

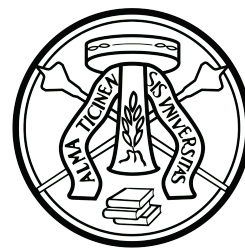
INTER-UNIVERSITY MASTER'S DEGREE PROGRAMME



Università degli  
Studi di Milano



Università degli Studi di  
Milano - Bicocca



Università di  
Pavia



Master's Degree Programme  
Artificial Intelligence for Science and Technology

**This is the title of my thesis**

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Academic Year 2021/2022



# Abstract

**What is the abstract?** The abstract is an important component of your thesis. It is likely the first substantive description of your work read by an external examiner. You should view it as an opportunity to set accurate expectations. The abstract is a summary of the whole thesis. It presents all the major elements of your work in a highly condensed form. It is not merely an introduction in the sense of a preface or advance organizer that prepares the reader for the thesis. It must be capable of substituting for the whole thesis when there is insufficient time and space for the full text.

**Size and Structure.** Typical lengths are within 200 and 300 words (without sections). An abstract has to live as a stand-alone text. The structure should mirror the structure of the whole thesis, and should represent all its major elements. For example, if the thesis has five chapters (introduction, literature review, methodology, results, conclusion), there should be one or more sentences assigned to summarize each chapter.

**Clearly Specify Your Research Questions.** As in the thesis itself, your research questions are critical in ensuring that the abstract is coherent and logically structured. They form the skeleton to which other elements adhere. They should be presented near the beginning of the abstract.

**Don't Forget the Results.** The most common error in abstracts is failure to present results. The primary function of your thesis (and by extension your abstract) is not to tell readers what you did, it is to tell them what you discovered. Other information, such as the account of your research methods, is needed mainly to back the claims you make about your results. Approximately the last half of the abstract should be dedicated to summarizing and interpreting your results.



*Here you can write whatever you want*

*and here too.*



# Acknowledgments

Some acknowledgments to family, friends, supervisors, etc.





# Contents

<b>Contents</b>	<b>ix</b>
<b>List of Figures</b>	<b>xi</b>
<b>List of Tables</b>	<b>xiii</b>
<b>1 Introduction</b>	<b>3</b>
1.1 General recommendations . . . . .	4
1.1.1 Formatting text . . . . .	6
1.1.2 Citations . . . . .	6
1.1.3 Use of acronyms . . . . .	7
1.2 Objectives of the thesis . . . . .	7
1.3 Organization of the document . . . . .	7
1.4 Partnership . . . . .	8
<b>2 State of the art</b>	<b>9</b>
<b>3 Tools and Frameworks</b>	<b>11</b>
<b>4 Implementation</b>	<b>13</b>
<b>5 Results</b>	<b>15</b>
<b>6 Conclusions</b>	<b>17</b>
<b>Bibliography</b>	<b>19</b>



# List of Figures

1.1	This is the text that goes in the list of figures . . . . .	5
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# List of Tables

1.1 This is the title of the table that goes in the list of tables . . . . . 4



# Acronyms

**LED** Light Emitting Diode

**UNIPV** University of Pavia

**Robolab** Robotics Laboratory





# Chapter 1

## Introduction

“A design of any kind shows its real value when taking beyond its original limits.”

---

*Tom Jennings*

Some few conventions (and an example of nested item list):

- In a `.tex` file, text lines can have variable length.
- Put a newline after every fullstop, see an example in section 1.1; paragraphs are separated by empty lines in the `tex` file, so a newline at the end of a sentence does not affect the structure of the paragraph.
- This is a tradeoff for using versioning tools:
  - Lines too long (full paragraphs) would introduce diffs that are too large.
  - Fixed maximum line widths (e.g., 80 columns) lead to editors to reorganize the paragraph to fit the width, causing again diffs that are too large.

You can use the percentage symbol (%)<sup>1</sup> to avoid a space between item list and this paragraph, so that the first line of this paragraph is not indented.

Enumerated list:

1. Item 1.
2. Item 2.
3. Item 3.

---

<sup>1</sup>And notice how to insert a symbol of percentage!

---

<i>Column</i>	
<i>Column 1</i>	<i>2</i>
text 1	Some long text in the table. Some long text in the table. Some long text in the table. Some long text in the table. Some long text in the table. Some long text in the table. Some long text in the table.
text 2	some other text. some other text. some other text. some other text. some other text. some other text.

---

**Table 1.1:** This is the caption of the table.

#### 4. Item 4.

Sometimes, when you have a list of items for which you don't want to use bullet points or enumerations, you can use paragraphs with titles. See the following text.

**This is the first paragraph.** This is the long text of the first paragraph. This is the long text of the first paragraph.

**This is the second paragraph.** This is the long text of the second paragraph. This is the long text of the second paragraph. This is the long text of the second paragraph. This is the long text of the second paragraph.

**This is the third paragraph.** This is the long text of the third paragraph. This is the long text of the third paragraph. This is the long text of the third paragraph. This is the long text of the third paragraph. This is the long text of the third paragraph.

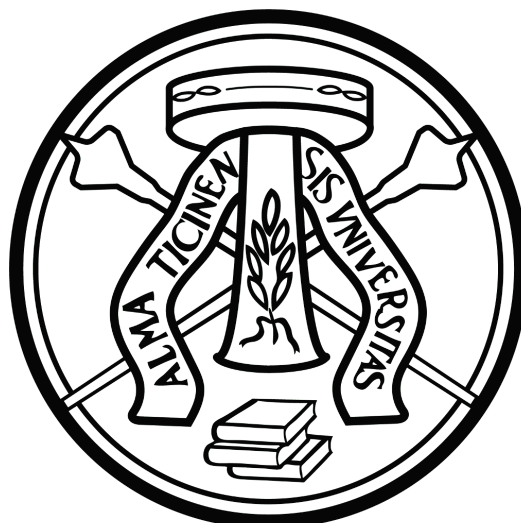
Finally, table 1.1 provides an example of table. You can add as many columns and rows as you wish. Please refer to <https://www.ctan.org/pkg/tabulary> for the documentation of the package. In particular, see how to change the size and the alignment of the columns, if you need it.

## 1.1 General recommendations

An example of line breaking follows<sup>2</sup>. Do you see it? This is a new line in the `.tex` file but it is the same paragraph in the pdf.

---

<sup>2</sup>And this is another example of footnote; don't forget the full stop at the end of the footnote.



**Figure 1.1:** Example of figure; this is the caption that goes below the figure.

Figure 1.1 reports an example of template to include a figure. Just copy this template around and set the filename (without extension!), the size, and write the caption.

Use something like

```
width=0.5\textwidth
```

to set the size of the figure as a percentage of the text width (in this case it is 50%). You can also specify an absolute width with `width=4cm`, but usually a relative size is fine. Sometimes (very rarely, in my experience) you may want to set the size on the basis of the height of the figure, i.e., `height=4cm`.

The label **must go inside the caption**, otherwise sometimes  $\text{\LaTeX}$  does not handle the references correctly.

Every figure, table, listing or equation must be referenced and properly described in the text. **Never use statements such as “previous chapter”, “next section” or “figure below”**: these elements may be moved during the editing of the text, thus if you use these statements then you may have to update the sentences every time you move something around. This document uses the package `cleveref`, so use the command `\cref` (e.g., this is a reference to section 1.1) for a smart referencing (use `\Cref` for uppercase). It takes care of putting the right label and spacing before the number, and it will reference the item independently from its position in the text.

To use equations and to refer to them, use the `equation` environment like in this way:

**Listing 1.1:** Example of listing.

---

```
def filter_difference(lines):
    filter_header_lines = filter(lambda line: not line.startswith(
        '---') and not line.startswith('+++'), lines)
    filter_difference = filter(lambda line: line.startswith(
        '-') or line.startswith('+'), filter_header_lines)
    return filter_difference
```

---

$$A = \pi r^2 \tag{1.1}$$

And proper reference to eq. (1.1).

If you don't need to refer to an equation, you can skip the numbering:

$$2 + 2 = 4$$

In case of inline math, this is how it is done:  $P = 2 \cdot \pi \cdot R$ .

Listing 1.1 provides an example of listing for source code.

### 1.1.1 Formatting text

Beside equations and math text, there are some other formattings that are worth mentioning:

- for everything related to software, such as file names, functions, variables, etc., use `texttt`, e.g., `hello.txt` or `var_name`.
- to put some text within quotes, use `enquote`, e.g., “like this”; `enquote` is better than other solutions because it is more robust and handles internationalization correctly.

### 1.1.2 Citations

For citations from the bibliography use `\cite`. Here an example: [1].

Citations go **inside** the corresponding sentence. Note the position of the citation w.r.t. the full stop:

- “The algorithm has poor efficiency. [1]” **WRONG**
- “The algorithm has poor efficiency [1].” **CORRECT**

You have to populate the bibliography file `biblio.bib`. You can put as many items as you want in the file. Only the items that are cited in the thesis with `\cite` will be included in the bibliography, as in the example above.

The items to populate the `.bib` file are in BibTeX format. This is a popular format. If you look for some paper or book, it is likely that somewhere the bib format already exists. Try to search on the Internet for the title of the paper plus *bibliography* or *bib*.

### 1.1.3 Use of acronyms

Acronyms are very popular in scientific and technical documents. We use the `acronym` package.

All the acronyms are defined in `cap_acronyms.inc.tex`.

Use the acronyms with “University of Pavia (UNIPV)”, “Robotics Laboratory (Robolab)”, “Light Emitting Diode (LED)”. The package is smart enough to write the long version the first time, and then to use the short version, like so: “UNIPV” and “Robolab”.

Sometimes you need to use the full version again, do it with University of Pavia (UNIPV). If you need the long version only, use University of Pavia.

Plurals can be handled with LEDs.

## 1.2 Objectives of the thesis

Put here the objectives of the thesis.

## 1.3 Organization of the document

The thesis is organized as follows:

- chapter 2 explains this ...
- chapter 3 explains that ...
- chapter 4 presents this ...
- chapter 5 presents that ...
- finally the conclusions in chapter 6.

## 1.4 Partnership

Any possible additional information regarding the thesis.

## Chapter 2

# State of the art

“The wireless telegraph is not difficult to understand. The ordinary telegraph is like a very long cat. You pull the tail in New York, and it meows in Los Angeles. The wireless is the same, only without the cat.”

---

*Albert Einstein*

This chapter provides an overview of the state of the art.





## Chapter 3

# Tools and Frameworks

“I believe that inside every tool is a hammer.”

---

*Adam Savage*

This chapter describes the tools and frameworks used in the thesis.



## Chapter 4

# Implementation

“Sometimes, the elegant implementation is just a function. Not a method. Not a class. Not a framework. Just a function.”

---

*John Carmack*

This chapter shows the details of the implementation of the work.



# Chapter 5

## Results

“Somewhere, something incredible is waiting to be known.”

---

*Carl Sagan*

This chapter shows the results obtained in the thesis.



## Chapter 6

# Conclusions

“Computer Science is no more about computers than astronomy is about telescopes.”

---

*E. W. Dijkstra*

This chapter summarizes the conclusions of the work.





# Bibliography

- [1] Tullio Facchinetti. How to write a thesis in latex, 2021. <http://robot.unipv.it/toolleeo>, Last Access 2021.06.21.