

# VON001F: Thesis Skills

Hands-On Exercises:

## 6.2 Using LaTeX for Writing Theses

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# Chapter Objectives

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- Getting hands-on experience in using LaTeX:
  - Using Cloud-based Overleaf LaTeX environment.
  - Some basic of LaTeX.
  - Using the School of Engineering and Natural Sciences LaTeX thesis template.
- Note: Assumption that you attended class two weeks ago  
(or read [VON001F-04-3 Latex overview.pdf](#) )

# Getting started

If have yet no overleaf account:  
Register at [overleaf.com](https://overleaf.com) now, while  
I am talking.

The free plan that you get when you  
register is sufficient for thesis writing.

- We use [overleaf.com](https://overleaf.com)
  - LaTeX environment.
  - Advantage:
    - Cloud-based: no need to install any software.
    - Cloud-based: easy collaboration, e.g. with your supervisor.
  - Disadvantages:
    - Cloud-based: slow transmission of output to your browser.
      - If you have a very long thesis, you want to run LaTeX locally.
    - Cloud-based: if they are down or bankrupt, your data is lost.
      - Do backups to your local computer or another cloud data provider.



# LaTeX commands

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- LaTeX commands
  - start with a backslash `\`
  - have a case sensitive `\command` name,
  - may have a `{parameter}` passed within curly brackets:  
`\documentclass{article}`
  - may have one or more optional `[parameters]` passed in within square brackets: `\documentclass[12pt, a4paper]{article}`
- White space following a command name is ignored.
  - If a command takes no parameter, e.g. any white space following `\dots` command (creates three ellipsis dots ...) will be eaten up.
  - You need to add the empty parameter `{ }` to prevent this. E.g.:
    - `and so on\dots New sentence` → and so on...New sentence
    - `and so on\dots{} New sentence` → and so on... New sentence

Results  
in no  
space  
here!

# Learn LaTeX in 30 minutes

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- <https://www.overleaf.com/learn>
  - → Start with our *[Learn LaTeX in 30 minutes](#)* guide.
- Do this tutorial now!
  - If you are already familiar with LaTeX:
    - Help the others with this tutorial.
- Once you are finished with this tutorial:
  - Let me know!
  - Pair with someone who finished, be nasty to each other:
    - Swap laptops and remove secretly from the LaTeX source code,
      - `}`, `\end,` `$` (or something similar).
    - Swap back and try to fix the problem.

After 14:50-15:00 break, we start with remaining slides. If you finished early, you may already start with these.

# Overleaf: Best practises

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- **Switch off auto Recompile** (it slows down). Use CTRL-S trigger compile.
- The arrows between preview and source editor are nice to jump around.
  - After source code edits, may require Recompile to work.
- Do not ignore the built-in spellchecker.
  - Unfortunately: Icelandic not support, no grammar checker (even browser plug-ins for grammar checking do not work).
- Turn on link sharing and send share link to supervisors:
  - They can comment via "Review".
- You have a **History** of changes.
  - Free plan: only last 24h, but you can **label versions that are then kept**.
    - **Regularly label versions**, e.g. end of each session or day.
- Regularly, download zip to have a backup.

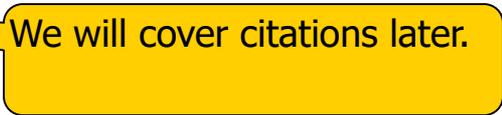
# Essentials not covered in Overleaf Tutorial: LaTeX: Special characters

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- To able to use  $\beta$ ,  $\ddot{o}$ ,  $\acute{a}$ , etc.:
  - Add to preamble (i.e. after `\documentclass`, but before `\begin{document}`):
    - `\usepackage[utf8]{inputenc}`
    - `\usepackage[T1]{fontenc}`
- `%`, `#`, `%`, `$`, `_`, `{` have a special meaning (e.g. comment):
  - If you need them to appear in the output, **escape them** by preceding it with a backslash, e.g. `\%`
    - Others (e.g. `\`) need special treatment, e.g. use `\textbackslash`

# Essentials not covered in Overleaf Tutorial: White space: Non-breaking space

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- Take care to use a non-breaking space “~” in front of `~\ref` and `~\cite`.
    - Otherwise, things that belong together may get split by a linebreak: “Table 1” looks ugly because you want to have both in the same line: “Table 1”.
    - The same applies to citations: “Einstein [10]” looks better than “Einstein [10]”.
- ⇒ Get used to type always `~\ref` and `~\cite` right from the beginning!
- Did you know? you can also refer to chapter, sections, etc. by having a label: `\section{My Section}\label{sec:mysection}`

# Essentials not covered in Overleaf Tutorial: White space: Sentence spacing

- By default, LaTeX uses **sentence spacing**, i.e. small extra space at the end of a sentence.
    - LaTeX assumes end of a sentence if it encounters a dot in the source code.
    - Sometimes, you have a dot in the middle of a sentence, e.g.:
      - LaTeX cannot not know whether ".  
starts a new sentence or not.  

<code>2. October 2019</code>	<code>2. October 2019</code>
------------------------------	------------------------------
      - You have to tell LaTeX using "`\` " (=backslash followed by space) after a dot that this dot does not end a sentence.  

<code>2.\ October 2019</code>	<code>2. October 2019</code>
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      - Same applies to abbreviations such as "i.e." and "e.g."
- ⇒ Get used to type always "`i.e.\` " and "`e.g.\` "!
- Price to pay for a nice layout.

Note the extra space?!

Talking about "e.g.":  
Never start a sentence with "E.g.", rather use "For example, "

# Essentials not covered in Overleaf Tutorial: Footnote

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- Add footnotes into your text (where the footnotenumber shall later appear) via:

**My text `\footnote{Footnote text}` has a footnote.**

- Will automatically generate footnote number and note at foot of page.
- Did you know? Never have white space in front of `\footnote`.
  - (A footnotenumber always follows directly a word or – if at end of sentence – a full stop.)

# Essentials not covered in Overleaf Tutorial: Floats for figures and tables (1)

- In contrast to text, it makes no sense to have a page break within a figure or table.
- ⇒ Let them `float` so that LaTeX places them on the next page if it would fit on the current page only with a page break:

- `\begin{figure}[placement specifier]`  
your `\includegraphics \caption \label` etc. here  
`\end{figure}`

More on float placement specifiers on next slide.

Figure caption allows below figure.

- `\begin{table}[placement specifier]`  
your `\caption \label \begin{tabular} \end{tabular}` etc. here  
`\end{table}`

Table caption allows above table.

- More info: <https://www.latex-tutorial.com/tutorials/tables/>
- More info: <https://www.latex-tutorial.com/tutorials/figures/>
- Did you know? In your scientific writing, always refer to & describe *a//* floats in your text: In `Figure~\ref{fig:myfigure}`,

# Essentials not covered in Overleaf Tutorial: Floats for figures and tables (2)

- Possible placement specifiers:
  - `[t]` **top** of page (looks often best layout-wise)
  - `[b]` **bottom** of page
  - `[h]` “**here**”=where the float is with respect to surrounding text.
- LaTeX has many internal restrictions, e.g. not too many floats per page.
  - Due to this, the **floats end up rarely where you would expect**.
  - Restrictions can be relaxed by adding `!` the placement specifier, e.g. `[tb!]`
  - If the float is placed on a later page than intended, move the float earlier in the source code.
    - You may have to move it to locations in the source, where it does logically not belong to.
  - Sometimes, you have to use `\clearpage` to tell LaTeX that it is OK to place floats on an extra page.

Can be combined, e.g. `[tb]` to place top or bottom.  
Order does not matter:  
`[ht] = [th]`

# School of Engineering and Natural Sciences

## Thesis template: Getting started

Hands-on: do this (and next slides) now!

- Let's get started writing your future thesis!
- In principle, LaTeX templates should be in UGLA:
  - <https://ugla.hi.is/kerfi/view/page.php?sid=4500>
  - <https://ugla.hi.is/kerfi/view/page.php?sid=2617>
  - But they tend to disappear or be at a new URL
  - and in particular the names of the included logos do not match the names of the provided logo files.

⇒ **Download my copy** (one zip file): Google for "latex uni iceland" and you should get <http://uni.hi.is/helmut/2017/11/27/latex-templates-for-theses-at-university-of-iceland-latex-snidmat-ritgerdar-lokaverkefna-haskola-islands>

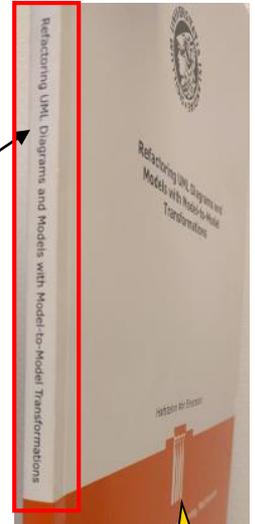
- In Overleaf, go to the projects view:
  - If you are in the editor, click in the upper left corner on the up arrow (next to "Menu"):
  - →"New Project" →"Upload Project": Add downloaded zip file.



# School of Engineering and Natural Sciences

## Thesis template: First steps: fix title pages

- Fill in your name in `\thesisauthor`
  - If you know already: also fill the other fields.
- Theses are not printed on paper anymore:
  - Delete all lines where `\thesisISBN` and `\thesisPrinting` occur.
  - `\thesisshorttitle` was mainly needed for the spine of a printed version so that Háskólaprent knew what to put there:
    - Delete all lines where `\thesisshorttitle` occurs.
- Instead of a Faculty Representative, there is an External Examiner:
  - Rename hard-coded text "Faculty Representative" to "External Examiner".
- Fix ugly "M.Sc. Committee" on page 3:
  - Search for "M.Sc. committee": replace by `"\thesiskind{} \ Committee"`.



Note the extra space?!

M.Sc. committee  
XXNN4  
XXNN5

As `\thesiskind` will contain a dot (from "M.Sc."), we need to prevent extra sentence spacing by using `"\ "`.

Also change to upper case.

In fact, the orange footer does not use the same centering as the other elements: at home, you may use your graphics program to remove pixels from the left and add them to the right.

# Useful packages: Acronyms

Hands-on: do this (and next slides) now!  
Add acronyms below, refer to acronym in abstract and twice in Chapter 1: See how `\acresetall` changes expansion in chapter 1.

- Expand acronyms automatically, when they are first used, use later only short form:

- In preamble, add: `\usepackage{acronym}`

- In the “Abbreviations” chapter of the thesis template:

- add: `\markboth{Abbreviations}{Abbreviations}`

If your acronyms span more than one page, this will displayed as header on the top of left and right page.

- add: `\begin{acronym}[SENS]`

Longest acronym (short form) that occurs in your list of acronyms: needed for proper indentation

```
\acro{SENS}{School of Engineering and Natural Sciences}
```

```
\acro{UoI}{University of Iceland}
```

```
\end{acronym}
```

Need to manually sort order of entries alphabetically.

- Where ever you use the acronym in your text: `\ac{UoI}`

- `\acp` if need the plural form.

- `\ac1` if you explicitly want to have the long form only.

- `\acf` if you explicitly want to have the full long and short form (=like first use of `\ac`)

- ...

- `\acresetall` to forget about earlier usage (=expansion) of acronyms, e.g. if used in Abstract or Introduction, but want to expand later once again in Foundations.

- Add `\acresetall` at start of Introduction chapter (and maybe also Foundations chapter).

Expand automatically to long and short form at first use, later only short form.

# Useful packages: URLs and Links within PDF

Hands-on: do this (and next slides) now!  
Add some `\url`

- `\usepackage{url}`
  - Provides command `\url{http://some.web.site}` to format URLs .
- `\usepackage{hyperref}`
  - This package provides as well a `\url` command, but also
  - automatically adds links inside the PDF:
    - E.g. in table of contents to jump to chapter, on reference to jump to list of references, acronym, etc.
    - Works as well in Overleaf preview.
- The thesis template has both packages already in it's preamble.

# Useful packages: Listings

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- If you want to include programming language listings as float with syntax highlighting:

- `\usepackage{listings}`
- `\begin{lstlisting}[language=Python]`  
`import numpy as np`  
`def incmatrix(gen11,gen12):`  
 `return 0`  
`\end{lstlisting}`

- or include from file (e.g. import only lines 2-12):

```
\lstinputlisting[language=Java, firstline=2, lastline=12]{Main.java}
```

- Many options (e.g. adding line numbers, caption/labels/placement for float, etc.), see [https://www.overleaf.com/learn/latex/Code\\_listing](https://www.overleaf.com/learn/latex/Code_listing)

# There is a package for everything!

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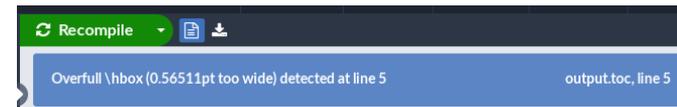
- Check <https://www.overleaf.com/learn> for the most frequently used packages. E.g.:
  - Todonotes
  - Chemistry
  - Presentations/Slides: Beamer package.
    - Makes sense if you need a lot of math etc. on your slides.
      - Otherwise, some “what you see is what you get” (WYSIWYG) tool, such as PowerPoint is better!
    - UoI slide template – as well on <https://uni.hi.is/helmut/2017/11/27/latex-templates-for-theses-at-university-of-iceland-latex-snidmat-ritgerdar-lokaverkefna-haskola-islands/>
- Google for “LaTeX” followed by name of whatever feature you need/problem you have.

# Defining your own macros

- You can define your own macros in the preamble for later use. E.g.:
  - In your text, you want to refer to a keyword used in a programming language listing, but have not yet decided whether you want to have it formatted in typewriter text or not:
    - In preamble: `\newcommand{\kw}[1]{\texttt{#1}}`
    - In the text, use: `\kw{println}`, `\kw{return}`, etc.
    - If you later decide that you want to rather use sans serif text, change to: `\newcommand{\kw}[1]{\textsf{#1}}`
  - You have that long word that you do not want to type every time:
    - In preamble: `\newcommand{\e}{Eyjafjallajökull}`
    - In the text, use: `\e{}`
  - You have yet to decide how to call you newly invented approach:
    - In preamble: `\newcommand{\myapproach}{my new approach}`
    - In the text, use: `\myapproach{}`
    - Can later change to `\newcommand{\myapproach}{the approach developed in this thesis}`

# Typography

- **Opening and closing quotation marks** typically used in English: “ ”
  - To get these, type in LaTeX source code: `` `` and `' '` (=2 single quotes).
    - Do not use `"` (that you get via Shift-2).
- A **dash** (used in “1–10” or in a remark “–” like this) is longer than a minus: In LaTeX, type two times a minus: `--`
- If LaTeX cannot hyphenate a word, it rather gives up than silently producing non-optimal output: **“overfull hbox”** (=horizontal box).
  - These warnings are shown in the LaTeX logs.
  - Try to find out, at which word LaTeX has problems doing the linebreak and **add `\-`** into the word to tell LaTeX where to hyphenate.
  - Sometimes, you need to rephrase a sentence to move the problematic word to a different location.



```
Inside this vbox
we'll set the linewidth
to 30mm using \hspace=30mm.
We are typesetting
some text inside a
\vbox because it will
cause TeX to perform
linebreaking and build
the paragraph as a
stack of horizontal boxes.
For some lines TeX
might be unable to
find a good linebreak
which can result in
lines too wide to fit
```

Output from:  
<https://www.overleaf.com/learn/latex/%5Coverfullrule>

# Conclusion

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- LaTeX is a proven tool used since decades by scientists.
  - Trust it for your thesis!
- Tons of documentation on the web.
  - <https://www.latex-tutorial.com/>
  - Or google for “lshort” to get the very good PDF “The Not So Short Introduction to LaTeX”
  - Overleaf itself has often good documentation, e.g. <https://www.overleaf.com/learn/latex/Errors>
  - In case of problems: just google.