An Interactive Introduction to LaTeX

Introduction to Figures and Tables

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Outline

Starting Point and Goals

- You already know some LaTeX and have been introduced to **Overleaf**
- Now, we'll learn about positioning **figures** and creating **tables** in LaTeX
- You'll have a chance to try this in your own document within Overleaf

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

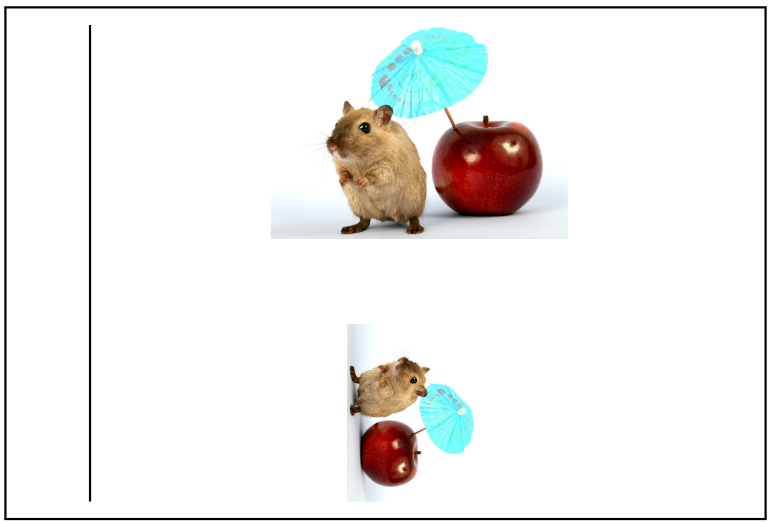
For best results, please use Google Chrome or a recent FireFox.

- Let's get started!

Outline

Graphics

- To handle external images, LaTeX requires the `graphicx` package, which provides the `\includegraphics` command.
- Just add a `\usepackage{graphicx}` in the preamble.
- Supported graphics formats include JPEG, PNG and PDF.
- LaTeX treats graphics like a chunk of text (a box of a certain width and height).



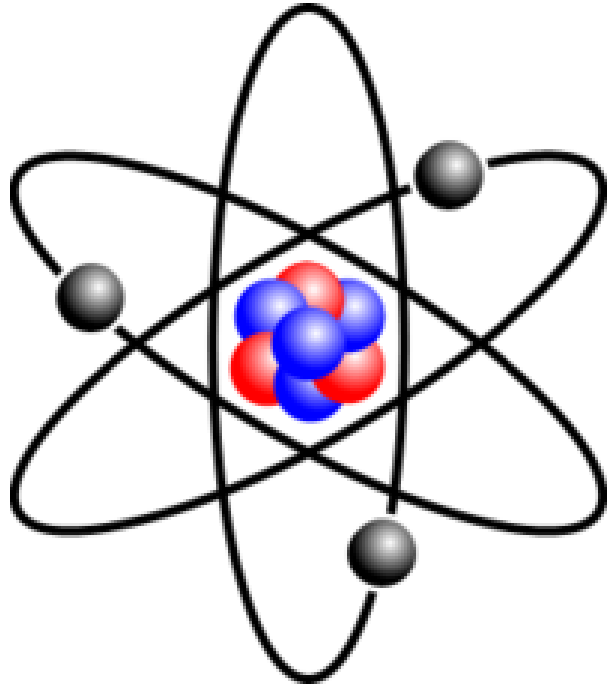
Click to download example image

- Upload this image to Overleaf (use the project menu).

Image license: CC0

Simple Example

```
\begin{figure}
\centering
\includegraphics[width=1.5in]{atom.png}
\end{figure}
```



Click to download example image

Interlude: Optional Arguments

- We use square brackets [ ] for optional arguments, instead of braces { }.
- `\includegraphics` accepts optional arguments that allow you to transform the image when it is included. For example, [`width=0.3\textwidth`] makes the image take up 30% of the width of the surrounding text. You can also use "real" units: [`width=1.5in`].
- Other arguments include [`height`] and [`angle`].
- Where do you find out about these? See the Online Resources at the end of this presentation for links to more information.

Simple Example with Caption

```
\begin{figure}
\centering
\includegraphics[scale=0.5]{atom.png}
\caption{This is Lithium ($^6$Li)}
\end{figure}
```

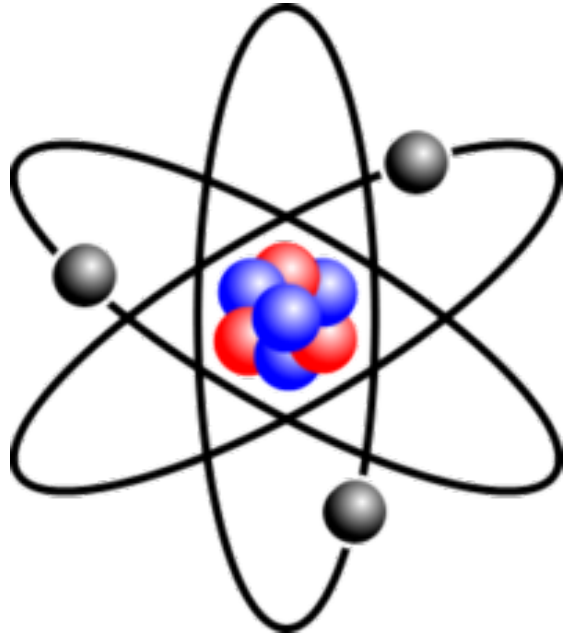


Figure: This is Lithium (^{6}Li)

Labeling Figures

- By default, LaTeX will decide where the figure will go within the document (figures and tables "float"). A Float is an object (typically a table or figure) which cannot be broken over a page.
- You can caption a float.
- With a caption, you can also reference a float using a `\ref` and `\label` pair:

```
\documentclass{article}
\usepackage{graphicx}
\begin{document}

Figure \ref{fig:gerbil} shows \ldots

\begin{figure}
\centering
\includegraphics[
  width=0.5\textwidth]{gerbil}
\caption{\label{fig:gerbil}Aww\ldots.}
\end{figure}

\end{document}
```

Figure 1: Aww....

Figure 1 shows ...

Image license: CC0

Placing Figures

LaTeX tries to put a float in the "best" place, to make the document look nice. Overall, it is very good at this.

Because floats are treated as separate entities, and placed on a separate part of the page, away from other text, they tend not to "fit" in the exact place you have placed them in your electronic text. LaTeX is good at finding the optimal location for a float, and placing it there, so you don't have to continue to edit the document, moving figures around whenever you add or remove a bit of text. So we let LaTeX do all the hard work.

- However, sometimes you need to tweak the position of a float. One way is to use the optional position argument in `\begin{figure}[position]`.
  For example: `\begin{figure}[b]`

Option	Position
h	Place the float **h**ere (more or less)
t	Position at the **t**op of the page
b	Position at the **b**ottom of the page
p	Place it on a special **p**age for floats only
!	Prevent LaTeX from trying to adjust float location
H	Place the float precisely **H**ere (like **h!**)

Outline

Intro to Tables

- Tables in LaTeX take some getting used to.
- In general, you should only try to create *from scratch* within LaTeX very simple tables.
- For real life tables, it will be far easier to export *the data* directly from your code, with LaTeX formatting added by your code.
- Tools exist to help you with this:
  - Excel2LaTeX
  - PyLaTeX (or DataFrame in Pandas).
  - print(xtable(MyRdata, type = "latex"), file = "MyRtab.tex")
  - Other options
- Once you have exported the properly formatted data, you can copy and paste it into your document (or just upload it into your project as a separate file).

A Simple Table

- Use the `tabular` environment from the `tabularx` package.
- The argument specifies column alignment — **l**eft, **r**ight, **r**ight.

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

Produces the following table:

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.

Tables: Adding Lines

- You can also specify vertical lines in the optional arguments (use `\hline` for horizontal lines).

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

  Produces:

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

- Note: The spacing and alignment in the typed table does not impact the spacing and alignment in the typeset table.

Tables: Aligning Columns

- In addition to aligning the columns to left, right or center, you can use an @-expression

```
\begin{tabular}{r@{.}l}
  3  & 14159 \\
  16 & 2     \\
  123& 456   \\
\end{tabular}
```

  Produces:

```
   3.14159
  16.2
 123.456
```

- What happened? All of the space between the two columns was removed, and a decimal point was inserted in between. A bit odd, but this is a way to make a column of numbers of different precision line up on the decimal point. You do have to separate the numbers (replacing the decimal point with a ampersand).

Tables: \multicolumn and \multirow

```
\begin{tabular}{ | l | l | r | } \hline
\multicolumn{2}{|c|}{Item} & \multirow{2}{*}{Price (\$)} \\
\cline{1-2}
  Animal & Description &  \\ \hline
  Gnat  & per gram & 13.65 \\
        & each     &  0.01 \\
  Gnu   & stuffed  & 92.50 \\
  Emu   & stuffed  & 33.33 \\
  Armadillo & frozen & 8.99 \\ \hline
\end{tabular}
```

Produces:

Item		Price ($)
Animal	Description	
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

Tables: Positioning, Caption and Labeling

Item		Price ($)
Animal	Description	
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

Table: Wholesale Prices

Outline

Resources and Help

- The Overleaf Learn Wiki — hosts lots of tutorials and reference material
- The LaTeX Wikibook — excellent tutorials and reference material.
- TeX Stack Exchange — ask questions and get excellent answers incredibly quickly
- LaTeX Community — a large online forum
- Comprehensive TeX Archive Network (CTAN) — over four thousand packages plus documentation
- Google will usually get you to one of the above.
- Ask me! I'm always happy to help with LaTeX questions ricky@virginia.edu