Outline

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Structured Documents

- In Part 1, we learned about commands and environments for typesetting text and mathematics.
- Now, we’ll learn about commands and environments for structuring documents.
- You can try out the new commands in 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!
Title and Abstract

- Tell \LaTeX{} the \texttt{\title} and \texttt{\author} names in the preamble.
- Then use \texttt{\maketitle} in the document to actually create the title.
- Use the abstract environment to make an abstract.

\begin{verbatim}
\documentclass{article}
\title{The Title}
\author{A. Author}
\date{\today}
\begin{document}
\maketitle
\begin{abstract}
Abstract goes here...
\end{abstract}
\end{document}
\end{verbatim}
Sections

- Just use \section and \subsection.
- Can you guess what \section* and \subsection* do?

\documentclass{article}
\begin{document}
\section{Introduction}
The problem of \ldots
\section{Method}
We investigate \ldots
\subsection{Sample Preparation}
\subsection{Data Collection}
\section{Results}
\section{Conclusion}
\end{document}

1 Introduction
The problem of …

2 Method
We investigate …

2.1 Sample Preparation
2.2 Data Collection

3 Results

4 Conclusion
Labels and Cross-References

- Use `\label` and `\ref` for automatic numbering.
- The `amsmath` package provides `\eqref` for referencing equations.

```latex
\documentclass{article}
\usepackage{amsmath} % for \eqref
\begin{document}

\section{Introduction}
\label{sec:intro}
In Section \ref{sec:method}, we \ldots

\section{Method}
\label{sec:method}
\begin{equation}
\label{eq:euler}
e^{i\pi} + 1 = 0
\end{equation}
By \eqref{eq:euler}, we have \ldots

\end{document}
```
Structured Documents Exercise

Typeset this short paper in \LaTeX: \(^1\)

Click to open the paper

Make your paper look like this one. Use \ref and \eqref to avoid explicitly writing section and equation numbers into the text.

Click to open this exercise in Overleaf

► Once you’ve tried, click here to see my solution.

\(^1\)From http://pdos.csail.mit.edu/scigen/, a random paper generator.
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Graphics

- Requires the \texttt{graphicx} package, which provides the \texttt{\includegraphics} command.
- Supported graphics formats include JPEG, PNG and PDF (usually).

\begin{itemize}
\item \texttt{\includegraphics[width=0.5\textwidth]{big_chick}}
\item \texttt{\includegraphics[width=0.3\textwidth, angle=270]{big_chick}}
\end{itemize}

Image from http://www.andy-roberts.net/writing/latex/importing_images
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 (`\textwidth`).
- `\documentclass` accepts optional arguments, too. Example:

```
\documentclass[12pt,twocolumn]{article}
```

makes the text bigger (12pt) and puts it into two columns.
- Where do you find out about these? See the slides at the end of this presentation for links to more information.
Floats

- Allow \LaTeX{} to decide where the figure will go (it can “float”).
- You can also give the figure a caption, which can be referenced with \ref{}.

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

Figure \ref{fig:chick} shows \ldots

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

\end{document}
Tables

- Tables in \LaTeX take some getting used to.
- Use the `tabular` environment from the `tabularx` package.
- The argument specifies column alignment — left, right, right.

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

- It also specifies vertical lines; use \texttt{\textbackslash hline} for horizontal lines.

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

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

```latex
@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.
Use the \texttt{natbib} package\textsuperscript{2} with \texttt{\citet} and \texttt{\citep}.

Reference \texttt{\bibliography} at the end, and specify a \texttt{\bibliographystyle}.

\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}

\textsuperscript{2}There is a new package with more features named \texttt{biblatex} but most of the articles templates still use \texttt{natbib}.
Exercise: Putting it All Together

Add an image and a bibliography to the paper from the previous exercise.

1. Download these example files to your computer.
   - Click to download example image
   - Click to download example bib file

2. Upload them to Overleaf (use the project menu).
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More Neat Things

- Add the `\tableofcontents` command to generate a table of contents from the `\section` commands.
- Change the `\documentclass` to
  `\documentclass{scrartcl}`
  or
  `\documentclass[12pt]{IEEEtran}`
- Define your own command for a complicated equation:

```
\newcommand{\rperf}{%
  \rho_{\text{perf}}%
}\rperf = {\bf c}'{\bf X} + \varepsilon
```

\[\rho_{\text{perf}} = {\bf c}'{\bf X} + \varepsilon\]
More Neat Packages

- **beamer**: for presentations (like this one!)
- **todonotes**: comments and TODO management
- **tikz**: make amazing graphics
- **pgfplots**: create graphs in \LaTeX
- **listings**: source code printer for \LaTeX
- **spreadtab**: create spreadsheets in \LaTeX
- **gchords, guitar**: guitar chords and tabulature
- **cwpuzzle**: crossword puzzles

See https://www.overleaf.com/latex/examples and http://texample.net for examples of (most of) these packages.
Installing \LaTeX

- To run \LaTeX on your own computer, you’ll want to use a \LaTeX *distribution*. A distribution includes a \latex program and (typically) several thousand packages.
  - On Windows: MikTeX or TeXLive
  - On Linux: TeXLive
  - On Mac: MacTeX
- You’ll also want a text editor with \LaTeX support. See http://en.wikipedia.org/wiki/Comparison_of_TeX_editors for a list of (many) options.
- You’ll also have to know more about how \latex and its related tools work — see the resources on the next slide.
Online Resources

- 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.
Thanks, and happy \TeXing!