A LaTeX Tutorial

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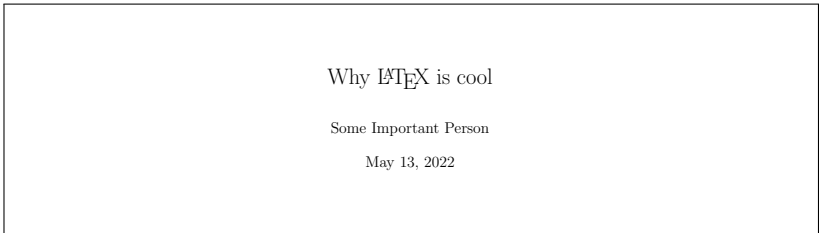
Goals of this presentation

- **Not** comprehensive
- Starting reference to show that LaTeX isn't *that* scary
- Provide some tips & tricks
- Tons of useful LaTeX tutorials by Overleaf


Why LaTeX is cool

Some Important Person

May 13, 2022

What is LaTeX?

- From Encycolpedia Britannica:

  "TeX, a page-description computer programming language developed during 1977–86 by Donald Knuth, a Stanford University professor, to improve the quality of mathematical notation in his books. Text formatting systems [...] embed plain text formatting commands in a document, which are then interpreted by the language processor to produce a formatted document for display or printing."
- LaTeXis the corresponding software package
- TeX consists of the greek letters τ, ϵ, χ, and is pronounced "lay-tech"

A LaTeX document

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

% remaining preamble goes here

\begin{document}

% content goes here

\end{document}
```

Creating a title


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

\title{Automatic Material Classification}
\author{Unal Artan \thanks{Thank you to Natalie \& Johann}}
\date{August 24, 2021}

\begin{document}

\maketitle
...
```

Automatic Material Classification

Unal Artan *

August 24, 2021

*Thank you to Natalie & Johann

Common commands

comments	`% ...`
bold	`\textbf{...}`
italic	`\textit{...}` or `\emph{...}`
underline	`\underline{...}`
inline equations	`$...$`
block equations	`$$...$$` or `\[...\]`
...and many more!	`\ldots`

`\include{...}` is used to insert LaTeXcode from another file in-place

Layout commands/info

Command	Description
`\vspace{...}`	add vertical space
`\hspace{...}`	add horizontal space

Dimension	Description
`pt`	point, smallest unit of measure
`in`	inch (72.27 `pt`)
`cm`	centimeter
`mm`	millimeter
`em`	relative to current point size (e.g., for `11pt` font, `1em` = `11pt`)
`en`	half the width of `em`

Typesetting notes

- Extra spaces between words are ignored
- An empty line starts a new **paragraph**
- Two backslashes (\\) **forces** a line break, but does not start a new paragraph (i.e., no indent)
- Periods are treated as the **end of a sentence**, unless followed by a comma or backslash (e.g., i.e.\)
- Tilde (~) inserts **non-breaking whitespace**
- **Opening quotes** are denoted by 1–2 grave accents (‘ or “)
- **Closing quotes** are denoted by 1–2 apostrophes (’ or ”)

Lists I: Itemize

```
\begin{itemize}
  \item Lima
  \item[-] Navy
  \item Kidney
  \begin{itemize}
    \item[yes] Bean
    \item[no] Stone
  \end{itemize}
\end{itemize}
```

- Lima
- Navy
- Kidney
  - yes Bean
  - no Stone

Lists II: Enumerate

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

1. One
2. Two
3. Three
    3.a Three Eh
    3.b Three Bee

Tables

```
\begin{tabular}{ | r | c c | }
  \hline
      & col1 & col2 \\
  \hline
  row1 & r1c1 &      \\
  row2 &      & r2c2 \\
  \hline
\end{tabular}
```

	col1	col2
row1	r1c1	
row2		r2c2

Common math syntax

Description	Code	Output
subscript	`x_y`	x_y
superscript	`x^y`	x^y
grouping	`x^{y+z}`	x^{y+z}
fraction	`\frac{x}{y}`	$\frac{x}{y}$
square root	`\sqrt{x+y}`	$\sqrt{x+y}$
greek letters	`\alpha \beta \gamma`	$\alpha\ \beta\ \gamma$
spacing	`\; \: \, \!`	contextual

Equations

```
\begin{equation}
  \beta(s) = \int^\infty_{-\infty} CWT(s, \tau) \; d\tau
  \label{eq:CWTint}
\end{equation}
```

$$\beta(s) = \int_{-\infty}^{\infty} CWT(s, \tau)\, d\tau \tag{1}$$

Multiline equations

```
\begin{equation}
  \begin{split}
    a_{1, X} = & a_{1,x} \cos{\alpha} \\
                & - a_{1,z} \sin{\alpha}
  \end{split}
\end{equation}
```

$$\begin{aligned} a_{1,X} =& a_{1,x} \cos \alpha \\ & - a_{1,z} \sin \alpha \end{aligned} \tag{2}$$

Creating a figure I

```
\begin{figure}[t]
  \centering
  \includegraphics[height=0.65\textheight]{figures/loader_
      diagram.png}
  \caption{The Kubota R520s robotic 1-tonne-capacity wheel
      loader that was used for field experiments.}
  \label{fig:loader}
\end{figure}
```

Creating a figure II

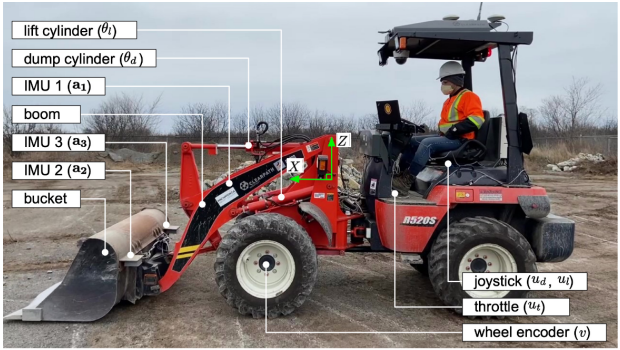


Figure 1: The Kubota R520s robotic 1-tonne-capacity wheel loader that was used for field experiments.

Label references

```
``\ldots the Kubota Loader in Figure~\ref{fig:loader}''
```

"...the Kubota Loader in Figure 1"

```
``see Equation~\ref{eq:CWTint}''
```

"see Equation 1"

Bibliography references

BibTeX entry (.bib files):

```
@inproceedings{artan2021,
  author    = {Artan, Unal and Fernando, Heshan and Marshall, Joshua A.},
  booktitle = {2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)},
  title     = {Automatic Material Classification via Proprioceptive Sensing and Wavelet Analysis During
      Excavation},
  year      = {2021},
  pages     = {612-617},
  doi       = {10.1109/AIM46487.2021.9517696}
}
```

```
``\ldots due to breakthrough research \cite{artan2021}''
```

"...due to breakthrough research [1]"

Inserting a bibliography

Often requires you to precompile your document, run bibtex, then compile it again with resolved references ...

```
\bibliographystyle{ieeetr}
\bibliography{references.bib}
```

[1] U. Artan, H. Fernando, and J. A. Marshall, "Automatic material classification via proprioceptive sensing and wavelet analysis during excavation," in *2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, pp. 612–617, 2021.

Hyperlinks

```
\href{https://ieeexplore.ieee.org/document/9517696}{Paper}
```

Paper

```
\hypertarget{link:resolved}{This part}
\hyperlink{link:resolved}{That part}
```

This part

That part

Custom commands

```
\newcommand{cmd}[args][default]{def}
```

`cmd`	name of the command
`args`	number of parameters
`default`	default value for optional first parameter #1
`def`	command body

```
\newcommand{\proot}[2][]{{^{#1}}\!\!\!\sqrt{#2}}
\[ \proot[3]{x + y} + \proot{x} \]
```

$$\sqrt[3]{x+y}+\sqrt{x}$$

Custom environments I

`\newenvironment{name}[args][default]{begdef}{enddef}`

`name`	name of the environment
`args`	number of parameters
`default`	default value for optional first parameter #1
`begdef`	`\begin` command body
`enddef`	`\end` command body

Custom environments II

```
\newenvironment{LARGEcenter}
  {\begin{center}\LARGE}
  {\end{center}}

\begin{tinycenter}
  Thank you for your time!
\end{tinycenter}
```

Any questions?