

Writing a thesis, a paper or a (small) report?

You should try **L^AT_EX**!

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LaTeX??
What's wrong
with my word
processor?



Nothing!!!





**Just use the right tool
for the right job!**



**Why is LaTeX
better than my
word processor?**



Because eyes eat first!



1- Resumo

O objetivo deste trabalho de revisão prende-se, em identificar os diversos pontos de vista relativamente à situação- problema, que são as alterações climáticas e como estas podem afetar a agricultura e os sistemas agro-florestais. Não culpabilizando apenas a atividade e ação do Homem, mas também tendo em conta a ciclicidade climática do planeta Terra ao longo dos anos.

Realizou-se uma reflexão sobre a notoriedade das mudanças do clima tanto na agricultura como nas florestas e sistemas agro-florestais, sendo perceptível que ambas evoluem no sentido de uma iminente adaptação aos eventos atuais e futuros. Observando-se uma tendência para redução da capacidade de produção de alimentos, caso não haja uma mitigação das alterações climáticas em cada região do globo.

2- Introdução

A Revolução industrial, em meados do sec. XVIII, levou a que as emissões de dióxido de carbono (CO_2) para a atmosfera, resultantes da desflorestação e da combustão de combustíveis fósseis (carvão, gás natural e petróleo) contribuíssem para um aumento de 30% na concentração de CO_2 na atmosfera.

Já no sec. XX verificou-se um aumento da temperatura média global de $0,6 \pm 0,2^\circ \text{C}$, que aparentou ter origem no aumento da concentração de gases com efeito de estufa na atmosfera. No sec. XXI, essas mesmas concentrações irão provavelmente aumentar, apesar dos esforços de mitigação por parte da comunidade internacional, resultando em alterações no sistema climático completamente novas. [1]

A evolução do clima nas últimas décadas levantou o problema das alterações climáticas e as suas consequências, em particular na agricultura, devido à sua enorme dependência do clima. [2] Com a previsão de se ultrapassar a meta de 2°C para o aquecimento global do planeta devido à evolução das emissões de gases com o efeito de estufa, torna-se imperativo a intensificação dos esforços para uma adaptação às novas condições.

O aumento das temperaturas e as alterações nas condições meteorológicas associadas ao aumento da intensidade e frequência de eventos climáticos extremos (secas, inundações, tempestades, deslizamentos de terra), fazem com que a disponibilidade e a distribuição da água seja afetada. [3] Prevê-se ainda, tendo em

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2 Introdução

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A ideia de realizar uma caracterização da sensibilidade climática tendo

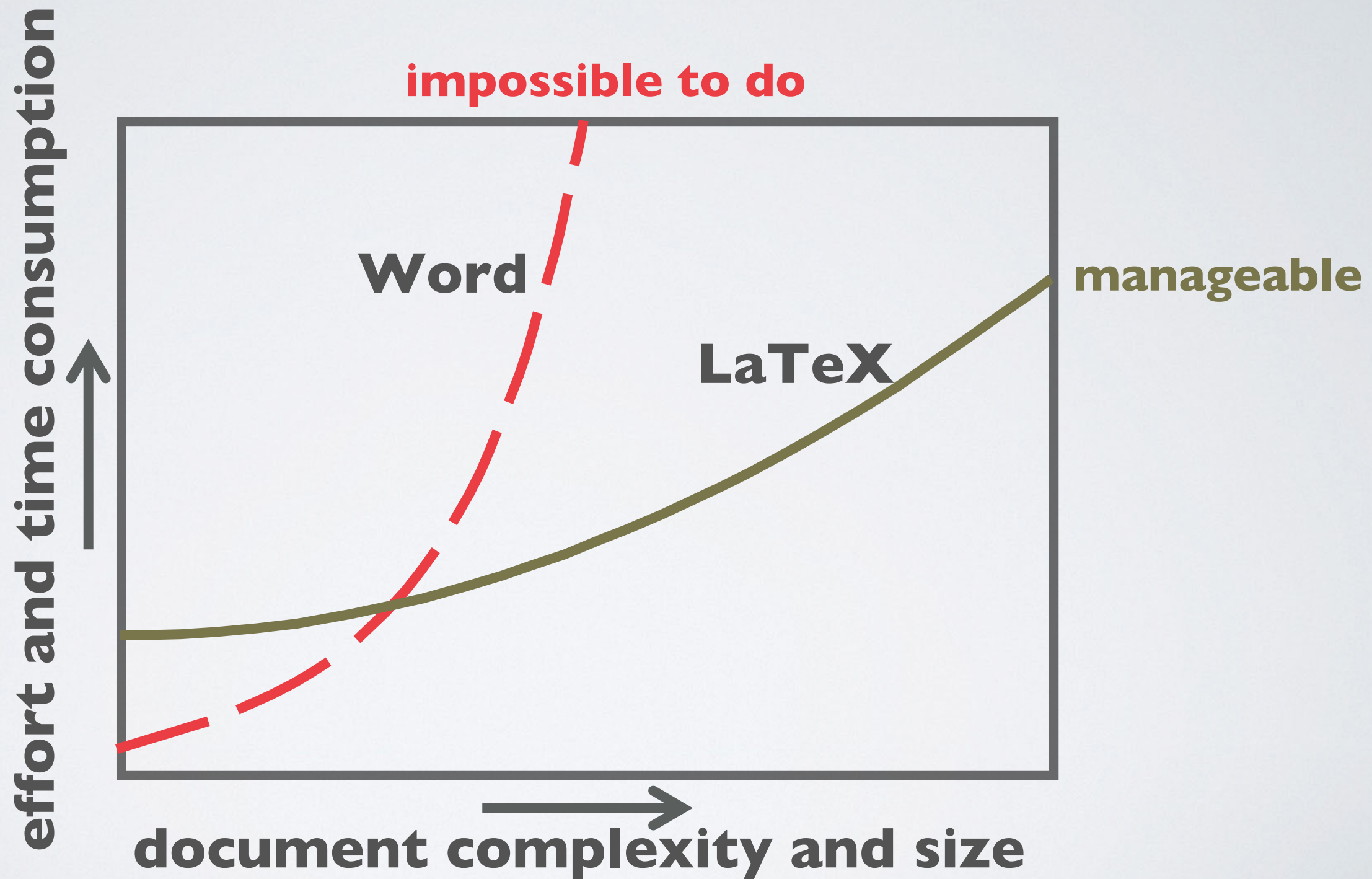
1- Resumo

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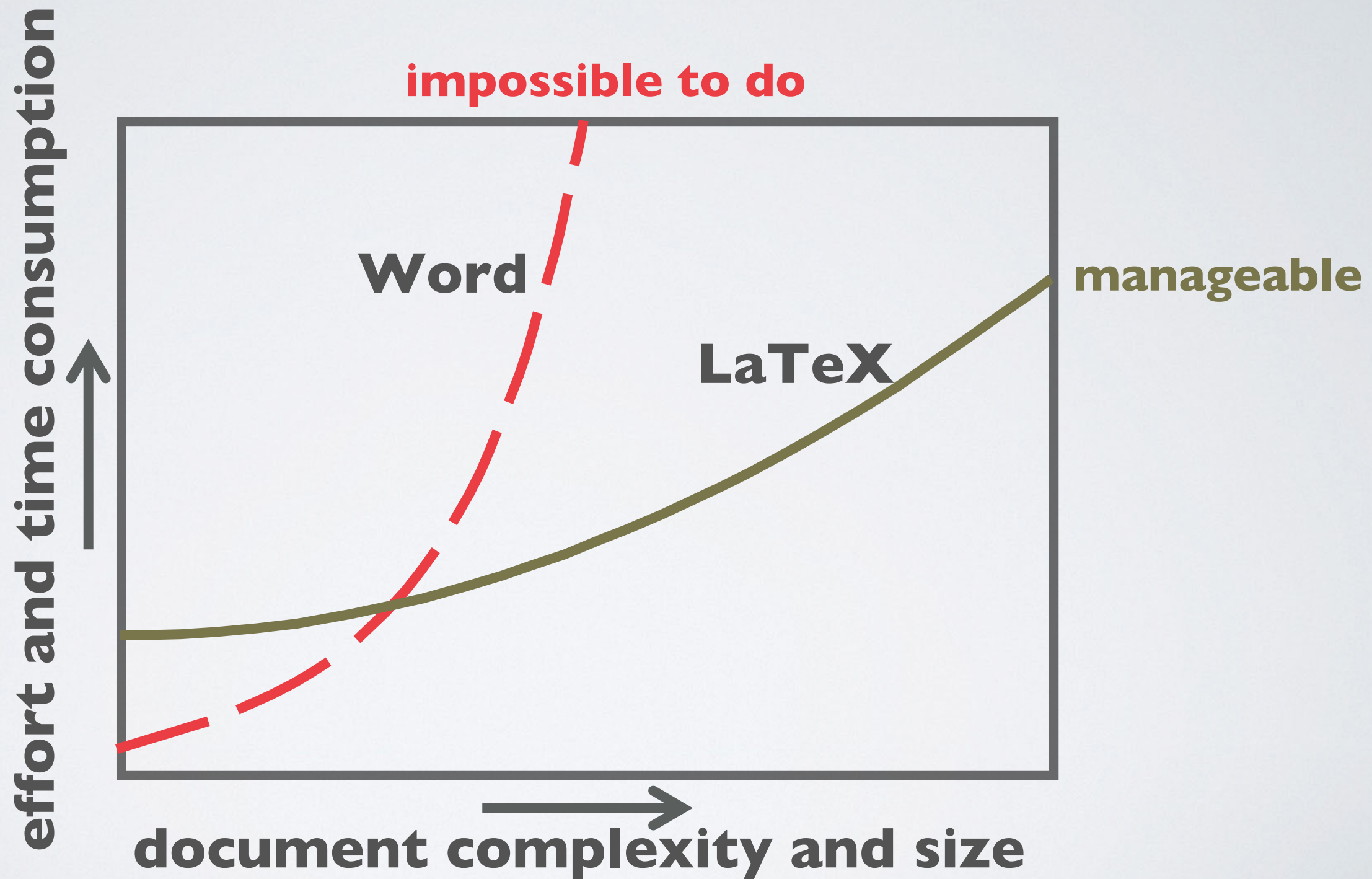
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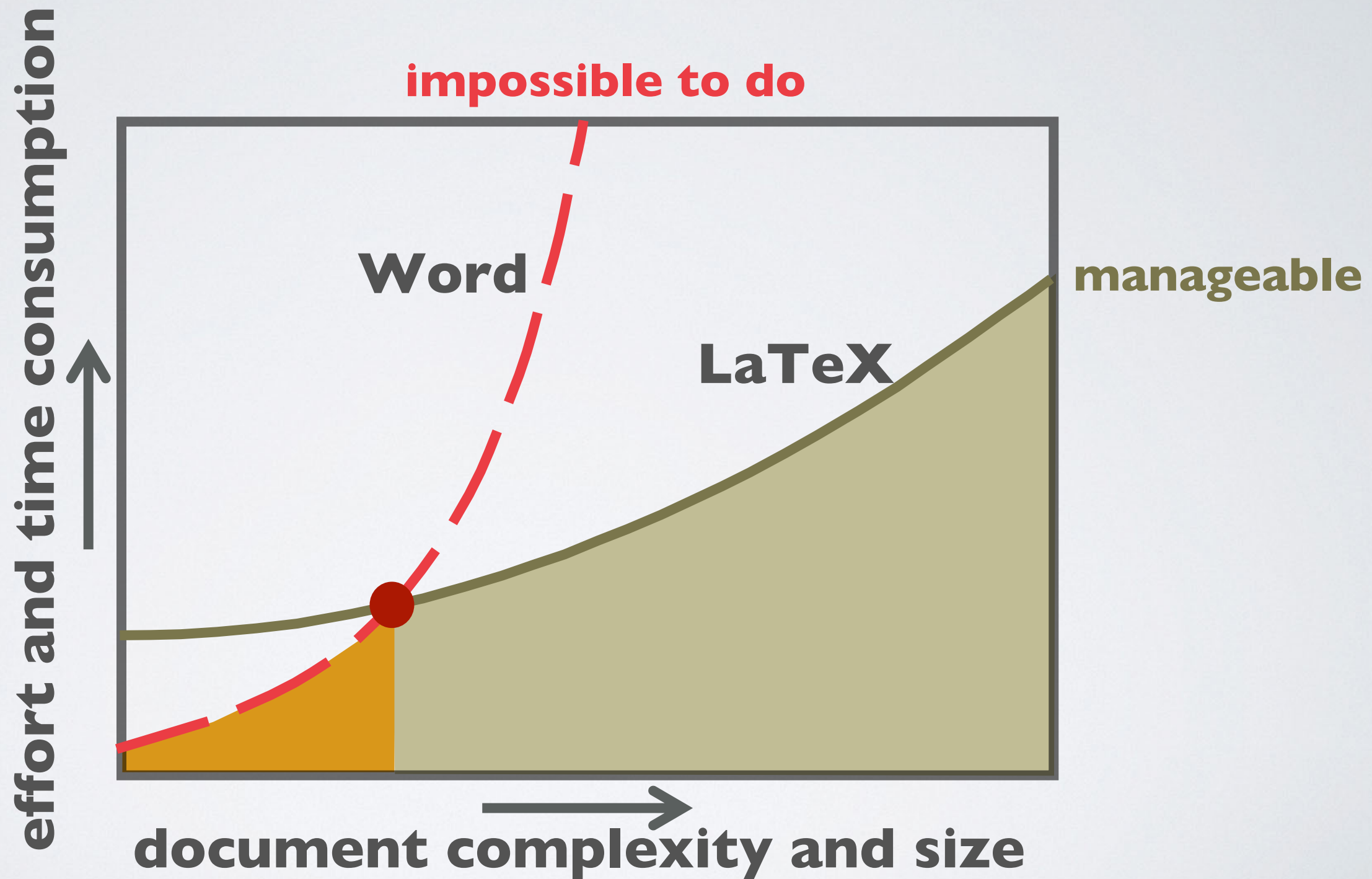
Using Word vs. LaTeX



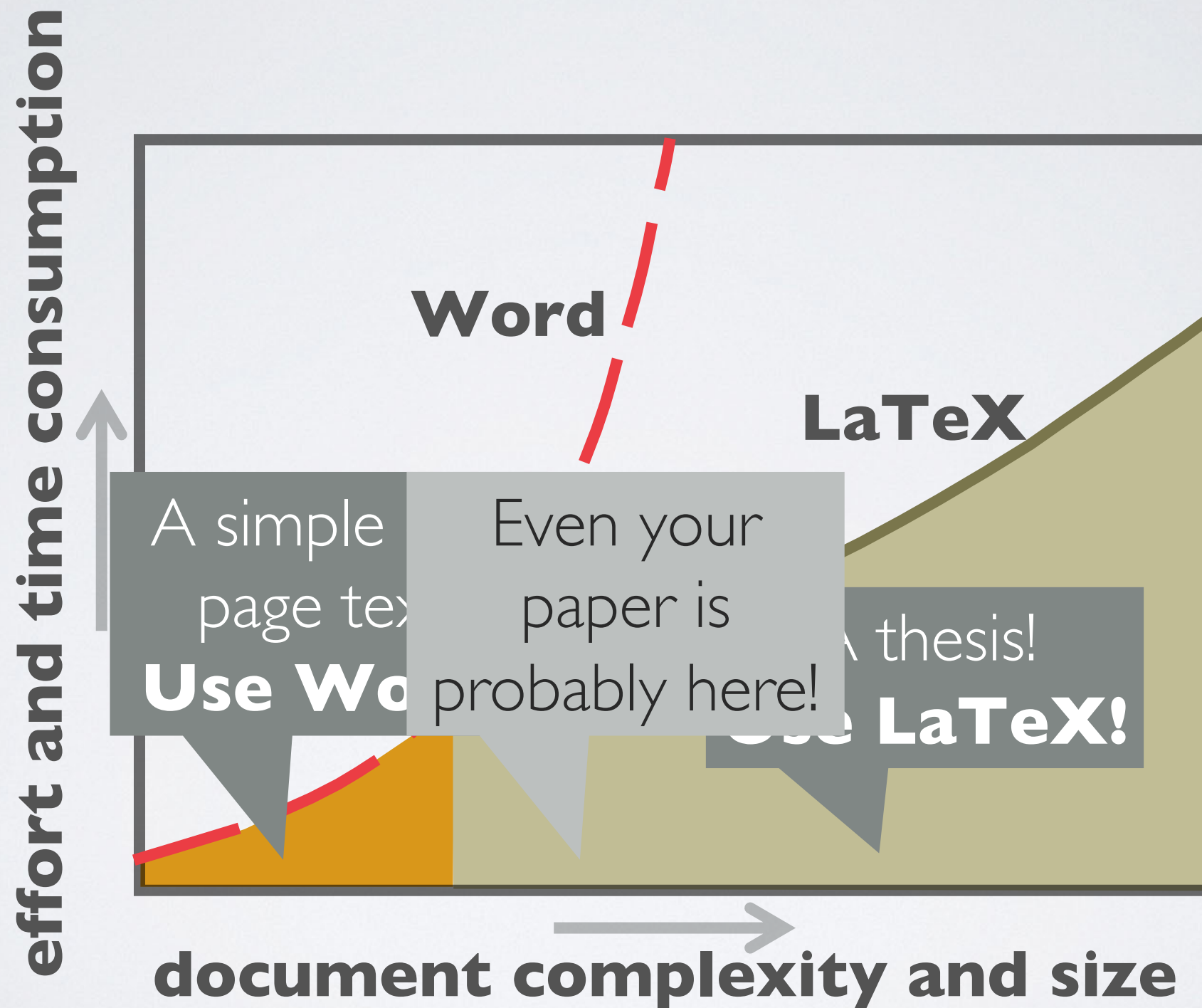
Which one to use?



Use the right tool for the right job!



Use the right tool for the right job!





Remember to use the right
tool for the right job!

Workflow Complexity

- Chapters, sections, subsections, ...

- and Appendixes and Annexes

- and Figures... many figures!

- and Tables

- and Lists, of Figures, of Tables, of Equations...

- and Cross References to chapters, sections, tables...

- and Bibliography

- and Glossary, Abbreviations and Index

- and a Front-Cover, a Book-Spine, and sometimes a Back-Cover

- and regulations on Fonts, Margins, Line Spacing, ...

- and Collaboration with the adviser(s) and Versioning

Focus on the **Text Structure**

and not on **How it Looks!**

Document
complexity

Publishing

Workflow

Visual vs. Structure

- **Word:**

*let's make a **bulleted list***

Visual vs. Structure

- **Word:**

*let's make a **bulleted list***

- **LaTeX:**

*let's make an **unordered list***

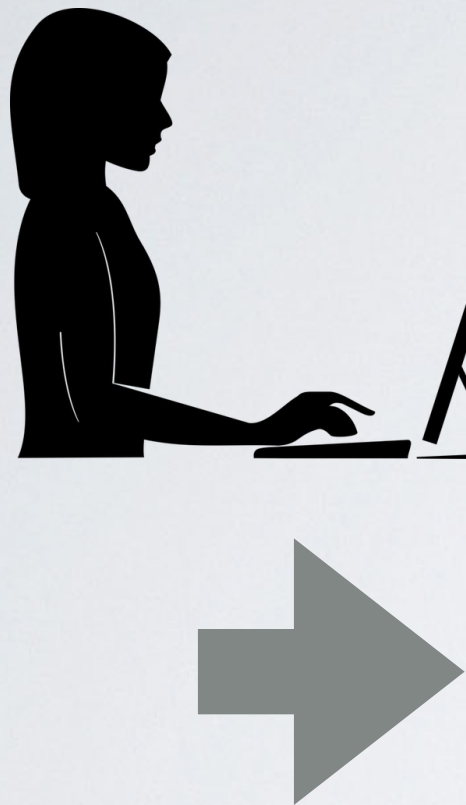
**How do I write
a document
with LaTeX?**



LaTeX Workflow



LaTeX Workflow



Help Projects cloud.sagemath ... x SMC User Statis... x PRIMES -- book x wstein@gmail.com websocket 106ms

Files Recent + New Log rh.tex

Save Forward Inverse Preview Issues PDF Build book/rh.tex

```
387 % This is from http://en.wikipedia.org/wiki/File:Frans_Hals_-_
388 _Portret_van_Ren%C3%A9_Descartes.jpg
389 % There is a higher resolution scan available there
390
391
392 \ill{dulcineal}{.2}{Don Quixote and ``his'' Dulcinea del Toboso}
393
394 Numbers are obstreperous things. Don Quixote encountered this when he
395 requested that the ``bachelor'' compose a poem to his lady Dulcinea del
396 Toboso, the first letters of each line spelling out her name. The
397 ``bachelor'' found
398
399
400
401
402 \begin{quote}
403 ``a great difficulty in their composition because the number of
404 letters in her name was $17$, and if he made four Castilian stanzas
405 of four octosyllabic lines each, there would be one letter too many,
406 and if he made the stanzas of five octosyllabic lines each, the ones
407 called {\em d{\e}cimas} or {\em redondillas,} there would be three
408 letters too few...'' \bibnote{See Chapter IV of the Second Part of the
409 Ingenius Gentleman Don Quixote of La Mancha.}
410 \end{quote}
411
412 ``It must fit in, however, you do it,'' pleaded Quixote, not willing to
413 grant the imperviousness of the number $17$ to division.
414
415 % http://www.jus.uio.no/sisu/don_quixote.miguel_de_cervantes/60.html#2068
416
417
418
419 {\em Seventeen} is indeed a prime number: there is no way of factoring
420 it as the product of smaller numbers, and this accounts---people tell
421 us---for its occurrence in some phenomena of nature, as when
422 the $17$-year cicadas all emerged to celebrate a ``reunion'' of some
423 sort in our fields and valleys.
424
425 \ill{cicada}{.3}{Cicadas emerge every 17 years}
```

10 CHAPTER 1. THOUGHTS ABOUT NUMBERS



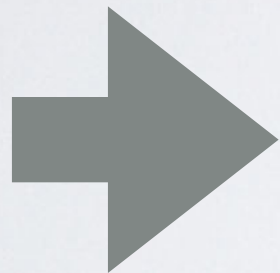
Figure 1.2: Don Quixote and “his” Dulcinea del Toboso

Numbers are obstreperous things. Don Quixote encountered this when he requested that the “bachelor” compose a poem to his lady Dulcinea del Toboso, the first letters of each line spelling out her name. The “bachelor” found

“a great difficulty in their composition because the number of letters in her name was 17, and if he made four Castilian stanzas of four octosyllabic lines each, there would be one letter too many, and if he made the stanzas of five octosyllabic lines each, the ones called *décimas* or *redondillas*, there would be three letters too few...” [5]

“It must fit in, however, you do it,” pleaded Quixote, not willing to grant the

LaTeX Workflow



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Save Forward Inverse Preview Issues PDF Build book/rh/rh.tex

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LaTeX Workflow



**Can you show
me an example?**



Creating the first document

```
\documentclass{article}
```

```
\begin{document}
```

Typeset your document here!!

Just use anything you have
learned up to now!

```
\end{document}
```

Creating the first document

```
\documentclass{article}
```

```
\begin{document}
```

Typeset your document here!!

Just use anything you have
learned up to now!

```
\end{document}
```


Creating the first document

`\doc` Typeset your document here!! Just use
`\beg` anything you have learned up to now!

Typeset your document here!!

Just use anything you have
learned up to now!

`\end{document}`

A more Complex Example

```
\documentclass[a4paper,12pt]{article}
\usepackage{graphicx}
\begin{document}
```

This is a simple

```
\includegraphics[width=.2\textwidth]{earth.png}
\document\footnote{This is a
```

This is a new paragraph. %title

```
\end{document}
```



This is a simple document¹.

This is a new paragraph.

¹This is a simple footnote.

A more Complex Example

```
\documentclass[a4paper,12pt]{article}
\usepackage{graphicx}
\begin{document}
This is a simple
\includegraphics[width=.2\textwidth]{earth.png}
document\footnote{This is a
% This is a simple footnote.
This is a new paragraph. % This is a new paragraph.
\end{document}
```

This is a simple  document¹.
This is a new paragraph.

¹This is a simple footnote.

Text Elements: Sections

- **New sections are marked with the commands `\section{...}`, `\subsection{...}`, `\subsubsection{...}`**

```
\section{The first section}
More text.
\subsection{A subsection}
Even more text.
\section{The second section}
And even more text.
```

1 The first section

More text.

1.1 A subsection

Even more text.

2 The second section

And even more text.

Text Elements: Lists

- ***Unordered* lists are defined with the environment *itemize***

This is an enumerated list with only two items.

```
\begin{itemize}  
  \item the first item;  
  \item the second item.  
\end{itemize}
```

This is a bulleted list with only two items.

- the first item;
- the second item.

Text Elements: Lists

- ***Enumerated* lists are defined with the environment *enumerate***

This is an enumerated list with only two items.

```
\begin{itemize}
  \item the first item;
  \item the second item.
\end{itemize}
```

This is a bulleted list with only two items.

- the first item;
- the second item.

This is an enumerated list with only two items.

```
\begin{enumerate}
  \item the first item;
  \item the second item.
\end{enumerate}
```

This is an enumerated list with only two items.

1. the first item;
2. the second item.

Text Elements: Complex Lists

- **Lists may be nested**

This is complex list with many items.

```
\begin{itemize}
```

```
\item item 1
```

```
\begin{enumerate}
```

```
\item the first sub-item;
```

```
\item the second sub-item;
```

```
\begin{enumerate}
```

```
\item the first sub-sub-item;
```

```
\item the second sub-sub-item;
```

```
\end{enumerate}
```

```
\end{enumerate}
```

```
\item item 2
```

```
\item item 3
```

```
\end{itemize}
```

This is complex list with many items.

- item 1

1. the first sub-item;

2. the second sub-item;

- (a) the first sub-sub-item;

- (b) the second sub-sub-item;

- item 2

- item 3

Maths

- **Yet another nice formula**

The following formula

`\[ x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} \]`
also looks very nice.

The following formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

also looks very nice.

Maths

- **Equations**

```
\begin{equation}  
  \label{eq:int_sin_x}  
  \int_0^{\pi} \sin x \, dx = 2  
\end{equation}
```

(1)

$$\int_0^{\pi} \sin x \, dx = 2$$

Referencing

- Referencing with `\ref{...}` and `\pageref{...}`

see equation~(`\ref{eq:int_sin_x}`) on
page~`\pageref{eq:int_sin_x}`.

see equation (1) on page 15

Floating Elements: Figures

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.



Figure 1: This is our earth.

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Lorem ipsum ...

```
\begin{figure}[htbp]
  \centering
  \includegraphics[width=.3\textwidth]{earth.jpg}
  \caption{This is our earth.}
  \label{fig:earth}
\end{figure}
```

Lorem ipsum ...

Floating Elements: Figures

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\end{figure}
```

Lorem ipsum ...

Floating Elements: Figures

here
top
bottom
page (by itself)

Lorem ipsum ...

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Lorem ipsum ...

Floating Elements: Figures

Lorem ipsum ...

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```
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Floating Elements: Figures

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Floating Elements: Figures

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Lorem ipsum ...

Floating Elements: Figures

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Lorem ipsum ...

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Lorem ipsum ...

Floating Elements: Figures

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Lorem ipsum ...

Floating Elements: Figures

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Lorem ipsum ...

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Lorem ipsum ...

Floating Elements: Figures

...see Figure~\ref{fig:earth}...

Lorem ipsum ...

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**How do I
customise my
LaTeX
document?**



Packages

- **Added in the *preamble* area**

```
\documentclass{article}  
% preamble area  
\begin{document}  
% document contents here  
\end{document}
```

- **Syntax:**

```
\usepackage[options]{package-name}
```

- **Some useful packages:**

- `\usepackage[utf8]{inputenc}`
- `\usepackage[T1]{fontenc}`
- `\usepackage{graphicx}`

Include to use the command
`\includegraphics{...}`

**What
about repetitive
work? Can LaTeX
make it easier for
me?**



Definition of Commands

- **LaTeX allows the user to define new commands**

```
\documentclass{article}  
% preamble area  
\begin{document}  
% document contents here  
\end{document}
```

- **Use new commands to configure the typesetting of complex elements used multiple times in the document**
- **Command are defined in the *preamble* area as well**

Definition of Commands

- **Let's assume we want to write**

With the default VAT is: € 200 + 23% VAT or € 250 + 23% VAT.
However, with a customized VAT is: € 100 + 6% VAT.

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```

```
\usepackage{eurosym}
```

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\begin{document}
```

With the default VAT is: \EUR 200 + 23\% VAT or \EUR 250 +

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\end{document}
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```
\newcommand{\m}[2]{\EUR #2 + #1\% VAT}
```

```
\begin{document}
```

With the default VAT is: $\m{23}{200}$ or $\m{23}{250}$.

However, with a customized VAT is: $\m{6}{100}$.

```
\end{document}
```


Definition of Commands

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```
\documentclass{article}
\usepackage{eurosym}
\newcommand{\m}[2]{\EUR #2 + #1\% VAT}
\begin{document}
```

With the default VAT is: `\m{23}{200}` or `\m{23}{250}`.

However, with a customized VAT is: `\m{6}{100}`.

```
\end{document}
```

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```
\documentclass{article}
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\newcommand{\m}[2][23]{\EUR #2 + #1\% VAT}
\begin{document}
```

default value for first argument

With the default VAT is: `\m{200}` or `\m{250}`.

However, with a customized VAT is: `\m[6]{100}`.

```
\end{document}
```


Definition of Commands

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```
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```
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```

```
\newcommand{\m}[2][23]{\EUR #2 + #1\% VAT}
```

```
\begin{document}
```

With the default VAT is: $\m{200}$ or $\m{250}$.

However, with a customized VAT is: $\m[6]{100}$.

```
\end{document}
```

missing... use default value

Definition of Commands

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\usepackage{eurosym}
```

```
\newcommand{\m}[2][23]{\EUR #2 + #1\% VAT}
```

```
\begin{document}
```

With the default VAT is: $\m{200}$ or $\m{250}$

present... use given value

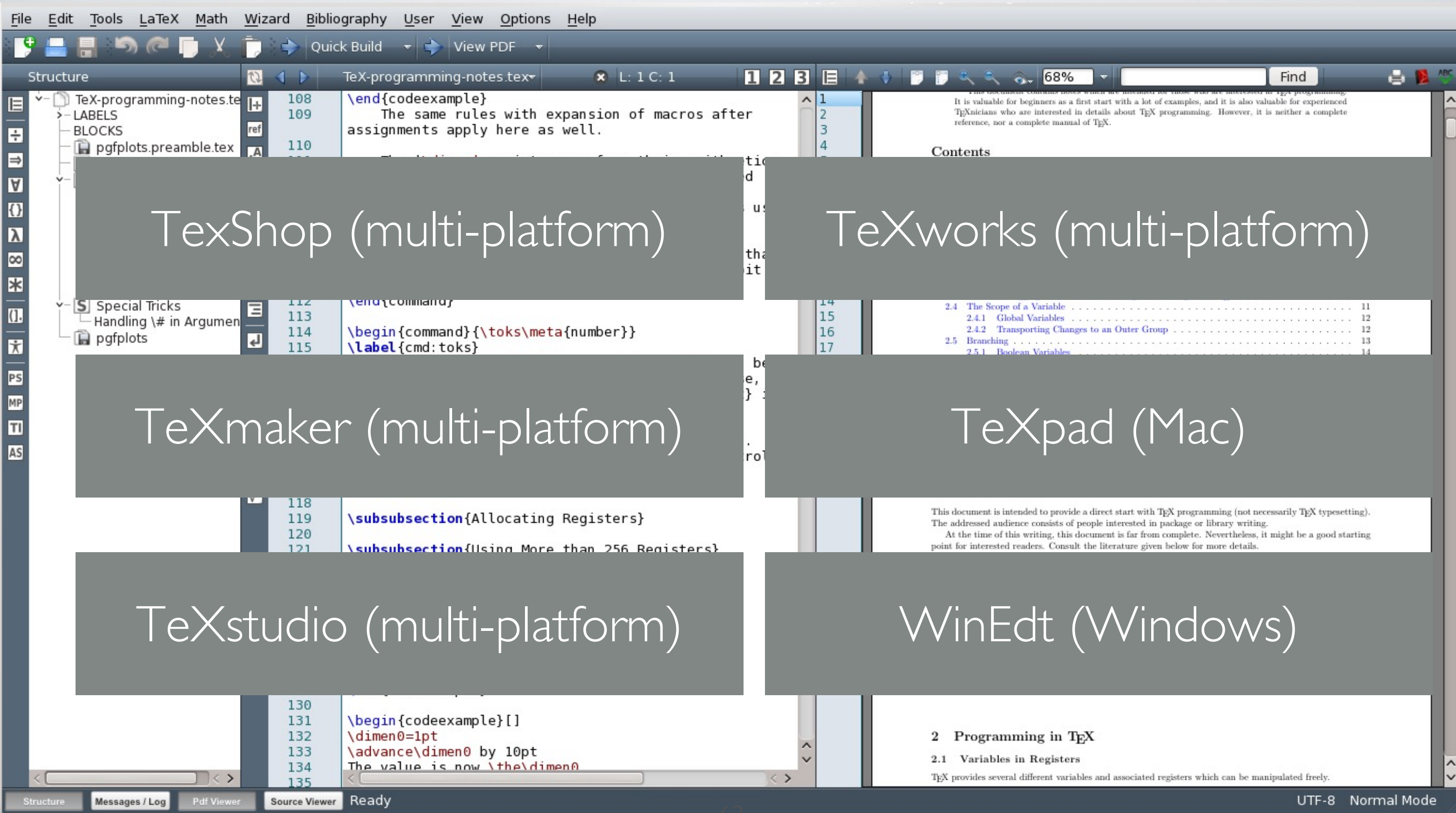
However, with a customized VAT is: $\m[6]{100}$.

```
\end{document}
```


**I am definitely
convinced!
Where can I get
help?**

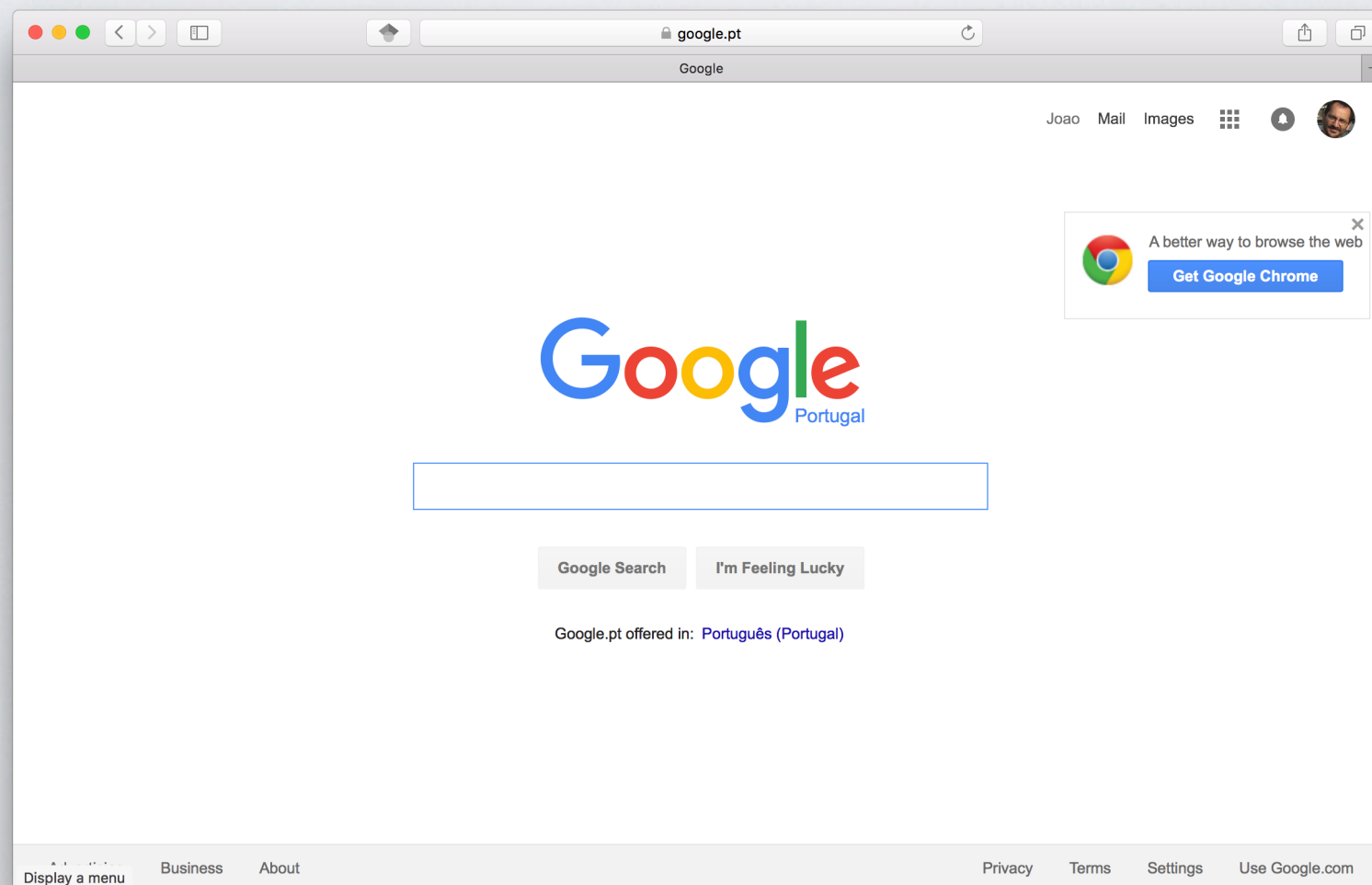


LaTeX Editors



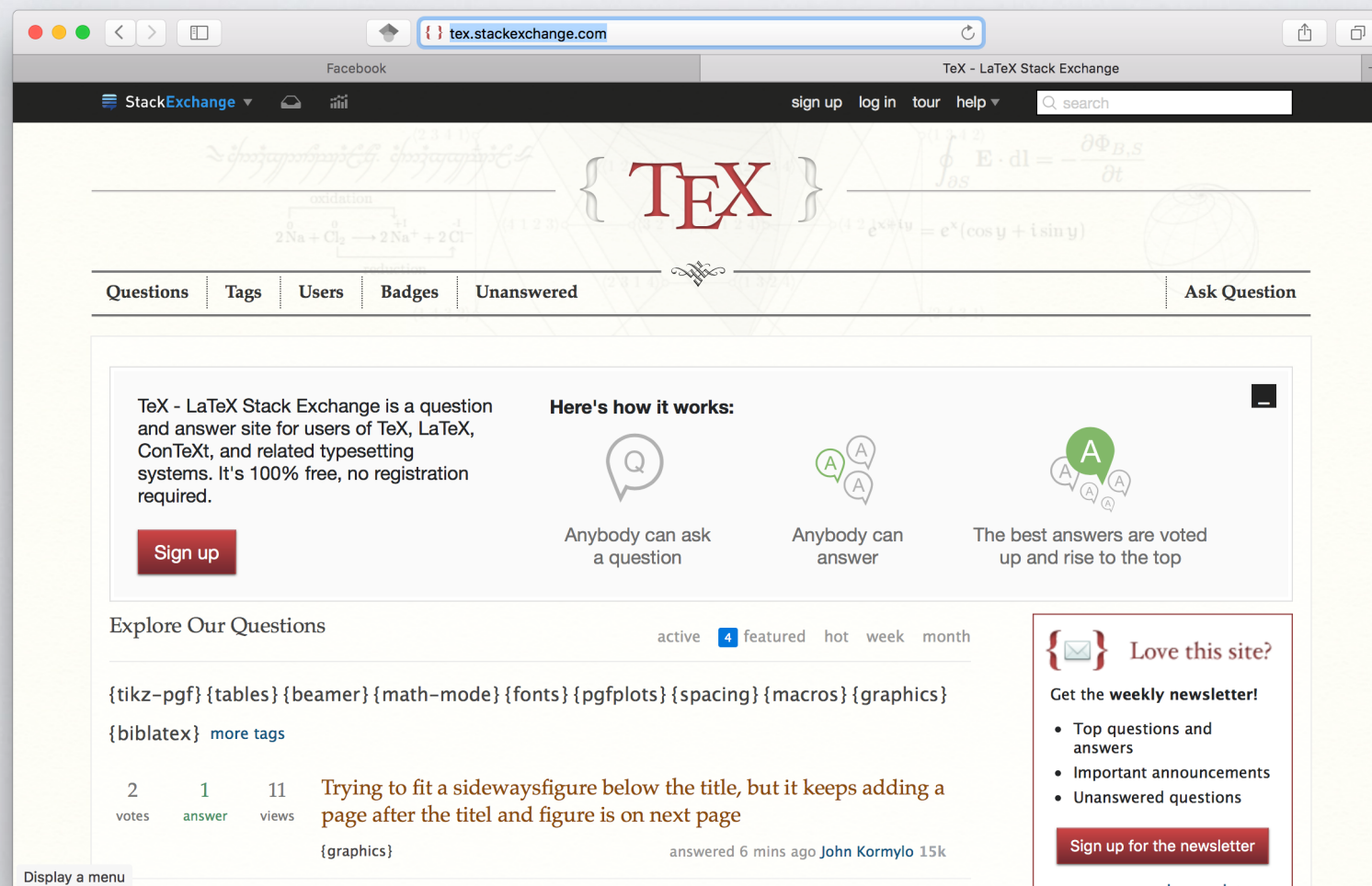
LaTeX Resources

- **Google** (<https://www.google.com>)



LaTeX Resources

- **TeX - LaTeX Stack Exchange**
(<http://tex.stackexchange.com>)



LaTeX Online

- Overleaf (www.overleaf.com)

write^LA^TE^X

PROJECT

VERSIONS

SHARE

PDF

PUBLISH

Upload files

More

files

Compare_S.pdf

Compare_pulse.pdf

Courant_2.pdf

FigureLP_ancien_mod.pdf

IEEEabrv.bib

IEEEtran.bst

IEEEtran.cls

biblio_traps_dynamics.bib

main.tex

Download as zip

Save to Dropbox

Source

Rich Text

find

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B

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TT

Π

Modeling of Trap Induced Dispersion of Large Signal Dynamic Characteristics of GaN HEMTs

O. Jardel¹, S. Laurent², T. Reveyrand², R. Quere², P. Nakkala², A. Martin², S. Piotrowicz¹, M. Campovecchio², S.L. Delage¹

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²XLIM, 7 rue Jules Valles, 19100 Brive-la-gaillarde, France
olivier.jardel@3-5lab.fr

Abstract—We propose here a non-linear GaN HEMT model for CAD including a trapping effects description consistent with both small-signal and large-signal operating modes. It takes into account the dynamics of the traps and then allows to accurately model the modulated large signal characteristics that are encountered in telecommunication and radar signals. This model is elaborated through low-frequency S-parameter measurements complementary to more classical pulsed-IV characterizations. A 8x75 μ m AlInN/GaN HEMT model was designed and particularly validated in large-signal pulsed RF operation. It is also shown that thermal and trapping effects have opposite effects on the output conductance, thus opening the way for separate characterizations of the two effects.

Index Terms—Trappings effects, thermal effects, low frequency S-parameters, CAD non-linear model, RF pulsed operation.

Preview

Manual

Auto

warning

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Index Terms—Trappings effects, thermal effects, low frequency S-parameters, CAD non-linear model, RF pulsed operation.

I. INTRODUCTION

Gallium Nitride (GaN) High Electron Mobility Transistors (HEMT) on SiC are now recognized as good candidates for the development of a number of RF applications and notably Power Amplifiers (PA) for telecommunications and radars, due to their high breakdown voltage, their high cut-off frequency as well as their high temperature capabilities. However they are still subject to parasitics effects such as thermal effects and especially trapping effects. Those trapping effects have been extensively studied using a number of techniques such as pulsed measurements, load-pull measurements as well as frequency dispersion measurements. At the same time, models have been proposed that take those effects into account [1], [2], [3], and while the effects of traps are well taken into account in CW conditions, their impacts on dynamic large signal characteristics remains difficult to understand. They manifest themselves under modulated signals such as RF pulses or telecommunication signals. Memory effects are the main consequence of those trapping effects. In this paper we propose to investigate the dynamics of those trapping effects using large signal pulsed load-pull measurements as well as low frequency dispersion measurements. It will be shown that a consistent nonlinear model can be obtained that allows to describe the full dynamic behavior of GaN transistors. The paper is organized as follows: Section II describes the theoretical impact of traps on the average current obtained under pulsed load pull conditions. Section III presents the measurements performed on an AlInN/GaN 8x75 μ m HEMT and the results obtained using a large signal nonlinear electrothermal model taking into

account the dynamics of the traps. Finally we conclude and draw some perspectives.

II. IMPACT OF TRAPS ON LARGE SIGNAL CHARACTERISTICS

One convenient way to identify the impact of trapping effects is to monitor the average drain current of the transistor versus an increasing RF input power. It has already been reported in [1] and [3] that this drain current under class-AB conditions decreases as the input power increases, contradicting the expected characteristics. Clearly this behavior cannot be explained by thermal behavior as far as the channel temperature sinks when the power increases and would leads, at least for moderate powers, to an average drain current enlargement.

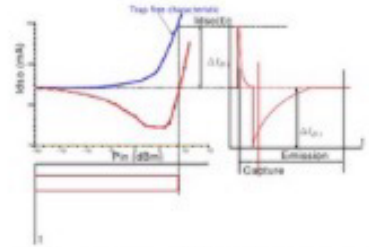


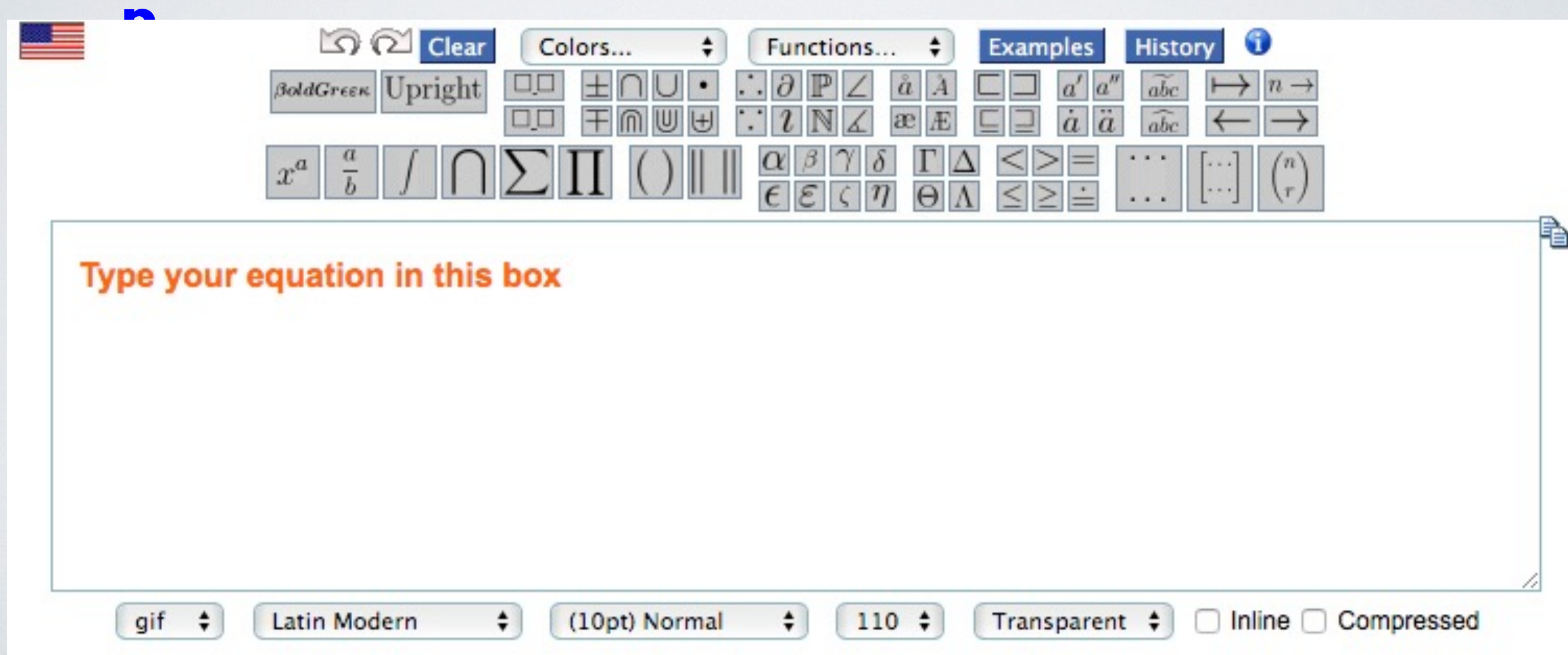
Fig. 1. Representation of the mechanism induced by traps on the average drain current.

Pulsed RF measurements were performed under DC bias on AlGaN/GaN and AlInN/GaN HEMTs of 8x75 μ m² for a large number of output loads. For all devices, we obtain the same shape of the average drain current which is schematized in Figure 1. The average current decrease is due to the trap capture, which increases alike to the gate and drain voltage excursions versus the input power for a CW measurement. Indeed, the number of ionized traps is roughly proportional to the maximum value of the drain-source voltage, because of the asymmetry of the capture and emission time constants

Ask a question

LaTeX Equation Editor

- <https://www.codecogs.com/latex/eqneditor.php>



The screenshot shows the LaTeX Equation Editor interface. At the top left is a small American flag icon. The main toolbar includes buttons for 'Clear', 'Colors...', 'Functions...', 'Examples', and 'History'. Below these are two rows of mathematical symbols and functions, including Greek letters, operators, and set notation. A large text box in the center is labeled 'Type your equation in this box'. At the bottom, there are settings for file format (gif), font (Latin Modern), size (10pt), style (Normal), and other options like 'Inline' and 'Compressed'.

Clear Colors... Functions... Examples History

β α γ δ ϵ ζ η θ λ μ ν ξ $\omicron$ π ρ σ τ υ ϕ χ ψ ω Γ Δ ∇ $\propto$ ∞ $\int$ $\sum$ $\prod$ $\bigcap$ $\bigcup$ $\pm$ $\mp$ $\neq$ $\approx$ $\cong$ $\subseteq$ $\supseteq$ $\equiv$ $\leq$ $\geq$ $\lt$ $\gt$ $=$ $\dots$ $\left[\dots \right]$ $\left(\dots \right)$ $\frac{a}{b}$ x^a $\int$ $\cap$ $\sum$ Π $()$ $|||$ α β γ δ Γ Δ $<$ $>$ $=$ $\dots$ $[\dots]$ $\left(\begin{matrix} n \\ r \end{matrix} \right)$

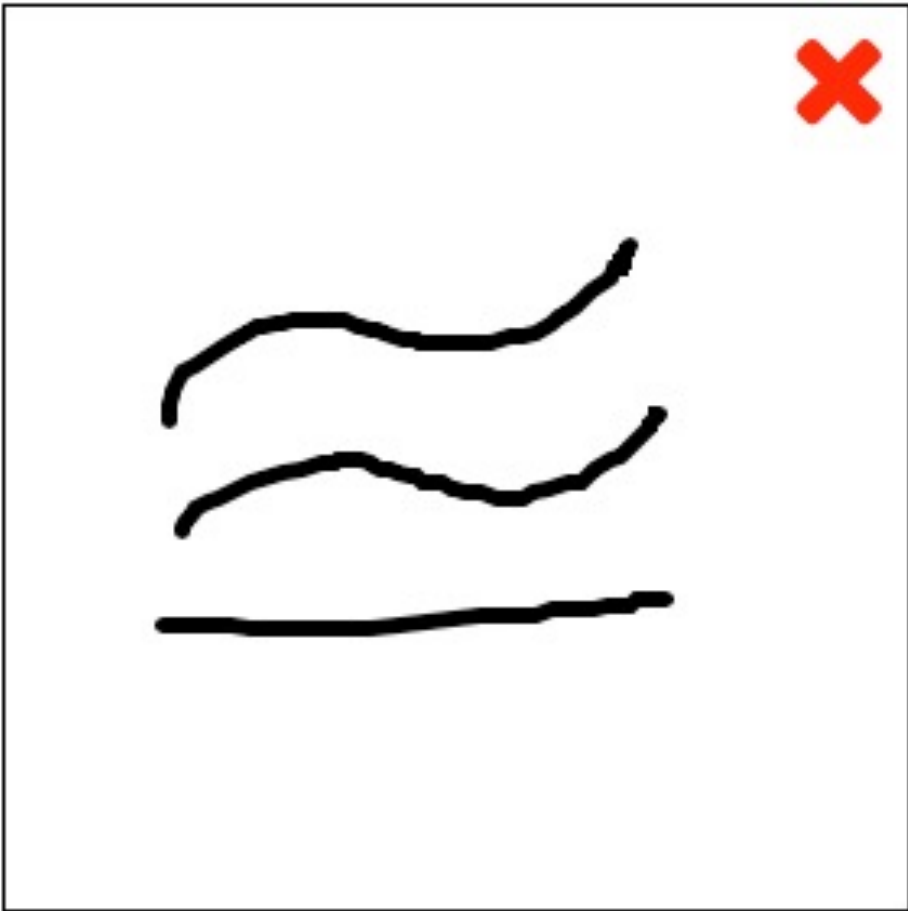
Type your equation in this box

gif Latin Modern (10pt) Normal 110 Transparent ☐ Inline ☐ Compressed

Math Symbols

- DeTexify (<http://detexify.kirelabs.org/classify.html>)

Detexify classify symbols





Score: 0.11054320854895153
`\cong`
mathmode



Score: 0.12059828835874106
`\usepackage{ amssymb }`
`\approxeq`
mathmode



Score: 0.1365602478467491
`\usepackage{ wasysym }`
`\aquarius`
textmode & mathmode

Tables (online)

- <http://www.tablesgenerator.com/>

The screenshot displays the online table generator interface. At the top, there is a toolbar with icons for table structure (rows, columns, merge, split), text formatting (bold, italic, underline), background color, and a style dropdown menu set to "Booktabs table style".

Below the toolbar, a table is shown with the following data:

	A	B	C	D	E
1	Number	Who	Age range		Location
2	1	A Mature Person	65	99	Lisbon
3	2	A Small Baby	1	3	Aveiro
4	3	A Teenager	12	18	Santiago do Cacém
5	4	An adult	18	65	Almada

Below the table, there is a "Generate" button. Underneath, the "Result" section shows the LaTeX code generated for the table, which includes package declarations, table structure commands, and the data rows with color specifications.

```
1 % Please add the following required packages to your document preamble:
2 % \usepackage{booktabs}
3 % \usepackage[table,xcdraw]{xcolor}
4 % If you use beamer only pass "xcolor=table" option, i.e. \documentclass[xcolor=table]{beamer}
5 \begin{table}[]
6 \centering
7 \caption{My caption}
8 \label{my-label}
9 \begin{tabular}{@{}clrrl@{}}
10 \toprule
11 \rowcolor[HTML]{3166FF}
12 {\color[HTML]{FFFFFF} Number} & \multicolumn{1}{c}{\cellcolor[HTML]{3166FF}{\color[HTML]{FFFFFF} Who}} & \multicolumn{2}{c}{\cellcolor[HTML]{3166FF}{\color[HTML]{FFFFFF} Age range}} & \multicolumn{1}{c}{\cellcolor[HTML]{3166FF}{\color[HTML]{FFFFFF} Location}} \\
13 1 & A Mature Person & 65 & 99 & Lisbon \\
14 2 & A Small Baby & 1 & 3 & Aveiro \\
15 3 & A Teenager & 12 & 18 & Santiago do Cacém \\
\end{tabular}
\end{table}
```


Tables (offline)

- ctan.org/tex-archive/support/excel2latex

Excel

Item		
Animal	Description	Price (\$)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.5
Emu	stuffed	33.33
Armadillo	frozen	8.99

Excel2LaTeX

Item		
Animal	Description	Price (\$)
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	each	0.01
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Formatting	Currency	Percent	x	x^2
Bold	\$ 3.24	40%	1.00	1.00
	\$ 9.10	30%	1.50	2.25
<i>Italic</i>	\$ (8.20)	-5%	2.00	4.00
Both	\$ 3.00	100%	3.00	9.00

Formatting	Currency	Percent	x	x^2
Bold	\$ 3.24	40%	1.00	1.00
	\$ 9.10	30%	1.50	2.25
<i>Italic</i>	\$ (8.20)	-5%	2.00	4.00
Both	\$ 3.00	100%	3.00	9.00

1.0	2.0	3.0
4.0	5.0	6.0
7.0	8.0	9.0

a	b	c
1.0	2.0	3.0
4.0	5.0	6.0
7.0	8.0	9.0

**How do I
install LaTeX
on my
computer?**



Installing LaTeX

- **Windows: MikTeX TeX Live**
 - <http://miktex.org>
 - <https://www.tug.org/texlive/>
- **Mac: MacTeX** (customised from TeX Live)
 - <https://tug.org/mactex/>
- **Linux: TeX Live**
 - <https://www.tug.org/texlive/>



That's all Folks!

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International)***

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