Submission

File Format. All final submissions must be delivered as PDF documents. `novathesis` automatically generates compliant PDFs with embedded fonts and searchable text.

File Naming. Use the institutional naming convention, typically:

`Lastname_Firstname_Thesis_YEAR.pdf`

Avoid spaces, special characters, or diacritics in filenames.

Cover and Metadata. Ensure that all metadata fields (author, title, degree, supervisor, and date) are defined in `1_novathesis.tex`. These populate both the title page and the embedded PDF metadata via `hyperref`.

Example.

```
\ntauthor{Maria Silva}
\nttitle(main,en){Analysis of Renewable Energy Markets}
\ntdegree{Doctor of Philosophy in Economics}
\ntsupervisor{Prof.~João Pereira}
\ntdate{March 2025}
```

13.6 PDF/A Compliance for Archiving

Many repositories require archival formats such as PDF/A-1b or PDF/A-2u, ensuring long-term preservation and font integrity.

Validation. After compiling, verify compliance using:

```
pdfinfo -meta template.pdf
```

or with specialized tools such as *veraPDF*.

Creating PDF/A Files. `novatheresis` does not automatically enforce PDF/A mode, but compliance can be achieved using `ghostscript`:

```
gs -dPDFA=2 -dBATCH -dNOPAUSE -dNOOUTERSAVE \
-sProcessColorModel=DeviceCMYK \
-sDEVICE=pdfwrite \
-sPDFACCompatibilityPolicy=1 \
-sOutputFile=Thesis_PDFA.pdf template.pdf
```

Font Embedding. Ensure that all fonts are embedded; this is automatically managed when using TeX Live or MacTeX with `fontspec` under XeLaTeX or LuaLaTeX.

13.7 Institutional Packaging and Submission

Institutions typically require submission of the following files:

- Final thesis PDF (compiled in `mode=final`);
- Source code archive (optional, but recommended for reproducibility);
- Supplementary data (datasets, scripts, figures);
- Licensing and originality statements, if applicable.

Automated Packaging. `novatheresis` includes a Makefile target that packages the complete project for submission:

```
make package
```

This generates an archive:

```
ThesisPackage_<author>_<date>.zip
```

containing:

- `template.pdf` (final output);
- `0-Config/`, `1-FrontMatter/`, `2-MainMatter/`, `3-BackMatter/`;
- `4-Bibliography/` and `5-Figures/`;
- The Makefile and configuration files;
- A `README.txt` with metadata summary.

Optional Source Exclusion. To exclude the internal class files:

```
make package SRC=false
```

13.8 Digital Repository Submission

Many universities require electronic deposit into an institutional repository or national archive. Before uploading:

- Confirm that the PDF opens without warnings in Acrobat Reader;
- Verify embedded metadata (author, title, subject, keywords);
- Check that page numbering and bookmarks are correct;
- Include separate files for appendices or supplementary material if requested.

Embargo and Licensing. For works under embargo or with restricted data:

- Include the embargo statement in both the abstract and metadata;
- Specify Creative Commons or institutional licensing in the submission form;
- Retain a signed copy of the copyright declaration.

13.9 Archiving the Project

To ensure long-term reproducibility, the complete project directory should be archived in a versioned repository or institutional backup system. Include:

- The L^AT_EX source files and configuration directories;
- The final compiled PDF;
- A README documenting the compilation environment (engine, TeX distribution, version);
- The bibliography files and all figures;
- Checksums (e.g., SHA-256) for verification.

Example.

```
sha256sum template.pdf > thesis_checksum.txt
```

Store both the source and the checksum in the repository archive.

13.10 Long-Term Preservation Best Practices

- Use open-source fonts (e.g., Latin Modern, XITS) for guaranteed embedding;
- Maintain a copy of the corresponding TeX Live installer image;
- Include the `novathesis` version number in your repository metadata;
- Prefer vector images (PDF, EPS) for figures to ensure scalability;
- Avoid proprietary or compressed font formats;
- Document all system dependencies (Biber, Ghostscript, etc.).

Version Tagging. The project version is recorded automatically in the class header:

```
\ProvidesClass{novathesis}[2025/04/07 v7.6.0 NOVA Thesis Template]
```

Include this line in your submission documentation for traceability.

13.11 Quality Assurance Checklist

Before final submission, confirm the following items:

The document compiles in `mode=final` without errors or warnings;

All figures and tables are properly numbered and referenced;

All cross-references are resolved;

The bibliography is complete and formatted consistently;

Acronyms and glossaries are printed;

The title page and metadata match institutional templates;

Fonts are embedded, and the PDF opens cleanly on multiple platforms;

A copy of the project has been archived.

13.12 Sample Build Commands for Final Output

Final Digital Version (screen).

```
make MODE=final MEDIA=screen xe
```

Print Version (paper).

```
make MODE=final MEDIA=paper pdf
```

Archive Packaging.

```
make clean-all  
make package
```

13.13 Summary

This chapter consolidates all procedures required for producing, validating, and preserving the final version of a thesis prepared with `novathesis`. By selecting the correct build mode, embedding complete metadata, and packaging the project according to institutional requirements, authors ensure that their work is reproducible, portable, and compliant with long-term archiving standards such as PDF/A. The result is a thesis that remains accessible and verifiable long after its original submission.

Troubleshooting and Frequently Asked Questions

14.1 Overview

This chapter provides solutions to the most common issues encountered when compiling, configuring, or customizing the `novathesis` template. It also answers frequently asked questions regarding supported environments, fonts, language options, and institutional presets. Each subsection addresses a distinct category of problems, followed by a concise resolution procedure.

14.2 Compilation Problems

14.2.1 The document fails to compile on the first run

Symptom. `latexmk` or `make` aborts with “undefined references” or “missing file” errors on a clean installation.

Cause. The auxiliary files required by L^AT_EX (e.g., `.aux`, `.toc`, `.bb1`) do not exist yet.

Resolution. Run the full build command twice:

```
make xe  
make xe
```

or simply use `latexmk`, which automatically performs multiple passes:

```
latexmk -xelatex template.tex
```

All cross-references, tables, and bibliography entries should then resolve correctly.

14.2.2 Bibliography not appearing or citations show as “(?)”

Cause. The bibliography backend (`biber` or `bibtex`) was not executed.

Resolution.

1. Ensure that the backend specified in 0-Config/2_biblatex.tex matches the installed tool:

```
\ntbibsetup{backend=biber}
```

2. Recompile cleanly:

```
make clean  
make xe
```

3. If errors persist, run manually:

```
biber template  
latexmk -xelatex template.tex
```

Additional note. In Overleaf, the bibliography backend must be set to `biber` under the project menu. Free accounts may not support this due to resource limits (see Section 14.3).

14.2.3 Font not found or substituted

Symptom. Warnings such as “Font not found: Arial” or “Font substitution: CM Roman used instead.”

Cause. The selected font theme requires a system or OpenType font that is not installed.

Resolution.

- Install the required font family on the system;
- Recompile using XeLaTeX or LuaLaTeX;
- If using Overleaf, switch to a fully portable font theme (e.g., `newpx`, `libertine`, or `erewhon`).

Tip. To verify which font theme is active, check the line

```
\ntsetup{style/font=<name>}
```

in 0-Config/1_novathesis.tex.

14.2.4 Missing packages or “Undefined control sequence” errors

Cause. Your L^AT_EX distribution lacks one or more required packages.

Resolution.

- For macOS or Linux, install the full distribution:

```
sudo apt install texlive-full
```

or reinstall MacTeX from <https://tug.org/mactex/>.

- For Windows, open the MiKTeX Console and enable “Install missing packages on the fly.”

Diagnosis. Inspect the first missing package name reported in the log, and install it manually if necessary. For example:

```
tlmgr install titlesec
```

14.2.5 Glossaries or acronyms not generated

Cause. The glossaries build step was not executed.

Resolution.

1. Ensure that the relevant glossaries packages are loaded in 0-Config/5_packages.tex;
2. Add the corresponding list in 0-Config/6_list_of.tex:

```
\ntaddlistof{listsofglossaries}
```

3. Perform a full rebuild:

```
make clean-all  
make xe
```

14.2.6 Figures not displaying

Cause. File path or format mismatch.

Resolution.

- Place all figures under `5-Figures/`;
- Use relative paths (e.g., `\includegraphics{5-Figures/figure1}`);
- Prefer PDF or PNG formats; avoid JPEG for line art;
- Ensure that capitalization matches exactly—paths are case-sensitive on Linux and macOS.

14.2.7 Compilation too slow or running out of memory**Possible causes.**

- Large images with excessive resolution;
- Multiple redefinitions of macros in `5_packages.tex`;
- Overuse of TikZ or complex vector graphics.

Mitigation.

- Downsample images to 300 dpi for print-quality output;
- Comment unused packages in `5_packages.tex`;
- Use externalized TikZ figures (`tikzexternalize`) to compile them once.

14.3 Overleaf-Specific Issues

14.3.1 Project does not compile in Overleaf

Cause. Free-tier Overleaf accounts provide limited memory and compilation time. `novathesis` is a large, multi-pass template.

Resolution.

- Use a **Professional** or **Group Plan** account, which increases build resources;
- Set the compiler to XeLaTeX or LuaLaTeX;
- Enable the `biber` backend under “Project Settings”;
- Clean auxiliary files manually if builds fail repeatedly.

Alternative. Compile locally using `make xe`, then upload only the final PDF to Overleaf for collaboration.

14.3.2 Images or logos not appearing in Overleaf

Cause. Overleaf ignores symbolic links and certain non-ASCII file names.

Resolution.

- Ensure all logos and figures are actual files (no symlinks);
- Avoid characters with accents or spaces in filenames;
- Use plain ASCII filenames (a-z0-9_) and relative paths.

14.3.3 Bibliography errors in Overleaf

Cause. BibTeX execution timeout or memory limit reached.

Resolution.

- Reduce bibliography size (split large .bib files);
- Recompile locally to generate .bb1, then upload that file to Overleaf;
- Contact Overleaf support if the issue persists with a Professional account.

14.4 Institutional Preset and Cover Issues

14.4.1 Institution logo missing on cover

Cause. The preset references a logo file that does not exist in `novatheresisFiles/Logos/`.

Resolution.

- Confirm the expected filename (e.g., `nova_fct.pdf`);
- Ensure the extension is lowercase (`.pdf`);
- Replace the logo file or edit the preset to use the correct name:

```
\ntsetup{logo/front=mylogo}
```

14.4.2 Wrong institution name or degree shown

Cause. Multiple degree definitions are uncommented in the preset file.

Resolution. Open the preset file (e.g., `0-Config/9_nova_fct.tex`) and ensure that only one pair of `\ntdegreename(pt)` and `\ntdegreename(en)` is uncommented.

14.4.3 Committee page shows missing names

Cause. Committee member entries were not defined in `0-Config/3_cover.tex`.

Resolution. Ensure each committee member is declared using the syntax:

```
\ntaddperson{committee}{r,m}{Dr. John Doe, Associate Professor, NOVA}
```

where the first parameter indicates the role and the second indicates gender (m/f).

14.5 Output Formatting Issues

14.5.1 Unexpected spacing or indentation

Cause. A `\parskip` or `\baselinestretch` command was redefined in a user package.

Resolution. Check `0-Config/5_packages.tex` and comment out any spacing or layout packages such as `setspace`, `parskip`, or `titlesec`. `novathesis` manages these internally through `memoir`.

14.5.2 Incorrect page numbering

Cause. Improper file order or mixed numbering styles.

Resolution. Ensure that front matter files (abstracts, acknowledgments) appear before main matter chapters in `0-Config/4_files.tex`. The class automatically resets numbering at the transition between front and main matter.

14.6 Advanced Debugging Techniques

14.6.1 Using the `--interaction=nonstopmode` flag

Run the compiler in nonstop mode to suppress interactive prompts:

```
latexmk -xelatex --interaction=nonstopmode template.tex
```

This is the mode used internally by `make xe`. All errors will be logged to `template.log`.

14.6.2 Examining the Log File

Search the log for:

- ! LaTeX Error: — shows the exact command causing failure;
- Missing `\end{...}` — indicates mismatched environments;
- File ... not found — missing figures or bibliography files.

Tip. Use a text editor with syntax highlighting and search (e.g., VS Code, TeXstudio, or TeXworks).

14.6.3 Verbose bibliography debugging

Run:

```
biber --debug template
```

to obtain detailed information about the bibliography parsing process. Inspect the `template.blg` file for missing fields or syntax errors in the `.bib` database.

14.6.4 Minimal Working Example (MWE)

When requesting support, isolate the issue by creating a minimal working example:

1. Copy `template.tex` and include only one configuration file and one chapter;
2. Remove all images and external packages;
3. Test compilation;
4. Gradually reintroduce content until the error reappears.

14.7 Frequently Asked Questions

Q1: Can I use `novathesis` for non-NOVA universities?

Yes. While the template was originally developed for NOVA University Lisbon, it is fully modular. You can create new presets in `0-Config/9_<school>.tex` (see Chapter 7.3).

Q2: Does `novathesis` support double-spacing?

Yes. Add to `0-Config/0_memoir.tex`:

```
\DoubleSpacing
```

However, confirm that your institution permits double-spacing in the final submission.

Q3: Can I print on A4 and Letter paper interchangeably?

Yes. Set the paper size through your TeX distribution or in the document class options:

```
\documentclass[a4paper]{novathesis}
```

For US submissions, use `letterpaper`.

Q4: Is XeLaTeX better than LuaLaTeX?

Both engines produce high-quality Unicode output. XeLaTeX offers simpler font handling; LuaLaTeX provides finer microtypography control. Most users will not notice practical differences.

Q5: How do I include code listings?

Load either `listings` or `minted` in `5_packages.tex`. For `minted`, compile with:

```
make xe LATEXMKOPTS="--shell-escape"
```

Q6: Can I use multiple bibliography files?

Yes. Add them to `0-Config/4_files.tex`:

```
\ntaddfile{bib}{main.bib}
\ntaddfile{bib}{secondary.bib}
```

`novathesis` merges them automatically in the final bibliography.

Q7: How can I disable colored hyperlinks?

Set in `1_novathesis.tex`:

```
\ntsetup{media=paper}
```

This changes hyperlink colors to black and adjusts margins for print output.

Q8: How can I check my novathesis version?

Open `novathesis.cls` and look for the line:

```
\ProvidesClass{novathesis}[YYYY/MM/DD vX.Y.Z]
```

or check the header of `README.md`. Document the version in your thesis metadata for reproducibility.

Q9: How can I change numbering style (e.g., from Arabic to Roman)?

Add the following in `0-Config/0_memoir.tex`:

```
\renewcommand{\thechapter}{\Roman{chapter}}
```

Avoid redefining numbering directly in `novathesis.cls`.

Q10: How do I report bugs or request new features?

Submit an issue to the official repository or contact the maintainer through your institution's documentation portal. Include:

- The `novathesis` version number;
- The TeX distribution and engine used;
- A minimal working example reproducing the problem.

14.8 Summary

This chapter has presented comprehensive solutions to common compilation, configuration, and formatting problems encountered when using `novathesis`. By following the structured troubleshooting procedures and verifying system setup, users can resolve nearly all issues without modifying the class itself. For persistent or institutional-specific problems, users should isolate the issue with a minimal example and consult the maintainers with full version and environment details.

Contribution Guidelines

15.1 Overview

The `novathesis` project is a collaborative, open-source initiative maintained by the academic community at NOVA University Lisbon. Its continued evolution depends on feedback, bug reports, and contributions from users across institutions and disciplines. This chapter establishes the formal contribution workflow, coding standards, documentation requirements, and release procedures for maintainers and external contributors.

15.2 Governance Model

The project is maintained under the supervision of the NOVA University Lisbon repository administrators. Governance follows a meritocratic model typical of open academic projects:

- Core maintainers have commit privileges and review merge requests;
- Regular contributors may submit patches or pull requests;
- Institutional representatives may propose new style presets or language modules.

Decisions regarding structural changes or new features are made by consensus among maintainers, with public discussion recorded in the project issue tracker.

15.3 Repository Structure

The Git repository follows a standardized hierarchy aligned with the template itself:

```
novathesis/
  \gls{novathesis}Files/      # Core class and institutional presets
  0-Config/                 # Default configuration templates
  examples/                 # Demonstration projects
  docs/                     # Manual and auxiliary documentation
```

```
Makefile           # Build automation
README.md         # Overview and usage instructions
LICENSE.txt       # LPPL license declaration
```

Contributors must ensure that new or modified files comply with this structure and do not introduce redundant or overlapping functionality.

15.4 Code of Conduct

All contributors are expected to adhere to the project's Code of Conduct, based on the Contributor Covenant v2.1. In particular:

- Be respectful and constructive in all discussions;
- Provide technically grounded feedback;
- Avoid personal, political, or institutional bias in reviews;
- Cite authoritative sources when proposing standard or typographic changes.

Violations of the Code of Conduct may result in suspension of contribution privileges.

15.5 How to Contribute

15.5.1 Reporting Issues

Before submitting a new issue, verify that it has not been previously reported. Use the issue tracker to file:

- Bug reports (unexpected behavior, compilation errors);
- Feature requests (new configuration keys, institutional options);
- Documentation improvements or clarifications.

Bug Reports Should Include:

- **novathesis** version and date (from the class header);
- Operating system and L^AT_EX distribution;
- Compilation engine (pdfL^AT_EX, XeL^AT_EX, or LuaL^AT_EX);
- A minimal working example reproducing the issue.

Example command to extract version information:

```
grep ProvidesClass \gls{novathesis}Files/novathesis.cls
```

15.5.2 Submitting Patches or Pull Requests

All contributions must be submitted via GitHub pull requests. Each pull request must:

- Target the `develop` branch (never `main`);
- Contain atomic commits addressing a single logical change;
- Pass automated build and regression tests;
- Include updated documentation in the relevant configuration files.

Standard Procedure.

1. Fork the repository on GitHub;
2. Create a feature branch:

```
git checkout -b feature/new-config-key
```

3. Implement and test the modification;
4. Commit with a descriptive message:

```
git commit -m "Add institution-specific cover page layout"
```

5. Push the branch and open a pull request targeting `develop`.

Commit Message Guidelines.

- Use the imperative mood (“Add”, “Fix”, “Update”) in subject lines;
- Keep the first line under 72 characters;
- Reference related issue numbers where applicable (e.g., “Fixes #47”);
- Include a short rationale in the body if necessary.

15.6 Development Standards

15.6.1 Class and Package Modifications

When modifying or extending `novathesis.cls` or other internal files:

- Maintain full backward compatibility with existing configuration keys;
- Do not hardcode institutional data or language-dependent strings;

- Use conditional macros and configuration hooks for all institution-specific logic;
- Document all new keys in `docs/Manual` or inline comments.

Naming Conventions.

- Class-level macros: `\nt...` prefix (e.g., `\ntsetup`, `\ntauthor`);
- Internal variables: `\NT@...` prefix (for maintainers only);
- File naming: lowercase, hyphen-separated (e.g., `nt-cover-ulisboa.sty`).

15.6.2 Documentation Updates

Every feature addition or configuration change must include corresponding updates to:

- The `README.md` file;
- The User Manual (this document);
- The `CHANGELOG.md` file summarizing notable revisions.

All examples provided in the manual must compile without modification under the current release.

15.6.3 Testing

Each contribution must be tested under the following configurations:

- TeX Live, MacTeX, and MiKTeX distributions;
- pdfLaTeX, XeLaTeX, and LuaLaTeX engines;
- Linux, macOS, and Windows environments.

The repository includes a `Makefile` target for automated tests:

```
make test
```

This command verifies successful compilation of all example documents.

15.7 Institutional Preset Contributions

Institutions wishing to integrate their formatting guidelines into `novathesis` should follow the structured preset model.

Procedure.

1. Create a new folder under `novathesisFiles/Schools/`;
2. Copy and adapt an existing preset (e.g., UNL, FCT);
3. Define visual identity files (logo, colors, cover design);
4. Update localized strings in `novathesisFiles/Strings/`;
5. Test the preset with a sample thesis project;
6. Submit the preset as a pull request with accompanying documentation.

Each preset must comply with the institutional graphic charter and `novathesis` structure.

15.8 Versioning and Release Workflow

The project uses **semantic versioning (SemVer)** in the form MAJOR.MINOR.PATCH, e.g., 7.6.0.

Policy.

- Increment the MAJOR version for incompatible API or class changes;
- Increment the MINOR version for new features that preserve compatibility;
- Increment the PATCH version for bug fixes and minor improvements.

Release Process.

1. Merge the `develop` branch into `main`;
2. Tag the release:

```
git tag -a v7.6.1 -m "Minor corrections and documentation update"
```

3. Push tags:

```
git push --tags
```

4. Generate release notes and update the manual version header.

15.9 License and Intellectual Property

The **novathesis** Template and all related files are distributed under the **LaTeX Project Public License (LPPL)** version 1.3c or later. All contributions are accepted under this license to ensure consistent legal status and free academic use.

Contributor Agreement. By submitting a contribution, you agree that:

- Your work is original and does not infringe third-party rights;
- You license it under the LPPL for redistribution and modification;
- The maintainers may modify or redistribute your contribution under the same terms.

License Reference.

LaTeX Project Public License (LPPL), version 1.3c or later. <https://www.latex-project.org/lppl.txt>

15.10 Citation and Acknowledgment of Contributions

Contributors are credited in the release notes and documentation. Major institutional or code contributions should be cited formally in the project's reference documentation as:

NOVA University Lisbon. *novathesis Template and User Manual*. Version 7.6.0, April 2025. Available at <https://github.com/novathesis/novathesis>.

Contributors may also include their names in the internal AUTHORS.md file with institutional affiliation and contribution description.

15.11 Communication Channels

- **GitHub Issues:** primary platform for bug reports and feature requests;
- **GitHub Discussions:** for usage questions and community support;
- **Mailing List:** maintained by the **novathesis** coordination team for institutional correspondence;
- **Release Announcements:** published via GitHub Releases and the official university website.

15.12 Deprecation and Backward Compatibility

novathesis maintains backward compatibility for at least two minor versions. Deprecated configuration keys are retained with warning messages before removal.

Policy.

- Deprecated keys trigger a log warning: “WARNING: Deprecated option in novathesis”;
- Equivalent replacement keys are documented in the changelog;
- Obsolete features are removed only in major version updates.

15.13 Security and Integrity

To maintain trust in official releases:

- All release archives are signed using GPG keys of the maintainers;
- Checksums (SHA-256) are published alongside release notes;
- Users are encouraged to verify signatures before installation.

15.14 Summary

The `novathesis` project thrives on community collaboration and academic transparency. These guidelines ensure that every contribution—whether a bug fix, feature enhancement, or institutional preset—is reviewed, tested, documented, and released consistently. By adhering to the governance, testing, and licensing policies described herein, contributors help maintain the template’s reliability, interoperability, and long-term sustainability across institutions and disciplines.

Project Maintenance and Future Development

16.1 Overview

This chapter documents the long-term maintenance strategy and development roadmap for the **novathesis** Template. It is intended for maintainers, institutional partners, and contributors responsible for ensuring the continuity, stability, and evolution of the project.

novathesis has matured into a modular and extensible platform that serves as the standard academic writing framework across NOVA University Lisbon and other partner institutions. To preserve its long-term relevance, the project adheres to structured maintenance practices, semantic versioning, and formal governance procedures.

16.2 Maintenance Objectives

The main objectives of project maintenance are:

1. **Reliability** — ensuring that every release compiles successfully across supported systems;
2. **Compatibility** — preserving backward compatibility of configuration files and institutional presets;
3. **Compliance** — maintaining alignment with institutional formatting and publication standards;
4. **Sustainability** — providing a clear development roadmap, documentation updates, and succession planning;
5. **Reproducibility** — ensuring that older theses can be recompiled identically using the same template version.

16.3 Maintenance Model

novathesis follows a hybrid maintenance model combining centralized coordination with community input.

Core Maintainers. A small group of maintainers is responsible for:

- Reviewing and merging contributions;
- Coordinating institutional preset updates;
- Publishing release tags and build artifacts;
- Maintaining documentation and build automation.

Community Contributors. External contributors may:

- Submit bug reports and feature proposals;
- Contribute institutional styles and translations;
- Improve documentation and example projects;
- Participate in roadmap discussions.

All development activity occurs through transparent processes documented in the public repository.

16.4 Release Lifecycle Policy

Each major **novathesis** release is maintained under the following lifecycle:

- **Active Maintenance:** 12 months — includes feature updates and bug fixes;
- **Extended Support:** 12 additional months — security and compatibility fixes only;
- **Archived Status:** after 24 months — release remains accessible but unsupported.

Maintenance versions are tracked in the `CHANGELOG.md` file. Older releases remain permanently available in the GitHub Releases archive to ensure reproducibility of previously submitted theses.

16.5 Automated Testing and Continuous Integration

Each commit and pull request undergoes automated testing to verify compilation integrity.

Testing Pipeline.

- Compilation using `latexmk` under pdfLaTeX, XeLaTeX, and LuaLaTeX;
- Validation of glossary, bibliography, and cross-references;
- Verification of institutional presets and multi-language examples.

Failures must be resolved before merging into the `main` branch. Testing infrastructure is implemented using GitHub Actions or an equivalent CI environment.

16.6 Documentation Maintenance

The `novathesis` manual (this document) is versioned alongside the template and updated for every minor release. Documentation is maintained in both `.tex` and `.pdf` formats, and all examples are verified through automated builds.

Documentation Sources.

- `docs/manual/` — L^AT_EX sources of the User Manual;
- `README.md` — short introduction for repository users;
- `examples/` — compilable sample projects illustrating usage.

Publication. Updated documentation is distributed with every tagged release and uploaded to the project’s GitHub Pages site for online access.

16.7 Dependency Management

To minimize incompatibility with upstream L^AT_EX distributions:

- Dependencies are limited to core packages included in TeX Live, MacTeX, or MiKTeX;
- Version constraints are documented in `novathesisFiles/requirements.txt`;
- The project is periodically tested against the latest TeX Live distribution (LTS and rolling versions).

If upstream packages introduce breaking changes, maintainers issue compatibility patches under the next minor version.

16.8 Institutional Collaboration

novathesis encourages formal collaboration with universities and research institutions. Each partner institution may contribute:

- Custom visual identity presets (cover pages, logos, color schemes);
- Localized string files for additional languages;
- Standardized formatting policies for specific degree programs.

To ensure consistency, new institutional presets must undergo review by the core maintainers before inclusion in the main repository.

16.9 Internationalization and Accessibility Roadmap

Internationalization. Future versions aim to expand built-in localization support beyond the existing languages, with improved handling of right-to-left scripts and additional regional typographic standards.

Accessibility. Planned improvements include:

- Automatic tagging of structural elements for screen readers (PDF/UA compliance);
- Better contrast verification for color themes;
- Guidelines for accessible figure captions and table descriptions.

16.10 Technical Roadmap

The following roadmap outlines the current development priorities:

Version 7.7.0 — Improved build performance, modular bibliography styles, and expanded example projects.

Version 7.8.0 — Enhanced institutional preset management and internationalized metadata fields.

Version 8.0.0 — Major release introducing complete class modularization, Lua-based configuration, and native PDF/A generation.

Each roadmap item is subject to revision following community review and institutional requirements.

16.11 Sustainability and Archival Strategy

Long-term sustainability depends on transparent documentation, reproducible builds, and open governance. The following practices are enforced:

- All releases archived with digital signatures and SHA-256 checksums;
- Documentation preserved in PDF/A format for institutional libraries;
- Source code and manual mirrored in the university's GitLab and GitHub instances;
- A stable identifier (DOI) assigned to each major version for citation.

16.12 Succession Planning

To guarantee project continuity:

- At least two maintainers must have administrative access to the repository;
- Maintenance credentials are documented in the institutional repository;
- Handover documentation describes the build process, test routines, and release workflow;
- All core macros and configuration files include inline version metadata.

16.13 Community Engagement

Community engagement is central to **novathesis** sustainability. The maintainers encourage:

- Academic workshops and thesis preparation seminars using the template;
- Student contributions through open coursework or theses;
- Continuous feedback via GitHub Discussions;
- Cross-institutional collaboration for formatting harmonization.

Community input directly informs roadmap priorities and design decisions.

16.14 Acknowledgment of Institutional Support

NOVA University Lisbon and its affiliated schools provide infrastructure and academic oversight for **novathesis**. Special recognition is extended to the faculty members and students who contributed to the early design, testing, and translation of the template. Institutional support ensures that the project remains aligned with current academic publishing standards.

16.15 End of Document Notice

This User Manual, version 7.6.0, concludes the official documentation for the corresponding **novathesis** release. Readers are encouraged to verify the version date printed on the cover and consult the repository for subsequent updates.

Citation.

NOVA University Lisbon. **novathesis Template and User Manual**. Version 7.6.0, April 2025. Available at <https://github.com/novathesis/novathesis>.

Contact. For official correspondence and maintenance coordination:

novathesis Coordination Team
NOVA University Lisbon
Lisbon, Portugal
<https://novathesis.github.io>

16.16 Summary

This chapter defines the long-term maintenance and development framework of the **novathesis** project. By maintaining rigorous testing, transparent governance, and institutional collaboration, **novathesis** ensures durability and adaptability in the evolving academic and technological landscape. Through sustained community engagement and adherence to open standards, the project will continue to support the preparation of high-quality academic theses for years to come.

License & Acknowledgments

17.1 License Overview

The **novatheresis** Template, its associated files, and this User Manual are distributed under the terms of the **LaTeX Project Public License (LPPL)**, version 1.3c or later. The LPPL is an established license recognized by the Free Software Foundation, designed specifically for the distribution and maintenance of **LATEX** classes, packages, and documentation.

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Key Provisions of the LPPL.

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<https://www.latex-project.org/lppl.txt>

License Declaration.

© 2008–2025, NOVA University Lisbon and individual contributors. This work may be distributed and / or modified under the conditions of the **LaTeX Project Public License (LPPL)**, version 1.3c or later.

17.2 Authorship and Maintenance

The **novathesis** project was conceived, developed, and is maintained by the academic and technical community of **NOVA University Lisbon**. Its long-term sustainability is ensured by continuous institutional support and voluntary contributions from students, faculty, and researchers.

Core Maintainers.

- **novathesis** Coordination Team — NOVA University Lisbon
- Faculty of Science and Technology (FCT NOVA)
- Collaborating Schools and Research Units

Editorial Oversight.

- Documentation maintained by the **novathesis** Documentation Committee;
- Peer review provided by representatives of participating faculties.

Contributors are listed individually in the `AUTHORS.md` file included with the repository.

17.3 Acknowledgment of Contributions

novathesis incorporates the work and feedback of numerous contributors who assisted in the design, testing, and translation of the template. The maintainers extend their gratitude to all individuals who provided issue reports, feature suggestions, and localization improvements over the years.

Community Contributions.

- Developers of institutional presets and cover layouts;
- Translators responsible for multilingual support;
- Testers validating compatibility across TeX Live, MacTeX, and MiKTeX;
- Early adopters and graduate students who provided field feedback;
- Academic supervisors and reviewers who ensured compliance with official guidelines.

Upstream Software. `novathesis` depends on the foundational work of the following L^AT_EX packages and projects:

- `memoir` — document class for books and theses;
- `biblatex` and `biber` — bibliography and citation management;
- `fontspec` and `unicode-math` — modern font and math support;
- `hyperref` and `cleveref` — hyperlinking and cross-referencing;
- `glossaries`, `siunitx`, and `tikz` — advanced typesetting and figures.

The maintainers acknowledge the entire L^AT_EX development community for their continued contributions to the open-source academic publishing ecosystem.

17.4 Institutional Support

`novathesis` was originally developed to standardize thesis formatting at NOVA University Lisbon and has since evolved into a reference model for academic writing across multiple institutions.

Institutional support is provided by:

- NOVA University Lisbon Rectorate;
- Faculty of Science and Technology (FCT NOVA);
- NOVA School of Social Sciences and Humanities (FCSH NOVA);
- NOVA Information Management School (NOVA IMS);
- NOVA School of Business and Economics (NOVA SBE);
- Associated research centers and graduate programs.

Their continued engagement ensures that the template reflects current formatting, linguistic, and submission standards.

17.5 Citation of the `novathesis` Template

When referencing the `novathesis` Template or this manual in publications, please use the following citation format:

NOVA University Lisbon. *novathesis Template and User Manual*. Version 7.6.0, April 2025. Available at <https://github.com/novathesis/novathesis>.

This citation ensures proper academic attribution and version traceability.

17.6 Disclaimer

The **novathesis** Template and its documentation are provided for academic use without warranty of any kind. The maintainers and affiliated institutions are not responsible for any damages or non-compliance resulting from improper configuration, modification, or institutional requirements that deviate from the template defaults.

Users must verify that their final thesis complies with the official formatting guidelines of their specific department or graduate school.

17.7 Final Note

novathesis exemplifies the values of open academic collaboration—free distribution, transparent governance, and respect for institutional diversity. Its continued success depends on contributions from the academic community and adherence to open-source principles.

Lisbon, November 2025

novathesis Coordination Team

NOVA University Lisbon

Afterword

Reflection

The **novathesis** Template was created to unify, simplify, and professionalize the process of academic thesis preparation at NOVA University Lisbon. Over time, it has become more than a formatting tool—it has grown into an open, community-driven framework that embodies academic rigor, typographic excellence, and technological transparency.

This manual concludes a comprehensive effort to document not only the technical structure of the template, but also the principles that sustain it: clarity, reproducibility, and collaboration. Every command, file, and configuration key described herein was designed to serve a single goal—allowing authors to focus on the quality of their research rather than the mechanics of presentation.

Sustainability and Community

The longevity of **novathesis** depends on the participation and curiosity of its users. Students, supervisors, and institutions are encouraged to:

- Share improvements and report inconsistencies through the official repository;
- Translate or adapt the template for new languages or disciplines;
- Contribute documentation, presets, or design refinements;
- Promote open standards and reproducible research practices.

The maintainers believe that academic templates are living documents that evolve with the institutions they serve. Each contribution—no matter how small—preserves the continuity of a tradition rooted in precision, accessibility, and open knowledge.

Gratitude

The **novathesis** Coordination Team extends its sincere gratitude to all users, contributors, and institutions who have supported the project over the years. Your feedback, testing, and collaboration have made this template what it is today: a shared academic infrastructure built on trust and open science.

Special acknowledgment is given to the L^AT_EX community at large—whose commitment to excellence, open licensing, and documentation has made professional-quality typesetting universally accessible.

Looking Forward

The future of **novathesis** lies in adaptability. As academic publishing evolves toward digital, accessible, and data-rich environments, the template will continue to expand—embracing new technologies while remaining faithful to its original purpose. Its codebase and documentation will persist as an open educational resource for future generations of researchers.

Final Words

A thesis is both an individual and institutional achievement. **novathesis** exists to support that process—ensuring that every thesis, regardless of discipline or language, meets the highest standards of clarity, consistency, and permanence.

Lisbon, April 2025

The novathesis Coordination Team

NOVA University Lisbon

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- [1] R. J. Dias et al. “Verification of Snapshot Isolation in Transactional Memory Java Programs”. In: *Proceedings of the 26th European conference on Object-oriented programming (ECOOP’12)*. Springer-Verlag, 2012-06 (cit. on p. 132).

A

NOVAthesis covers showcase

This Appendix shows examples of covers for some of the supported Schools. When the Schools have very similar covers (e.g., all the schools from Universidade do Minho), just one cover is shown. If the covers for MSc dissertations and PhD thesis are considerable different (e.g., for FCT-NOVA and UMinho), then both are shown.

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B

Appendix 2 Lorem Ipsum

This is a test with citing something [1] in the appendix.

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Annex 1 Lorem Ipsum

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