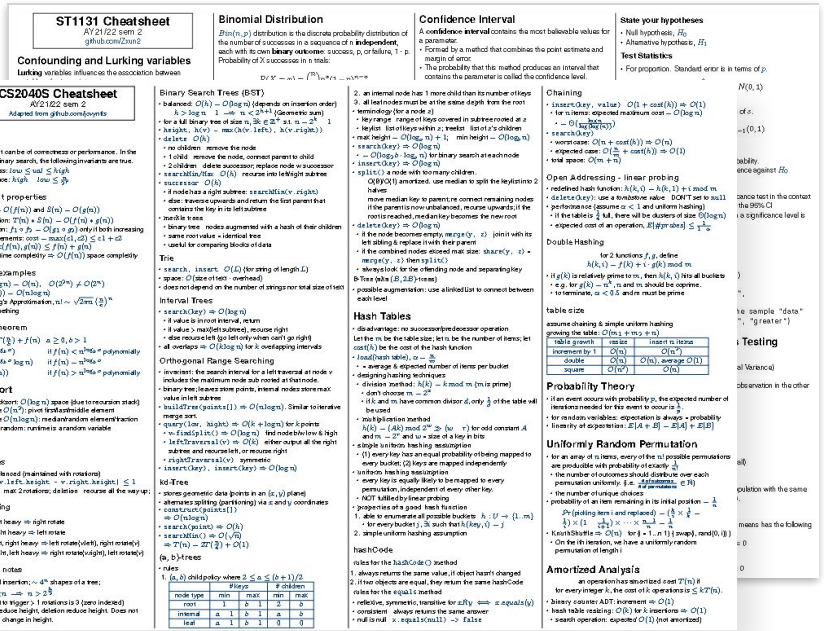
\LaTeX

The Basics

The contents from this sharing is adapted from [jdleesmiller/latex-course: An interactive introduction to LaTeX using Overleaf. (github.com)]

Why LaTeX?

- It makes beautiful documents (and cheat sheets)
- It is powerful – you can extend it
  - Packages for papers, presentations, spreadsheets…
- A large and active community

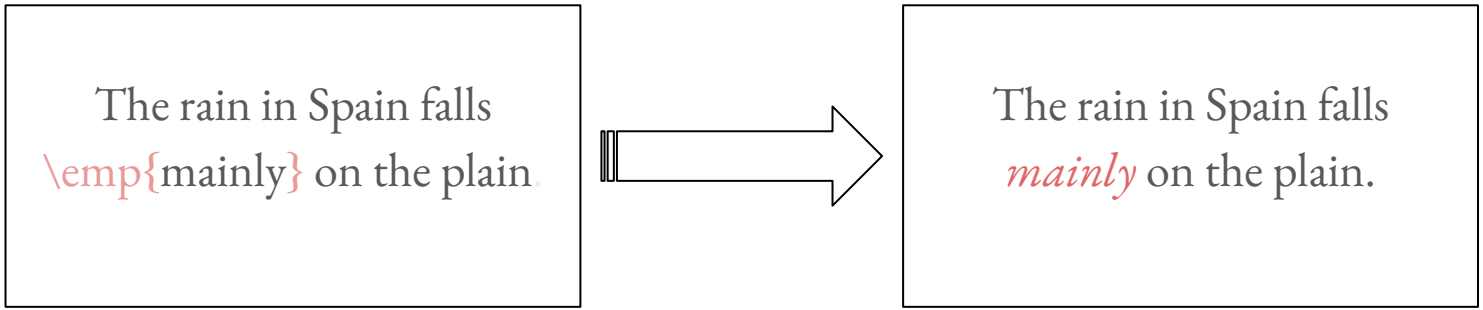


Attitude adjustment

- Use commands to describe ‘what it is’, not ‘how it looks’
- Focus on your content
- Let **LaTeX** do its job.

How does it work?

- Write your document in **plain text** with commands that describe its structure and meaning
- The LaTeX program processes your text and commands to produce a beautifully formatted document.



Getting started with Overleaf

- A website for writing documents in **LaTeX**.
- Alternatives?
  - To run LATEX on your own computer, you'll want to use a LaTeX distribution.
    - On Windows: **MikTEX** or **TEXLive**
    - On Linux: **TEXLive**
    - On Mac: **MacTEX**
  - A text editor with LaTeX Support (VS Code ??)
  - See **http://en.wikipedia.org/wiki/Comparison_of_TeX_editors**

Getting started

- A minimal **LaTeX** document

\documentclass{article} \begin{document} Hello World! \end{document}	Hello World!

- Commands start with a backslash, “\”.
- Every document starts with a **\documentclass**
- The argument in { } informs latex what kind of document we are creating.

Typesetting Text

Typesetting Text

- Type your text between **\begin{document}** and **\end{document}**
- Quotation marks is a bit tricky
  - Replace “ with ``.
- Some common characters (To use them precede them with a backslash):
  - % – Used for comments
  - $ – Used for inline mathematical equations
  - & – Used for tabular column separation
  - # – No idea what’s this used for, but it’s reserved.

Handling errors

Handling Errors

- **LaTeX** can get confused when it is trying to compile your document. If it does, it stops with an error, which you must fix before it will produce any output.
- For example, if you misspell *\emph* as *\meph*, **LaTeX** will stop with an “undefined control sequence” error, because “meph” is not one of the commands it knows.

Typesetting Exercise 1

Typesetting Exercise 1

In March 2006, Congress raised that ceiling an additional $0.79 trillion to $8.97 trillion, which is approximately 68% of GDP. As of October 4, 2008, the “Emergency Economic Stabilization Act of 2008” raised the current debt ceiling to $11.3 trillion.

Hint: Watch out for characters with special meanings!

Typesetting Mathematics

Typesetting Mathematics

- Dollar signs are used to mark mathematics in text.

```
% not so good:
Let a and b be distinct positive
integers, and let c = a - b + 1.

% much better:
Let $a$ and $b$ be distinct positive
integers, and let $c = a - b + 1$.
```

Let a and b be distinct positive integers, and let c = a - b + 1.

Let a and b be distinct positive integers, and let $c = a - b + 1$.

Typesetting Mathematics

- Use carets for superscripts and underscore for subscripts
- Use curly braces to group superscripts and subscripts
- There are commands for Greek letters and common notations.
    - *\mu, \omega, \sigma etc..*
- Display block equations on its own line using \begin{equation} and \end{equation}.

Environments

- equation is an *environment* – a context.
- A command can produce different outputs in different context. An inline vs block equation.
- \begin{...} and \end{...} commands are used to create many different environments.
    - itemize, enumerate etc...

Packages

- All the commands we've seen so far are built into LaTeX.
- Packages are libraries of extra commands and environments.
- To load each of the packages, use \usepackage command in the preamble.

Typesetting Exercise 2

Typesetting Exercise 2

Let $X_1, X_2, \ldots, X_n$ be a sequence of independent and identically distributed random variables with $\mathrm{E}[X_i] = \mu$ and $\mathrm{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{1}{n}\sum_{i=1}^{n} X_i$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

Hint: the command for ∞ is \infty.

Structured Documents

Title and Abstract

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

Sections

- Just use \section and \subsection.
- Can you guess what \section* and \subsection* do?
  - Hint: Its similar to {equation*} !

Labels and Cross References

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

Typesetting Exercise 3

Structured Document Exercise

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

The Relationship Between the UNIVAC Computer and Evolutionary Programming

Bob, Carol and Alice

July 23, 2022

Abstract

Many electrical engineers would agree that, had it not been for online algorithms, the evaluation of red black trees might never have occurred. In our research, we demonstrate the significant unification of massive multiplayer online role playing games and the location identity split. We concentrate our efforts on demonstrating that reinforcement learning can be made peer to peer, autonomous, and cacheable.

1 Introduction

Many analysts would agree that, had it not been for DHCP, the improvement of erasure coding might never have occurred. The notion that hackers worldwide connect with low-energy algorithms is often useful. LIVING explores flexible archetypes. Such a claim might seem unexpected but is supported by prior work in the field. The exploration of the location-identity split would profoundly degrade metamorphic models.

The rest of this paper is organized as follows. In section 2, we describe the methodology used. In section 3, we conclude.

2 Method

Virtual methods are particularly practical when it comes to the understanding of journaling file systems. It should be noted that our heuristic is built on the principles of cryptography. Our approach is captured by the fundamental equation (1).

$$E = mc^3 \tag{1}$$

Nevertheless, certifiable configurations might not be the panacea that end-users expected. Unfortunately, this approach is continuously encouraging. Certainly, we emphasize that our framework caches the investigation of neural networks. Thus, we argue not only that the infamous heterogeneous algorithm for the analysis of the UNIVAC computer by Williams and Suzuki is impossible, but that the same is true for object-oriented languages.

Graphics

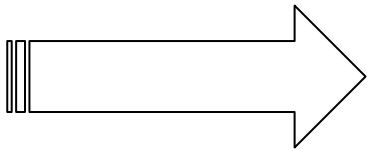
- Requires the graphicx package, which provides the \includegraphics command.
- Supported graphics formats include JPEG, PNG and PDF

```
\includegraphics[
width=0.5\textwidth]{gerbil}
```

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



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

Some 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 (Very useful!)
  - \newcommand

More neat packages

- todonotes: comments and TODO management (Very useful!)
- tikz: make amazing graphics
- pgfplots: create graphs in LaTeX
- listings: source code printer for LaTeX
- spreadtab: create spreadsheets in LaTeX

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

Have fun with LaTeX!