



LaTeX

Or “How I learned to stop worrying
and love plain text”

Chris Seal

Who am I?

2

Plastic deformation

As previously mentioned, the general philosophy for earthquake design is one of controlled failure. It is therefore expected that the steel frame within the structure will plastically deform, thus it is necessary to understand plastic deformation in order to better understand the behaviour of materials experiencing seismic loads. Plastic deformation is a complex process; accordingly, the models that are used to represent plastic deformation are also complex.

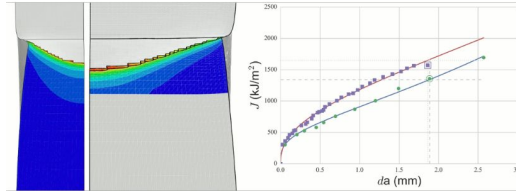
To fully study plastic deformation it is necessary to study the behaviour of dislocations. The way in which dislocations are generated, move and are annihilated all influence the overall plastic behaviour observed.

2.1 Dislocation mechanics

The presence, number and arrangement of dislocations within a metal affect the plastic behaviour of the metal and are an important consideration when studying plastic deformation. During plastic deformation dislocations are created, destroyed and move through the metal. These processes, combined with the generation of new surfaces, heat and sound absorb the energy of deformation.

2.1.1 Stresses associated with the presence of dislocations

When a dislocation is present within a crystal lattice it generates an elastic stress field due to the misplacement of the surrounding atoms. Dieter [1] shows that this elastic stress field can



Executive Summary

The ICAM structural integrity programme has made regular use of a ductile damage model developed by Oh et al [1, 2] to predict the fracture properties of blunt defects. This modelling work has been undertaken by visiting researchers from Korea University working as interns with ICAM on projects ICAM 06 and ICAM 30.

Toward the end of ICAM 30 it became apparent that BP would benefit from the capability to run these models in-house and work has been undertaken to develop a model that fulfils this need.

An iterative approach to crack growth by element removal has been used in this work in order to overcome some of the perceived difficulties that the original model presents. Fracture curves predicted using this approach have been compared with those predicted using the original model. While there are some differences between the predictions, these can be explained by variations in the material models, boundary conditions, and/or the damage model used. Because much of the work undertaken in past ICAM projects was done by visitors who have subsequently left, getting details of these differences is difficult, if not impossible.

The predictions made show the same general behaviour which suggests that there are no significant structural differences between the original model and the iterative one used in this work. As a result the two models are considered to be equivalent for the purposes of predicting the fracture properties of blunt defects and the model presented here meets the desire to have an in-house model that BP can use.

Furthermore, by detailing the modelling approach used, complete with the code written and commentary that explains the reasoning applied to the model, it is anticipated that the capability to use this modelling approach will be captured and that BP will be able to maintain the ability to run these types of model in the future.

<https://bit.ly/3nNfhUi>

International Centre for Advanced Materials

BP INTERNATIONAL CENTRE FOR ADVANCED MATERIALS
THE UNIVERSITY OF MANCHESTER

ICAM 13A
Well head structural integrity assessment
Final Report

December 2015

Dr. Chris Seal
PI: Prof. Bob Ainsworth

bp
MANCHESTER
1824
The University of Manchester
UNIVERSITY OF CAMBRIDGE
Imperial College
London
ILLINOIS
UNIVERSITY OF URBANA-CHAMPAIGN

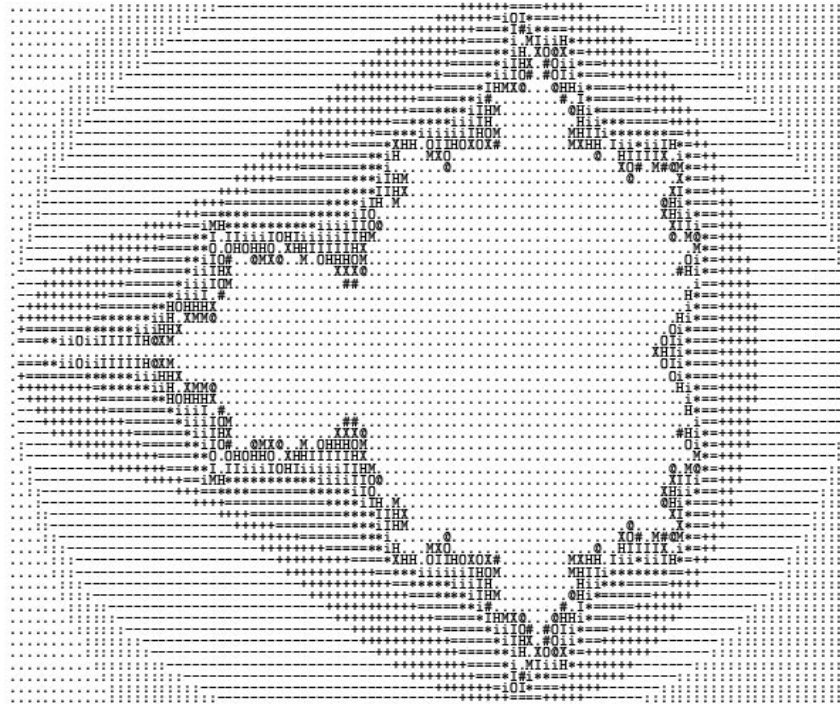
Why use LaTeX?

<https://bit.ly/3nNfhUi>

- Plain text - most portable format yet
 - You can use Notepad, should you wish...
 - Amenable to scripting - lets reduce double handling data
- Separate content from format
 - Leverage other people's work - easy formatting of theses and papers
- Make nice looking documents
- Its Turing Complete - you can do all sorts of things that you shouldn't really do in LaTeX, in LaTeX.

The Mandelbrot set in ASCII

<https://bit.ly/3nNfhUi>



Some useful tools

<https://bit.ly/3nNfhUi>

The screenshot shows the 'Tables Generator' website in a Google Chrome browser. The browser's address bar shows 'tablesgenerator.com'. The website has a navigation bar with tabs for 'LaTeX', 'HTML', 'Text', 'Markdown', and 'MediaWiki'. Below the navigation bar is a menu with options like 'File', 'Edit', 'Table', 'Column', 'Row', 'Cell', and 'Help'. A toolbar contains icons for text formatting (bold, italic, underline), table manipulation (insert, delete, merge, split), and a 'Booktabs table style' dropdown. The main workspace features a table editor with a grid of 4 rows and 5 columns. The first cell is highlighted in yellow. Below the editor is a 'Generate' button. The 'Result' section displays the generated LaTeX code for a table with 4 rows and 5 columns, using the 'booktabs' style. The code includes package declarations, table environment settings, and row content with various line styles. Below the code, there are checkboxes for 'Escape special TeX symbols', 'Compress whitespace', and 'Smart output formatting', along with an 'Extra options...' dropdown. A section titled 'How to use the LaTeX tables generator?' provides a 4-step guide: 1. Set table size using 'Table / Set size' menu. 2. Enter table data into the table, with sub-points for copying from spreadsheets or double-clicking cells. 3. Adjust text alignment and table borders using menu options. 4. Click 'Generate' to see the LaTeX source code. A 'Default or booktabs table style?' section is also visible at the bottom.

Tables Generator

File Edit Table Column Row Cell Help

Booktabs table style

Generate

Result (click "Generate" to refresh)

```
1 % Please add the following required packages to your document preamble:
2 % \usepackage{booktabs}
3 \begin{table}[]
4 \begin{tabular}{@{}lllll@{}}
5 \toprule
6 & & & & \\
7 & & & & \\
8 & & & & \\
9 & & & & \\
10 \end{tabular}
11 \end{table}
```

☒ Escape special TeX symbols (% , & , _ , # , \$)

☐ Compress whitespace ☐ Smart output formatting

Extra options...

How to use the LaTeX tables generator?

1. Set the desired size of the table using **Table / Set size** menu option.
2. Enter the table data into the table:
 - copy (Ctrl+C) table data from a spreadsheet (e.g. Google Docs, LibreOffice Calc, webpage) and paste it into our editor -- click a cell and press Ctrl+V
 - or double click any cell to start editing its contents -- Tab and Arrow keys can be used to navigate table cells
3. Adjust text alignment and table borders using the options from the menu and using the toolbar buttons -- formatting is applied to all the selected cells.
4. Click "Generate" button to see the generated table's LaTeX source code -- select it and copy to your document.

Default or booktabs table style?

<https://tablesgenerator.com>

Some useful tools

<https://bit.ly/3nNfhUi>

LaTeX-Tutorial.com - Beautiful typesetting made simple - Google Chrome

Create LaTeX tables online - x | Your Projects - Overleaf, Onli... | Learn LaTeX in 30 minutes - x | LaTeX-Tutorial.com - Beautifi... | Untitled presentation - Goog... | +

latextutorial.com

Apps | Queue Manager... | Support | Nuclino | Thycotic Secret S... | JaaS V2 - Research | How to Setup up... | PostgreSQL loggi... | Centre for eRese... | MyTardis - Instru... | TPM COVID Proje... | Using Emacs Seri... | Other bookmarks

> LaTeX-Tutorial.com

Installation Quick Start Tutorials Tools Symbols About Downloads Search

Discover the beauty of *LATEX*.
Prettyfy your research papers.

Read the tutorial!

How to get started?

With our tutorials, you will learn how to use LaTeX in no time. Step by step lessons help you to create a document fast and simple. No need to download or install an editor, you can follow most tutorials right away in your browser.

What is this?

LaTeX is a markup language to typeset documents. It excels at making math and the overall layout beautiful. Learn how to create top-notch academic papers. Explore all features with hands-on tutorials and code examples. For free.

Why learn it?

With LaTeX, you do the formatting *once* and then focus on your content. This guide shows you, that nice typesetting is easy and hassle free. Using LaTeX will enhance both, the look of your papers and your productivity.

<https://latex-tutorial.com>

design and content © 2019 Claudio Vellge

CTAN

<https://bit.ly/3nNfhUi>

CTAN
Comprehensive TeX Archive Network

Location: CTAN - Comprehensive TeX Archive Network

The Comprehensive TeX Archive Network

The Comprehensive TeX Archive Network (CTAN) is the central place for all kinds of material around TeX. CTAN has currently 5988 packages. 2743 contributors have contributed to it. Most of the packages are free and can be downloaded and used immediately.

Announcements on CTAN-announce

You can see what's new and even get informed about new or updated packages on CTAN.

- 2020-11-21 CTAN update: xkeyval
- 2020-11-21 New on CTAN: orcidlink
- 2020-11-20 CTAN Update: kbfont-of
- 2020-11-20 CTAN Update: reledmac

[more](#)

Activity on CTAN

An active TeX community takes care that CTAN is updated and extended regularly. CTAN receives usually more than 100 uploads per month.

Search on CTAN

The contents of CTAN can be searched with full-text search. This search considers the description, the documentation, and the contributors.

If you want to have finer control on the parameters of the search you can use the [advanced search form](#) instead.

Browse CTAN

This Web interface to CTAN provides a view on the directories and files in the archive. The files and some directories as a whole can be immediately be downloaded. You can immediately go to the

- [archive directory](#)
- [list of packages](#)
- [list of trojans](#)

Did you know?

The topic *ME Font* in the TeX Catalogue has 226 packages for fonts distributed as METAFONT source.

[more](#)

TeX

TeX is a typesetting program designed for high-quality composition of material that contains a lot of mathematical and technical expressions. It has been adopted by many authors and publishers who generate technical books and papers. It was created by Professor Donald E. Knuth of Stanford University, originally for preparation of his book series "The Art of Computer Programming". TeX has been made freely available by Knuth.

From these origins a whole eco-system of distributions, macro packages, and supporting programs has arisen.

[more](#)

Download a TeX System

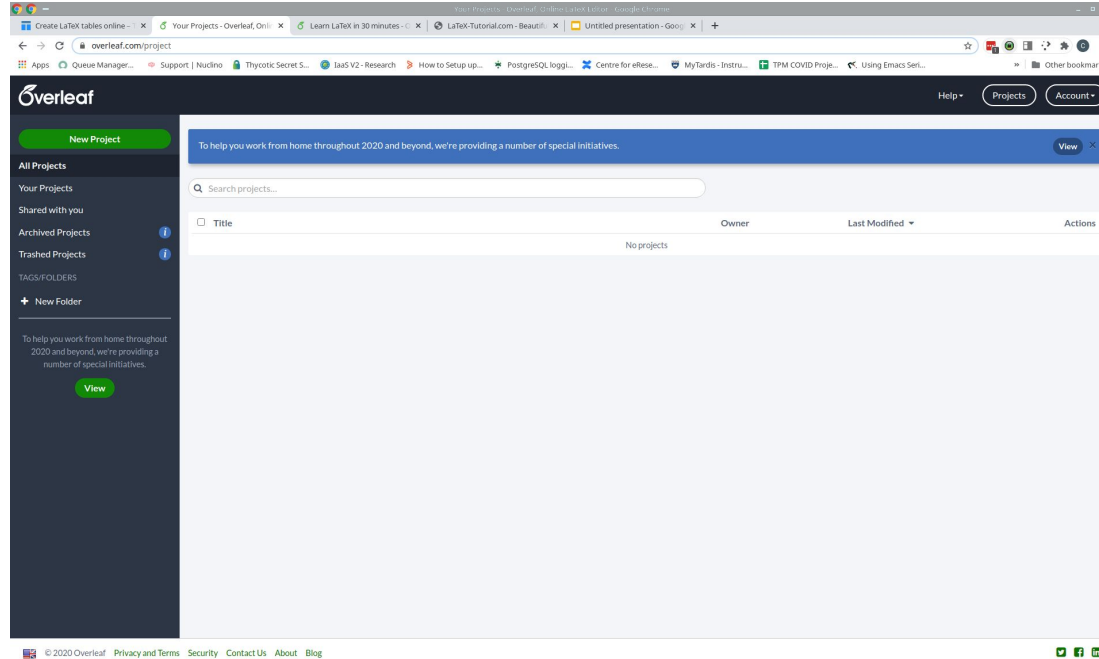
CTAN provides complete ready-to-run TeX systems for various platforms:

- TeX Live** a cross-platform TeX system. It includes support for most Unix-like systems, including GNU/Linux, Mac OS X, and Windows.
- MacTeX** an easy to install TeX system for Mac OS X, based on TeX Live. It also includes a native Mac installer, the TeXShop front-end, and additional Mac-specific tools.
- proTeX** an easy to install TeX system for Windows. It is based on MikTeX, with a detailed document to guide your installation and additional Windows-specific tools.

<https://www.ctan.org/pkg/aucklandthesis>

Some useful tools

<https://bit.ly/3nNfhUi>



<https://overleaf.com>

<http://www.latextemplates.com/template/classicthesis-typographic-thesis>

Hello World

<https://bit.ly/3nNfhUi>

Let's write some code :)

```
\documentclass{article}  
\title{A Hello World! Document}  
\author{Chris}  
\date{\today}  
\begin{document}  
\maketitle
```

Let's make a document that says:

```
\textbf{Hello World!}  
\end{document}
```

Structure

<https://bit.ly/3nNfhUi>

- Preamble - all the stuff before the `\begin{document}`
 - Defines the document - try changing documentclass to report or book. Letter doesn't have a titlepage
 - Defines 'packages' to use
 - Sets overarching formatting and constant user data
 - Author
 - Title etc.
- Document
 - Between `\begin{document}` and `\end{document}`
 - The text that you wish to write
- Blank line between paragraphs
- Environments (`\begin` and `\end`) vs commands

Adding document structure

<https://bit.ly/3nNfhUi>

- `\part` - if a book or class derived from book
- `\chapter` - books and reports and classes derived from these (theses)
- `\section`, `\subsection`, `\subsubsection` - books, reports and articles (papers)
- `%` for comments - `\%` for % sign
- Figure environments
- Table environments
- Maths environments
- Labels and references - `cleveref` nice package here

Sections and subsections

<https://bit.ly/3nNfhUi>

- `\section{Section Name}` - Numbered section
- `\section*{Section Name}` - Unnumbered section
- `\subsection` & `\subsection*` - Numbered and unnumbered sub-sections
- `\subsubsection` & `\subsubsection*` - Numbered and unnumbered sub-sub-sections

Hello World 2

<https://bit.ly/3nNfhUi>

```
\documentclass{article}
\usepackage{lipsum} % Provides Lorem Ipsum text
\title{A Hello World! Document}
...
\section{Introduction}
Let's make a document that says:
\textbf{Hello World!}
\section{Another section}
\lipsum[1-1]
\subsection{Split up Lorem Ipsum}
\lipsum[2-4]
\section*{And end?}
\lipsum[5-6]
\end{document}
```

Adding maths

<https://bit.ly/3nNfhUi>

- Amsmath package highly recommended
- Inline math $\$$ $\$$ or $\$ \$$ $\$ \$$
- `\begin{equation}; \begin{equation*}`
- `\end{equation}; \end{equation*}`
 - `\begin{align}; \end{align}`
- <https://detexify.kirelabs.org/classify.html> <- draw your symbol and get the LaTeX code for it.

Cross-referencing

<https://bit.ly/3nNfhUi>

- Define `\label{fig:eq:tab:sec:ch:any unique string}`
- Refer to label using `\ref{fig:eq:tab:sec:ch:any unique sting}`
 - If using `amsmath` package then `\eqref{egn:an equation}`
- If you see ?? in the text then there is an error in the label/ref linkage.
 - Try rerunning LaTeX first
- Helpful packages enhance cross-referencing
 - `Hyperref`
 - `cleveref`

Good practice and useful packages

https://en.wikibooks.org/wiki/LaTeX/Labels_and_Cross-referencing

Hello World 3

<https://bit.ly/3nNfhUi>

```
\usepackage{lipsum} % Provides Lorem Ipsum text
\usepackage{amsmath}
\title{A Hello World! Document}
```

...

A fracture mechanics equation ...

...

A holiday example:

```
\begin{align}
  \label{eqn:2}
  y &= \log_e \left( \frac{x}{m} - sa \right) r^2 \\
  yr^2 &= \log_e \left( \frac{x}{m} - sa \right) \\
  e^{yr^2} &= \frac{x}{m} - sa \\
  me^{yr^2} &= x - mas \\
  mer^{rry} &= x - mas \\
\end{align}
```

What is a float

<https://bit.ly/3nNfhUi>

- Figures, and tables in LaTeX 'float' to a position determined by the system to be optimal.
 - Can provide guidance as to where you would like them
 - h - here
 - t - top of page
 - p - on a separate page
 - b - bottom of the page
 - ! - ignore some constraints to make the float fit
- Packages available to force placement - use with caution

Adding a picture to Hello World!

<https://bit.ly/3nNfhUi>

1. Find a picture - from hard drive or url
 - a. <https://user-images.githubusercontent.com/22680912/46479049-d8a9c400-c80b-11e8-92a1-89fc10701f4a.jpg>
2. Upload to overleaf
3. Modify our document
 - a. Add `\usepackage{graphicx}` to the preamble
 - b. Create a figure environment with `\begin{figure}` & `\end{figure}`
 - c. Use `\includegraphics` command to add picture
 - d. Add a caption with `\caption` command

Hello World 4

<https://bit.ly/3nNfhUi>

```
\documentclass{article}
\usepackage{lipsum} % Provides Lorem Ipsum text
\usepackage{amsmath}
\usepackage{graphicx}
\title{A Hello World! Document}
```

...

Let's make a document that says:

```
\begin{figure}[!htp]
\centering
\includegraphics[width=0.75\linewidth]{Hello_World.jpg}
\caption{Hello World! \protect\footnotemark}
\end{figure}
\footnotetext{\a href="https://user-images.githubusercontent.com/22680912/46479049-d8a9c400-c80b-11e8-92a1-89fc10701f4a.jpg"}{https://user-images.githubusercontent.com/22680912/46479049-d8a9c400-c80b-11e8-92a1-89fc10701f4a.jpg}}
```

...

```
\end{document}
```

Acknowledging your sources

<https://bit.ly/3nNfhUi>

- Biblatex and the bibtex format

@article{ <- reference type, @book, @inproceedings, @incollection, @phdthesis

Author2020, <- the key used to cite the work

author = {Author, A. and Author, B.C.}, <- the names of the authors, lastname, firstname format

title={An interesting read}, <- the name of the article

journal={Int. J. of Stuff}, <- the source of the article

volume=1,

number=1,

pages={1--10}, <- note the double hyphen give an en-dash rather than a hyphen; em-dashes are triple hyphens

year=2020

}

- Most reference managers export to Bibtex

Natbib vs biblatex

<https://bit.ly/3nNfhUi>

- Natbib <- older standard, still used by some journals
 - Uses Bibtex program
 - `\usepackage[square,comma,numbers,sort&compress]{natbib}`
 - `\bibliographystyle{unsrtnat}` <- Unsorted Natbib style necessary for numbered style
 - `\bibliography{bib file}`
- Biblatex <- newer standard, more flexible (chapter bibliographies for example)
 - Uses either Bibtex or Biber program
 - `\usepackage[backend=biber, hyperref=true, sorting=none, style=numeric-comp, doi=false, isbn=false, url=false, maxbibnames=2, eprint=false, defernumbers=true, babel=hyphen]{biblatex}` <- lots of flexibility in defining bibliography style
 - `\addbibresource{bib file}`
 - `\printbibliography[title=References]`
- Both use same Bibtex format but have different setups
 - `\cite{key}` command in both.

Hello World 5

- Hello_World.bib

```
@article{Author2020,  
author = {Author, A. and Author, B.C.},  
title={An interesting read},  
journal={Int. J. of Stuff},  
volume=1,  
number=1,  
pages={1--10},  
year=2020  
}
```

<https://bit.ly/3nNfhUi>

- Hello_World.tex

```
...  
\date{\today}  
\usepackage[square,comma,numbers,sort&compress]{natbib}  
\begin{document}  
...  
\end{align}  
A citation \cite{Author2020}  
\section{Another section}  
...  
\lipsum[5-6]  
\bibliographystyle{unsrtnat}  
\bibliography{Hello_World.bib}  
\end{document}
```


Theses

<https://bit.ly/3nNfhUi>

- Based on report, book or memoir (book) document classes
- `\chapter{Chapter}` and `\part{Part}`
- Book has `\frontmatter`, `\mainmatter` and `\backmatter`
- University specific formatting for the title page
 - Victoria University of Wellington
 - <https://ecs.wgtn.ac.nz/Main/ProjectTemplates>
 - Style - import as a package - look at thes.tex file
 - University of Auckland
 - `\documentclass{aucklandthesis}`
 - Define: `\degreesought{}`, `\degreediscipline{}` and `\degreecompletionyear{}` in preamble
 - Check with your library

Hello World 6

- Hello_World.bib

```
@article{Author2020,  
author = {Author, A. and Author, B.C.},  
title={An interesting read},  
journal={Int. J. of Stuff},  
volume=1,  
number=1,  
pages={1--10},  
year=2020  
}
```

<https://bit.ly/3nNfhUi>

- Hello_World.tex

```
\documentclass{report}  
...  
\chapter{Introduction}  
...  
\chapter{Another section}  
...  
\section{Split up Lorem Ipsum}  
...  
\subsection{And end?}  
...  
\end{document}
```

Tables of contents and lists of figures

<https://bit.ly/3nNfhUi>

- `\tableofcontents`
- `\listoffigures`
- `\listoftables`
- If using a class based on book, then `\frontmatter \mainmatter` <- changes numbering
- `Tocstyle`, `tocloft`, `titletoc` packages allow for modification of tables of contents and lists of figures/tables
- May be defined in style/class already - check to see what the output is and how it matches requirements

Hello World 7

- Hello_World.bib

```
@article{Author2020,  
  author = {Author, A. and Author, B.C.},  
  title={An interesting read},  
  journal={Int. J. of Stuff},  
  volume=1,  
  number=1,  
  pages={1--10},  
  year=2020  
}
```

<https://bit.ly/3nNfhUi>

- Hello_World.tex

```
\documentclass{book}  
...  
\maketitle  
\frontmatter  
\tableofcontents  
\listoffigures  
\mainmatter  
\chapter{Introduction}  
...
```

Structuring documents

<https://bit.ly/3nNfhUi>

- `\include{file}` and `\input{file}`
 - No preamble in the included files
 - No `\begin{document}` or `\end{document}`
 - `\include` adds clear page before adding
 - `\input` adds the data directly to the location
- Use of `\input` with data files helps to minimise the risk of mistyped data

Hello World 8

- chapter3.tex

```
\chapter{A new hope?}  
\lipsum[7-9]
```

- result.tex

42

<https://bit.ly/3nNfhUi>

- Hello_World.tex

```
...  
A citation \cite{Author2020}
```

The answer to life the universe and everything is \input{result}

```
...
```

```
\lipsum[5-6]
```

```
\include{chapter3}
```

```
\bibliographystyle{unsrtnat}
```

```
...
```

Packages to investigate

- Graphicx - include pictures in your documents
- Amsmath - enhanced maths support
- Subcaption - subfigures in your figures
- Biblatex - bibliographies and citations
- Booktabs - nicer looking tables
- Longtable - tables that span multiple pages
- Cleveref - 'intelligent' cross referencing
- Hyperref - clickable links in documents
- Tikz - create images in LaTeX <- warning VERY in-depth