Writing papers and thesis using LaTeX2e

Part II: Writing papers and thesis using LaTeX

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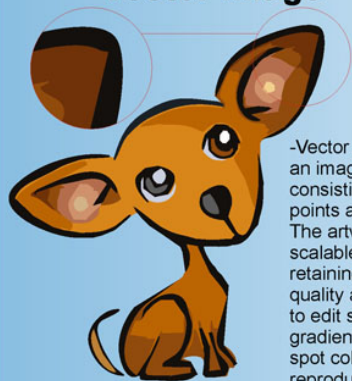The University of Texas at Austin

LaTeXfor Beginners

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Outline

Vector graphics vs. Raster images
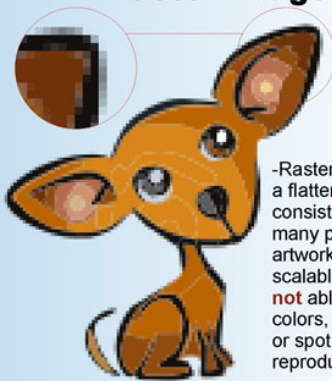
- Use `inkscape` to generate vector graphics

Colour blindness

The colours of the rainbow asviewed by a person with no colour vision deficiencies

The colours of the rainbow asviewed by a person with deuteranopia

The colours of the rainbow asviewed by a person with protanopia

The colours of the rainbow asviewed by a person with tritanopia

- Making graphs with colour-blind viewers in mind - Charlotte Houldcroft https://kks32.github.io/latex/articles/colour-blindness/
- Use `GNUPlot` to generate vector graphics of your plots. Make sure the plots have different line styles so it works well on a black and white print.

Figures

- LaTeXcan be easily extended using a *package* to typeset images.
- To use graphics in your LaTeXdocument use `\usepackage{graphicx}`
- Always use relative scaling to specify the width of the figure, i.e.,
  `[width = 0.75\textwidth]`
- Never ever use absolute values to scale your images!
- Set either the width or the height of the image. Or use `scale`

```
\begin{figure}
\includegraphics[width=0.75\textwidth]
                          {figs/minion}
\end{figure}
```

Figures

- For captioning a figure, you can use `\usepackage{caption}`
- tweak the location, label, separator: `[labelsep=space, tableposition=top]{caption}`
- I prefer to centre the figure. To do that use `\centering`
- You can use `~\cref{fig:minion}` to cross reference the figure. Requires package `cleveref`

```
\begin{figure}
\centering
\includegraphics[width=0.75\textwidth]
                      {figs/minion}
\caption[Minion]{
       Dave the Minion from Despicable Me!}
\label{fig:minion} % Unique identifier
               % for cross-reference
\end{figure}
```


Figure: Dave the Minion from Despicable Me!

\begin[option]{figure}

Parameter	Position
h	Place the float here, i.e., approximately at the same point it occurs in the source text (however, not exactly at the spot)
t	Position at the top of the page.
b	Position at the bottom of the page.
p	Put on a special page for floats only.
!	Override internal parameters LaTeX uses for determining "good" float positions.
H	Places the float at precisely the location in the LaTeX code. Requires the float package. This is somewhat equivalent to h!

Subcaption

I can cite Wall-E (see fig. 2b) and Minions in despicable me (fig. 2c). Figure 2 lets me cite the whole figure.

```latex
\begin{figure}
  \centering
  \begin{subfigure}[b]{0.3\textwidth}
    \includegraphics[width=\textwidth]
                    {figs/TomandJerry}
    \caption{Tom and Jerry}
    \label{fig:TomJerry}
  \end{subfigure}
  \begin{subfigure}[b]{0.3\textwidth}
    \includegraphics[width=\textwidth]{figs/WallE}
    \caption{Wall-E}
    \label{fig:WallE}
  \end{subfigure}
  \begin{subfigure}[b]{0.3\textwidth}
    \includegraphics[width=\textwidth]{figs/minion}
    \caption{Minions}
    \label{fig:Minnion}
  \end{subfigure}
  \caption{Best Animations}
  \label{fig:animations}
\end{figure}
```


(a) Tom and Jerry   (b) Wall-E   (c) Minions

Figure: Best Animations

Exercise 6: Pictures

Click to open this exercise in **Overleaf**

- In Overleaf create a new folder `figs` and move your figures in to `figs` folder.
- Format the King's college picture. Change it's location: (top, bottom, here, new page) and rescale the figure.
- Arrange Tom, WallE and Dave inside a single figure environment vertically.
- Cross-reference the figures (using `cleveref`).
- Create a list of figures. Use `\listoffigures`.

Click to open my solution

Outline

Tables

- Tables in LaTeX take some getting used to.
- The argument specifies column alignment — **l**eft, **c**enter, **r**ight.

```
\begin{tabular}{lcr}
Item  & Qty & Unit \$ \\
Widget & 1  & 199.99  \\
Gadget & 2  & 399.99  \\
Cable  & 3  & 19.99   \\
\end{tabular}
```

Item	Qty	Unit $
Widget	1	199.99
Gadget	2	399.99
Cable	3	19.99

- Don't use vertical lines, it's ugly. Use `\begin{booktabs}` to create horizontal lines. Never use `\hline`

```
\begin{table}[h]
\caption{Cost}
\begin{tabular}{lrr} \toprule
Item  & Qty & Unit \$ \\ \midrule
Widget & 1  & 199.99  \\
Gadget & 2  & 399.99  \\
Cable  & 3  & 19.99   \\ \bottomrule
\end{tabular}
\label{t:cost}
\end{table}
```

Table: Cost

Item	Qty	Unit $
Widget	1	199.99
Gadget	2	399.99
Cable	3	19.99

- Use an ampersand $\boxed{\&}$ to separate columns and a double backslash $\boxed{\backslash}\boxed{\backslash}$ to start a new row (like in the align* environment that we saw in part 1).

Table Environment

Option	Description
l	left-justified column
c	centered column
r	right-justified column
p{'width'}	paragraph column with text vertically aligned at the top
m{'width'}	paragraph column with text vertically aligned in the middle
b{'width'}	paragraph column with text vertically aligned at the bottom
\&	column separator
\\	start new row (additional space may be specified
\cmidrule{i-j}	partial horizontal line beginning in column i and ending in column j

Exercise 7: Tables

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- Use `tabularx` package for tables with paragraph text.
- Never use `\hline` or `\cline`, use `\toprule`, `\midrule`, `\bottomrule` and `\cmidrule{i-j}`
- Visual table editor: https://www.tablesgenerator.com/

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A badly formatted table

```latex
\begin{tabular}{|l|c|c|c|c|}
\hline
& \multicolumn{2}{c}{Species I} &
        \multicolumn{2}{c|}{Species II} \\
\hline
DM  & mean & SD  & mean & SD   \\
\hline
\hline
I1MD & 6.23 & 0.91 & 5.2  & 0.7  \\
\hline
I1LL & 7.48 & 0.56 & 8.7  & 0.71 \\
\hline
I2MD & 3.99 & 0.63 & 4.22 & 0.54 \\
\hline
I2LL & 6.81 & 0.02 & 6.66 & 0.01 \\
\hline
CMD & 13.47 & 0.09 & 10.55 & 0.05 \\
\hline
CBL & 11.88 & 0.05 & 13.11 & 0.04\\
\hline
\end{tabular}
```

	Species I		Species II	
DM	mean	SD	mean	SD
I1MD	6.23	0.91	5.2	0.7
I1LL	7.48	0.56	8.7	0.71
I2MD	3.99	0.63	4.22	0.54
I2LL	6.81	0.02	6.66	0.01
CMD	13.47	0.09	10.55	0.05
CBL	11.88	0.05	13.11	0.04

A nice looking table

```
\begin{tabular}{l c c c c}
\hline
\multirow{2}{*}{DM}
 & \multicolumn{2}{c}{Species I}
 & \multicolumn{2}{c}{Species II} \\
\cline{2-5}
  & mean & SD  & mean & SD  \\
\hline
I1MD & 6.23 & 0.91 & 5.2  & 0.7  \\

I1LL & 7.48 & 0.56 & 8.7  & 0.71 \\

I2MD & 3.99 & 0.63 & 4.22 & 0.54 \\

I2LL & 6.81 & 0.02 & 6.66 & 0.01 \\

CMD & 13.47 & 0.09 & 10.55 & 0.05 \\

CBL & 11.88 & 0.05 & 13.11 & 0.04\\
\hline
\end{tabular}
```

DM	Species I		Species II	
	mean	SD	mean	SD
I1MD	6.23	0.91	5.2	0.7
I1LL	7.48	0.56	8.7	0.71
I2MD	3.99	0.63	4.22	0.54
I2LL	6.81	0.02	6.66	0.01
CMD	13.47	0.09	10.55	0.05
CBL	11.88	0.05	13.11	0.04

An even nicer looking table

```
\begin{tabular}{l c c c c}
\toprule
\multirow{2}{*}{DM}
        & \multicolumn{2}{c}{Species I}
        & \multicolumn{2}{c}{Species II} \\
\cmidrule{2-5}
  & mean & SD  & mean & SD  \\
\midrule
I1MD & 6.23 & 0.91 & 5.2  & 0.7  \\

I1LL & 7.48 & 0.56 & 8.7  & 0.71 \\

I2MD & 3.99 & 0.63 & 4.22 & 0.54 \\

I2LL & 6.81 & 0.02 & 6.66 & 0.01 \\

CMD & 13.47 & 0.09 & 10.55 & 0.05 \\

CBL & 11.88 & 0.05 & 13.11 & 0.04\\
\bottomrule
\end{tabular}
```

DM	Species I		Species II	
	mean	SD	mean	SD
I1MD	6.23	0.91	5.2	0.7
I1LL	7.48	0.56	8.7	0.71
I2MD	3.99	0.63	4.22	0.54
I2LL	6.81	0.02	6.66	0.01
CMD	13.47	0.09	10.55	0.05
CBL	11.88	0.05	13.11	0.04

Formatting tables

- Use `tabulary` package for tables with paragraph text.
- Never use vertical lines in your table. It looks ugly!
- Use `booktabs` package for rules instead of lines.
- Never use `\hline` or `\cline`, use `\toprule`, `\midrule`, `\bottomrule` and `\cmidrule{i-j}`.
- Use `\centering` to center your tables, do **NOT** use `\begin{center}` and `\end{center}` as it adds additional white space

Outline

BibLATEX 1

- Put your references in a `.bib` file in 'biblatex' database format:

```
@Article{Jacobson1999Towards,
  author = {Van Jacobson},
  title = {Towards the Analysis of Massive Multiplayer Online
          Role-Playing Games},
  journal = {Journal of Ubiquitous Information},
  Month = jun,
  Year = 1999,
  Volume = 6,
  Pages = {75--83}}

@InProceedings{Brooks1997Methodology,
  author = {Fredrick P. Brooks and John Kubiatowicz and
            Christos Papadimitriou},
  title = {A Methodology for the Study of the
          Location-Identity Split},
  booktitle = {Proceedings of OOPSLA},
  Month = jun,
  Year = 1997}
```

- Most reference managers can export to bibtex format.

BibLATeX 2

- Each entry in the .bib file has a *key* that you can use to reference it in the document. For example, `Jacobson1999Towards` is the key for this article:

```
@Article{Jacobson1999Towards,
  author = {Van Jacobson},
  ...
}
```

- It's a good idea to use a key based on the name, year and title.
- LATeX can automatically format your in-text citations and generate a list of references; it knows most standard styles, and you can design your own.

BibLaTeX 3

- Use the `biblatex` package with `\textcite`and `\autocite` for textual and parenthetical citations, respectively.

- Add references using `\printbibliography` at the end, and specify a `\bibliographystyle`.

```
\documentclass{article}
\usepackage[style=authoryear-ibid]{biblatex}
%Import the bibliography file
\addbibresource{references.bib}

\begin{document}

\textcite{Brooks1997Methodology}
show that \ldots. Clearly,
all odd numbers are prime
\autocite{Jacobson1999Towards}.


\printbibliography

\end{document}
```

Brooks, Kubiatowicz, and Papadimitriou (1997) show that .... Clearly, odd numbers are prime (Jacobson 1999).

References

Brooks, Fredrick P., John Kubiatowicz, and Christos Papadimitriou (June 199
"A Methodology for the Study of the Location-Identity Split". In: *Proce
ings of OOPSLA*.

Jacobson, Van (June 1999). "Towards the Analysis of Massive Multiplayer O
line Role-Playing Games". In: *Journal of Ubiquitous Information* 6, pp. 7
83.

Exercise 8: Formatting a Paper

Click to open this exercise in **Overleaf**

- Reference styles:
  https://www.overleaf.com/learn/latex/Biblatex_bibliography_styles
  https://www.overleaf.com/learn/latex/Bibliography_management_with_biblatex

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Outline

PhD Thesis Template

Detailed instructions on how to use the template

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Click to open the template in **Overleaf**

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View the template in github