Writing papers and thesis using LaTeX2e

Part II: Writing papers and thesis using LaTeX

Krishna Kumar [*1]

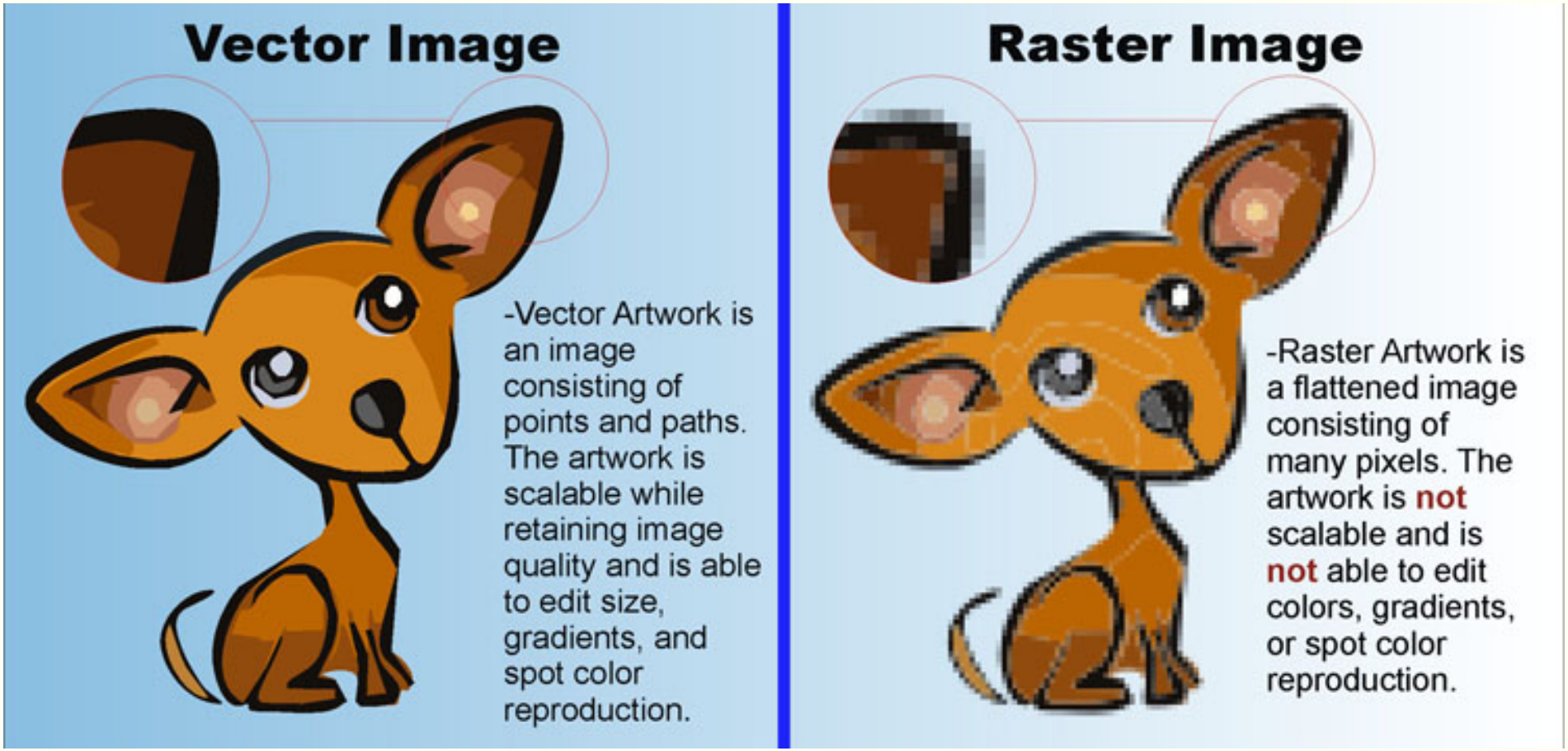
[1]Cockrell School of Engineering
The University of Texas at Austin

LaTeXfor Beginners

[1]krishnak@utexas.edu

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!

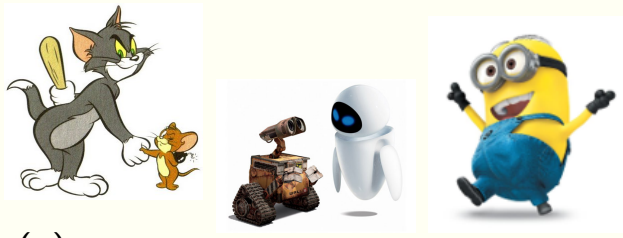
\begin[option]{figure}

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.

```
\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 writeLaTeXcreate 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 [&] to separate columns and a double 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

Click to open this exercise in **Overleaf**

- 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/

Click to open my solution.

A badly formatted table

```
\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

BibTeX 1

- Put your references in a `.bib` file in 'bibtex' 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.

BibTeX 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.

BibTEX 3

- Use the `natbib` package[2] with `\citet`and `\citep` for textual and parenthetical citations, respectively.
- Reference `\bibliography` at the end, and specify a `\bibliographystyle`.

```
\documentclass{article}
\usepackage[authoryear]{natbib}
\begin{document}

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

\bibliography{bib-example}
% if `bib-example' is the name of
% your bib file

\bibliographystyle{plainnat}
% try changing to abbrvnat

\end{document}
```

Brooks et al. [1997] show that .... Clearly, all odd numbers are pri
[Jacobson, 1999].

References

Fredrick P. Brooks, John Kubiatowicz, and Christos Papadimitriou. A metho
ology for the study of the location-identity split. In *Proceedings of OOPSL*
June 1997.

Van Jacobson. Towards the analysis of massive multiplayer online role-playi
games. *Journal of Ubiquitous Information*, 6:75–83, June 1999.

[2] There is a new package with more features named `biblatex` but most of the articles templates still use `natbib`.

Exercise 8: Formatting a Paper

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

Click to open my solution.

Outline

PhD Thesis Template

Detailed instructions on how to use the template

Write your PhD Thesis online

Click to open the template in **Overleaf**

or use it off-line

View the template in github