



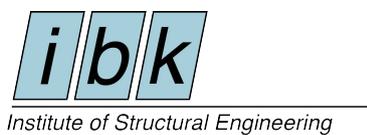
# **The title of the thesis**

**Do you really need a subtitle?**

**Author: Joseph Molloy**

**Thesis Type**

**December 2019**



## The title of the thesis

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December 2019

## Abstract

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## Keywords

keyword1, keyword2, etc

## Suggested Citation

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Dezember 2019

## **Zusammenfassung**

Dieses Bericht....

## **Schlagworte**

keyword1, keyword2, etc

## **Zitierungsvorschlag**

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# 1 Introduction

This is a small overview how to write papers at the IVT in L<sup>A</sup>T<sub>E</sub>X.

If you see bugs and errors in the layout please contact [joseph.molloy@ivt.baug.ethz.ch](mailto:joseph.molloy@ivt.baug.ethz.ch).

## 1.1 Structuring

To structure you paper you can define several headings and subheadings: “\section”, “\subsection”, “\subsubsection”, “\paragraph” and “\subparagraph”. The first three will be numbered and will show up in the content. The layout defines the style of the headings.

Examples of sections and subsections:

### 1.1.1 A subsubsection

Some text. Some text.

**A paragraph** Some text. Some text.

**A subparagraph** Some text. Some text.

## 1.2 A Really Long Section title

### 1.2.1 Page Break

There are three ways of performing a manual page break.

- “\clearpage”: omits the remaining space of the current page and starts the new one. Inserting two or more times that command does NOT produce follow up empty pages.
- “\cleardoublepage”: It does the same than the command above, but for a report L<sup>A</sup>T<sub>E</sub>X type that define different layouts for the odd and even pages (i.e. dissertation layouts), it sometimes produces a complete follow up empty page such that the next sections will occur always on the even page (odd page, resp.)
- “\include”: This is another way to start on a new page. If you use the “\include” command for separating a paper into different .tex files, “\include” will always start on top of the next page. If you do not want that, but still want to separate the paper into different files, use the “\input” command instead.

## 1.3 Text Blocks

A newline (one time “Return”) does NOT produce a new Block. You have to separate blocks with a COMPLETE EMPTY line.

Hence, it is a good idea to insert hard line breaks frequently, e.g. after commas or full stops. Most version control systems such as SVN are line-based; changes can be tracked easier if a paragraph is split over several lines. By the same token, it is not a good idea to let your text editor manage the line breaks for you.

This is a block. This is a block.

This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block.

## 1.4 Lists

There are three ways of making lists:

### 1.4.1 Items

- Item one
  - Item one
  - Item two Item two
  - Item three
- Item two Item two
- Item three

### 1.4.2 Enumerations

1. Item one
  - a) Item one
  - b) Item two Item twoItem two Item two
  - c) Item three
2. Item two Item twoItem two Item two
3. Item three

### 1.4.3 Descriptive list

**Desc one** Item one

**Desc one** Item one

**Desc two** Item two Item two

**Desc three** Item three

**Desc two** Item two Item two

**Desc three** Item three

### 1.4.4 Sub-Lists

List can be nested in any fashion you like:

- Item one
  - Item one
  - Item two
  - Item three
- Item three
  1. Item one

**Desc one** Item one

**Desc two** Item two  
Item two Item two Item two Item two Item two Item two Item two Item  
two Item two Item two

– Item one

– Item two  
Item two Item two Item two Item two Item two Item two Item two  
Item two Item two Item two Item two

– Item three

**Desc three** Item three

a) Item one

b) Item two  
Item two Item two Item two Item two Item two Item two Item two  
Item two Item two Item two Item two Item two Item two Item two  
Item two

c) Item three

2. Item two

3. Item three

• Item four

## 1.5 Text appearance

There are also more commands to change the appearance of text. However, underlining and letter-spacing is not recommended when writing papers. Some even consider bold-face as bad practice, as it changes the “average greyness” of the text (as does underlining and letter-spacing).

### 1.5.1 Bold, etc.

*Emphasis (instead of italic)*, **Bold**, SMALL CAPS, ***Bold italics***, Teletype, Sans serif.

### 1.5.2 URL

To write an url type: `www.ivt.ethz.ch`. The PDF will contain a link to that URL.

## 1.6 Special Characters

### 1.6.1 Large Space

Two sentence are separated with a large empty space. For dots used in acronyms (“i.e.” or “e.g.”) followed by an empty space, you do not want this extra large space. In this case you should add a backslash after the dot or use non-breaking space (see below). Example:

A fact, e.g. an example.

### 1.6.2 Quotation Mark

Quotation marks: “text to be quoted”, also in ‘single quotes’.

### 1.6.3 Dashes

There are three types of dashes:

**Hyphen Dash** agent-based

**Range Dash** page 123–138

**em Dash** bla bla—thinking—bla bla

### 1.6.4 Predefined special characters

Some characters are used for special functions. If you want to write them use the following substitutions:

`$ & % # { } § £ \ ~ ^ ` i i`

There are a lot more special characters, especially for formulas. You will find a fairly good overview in `lshort.pdf`. This is by the way a good reference for many questions concerning L<sup>A</sup>T<sub>E</sub>X.

### 1.6.5 Non-breaking space

Sometimes, you do not want that two words are split at a line ending. To prevent this use the “tilde” character. Example:

6 AM  
6 AM 6 AM

versus

6 AM  
6 AM 6 AM

### 1.6.6 Ligatures

Take a closer look at the words “affluent”, “effective” and “flow”. The joining of the f and l letters happens automatically; however on rare occasions you may want to suppress this, like for “shelfful”.

## 2 Complex Structures

Here you can find how to use labeling, cross-references, footnotes, etc. Some of them are standard  $\text{\LaTeX}$  commands, described in this section. Commands available only in the IVT environment will be explained in the next section.

### 2.1 Labels and Cross-Refs

Anywhere you want you can add a label (see above for this subsection). Wherever you want you can refer (cross-ref) to this label by using the “\ref” command. Example: Labels and Cross-Refs can be found in Section 2.1.

Labels can also be used in lists:

1. Step one

2. Step two
3. Feedback (Goto 1)

Labels are very important in Figures and Tables. It is used to refer to them in the written text (see Sections 3.1 and 3.2).

## 2.2 Clever referencing

The “cleveref” package provides the “\cref” command to conveniently reference any type of object<sup>1</sup>. For example:

- This is a reference to a single section: Labels are described in Section 2.1.
- This is a reference to multiple sections: This document contains, among others, Sections 2.1 to 2.3.
- This is a reference to multiple subsequent sections: This document contains, among others, Sections 2.1, 2.3 and 3.1.
- One can summarize refs to different types of objects. This becomes clear when taking a look at this sentence with references to Section 2.1 and Table 1.
- Figure 1—this is how a reference to a figure should look like at the beginning of a sentence.

Note how “cleveref” automatically adds the object type. One does not have to write it anymore. But remember using the “\Cref” command instead at the beginning of the sentence!

## 2.3 Footnotes

Footnotes are directly embedded in the text where you want to refer to them. Depending on the layout, they will appear at the bottom of the current page or at the end of the Section. Example:

This is a text<sup>2</sup> with a footnote<sup>3</sup>.

---

<sup>1</sup>See its CTAN entry, accessed on May 28th, 2010.

<sup>2</sup>more information about “text”

<sup>3</sup>more information about “footnote”

## 2.4 Formulas

To write formulas in L<sup>A</sup>T<sub>E</sub>X you can describe it as plain text. You can either embed a formula into the text or add it on a separate line. In the second version formula numbers will be automatically added. With labels you are able to refer to the formulas.

### 2.4.1 Formula embedded in text

The formula part is enclosed by \$. Examples:

bla bla bla  $[-30min, +30min]$  bla bla bla.

bla bla bla bla bla bla  $P > N$  bla bla bla  $S_j$  bla  $j$  bla bla bla  $\beta$  bla bla bla.

### 2.4.2 Formula as separate line

Using the “linenomath” and “flalign” environments the formulas will be placed on a separate line with a number. Examples:

$$S = (1 - \alpha) \cdot S_{\text{old}} + \alpha \cdot S_{\text{new}} \quad (1)$$

$$U_{\text{total}} = \sum_{i=1}^n U_{\text{perf},i} + \sum_{i=1}^n U_{\text{late},i} + \sum_{i=1}^n U_{\text{travel},i}, \quad (2)$$

$$U_{\text{perf},i}(t_{\text{perf},i}) = \max \left[ 0, \beta_{\text{perf}} \cdot t_i^* \cdot \ln \left( \frac{t_{\text{perf},i}}{t_{0,i}} \right) \right], \quad (3)$$

$$t_{0,i} = t_i^* \cdot e^{-\zeta/(p \cdot t_i^*)}, \quad (4)$$

$$U_{\text{perf},i}(t_{\text{perf},i}) = \max \left[ 0, \beta_{\text{perf}} \cdot t_i^* \cdot \left( \ln \left( \frac{t_{\text{perf},i}}{t_i^*} \right) + \frac{\zeta}{p \cdot t_i^*} \right) \right]. \quad (5)$$

$$U_{\text{late},i} = \begin{cases} \beta_{\text{late}} \cdot t_{\text{late},i} & : t_{\text{late},i} \geq 0 \\ 0 & : \text{otherwise} \end{cases} \quad (6)$$

$$\begin{aligned} U_{\text{travel},i} &= \beta_{\text{travel}} \cdot t_{\text{travel},i} \\ &= \beta_{\text{travel}} \cdot \dots \end{aligned} \quad (7)$$

With the labels you can refer to an equation with the “ref” command. Examples:

As shown in Eq. (2), the total utility is... See Eq. (7) for the definition of the travel-utility.

### 2.4.3 Text mode

Text in math mode looks ugly, and spaces are ignored: *bafflinglyugly*. Anything that consists of more than one letter should be surrounded by the “\text” command: `bafflingly ugly`. If you need italics, use “\text{\emph{...}}” or simply “\mathit”; the latter still eats spaces: *bafflinglyugly*.

## 2.5 Citations and References

By using the IVT bibliography database you can refer to a reference by using the command “\citep” (citation in parentheses) or “\citet” (citation embedded in the sentence).

With the unique key of the bib-entry you will automatically refer to that reference and the reference will automatically be added to the reference list. The way the references will be sorted depends on the layout you use.

Examples for “\citet”:

bla bla Axhausen *et al.* (2008) and Horni *et al.* (2016) bla Axhausen *et al.* (2008); Horni *et al.* (2016) bla bla bla bla bla bla bla bla.

Examples for “\citep”:

bla bla bla bla bla bla (Horni *et al.*, 2016; Axhausen *et al.*, 2008, e.g.).

bla bla bla bla bla bla (see also Axhausen *et al.*, 2008, pp.325-378).

bla bla bla bla bla bla (Axhausen *et al.*, 2008).

Just like with the clever referencing commands (cf. Section 2.2) you should use “\Citet” or “\Citep” instead at the beginning of a sentence. Axhausen *et al.* (2008) would be otherwise shown as Axhausen *et al.* (2008) in your paper.

### 3 Figures and Tables

This section defines the special commands that are available only at the IVT environment. Those special commands react on different layouts defined in the environment, thus making it convenient to switch between paper layouts.

#### 3.1 Figures

There are three commands for including Figures. One for a single Figure and one for a Multi-Figure. The position of the Figure is chosen by L<sup>A</sup>T<sub>E</sub>X, but a hint can be provided.

---

Figure 1: Single Figure: Here you can add the long Caption of the Figure.

---



Source: Christoph Dobler

---

### 3.1.1 Single Figures

A single figure as shown in Fig. 1 has the following construct:

```
\begin[placement]{figure} as in normal latex
```

The placement modifier specifies where the figure appears in the final document. It can be “tp”, “htp” or “hp”; “t” means “at the top of this or a following page”, “h” means “at the place where the command appears”, and “p” means “on a separate page”. If you leave out this parameter (including the square brackets), “tp” is the default. Usually a figure will appear on the next suitable location after it has been declared. The placement on a separate page will be used as a last resort if the figure does not fit anywhere else, even if you do not include it.

With `\ivtsource{text}` you can add a source. If you do not want to add a source, just leave it empty. If not, “Source: ” or “Quelle: ” will be added followed by your text.

## 3.2 Tables

A table has the same structure as the single Figure (see above). But instead of including a graphic in item 4 you add the “tabular” construct. Unfortunately it is not that easy to understand and edit such a table. One has to get used to it. However, quite a few tools can help converting the data to the L<sup>A</sup>T<sub>E</sub>X format, see <http://tex.stackexchange.com/q/49414/8057> for an overview.

If you do not like it you can still add the table as a graphic (with the “\includegraphics” command). But you still need to use the “\creatable” command, otherwise your table will appear in the list of figures instead of the list of tables. Table 1 shows an example of a table.

Table 1: A Tables Caption

---

Bias / Error	Routes Only	Times and Routes
Mean Abs. Bias:	+331.40	+306.32
Mean Rel. Bias:	+19.62%	+25.27%
Mean Abs. Error:	533.55	503.77
Mean Rel. Error:	37.50%	35.38%

---

Source: my source

---

## 4 Summary and Important Notes

This example paper gives you a short overview of how to write a paper in L<sup>A</sup>T<sub>E</sub>X inside the IVT L<sup>A</sup>T<sub>E</sub>X-BibT<sub>E</sub>X environment. Some of the concepts are general while other are made for the use at the IVT using the IVT L<sup>A</sup>T<sub>E</sub>X environment.

If you want to know more about L<sup>A</sup>T<sub>E</sub>X, there are very resources on the overleaf website.

## 5 References

Axhausen, K. W., S. Hess, A. König, G. Abay, J. J. Bates and M. Bierlaire (2008) Income and distance elasticities of values of travel time savings: New swiss results, *Transport*

*Policy*, **15** (3) 173–185.

Horni, A., K. Nagel and K. W. Axhausen (2016) *The multi-agent transport simulation MATSim*, Ubiquity Press, London.

## **A First section in the appendix**

The appendix starts with the “appendix” command. the rest is the same as in the sections.

### **A.1 A subsection in the appendix**

bla bla

bla  
bla  
bla  
bla  
bla  
bla bla

## **B Second section in the appendix**

bla  
bla  
bla  
bla  
bla  
bla  
bla bla