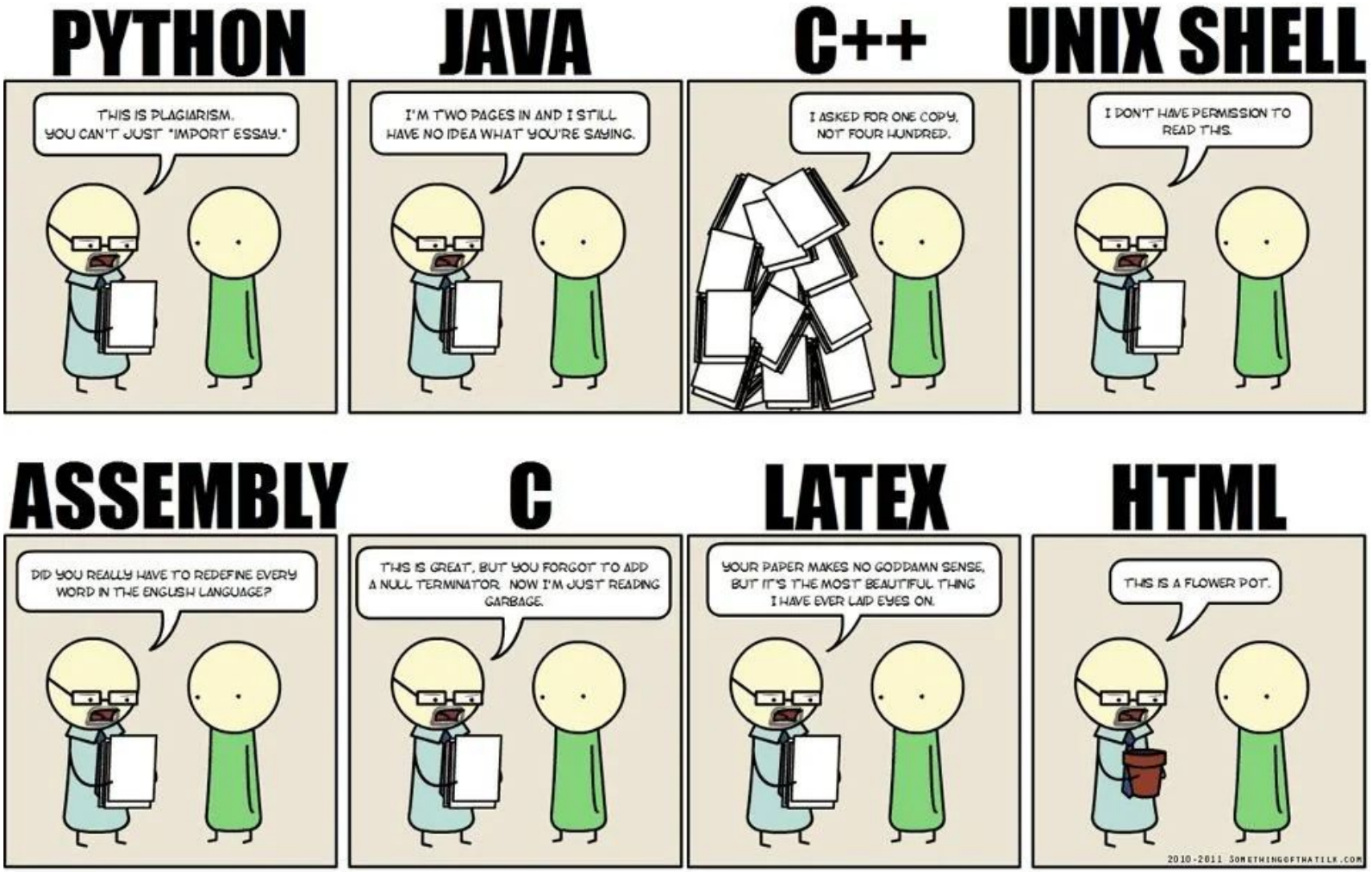
LaTeX


PYTHON
THIS IS PLAGIARISM. YOU CAN'T JUST "IMPORT ESSAY."
JAVA
I'M TWO PAGES IN AND I STILL HAVE NO IDEA WHAT YOU'RE SAYING.
C++
I ASKED FOR ONE COPY, NOT FOUR HUNDRED.
UNIX SHELL
I DON'T HAVE PERMISSION TO READ THIS.
ASSEMBLY
DID YOU REALLY HAVE TO REDEFINE EVERY WORD IN THE ENGLISH LANGUAGE?
C
THIS IS GREAT, BUT YOU FORGOT TO ADD A NULL TERMINATOR. NOW I'M JUST READING GARBAGE.
LATEX
YOUR PAPER MAKES NO GODDAMN SENSE, BUT IT'S THE MOST BEAUTIFUL THING I HAVE EVER LAID EYES ON.
HTML
THIS IS A FLOWER POT.
2010-2011 SOMETHINGOFTHATILK.COM

Introduction

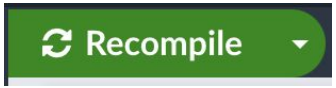
- LaTeX is a typesetting language that is commonly used in HEP
  - Steeper learning curve than e.g., Microsoft Word, but offers many advantages
- Uses a plain text document (.tex format) with LaTeX commands that is typeset to produce an output .pdf file
- LaTeX easily handles formatting, references and mathematical expressions
- Excellent for tedious tasks such as documenting large numbers of images that are frequently updated
- Source files can easily be factorized for ease of editing and collaboration
- Countless available packages to allow you to do almost anything

How to get LaTeX

- LaTeX is available for free to install on your computer
  - MikTeX seems to be the most popular for Windows
  - MacTeX for MacOS
  - LaTeX Workshop for VSCode
- Online services such as Overleaf allow easy collaboration
  - No need to deal with installations/updates
  - We will be using Overleaf for this class

Introduction to Overleaf

- Click on 

and select “Blank Project”
- A file called main.tex is created and automatically typeset
- Typesetting is performed by clicking on 

or Ctrl-S
- Errors and warnings are indicated in source viewer and/or when typesetting
- Files (.tex, images, etc.) can be uploaded and managed in the left panel

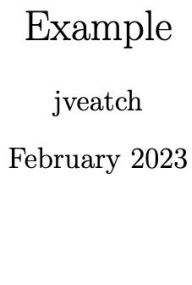
A basic LaTeX document

```
\documentclass{article}
\usepackage{graphicx} % Required for inserting images

\title{Example}
\author{jveatch}
\date{February 2023}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Preamble

Document information

Main body



Document classes

- article: for scientific articles, short reports, simple documents
- proc: for conference proceedings
- report: for longer reports containing several chapters, short books, thesis, ...
- book: for books
- slides: for slides
- letter: for writing letters
- beamer: for presentation slides
- Custom classes can also be defined and used

Packages

- Much LaTeX functionality is available in packages
  - Packages are written and maintained by many developers
- Include packages in preamble with \usepackge{<name>} command
- Documentation for individual packages is available at https://ctan.org/
- In local LaTeX installations, it is important to regularly download package updates

Macros

- Macros are predefined functions that make typesetting easy
  - Users can define their own macros - will be covered next time
- Macros can take 0 or more arguments, including optional arguments
- \tableofcontents creates a TOC - typically placed before any sections
- \section{<name>}, \subsection{<name>}, and \subsubsection{<name>} help to create navigation through the document
- \textbf{...}, \textit{...}, and \underline{...} for **bold**, *italic*, and underlined text

Lists

```
\begin{itemize}
  \item One
  \item Two
  \item Three
\end{itemize}
```

- One
- Two
- Three

```
\begin{enumerate}
  \item One
  \item Two
  \item Three
\end{enumerate}
```

1. One
2. Two
3. Three

```
\begin{enumerate}
  \item One
  \begin{enumerate}
    \item Two
    \item Three
    \item Four
  \end{enumerate}
  \item Five
  \item Six
\end{enumerate}
```

1. One
   (a) Two
   (b) Three
   (c) Four
2. Five
3. Six

Math mode

- Formulas can be embedded in text using math mode:
  - Denoted using $: $<math expression>$

$f(x) = x^2$

$$f(x) = x^2$$

- Standalone equations can be used (amsmath package is needed):

```
\begin{equation}
  1 + 2 = 3
\end{equation}
```

Other math examples:

- \int^a_b for integral sign
- \frac{a}{b} for fraction
- \sqrt{x} for square root
- Greek symbols, such as \mu

Figures

- Figures require the graphicx package

```
\begin{figure}
  \includegraphics[width=0.9\linewidth]{LHCTunnel.jpg}
  % Change width and the figure is scaled appropriately.
  \caption{LHC tunnel.}
  \label{fig:lhc}
\end{figure}
```

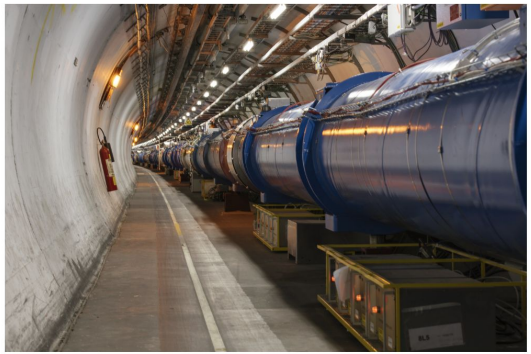


Figure 1: LHC tunnel.

Tables

```
\begin{table}[h!]
  \begin{center}
    \begin{tabular}{|l|c|r} % Alignments: 1st column left, 2nd middle and 3rd
right, with vertical lines in between
      \textbf{Value 1} & \textbf{Value 2} & \textbf{Value 3} \\
      $\alpha$ & $\beta$ & $\gamma$ \\
      \hline
      1 & 1110.1 & a\\
      2 & 10.1 & b\\
      3 & 23.113231 & c\\
    \end{tabular}
    \label{tab:table1}
    \caption{Your first table.}
  \end{center}
\end{table}
```

Value 1	**Value 2**	**Value 3**
α	β	γ
1	1110.1	a
2	10.1	b
3	23.113231	c

Table 1: Your first table.

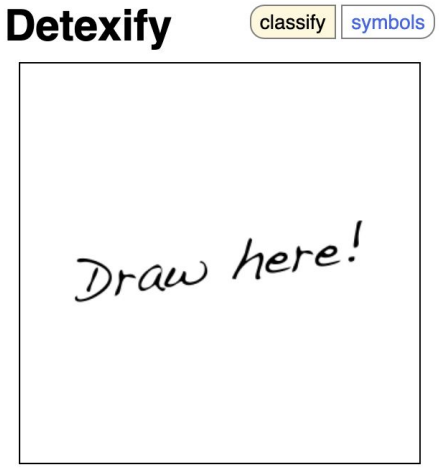
Labels and references

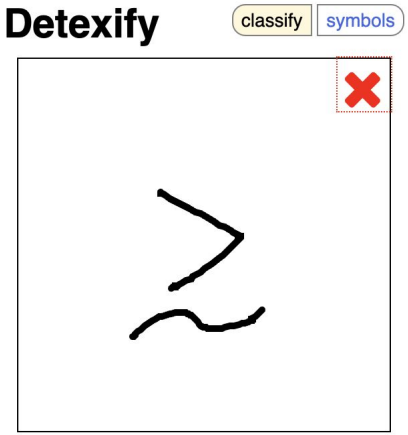
- Add labels to figures, tables, equations, sections, etc. for easy referencing
  - Use \label{} macro
  - Make sure a unique label is used for each item
  - Tip: begin labels with “fig:”, “tab:”, “eq:”, “sec:” etc. for easier bookkeeping
- Reference labels in text using:

  Some text referencing Table~\ref{tab:table1}
- It is important to write reference type in text
  - Some advanced reference packages can do this for you

Detexify

https://detexify.kirelabs.org/classify.html





Useful resources

- Wikibooks: https://en.wikibooks.org/wiki/LaTeX
- Overlead documentation: https://www.overleaf.com/learn
- LaTeX tutorials: https://www.latex-tutorial.com/tutorials/
- Stack exchange: https://tex.stackexchange.com/
- Google