LaTex for Scientific Writing: Day -2

Anthony FAUSTINE

The School of Computational and Communication Sciences and Engineering

NMAIST

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Presenter Bio

- PhD student at Nelson Mandela African Institution of Science and Technology,
- **Research :** Applied machine learning and signal processing for computational sustainability.
  - Hybrid HMM-DNN for energy dis-aggregation problem.
- co-founder pythontz [`https://pythontz.github.io`]
- ass.Lecturer : the University of Dodoma
- blog : [`https://sambaiga.github.io`]

Outline

Tables

Creating Tables

Use the tabular environment

```
\begin{tabular}[position]{column alignments}
...
\end{tabular}
```

postion is optional (vertical position) : [t] (top), [c] (center, this is default), [b] (bottom) ;

column alignments : l (left-justified), c (center justified), and r (right-justified) ;

Tables

Creating Tables

The column data is separated by &,row end is marked as \\ and \hline draw a horizontal line.

```
\centering
\begin{tabular}[t]{|l|l|}
\hline
\textbf{Parameter} & \textbf{Value}\\
\hline
Path loss (n) & 2.5\\
Model & Okumura-model\\
Cell-radius & $1km$\\
\hline
\end{tabular}
```

Parameter	**Value**
Path loss (n)	2.5
Model	Okumura-model
Cell-radius	$1km$

Tables

Creating Tables

The column data is separated by &,row end is marked as \\ and \hline draw a horizontal line.

```
\centering
\begin{tabular}[t]{|l|l|}
\hline
\textbf{Parameter} & \textbf{Value}\\
\hline
Path loss (n) & 2.5\\
Model & Okumura-model\\
Cell-radius & $1km$\\
\hline
\end{tabular}
```

Parameter	**Value**
Path loss (n)	2.5
Model	Okumura-model
Cell-radius	1*km*

Tables

Creating Tables

The `booktabs` package improve the quality LaTeX tables.

- The horizontal rules are called with `\toprule`, `\midrule` and `\bottomrule` instead of `\hline` command.
- The `\cmidrule` is used for mid-rules that span specified columns.
- The content of the tables is filled in the same manner as before.
- To use this package first you need to add this code in preamble. `\usepackage{booktabs}`

Tables

Creating Tables

Example :

```
\centering
\begin{tabular}[t]{ll}
\toprule
\textbf{Parameter} & \textbf{Value}\\
\midrule
Path loss (n) & 2.5\\
Model & Okumura-model\\
Cell-radius & $1km$\\
\bottomrule
\end{tabular}
```

Parameter	**Value**
Path loss (n)	2.5
Model	Okumura-model
Cell-radius	1*km*

Tables

Creating Tables

To draw multicolumn table like this one :

Name		
First name	Last Name	Grade
John	Doe	7.5
Richard	Miles	2

Tables

Creating Tables

Use the following command :

```
\multicolumn{n}{alignment}{item}
```

n : is the number of columns to be spanned.

alignemnt : is one of the `l, r and c`.

item : is the content.

Example :

```
\multicolumn{2}{c}{Name}
```

Tables

Creating Tables

```
\begin{tabular}{llr}
\toprule
\multicolumn{2}{c}{Name} \\
\cmidrule(r){1-2}
First name & Last Name        & Grade \\
\midrule
John  & Doe          & $7.5$ \\
Richard   & Miles  & $2$ \\
\bottomrule
\end{tabular}
```

Tables

Floating Tables

Latex provides the `table` environments for typesetting floating tables.

- A table environment is set up as follows :

```
\begin{table}
\caption{title}
\label{tab:xxx}
%Place the table here
\end{table}
```

Tables

Floating Tables

`\caption` command is optional and used to set table tittle.

`\label` command is also optional and is used to reference the table's number.

Example : To produce the following table

TABLE – Simulation Parameters

Parameter	**Value**
Path loss (n)	2.5
Model	Okumura-model
Cell-radius	1km

Tables

Floating Tables

```
\begin{table}
\caption{Simulation Parameters}
\label{tab:model_parameter}
\begin{tabular}[t]{ll}
\toprule
\textbf{Parameter} & \textbf{Value}\\
\midrule
Path loss (n) & 2.5\\
Model & Okumura-model\\
Cell-radius & $1km$\\
\bottomrule
\end{tabular}
\end{table}
```

Guide to Making nice Table : click here

Activity

Activity 1

Graphics

Include Graphics

The easiest way to include images in your document is to use the `graphicx` package.
Load the package graphicx : `\usepackage{graphicx}`

- The image format available depend on what you're using to compile.
- If you're compiling using pdflatex (recommended), then you can use jpg, png, pdf, or eps files.
- Place the file in the same directory as your tex file, and use the `\includegraphics[key-values]{imagefile}` command.

Graphics

Include Graphics

Example : `\includegraphics[scale=0.2]{images/bulb}`

Graphics

Include Graphics

The image can be scaled to a specified height and/or width as follows :

```
\includegraphics[height=2in,width=1in]{images/bulb}
```

Graphics

Floating images

Use `figure` environment :

```
\begin{figure}
\includegraphics{file}
\caption{title }
\label{fig:xxx}
\end{figure}
```

Graphics

Floating images

FIGURE – Green Bulb

To print the list of figures and tables use `\listoffigures` and `\listoftables` respectively.

Activity

Activity 2

Notes with todonotes

The `\todo` command from the `todonotes` package is great for leaving notes to yourself and your collaborators.

Include this package in preamble :

```
\usepackage[colorinlistoftodos]{todonotes}
```

Example :

```
\todo{Plain todonotes.}
```

Footnotes :The command you need is

```
\footnotes{An example footnote}
```
[1]

1. An example footnote

Notes with todonotes

- Only inline notes are supported with beamer, but margin notes are supported for normal documents.
- There is also a handy `\listoftodos` command.
  - To use this load : `\usepackage[colorlinks]{hyperref}` before `\usepackage[colorinlistoftodos]{todonotes}`

Activity

Activity 3

Outline

Bibliography

To manage and include references in a LATEX document use BIBTEX.

BibTex : a bibliographic tool that is used with LaTeX to help organize the user's references and create a bibliography.

- A BibTeX user creates a bibliography file with `.bib` extension.
- The `.bib` file is called a BibTEX database.
- Each entry in the `.bib` file is formatted with a certain structure and is given a "key" by which the author can refer to it in the source file.

Bibliography

The BibTEX Format

The generic form of a BibTEX entry is

```
@type{key, field1 = “ ” or {} or none,
field2 = “ ” or {} or none,
...
fieldn = “ ” or {} or none
}
```

Bibliography

The BibTEX Format

The generic form of a BibTEX entry is

```
@INPROCEEDINGS{Pantic2006,
author={M. Pantic and R. Zwitserloot},
booktitle={Proceedings. Frontiers in Education. 36th Annual Conference}
title={Active Learning of Introductory Machine Learning},
year={2006},
pages={1-6},
doi={10.1109/FIE.2006.322738},
ISSN={0190-5848},
month={Oct},}
```

Bibliography

The BibTEX Format

Example :

```
@article{Gettys90,
author = {Jim Gettys and Phil Karlton and Scott McGregor},
title = {The {X} Window System, Version 11},
journal = {Software Practice and Experience},
volume = {20},
number = {S2},
year = {1990},
abstract = {A technical overview of the X11 functionality.
of the X10 TOG paper by Scheifler \& Gettys.}
}
```

Bibliography

Export .bib file from Mendeley

To export BiBTex :

1. Open Mendeley, and within "My Library" found on the left, select references that you would like to texport to BibTeX.
2. In the drop-down menu in the toolbar at the top of the screen, click "File $\rightarrow$ Export.
3. In the dropdown list of filetypes chose "BibTeX (*.bib)" and save to the same location as the LaTeX file.

More on Mendeley and LaTeX :here.

Bibliography

Auto-syncing from Mendeley to BibTeX

Mendeley has the built-in capability to auto sync a BibTeX file when changes have been made to your Mendeley library.
To set up the Mendeley auto sync :

1. Go to Mendeley Desktop preferences.
2. Select the BibTeX tab.
3. Select the box labeled “Enable BibTeX syncing” and select the BiBTeX file option you prefer.
4. Select the location where you want the generated .bib file(s) to be stored (this should be the same location as your LaTeX file(s)).

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Activity

Activity 4

Bibliography

Using BibTEX in your LATEX Document

To use .bib file in latex document :

- We can use `natbib` packages with `\citet and \citep` commands ⇒ Reference sheet for natbib usage.
- Load with

  ```
  \usepackage [options]{natbib}
  ```

  See list of options at the end of Reference sheet for natbib usage.
- Example : `\usepackage [round]{natbib}`
- Include .bib file at the end of document with `\bibliography {bib file}` and specify a bibliographic styles `\bibliographystyle {stylename}`.

Bibliography

The BibTEX Format

Example :

```
\bibliographystyle{apa} %\bibliographystyle{apacite}
\newpage
\bibliography{bib/References_NILM}
```

Bibliography

The BibTEX Format

Example :

- According to Barker et al. (2015) ... $\Rightarrow$

```
According to \cite{Alcala2015} \ldots
```

- ...energy is important (Barker et al., 2015) $\Rightarrow$

```
\ldots energy is important \citep{Barker2015}
```

Activity

Activity 5

Outline

Proposal, Thesis and Joural paper with Latex

Folder structure : create a new folder (your project directory).

- Add some additional folders within this folder :

  fig $\Rightarrow$ will contain all images.
  tex $\Rightarrow$ will contain .TEX file.
  bib $\Rightarrow$ will contain bibliography files.

- This will help you keep the overview about your files.

Latex template make life easier.

link : How to write a thesis using LaTeX

Activity

Activity 6

Outline

LaTeX Beamer

The beamer class is a LaTeX class that allows you to create a beamer presentation and slides.

The basic steps to create a beamer presentation

- Specify beamer as document class instead of article.
- Structure your LaTeX text using section and subsection commands.
- Place the text of the individual slides inside frame commands.

Frames

Each beamer project is made up of a series of frames defined by `\begin{frame}..\end{frame}` environment.

- Each frame produces one or more slides depending on the slide overlays.

The title page frame : simply displays a title page

```
\begin{frame} \titlepage \end{frame}
```

The table of contents : dynamically creates a table of contents based on the sections and subsections.

```
\begin{frame}{Outline}\tableofcontents \end{frame}
```

Frame

Basic Frame :

```
\begin{frame}{Tittle} content... \end{frame}
```

Sections and Subsections

Presentations are divided into sections, subsections, and sub-subsections.

Activity

Activity 7

Structuring a Frame

Beamer provides many ways to structure your frames so they appear well organized and are easy for the audience to follow.

- Columns
- Blocks

Structuring a Frame

Coulmns

The column environment is called as shown below :

```
\begin{columns}
\column{.xx\textwidth}
First column text/graphics
\column{.xx\textwidth}
Second column text/graphics
\end{columns}
```

Structuring a Frame

Coulmns

Here is a simple example :

```
\begin{columns}
\column{.5\textwidth}
Column Number 1
\column{.5\textwidth}
Column Number 2
\end{columns}
```

Which gives us :

Column Number 1

Column Number 2

Structuring a Frame

Blocks

Blocks can be used to separate a specific section of text or graphics from the rest of the frame.

```
\begin{block}{Block Tittle}
content...
\end{block}
```

Which gives us :

Block Tittle

content...

Structuring a Frame

Blocks

Other block environments are also available :
Theorem block

```
\begin{theorem}
$x^2 + y^2 = 1 \rightarrow$ Circle with $r = 1$
\end{theorem}
```

Which gives us :

Theorem

$x^2 + y^2 = 1 \rightarrow$ *Circle with* $r = 1$

Structuring a Frame

Blocks

Other block environments are also available :
Example block

```
\begin{example}
This is $\ldots$
\end{example}
```

Which gives us :

Example

This is . . .

Structuring a Frame

Blocks

Other block environments are also available :
Alert block

```
\begin{alertblock}{Title}
This is $\ldots$
\end{alertblock}
```

Which gives us :

Title

This is . . .

Structuring a Frame

Blocks

Other block environments are also available :

Lemma block

```
\begin{lemma}
$x^2 + y^2 = 1$
\end{lemma}
```

Which gives us :

Lemma

$x^2 + y^2 = 1$

Structuring a Frame

Blocks

Other block environments are also available :
Corollary block

```
\begin{corollary}
This proof
\end{corollary}
```

Which gives us :

Corollary

This proof

Structuring a Frame

Blocks

Other block environments are also available :
Proof block

```
\begin{proof}
This proof
\end{proof}
```

Which gives us :

Démonstration.

This proof □

Structuring a Frame

Columns and Blocks

We can combine columns and blocks to make a much cleaner looking presentation.

```
\begin{columns}[t]
\column{.5\textwidth}
\begin{block}{Column 1 Header}
Column 1 Body Text
\end{block}
\column{.5\textwidth}
\begin{block}{Column 2 Header}
Column 2 Body Text
\end{block}
\end{columns}
```

Structuring a Frame

Columns and Blocks

Which gives us :

Column 1 Header	Column 2 Header
Column 1 Body Text	Column 2 Body Text

Note. Notice that the `[t]` argument to the columns command top-aligned our blocks so they are vertically even as opposed to vertically centered on the slide.

Overlay

In Beamer, overlays control the order in which parts of the frame appear.

- An easy way to implement an overlay is to place the `\pause` command between the parts you want to show up separately.

Example

```
\textbf{Step1:} Compute the maximal value of $x^2$.
\pause
\textbf{Step2:} Compute the maximal value of $y^2$.
\pause
\textbf{Step3:} Add $x^2$ and $y^2$.
```

Overlay

Which results into :

Step1 : Compute the maximal value of x^2.
Step2 : Compute the maximal value of y^2.
Step3 : Add x^2 and y^2.

Overlay

Which results into :

Step1 : Compute the maximal value of x^2.
Step2 : Compute the maximal value of y^2.
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Overlay

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Overlay

Which results into :

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Step3 : Add x^2 and y^2.

Overlay Specification

Overlay specifications are given in pointed brackets (<,>) and indicate which slide the corresponding information should appear on.

- The specification `<1->` means “display from slide 1 on.”
- `<1-3>` means “display from slide 1 to slide 3.”
- `<2>` means “display slide 2.”
- `<-3,5-6,8->` means “display on all slides except slides 4 and 7.”

Note : If you want each item of a list to appear in order, use the `[<+->] option`

E.g. `\begin{frame}[<+->]{title} ..... \end{frame}`

Overlay

Timing Specifications With Alert

Consider :

- Item Aaay
- Item Bee
- Item See
- Item Dee

```
\begin{itemize}[<+-| alert@+>]
\item Item Aaay
\item Item Bee
\item Item See
\item Item Dee
\end{itemize}
```

Overlay

Timing Specifications With Alert

Consider :

- Item Aaay
- Item Bee
- Item See
- Item Dee

```
\begin{itemize}[<+-| alert@+>]
\item Item Aaay
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Overlay

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\item Item Aaay
\item Item Bee
\item Item See
\item Item Dee
\end{itemize}
```

Activity

Activity 8

THANK YOU

References I

Barker, S., Musthag, M., Irwin, D., and Shenoy, P. (2015). Non-intrusive load identification for smart outlets. In *Proceeding of the 2014 IEEE International Conference on Smart Grid Communications, SmartGridComm 2014*, pages 548–553.