Writing papers and thesis using LaTeX2e

Part 0: Introduction to LaTeX

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LaTeXfor Beginners

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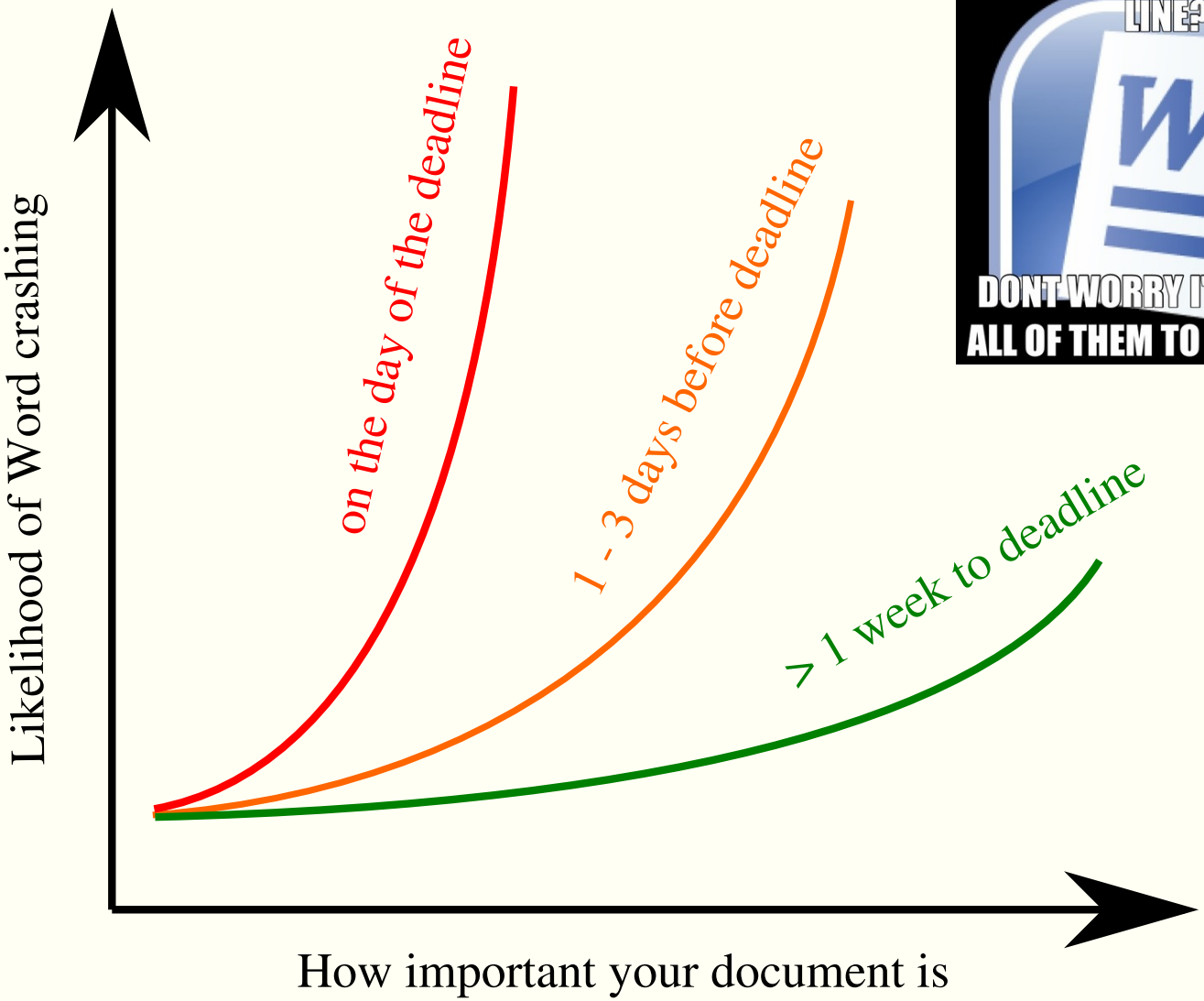
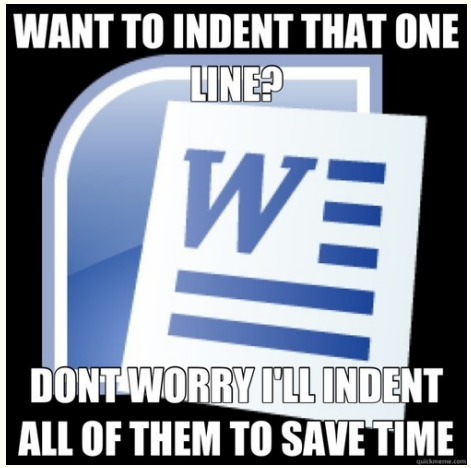
Outline

Why you shouldn't use Word to write your thesis





Can you see beyond the WYSIWYG bubble?

At first sight it must seem intolerably degrading for Zen — however the reader may understand this word — to be associated with anything so mundane as archery. Even if he were willing to make a big concession, and to find archery distinguished as an "art," he would scarcely feel inclined to look behind this art for anything more than a decidedly sporting form of prowess. He therefore expects to be told something about the amazing feats of Japanese trick-artists who have the advantage of being able to rely on a time-honored and unbroken tradition in the use of bow and arrow. For in the Far East it is only a few generations since the old means of combat were replaced by modern weapons, and familiarity in the handling of them by no means fell into disuse, but went on propagating itself, and has since been cultivated in ever widening circles. Might one not expect, therefore, a description of the special ways in which archery is pursued today as a national sport in Japan?

Nothing could be more mistaken than this expectation. By archery in the traditional sense, which he esteems as an art and honors as a national heritage, the Japanese does not understand a sport but, strange as this may sound at first, a religious ritual. And consequently, by the "art" of archery he does not mean the ability of the sportsman, which can be controlled, more or less, by bodily exercises, but an ability whose origin is to be sought in spiritual exercises and whose aim consists in hitting a spiritual goal, so that fundamentally the marksman aims at himself and may even succeed in hitting himself.

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Word vs. LaTeX

Can you see beyond the WYSIWYG bubble?

mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off – then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it, almost all men in their degree, some time or

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Word vs. InDesign vs. LaTeX

Ligatures

fire flower fjörd

Figure: MS Word

fire flower fjörd

Figure: LaTeX

D.Taraborelli (2008), The Beauty of LaTeX

Ligatures, smallcaps, kerning

grafiet efficiënt fles souffleur fjord

grafiet efficiënt fles souffleur fjord

Ligatures

AAa BB CC DD

AAa BB CC DD

Smallcaps

Tafel AVA *AVA*

Tafel AVA *AVA*

Kerning

Outline

Outline

What is LaTeX?

- LaTeXis a document preparation system for the TeXtypesetting program.
- Programmable desktop publishing, which automates most of the typesetting.
- LaTeXproduce beautiful documents, especially mathematics

$$i\hbar\frac{\partial}{\partial t}\Psi(r,t) = \left[\frac{-\hbar^2}{2\mu}\nabla^2 + V(r,t)\right]\Psi(r,t)$$

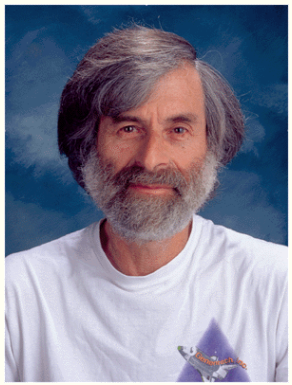
$$E^2 = (pc)^2 + (m_0c^2)^2$$

- LaTeXis WYSIWYM (What You See is What You Mean)

History

It all started with Donald Knuth and "The Art of Computer Programming"

- Donald Knuth, 1977, TEX- a computer language used for typesetting math and other technical material



- Leslie Lamport, LATEX- a higher-level method of accessing the power of TEX

Getting started with LaTeX

- **Typesetting**
  - TeXLive - full version
  - MiKTeX- Windows (Basic installer)
- **Off-line editors**
  - TeXStudio
  - TeXMakerX
- **Online editors & LaTeXcompilers**
  - Overleaf

How LaTeXworks? - The Magic

- You write your document in `plain text` with `commands` that describe its structure and meaning.
- The LaTeXprogram processes your text and commands to produce a beautifully formatted document.

LaTeX Pros and Cons

Pros

- It's free and works on Macs, Windows, Unix/Linux.
- LaTeX files are ASCII and are portable.
- The typesetting is better, especially the maths.
- Style changes are neater in LaTeX.

Cons

- Special/Modern Font selection is difficult, but one can use XeTeX.
- LaTeX encourages (almost insists on) structured writing and the separation of style from content. This is not the way that many people (especially non-programmers) are used to working.
- Without a WYSIWYG front end, it's not always easy to find out how to do things.

More examples of commands and their output. . .

```
\begin{itemize}
\item Despicable Me
\item Wall-E
\item Tangled
\end{itemize}
```

- Despicable Me
- Wall-E
- Tangled

```
\begin{figure}
\includegraphics{figs/minion}
\end{figure}
```

```
\begin{equation}
\alpha = \beta + 1
\end{equation}
```

$$\alpha = \beta + 1 \qquad (1)$$

Getting Started

- A minimal LaTeX document:

```
\documentclass{article}
\begin{document}
Hello World! % your content goes here...
\end{document}
```

- Commands start with a *backslash* \
- Every document starts with a `\documentclass` command.
- The *argument* in curly braces { } tells LaTeXwhat kind of document we are creating: an `article`.
- A percent sign % starts a *comment* — LaTeXwill ignore the rest of the line.

Declarations and Environments

Declaration and commands...

- Are stated once
- Take effect until further notice
- Can optionally be constrained

Eg., `\documentclass` or `\includegraphics`

Environments...

- Have matching begin and end declarations
- Must be constrained

Eg., `\begin{document}` ... `\end{document}`

Arguments

Required arguments...

- Are contained in curly braces
- Must be provided

Eg., `\documentclass{article}`

Optional arguments...

- Are contained in square bracket
- Can be left out, in which case default value is assumed
- Give you more control over the commands

Eg., `\documentclass[12pt]{article}`

Let's try that . . .

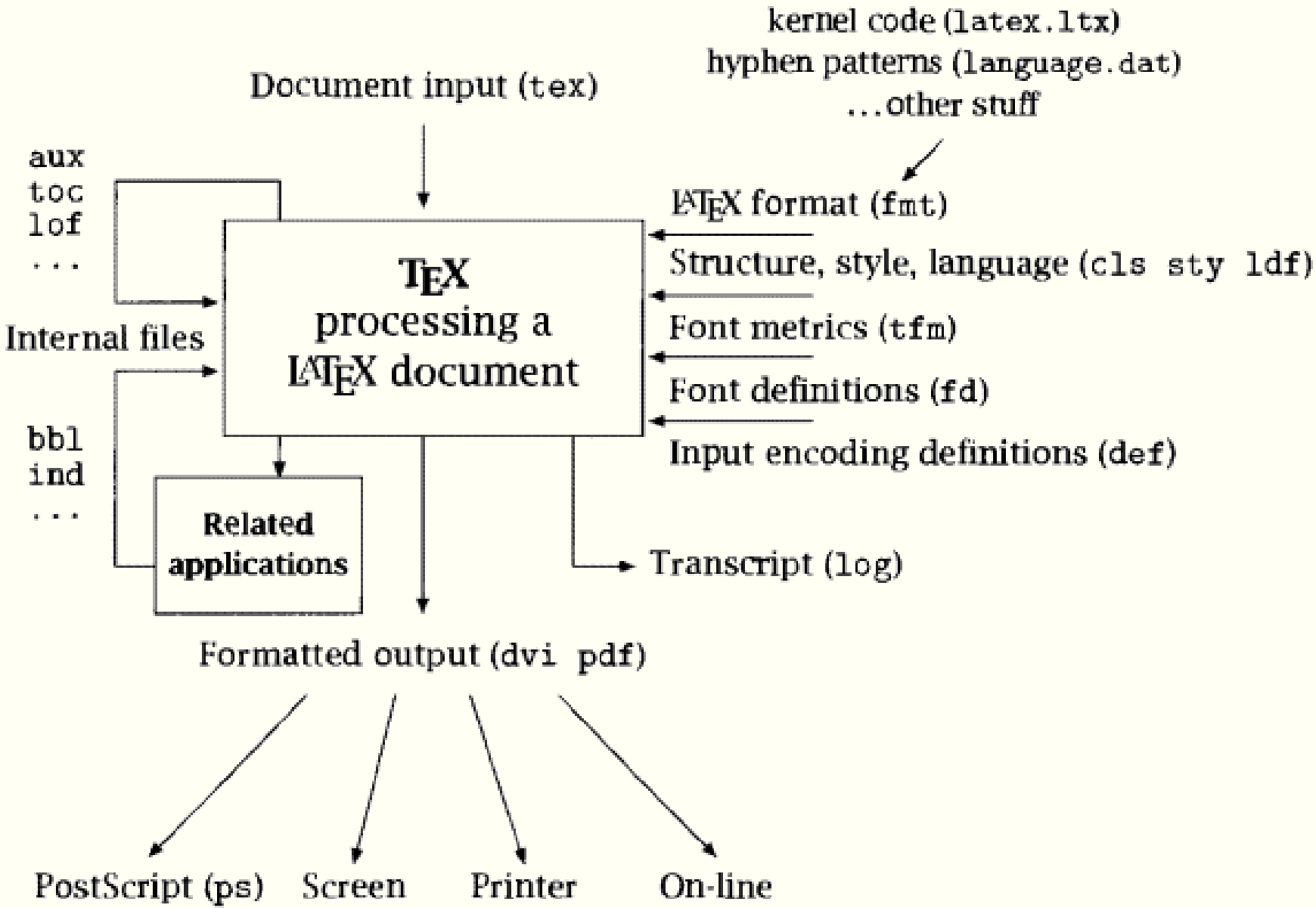
- writeLaTeX is a website for writing documents in LaTeX.
- It 'compiles' your LaTeX automatically to show you the results.

Click here to open the example document in **Overleaf**

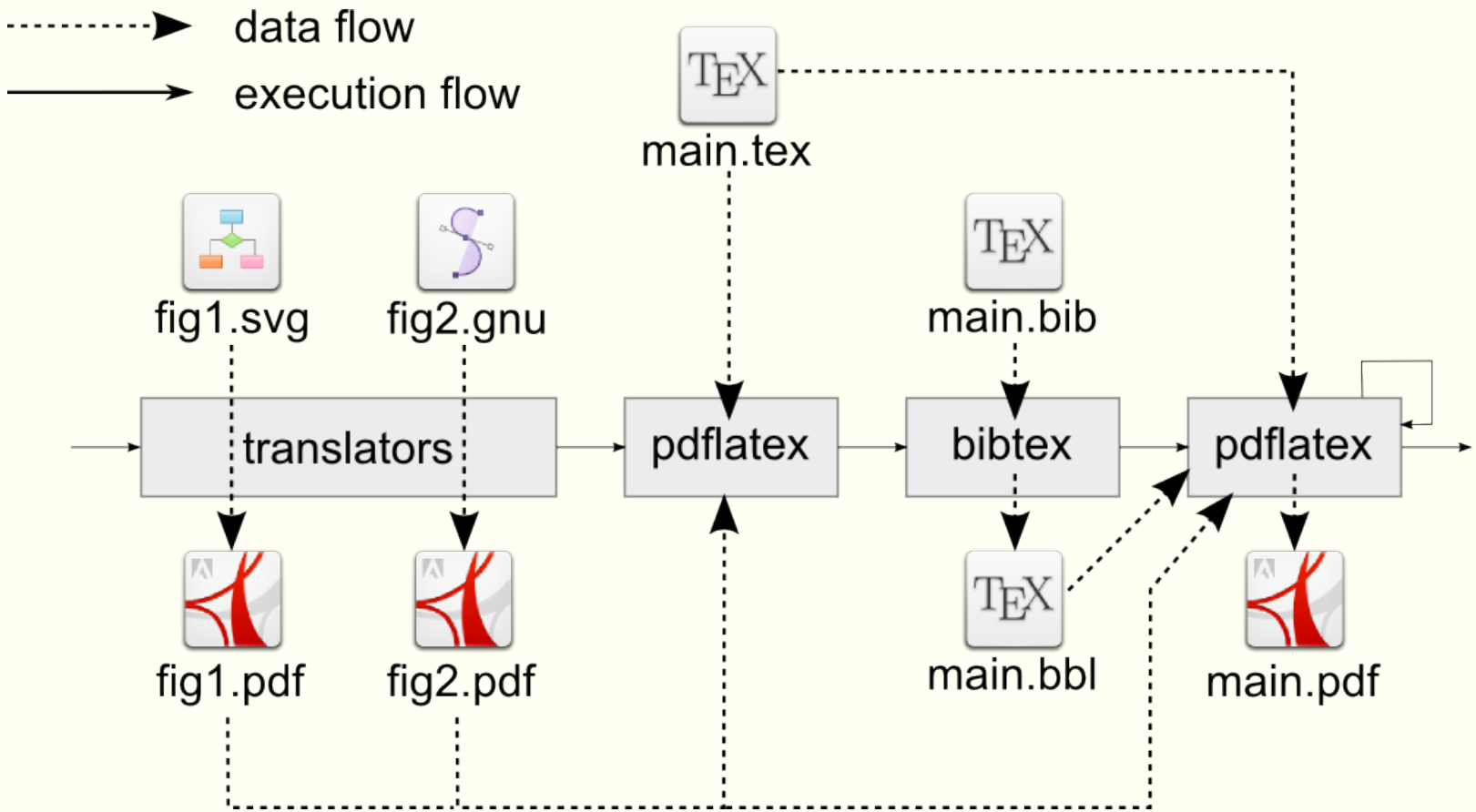
For best results, please use a recent FireFox or Google Chrome.

- If you would like to try out the exercise on your machine. Go to `Exercises / Ex1_Hello.tex`

LaTeX Structure - The Magic



LaTeX - Tool chains



\documentclass{}

minimal	Is as small as it can get. For debugging purposes.
letter	For writing letters.
article	articles in journals, documentation, invitations, ...
proc	A class for proceedings based on the article class.
report	For longer reports containing several chapters ...
book	For real books.
memoir	For advanced book style.
beamer	For writing presentations

Packages

Packages allow you to further customize LaTeX

The command:

```
\usepackage{amsmath}
```

Common packages

Environment	Packages
Maths	amsmath, amsfonts, amssymb
Maths Times Font	mathptx
Figures	graphicx, epsfig
Table	tabularx, booktabs
Pagelayout	geometry
Hyperlinks	hyperref
Algorithms and code	algpseudocode, algorithm, listings
Color	color, xcolor

Outline

Typesetting Caveats

- Quotation marks are a bit tricky: use a backtick [`] on the left and an apostrophe [´] on the right.

`Single quotes: `text'.`	Single quotes: ‘text’.
`Double quotes: ``text''.`	Double quotes: “text”.

- Some common characters have special meanings in LaTeX:

[%]	percent sign (comment)
[#]	hash sign (macro parameter #1)
[&]	ampersand (align)
[$]	dollar sign (in-line math)

- If you just type these, you'll get an error. If you want one to appear in the output, you have to *escape* it by preceding it with a backslash.

`\$\%\&\#`	$%&#

Exercise 2: Typesetting

Typeset this in LaTeX: [a]

[a] http://en.wikipedia.org/wiki/Economy_of_the_United_States

In March 2006, Congress raised that ceiling an additional $0.79 trillion to $8.97 trillion, which is approximately 68% of GDP. As of October 4, 2008, the "Emergency Economic Stabilization Act of 2008" raised the current debt ceiling to $11.3 trillion.

Click to open this exercise in **Overleaf**

- Hint: watch out for characters with special meanings!
- Once you've tried, click here to see my solution.

Outline

Handling errors

- LaTeX can get confused when it is trying to compile your document. If it does, it stops with an error, which you must fix before it will produce any output.
- For example, if you misspell `\emph` as `\meph`, LaTeX will stop with an "undefined control sequence" error, because "meph" is not one of the commands it knows.

Advice on Errors

1. Don't panic! Errors happen.
2. Fix them as soon as they arise — if what you just typed caused an error, you can start your debugging there.
3. If there are multiple errors, start with the first one — the cause may even be above it.

Exercise 3: Errors and Warnings

- Class not found
- Too many }'s
- Undefined control sequence
- Warning: Undeful hbox
- Warning: Overful hbox

Click to open this exercise in **Overleaf**

- Hint: solve one issue at a time, start with the first error

click here to see my solution.

Acknowlegements

This LaTeXfor Beginners course is loosely based on and examples from:

- John Miller's An interactive introduction to LaTeX: https://www.overleaf.com/blog/7
- WikiBook on LaTeX: https://en.wikibooks.org/wiki/LaTeX
- Overleaf Learn: https://www.overleaf.com/learn
- CUED Textprocessing: http://www.eng.cam.ac.uk/help/tpl/textprocessing/
- UCS Course on LaTeX 2_ε: http://www.ucs.cam.ac.uk/docs/course-notes/unix-courses/earlier/latex