

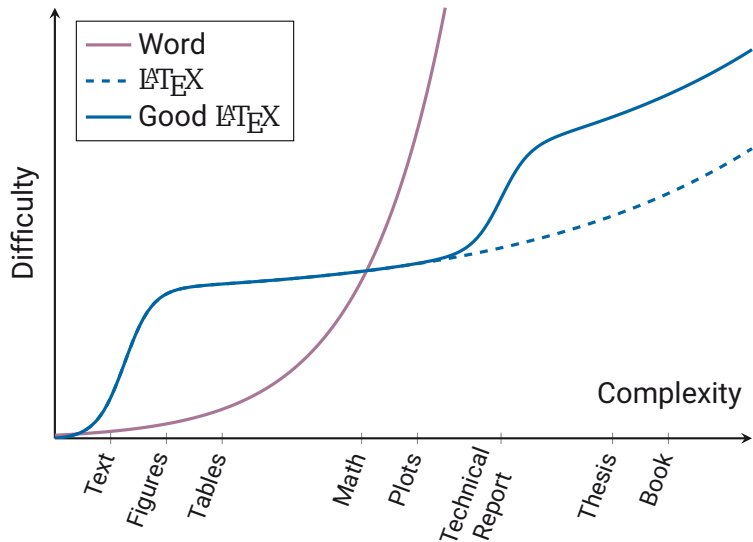
# Advanced L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> Workshop

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# I lied to you <sup>sorry</sup>



# Goals for today

- Organize your  $\text{\LaTeX 2}_{\epsilon}$  code because your last document was an *absolute fucking mess*
- Understand *why the hell* the compiler is complaining
- Consume your precariously short existence trying to learn to draw pictures with a terrible programming language called *TikZ*

# Do yourself a favor

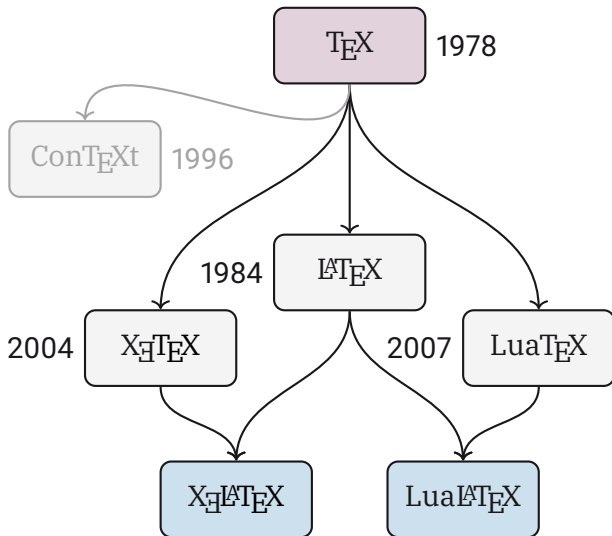
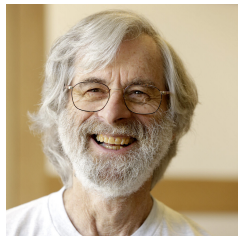
## Use the International US Keyboard Layout

~	! 1	@ 2	# 3	\$ 4	£ 5	% 6	^ 7	& 8	* 9	( 0	) 1	+ 2	÷ 3	← Backspace								
Tab ↵	Q	Å	W	Ä	E	É	R	T	Þ	Y	Û	Ü	Í	Í	O	Ó	P	Ö	{	}		~
Caps Lock ⬆	A	Å	S	Š	D	Đ	F	G	H	J	K	L	Ø	:	°	"	"	Enter ↵				
Shift ⬆	Z	Æ	X	C	¢	V	B	N	Ñ	M	<	Ç	>	?	Shift ⬆							
Ctrl	Win Key	Alt	Alt Gr										Win Key	Menu	Ctrl							

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- 1 Absolute Basics to not ruin the typesetting
- 2 Packages and classes
- 3 Why the  $\text{T}_{\text{E}}\text{X}$  compiler sucks
- 4 TikZ ist kein Zeichenprogramm

# Please enter the 21<sup>th</sup> century



A: Use XeLaTeX, it has UTF-8 support! (ä, ü, ô, ...)

## Stop putting line breaks everywhere.

### Don't

`%% wrong`

```
This is a sentence in the first paragraph. \\
This is another paragraph.
```

### Do

```
This is a sentence in the first paragraph.
```

```
This is another paragraph.
```

Use `\\` only in tabular

# Don't do manual styling

## Don't

I want that `\textbf{this part}` stands out.

There is an *emphasis* macro

## Do

I want that `\emph{this part}` stands out.

[Click here](#) if you want to change how `\emph` looks like.



## Never manually create headings

Yes, I've seen it done.

### Don't

```
% NEVER do this  
\textit{\textsf{My custom heading}} \\[1em]
```

# Customize headings

## With the titlesec package

```
% in the preamble
\usepackage{titlesec}

\titleformat{\paragraph}[hang]
  {\normalfont\itshape\sffamily}
  {\theparagraph}{1em}{}

% later in the document
\paragraph{My custom heading}
```

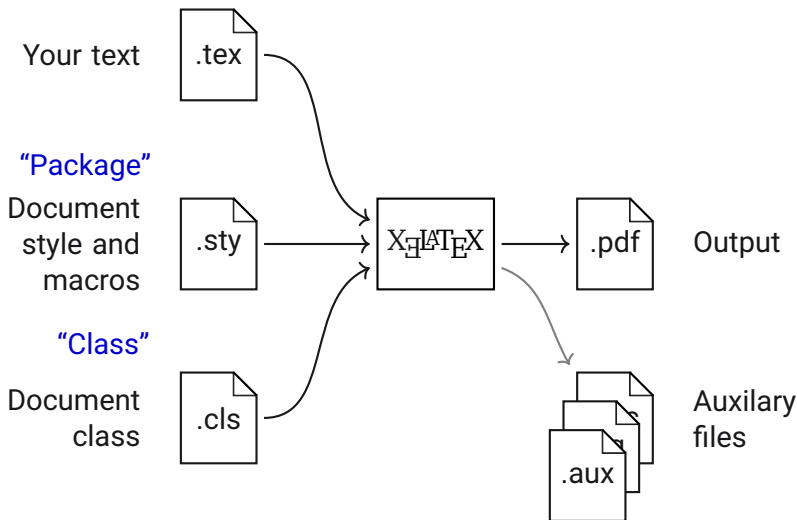
KOMA classes have their own customization commands

# Stop making ugly tables

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# What is a package?



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# The root of the problem

Essentially, because D. Knuth is too clever.

DemocracyFTW on HN under 29672872

*TeX uses recursive rewrites of the code that is the document to achieve what it does, without properly keeping track of where it is and what it does. There is no technical necessity for doing so, but the technique introduces huge complexity costs. On a somewhat related note, TeX's syntax at its very heart is also not trivial to parse short of executing (compiling) a given document (i.e. TeX's syntax itself is Turing-complete).*

# Let me give you an example

## Power tower function

```
\tower[a] % {a}  
\tower[a][b] % {a^{b}}  
\tower[a][b][c] % {a^{b^{c}}}
```

## Output

$a$     $a^b$     $a^{b^c}$

## How you think it's done

```
def tower(args):  
    for a in args:  
        write("%s^{{" % a)  
    write("}" * (len(args) - 1))
```



# Let me give you an example

## How it's actually done

```
# txt is like a pointer or iterator
def tower(txt):
    endtower = ""

    def step(t):
        if nextchr(t) == "[":
            endtower += "}"
            write("%s^{" % t + step(nextchr(t)))
        else:
            write(endtower)

    step(txt)
```

# Let me give you an example

Easy!

```
\makeatletter
\def\tower{\@ifnextchar[%
  {\def\endtower{}\towerstep}%
  }%
\def\towerstep[#1]{#1%
  \@ifnextchar[%
    {\edef\endtower{\endtower\egroup}%
    ^\bgroup\towerstep}\endtower}%
}
\makeatother
```

# What execution (compiling) looks like

## Execution flow

- 1 Load file
- 2 Recursively expand macros (in the aux file)
- 3 Something goes wrong
- 4 You're probably deep in a recursion but you don't know because you don't keep a stack
- 5 Print an incomprehensible message about a missing variable or something
- 6 Wait for user input or die

# Amazing error messages

## Almost as good as C++ template errors

```
) [13] (/var/folders/w1/cmd2jfv1229gcxvtdyfg1vjc0000gn/T/latex-  
build-1457ae9381593aa61ed49d5df3bb1135/advanced.toc) [14] [15]  
build-1457ae9381593aa61ed49d5df3bb1135/advanced.vrb (/Users/npr  
dist/tex/latex/listings/lstlang1.sty)) [16] (/var/folders/w1/cm  
build-1457ae9381593aa61ed49d5df3bb1135/advanced.vrb) [17]  
Runaway argument?  
{\let me give you an example} \begin {block}{Easy!} \begin {lstli  
./advanced.tex:555: Paragraph ended before \beamer@@@checkoldfra  
<to be read again>  
                                \par  
1.555
```

Output written on /var/folders/w1/cmd2jfv1229gcxvtdyfg1vjc0000gn/  
build-1457ae9381593aa61ed49d5df3bb1135/advanced.pdf (17 pages).  
Transcript written on /var/folders/w1/cmd2jfv1229gcxvtdyfg1vjc0000gn/  
build-1457ae9381593aa61ed49d5df3bb1135/advanced.log.

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## TikZ = TikZ ist kein Zeichenprogramm

```
\usepackage{tikz}  
\usetikzlibrary{calc, positioning, ...}
```

```
\begin{figure}  
  \centering  
  \begin{tikzpicture}[  
    % global settings / styles  
  ]  
  
    % drawing commands  
  
  \end{tikzpicture}  
  \caption{... \label{fig:...}}  
\end{figure}
```

## Basics

- `\coordinate (name)at (x,y);`
- `\node[options] (name)at (x,y){label};`
- `\draw[options] commands;`
- `\fill[options] commands;`

## Drawing commands

- Line (A) -- (B)
- Horiz. then vert. line (A) -| (B)
- Vert. then horiz. line (A) |- (B)
- Quadratic Bézier (A).. controls (P)and (Q).. (B)
- Advanced curve (A) to[options] (B)
- Nodes `node[options] (name){label}`
- Shapes (A)rectangle (B), (A)circle (2cm)

# Basic example

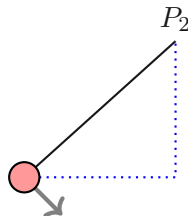
```
\begin{tikzpicture}
  \coordinate (O) at (0,0);
  \coordinate (A) at (2cm,18mm);
  % no units = cm

  \draw[thick] (O) -- (A);
  \draw[thick, dotted, blue]
    (O) -| (A);

  \draw[ultra thick, ->, gray]
    (O) -- ++(5mm, -5mm);

  \fill[thick, draw = black,
    fill = red!40] (O) circle (2mm);

  \node[above] at (A) {\(P_2\)};
\end{tikzpicture}
```





# Example with nodes

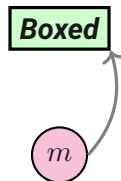
```
\node (A) at (0,0) {A node};

\node[
  rectangle, very thick,
  draw = black, fill = green!20,
  font = \bfseries\slshape,
  % positioning library
  below = 5mm of A,
] (B) {Boxed};

\node[
  circle, thick,
  draw = black, fill = magenta!20,
  below = 1cm of B,
] (C) {\(m\)};

\draw[very thick, gray, ->]
  (C.east) to[bend right] (B.south east)
  ;
```

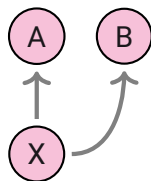
A node



# TikZ V: Matrix and scope

```
\matrix (M) [ % node with table of nodes
  row sep = 8mm,
  column sep = 4mm,
  nodes = {
    circle, thick,
    draw = black,
    fill = magenta!30,
    outer sep = 1mm,
  },
] {
  \node (A) {A}; & \node (B) {B}; \\
  \node (X) {X}; \\
};

\begin{scope}[ultra thick, gray, ->]
  \draw (X) -- (A);
  \draw (X) to[out = 0, in = -90] (B);
\end{scope}
```



# THE END

It wasn't worth the time I know, but hey,  
at least now you know how to draw pretty pictures