Writing a Scientific Research Paper using LaTeX
Part 1

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What is LaTeX?

- LaTeX is a word processor, especially designed for handling mathematical symbols or other symbols.
- LaTeX is **not** WYSIWYG like Microsoft Words, LibreOffice Writter or Apple Pages.
- LaTeX is more like a markup language like HTML.

What is LaTeX?

- LaTeX is programmable which output a text file.
- LaTeX will give the same output regardless of the operating system.
- LaTeX is free and open-source.

Microsoft Word 2008

Call me Ishmael. Some years ago – never mind how long precisely – having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen, and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off – then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it, almost all men in their degree, some time or other, cherish very nearly the same feelings towards the ocean with me.

Adobe InDesign CS4

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pdf-LaTeX 3.1415926

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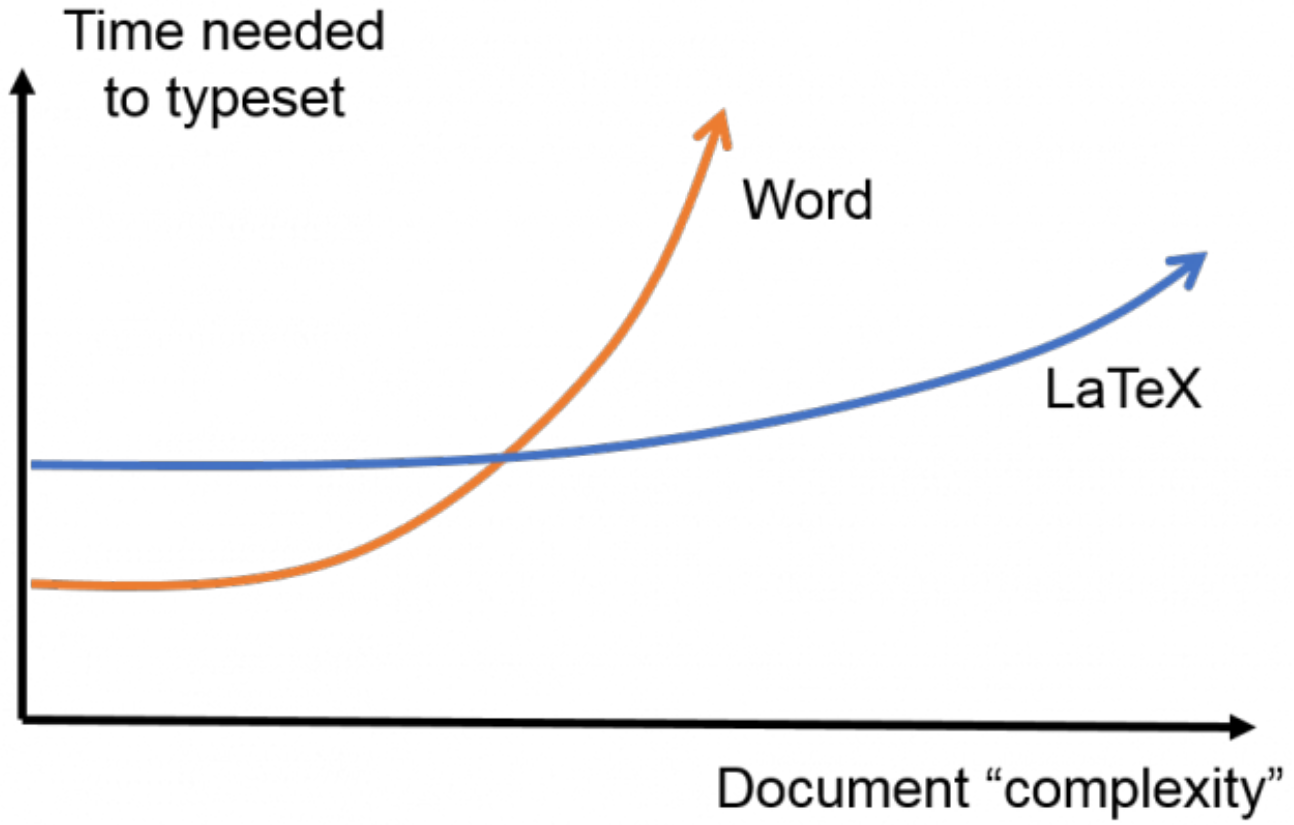
Efficiency of LaTeX

Hyphenation and inter-word spacing statistics

	Word	InDesign	pdf-LaTeX
Number of hyphenations	9	10	4
SD of IWS (pt)	2.26	1.94	1.42
Maximum IWS (pt)	14.4	13.2	9.0
Number of lines with IWS > 9 pt	5	2	0

SD: standard deviation; IWS: inter-word spacing

Efficiency of LaTeX

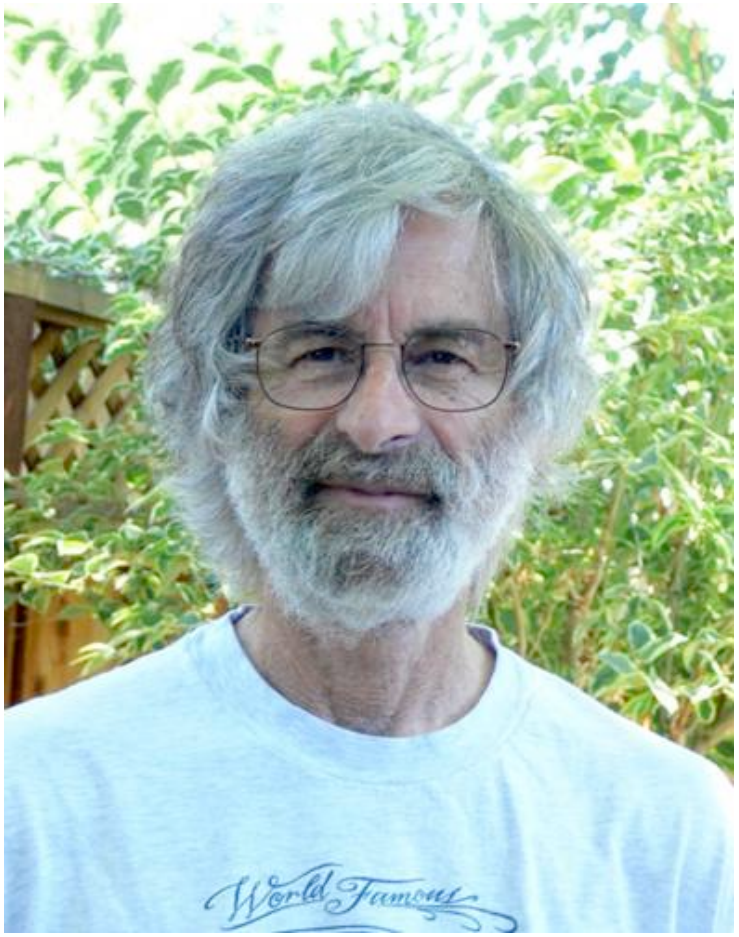


A Brief History of LaTeX

- TeX is a typesetting program designed by Dr. Donald Knuth and released in 1978.
- TeX has a lot of primitive commands, hence difficult to use.

A Brief History of LaTeX

- LaTeX was developed from TeX by Leslie Lamport.
- LaTeX is easier to use than TeX. LaTeX2e is the standard version.
- pdfLaTeX will output pdf file instead of dvi



TeX, LaTeX, XeLaTeX etc.

TeX

XeTeX

LaTeX

XeLaTeX

pdfLaTeX

LuaTeX

MikTeX

TeXShop

pdfTeX

LaTeX2e

TeXmaker

LuaLaTeX

XeTeX/XeLaTeX, LuaTeX, BibTeX etc.

- TeX and LaTeX do not support Unicode encoding i.e. does not support foreign languages.
- XeTeX / XeLaTeX and LuaTeX / LuaLaTeX are extensions of TeX / LaTeX to support Unicode.
- BibTeX is an add-on to LaTeX for references and bibliographies.

MikTeX, TeXShop, TeXmaker etc…

- Applications that runs TeX / LaTeX / XeTeX as an engine

TeXShop/**TeXShop**

Unofficial TeXShop source code repository. This repository is generated via scripts from the official source releases.

What LaTeX can do….

- Any forms of documents such as letters, articles, scientific articles, posters or pomphets
- Presentation slides
- Drawing or graphics
- Other output such as musical scores, calender, flow-chart map etc…

What LaTeX can do....

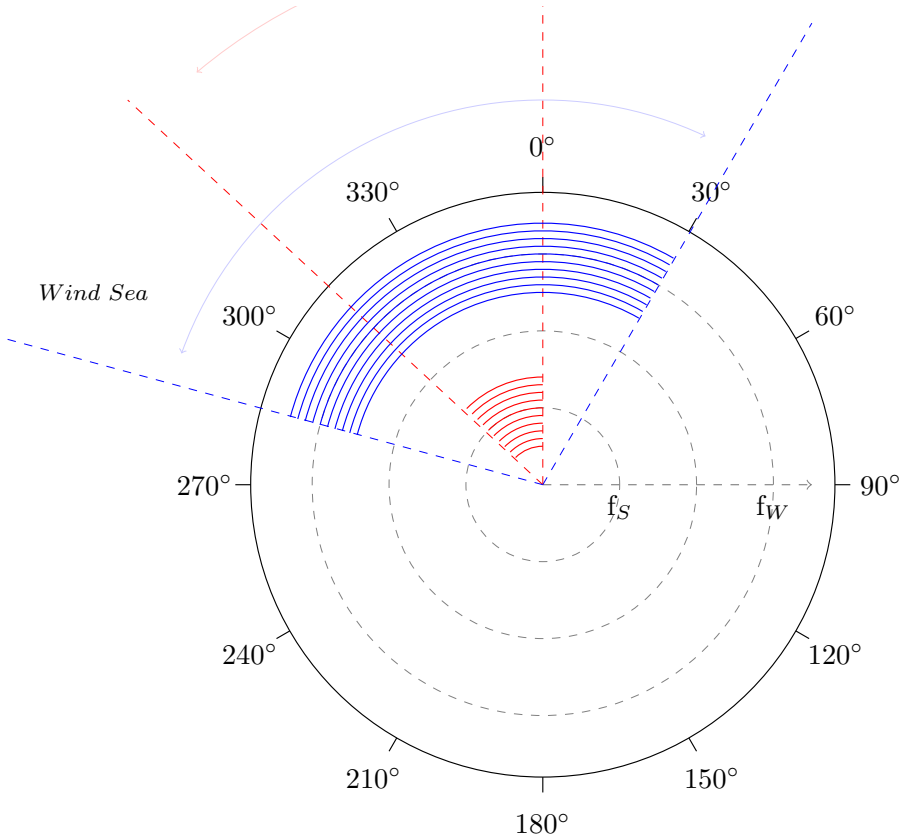
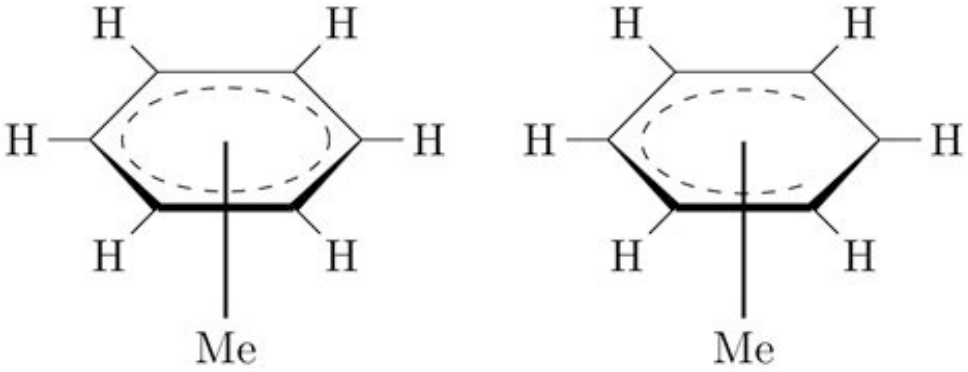
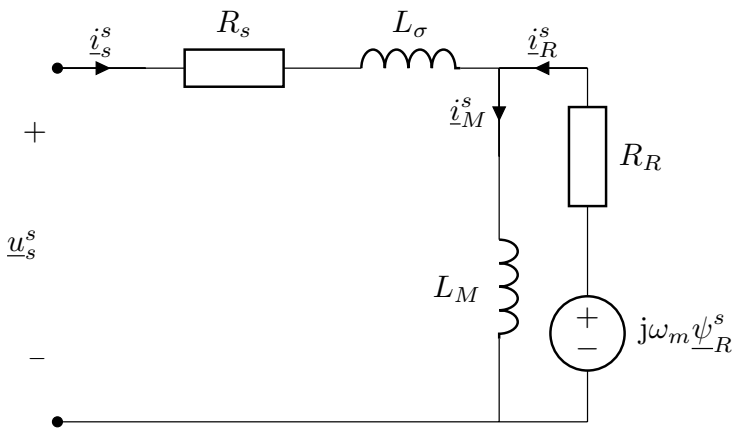


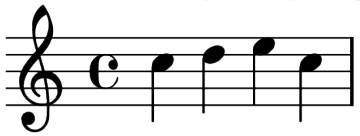
Figure 1: Idealised representation of directional spectrum (energy units omitted) for a typical north-westerly swell, mixed with presence wind sea . Typical case of Sub Developed Sea: Swell and Wind Sea occupy two different frequency bands (denoted separately with $f_S \approx 0.1$ Hz and $f_W \approx 0.3$Hz) but still a strong local wind sea is observable. It spans over a wider area, being under direct effect of wind and therefore not having had time yet to reach spectral maturation and fully develop. Conversely, swell sea (low frequencies), is the result of spectral disintegration being confined in its typical frequency domain: evidently it has travelled long distances away from where it was originated (fetch). Assume that energy is denser for swell band.

What LaTeX can do....



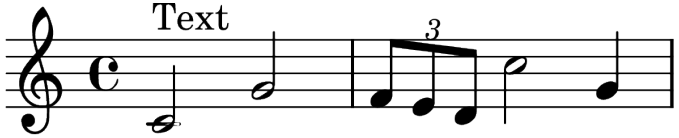


Test: integrating LaTeX and LilyPond.



Not too bad, isn't it?

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

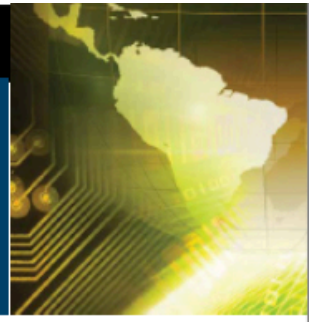


What LaTeX can do....

FEATURE STORY

Cyber Forensics in the Cloud

by Scott Zimmerman and Dominick Glavach



According to research from Gartner, cloud computing services revenue should total $68.3 billion for 2010, representing a 16.6% increase compared to 2009. The market is expected to explode to $148.8 billion in 2014. [1] This trend toward cloud computing is creating numerous challenges for cyber forensics professionals. In traditional models, an information assurance or digital forensics professional operates in a domain where system components are within physical reach and ownership boundaries are well defined. The forensic analyst works directly for an organization and has access to—if not directly administers—the organization's computing infrastructure. An organization's network infrastructure has uniform configurations and settings that they can collect, preserve, or analyze. For example, date stamps are consistently applied, and memory allocation and overwrite procedures are clearly and evenly executed. These consistent system configurations and behaviors (or breaches of anticipated behaviors) are an integral component of a forensic investigation. In a cloud model, consistently configured network infrastructure becomes less consistent. For example, because user systems and cloud systems can be separately administered, date stamp settings may differ from the user side and the provider side where the requested application lives in a cloud. How then can a digital forensics professional match up a user request to an actual use time?

This article addresses a variety of technical issues concerning cyber forensics in the cloud. But first, some definitions are in order.

Cloud Computing

Cloud computing is an emerging model that separates application and information resources from the underlying infrastructure, and the mechanisms used to deliver them. The National Institute of Standards and Technology (NIST) defines cloud computing as "... a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." [2] Cloud computing is not a new technology but a new way of providing computing resources and applications on demand. These resources are varied but generally fit into one of the three service delivery models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). The opportunities and challenges associated with each of these three is discussed later in this article.

Key Benefits of the Cloud and Associated Cyber Forensic Challenges

There are two key benefits of the cloud delivery model:

- **Cost savings**—Users pay only for the computing resources (i.e., applications, memory, etc.) as needed and on demand. This pay-as-you-need model is analogous to the consumption of electricity or water.
  - **Associated Cyber Forensic Challenge**—This elasticity poses a challenge to the forensics investigator due to resources such as disk space and memory allocated today that is gone and overwritten tomorrow.
- **Infrastructure independence**—Cloud services can be used without the need to know or understand how the underlying infrastructure operates or is physically located.
  - **Associated Cyber Forensic Challenge**—This lack of understanding makes it imperative that strong relationships and agreements are formed between your organization and the Cloud Service Provider (CSP).

LaTeX for scientific publication

Many publishers request authors to submit manuscripts in LaTeX due to many reasons.

- LaTeX papers generally look better than paper written in Microsoft Words especially with equations.

Word

Using Partially-Ordered Sequential Rules to Generate More Accurate Sequence Prediction

Philippe Fournier-Viger[1], Ted Gueniche[1] and Vincent S. Tseng[2]
[1]Dept. of Computer Science, University of Moncton, Canada
[2] Dept. of Computer Science and Inf.. Engineering, National Cheng Kung University, Taiwan
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Abstract. Predicting the next element(s) of a sequence is a research problem with wide applications such as stock market prediction, consumer product recommendation, and web link recommendation. To address this problem, an effective approach is to mine sequential rules from a set of training sequences to then use these rules to make predictions for new sequences. In this paper, we improve on this approach by proposing to use a new kind of sequential rules named "partially-ordered sequential rules" instead of standard sequential rules. Experiments on large click-stream datasets for webpage recommendation show that using this new type of sequential rules can greatly increase prediction accuracy, while requiring a smaller training set.

Keywords: symbolic sequence prediction, sequential rules, partial order

Latex

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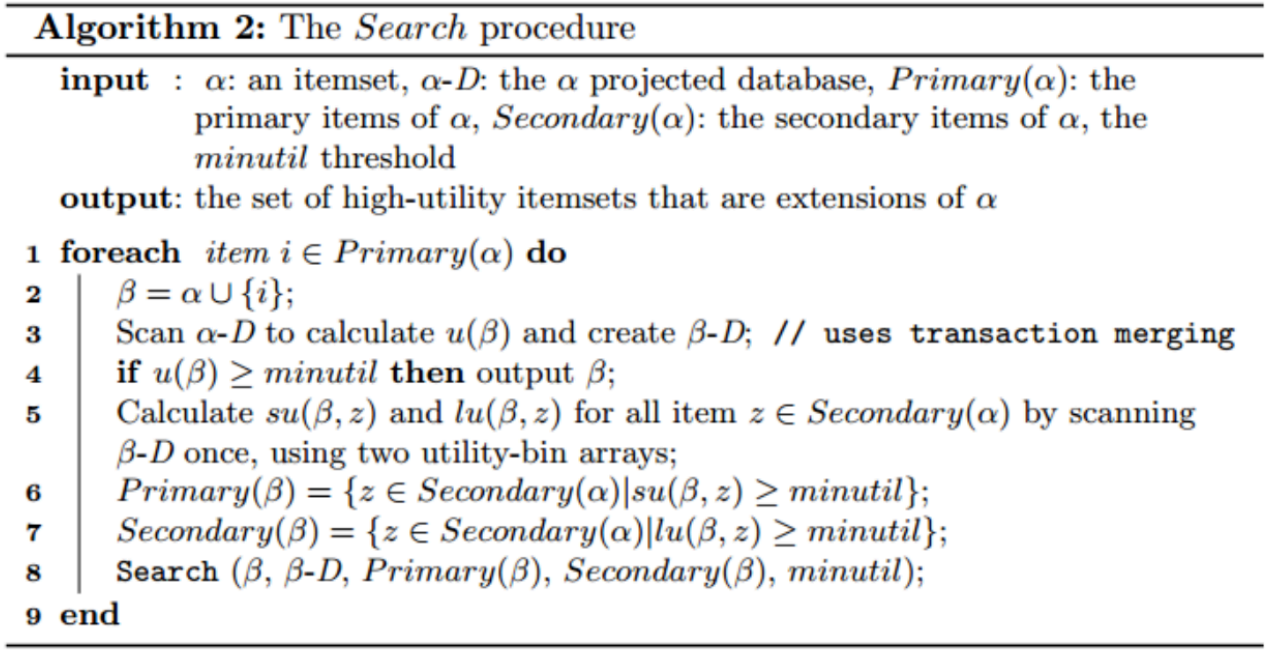
sequence (in any order). Formally, we say that a rule $I_a \Rightarrow I_b$ *occurs in a sequence* $s =$ $\langle I_1, I_2, \ldots I_n \rangle$ if and only if there exists an integer k such that $1 \leq k < n$, $I_a \subseteq \bigcup_{i=1}^{k} I_i$ and $I_b \subseteq \bigcup_{i=k+1}^{n} I_i$.

Latex

same sequence (in any order). Formally, we say that a rule $I_a \Rightarrow I_b$ occurs in a sequence $s = \langle I_1, I_2, \ldots I_n \rangle$ if and only if there exists an integer k such that $1 \leq k < n$, $I_a \subseteq \bigcup_{i=1}^{k} I_i$ and $I_b \subseteq \bigcup_{i=k+1}^{n} I_i$.

LaTeX for scientific publication

- LaTeX is free and is available to all platform.
- LaTeX source can be edited with any text-editors.
- LaTeX offers many packages for a specific propose.



Algorithm 2: The *Search* procedure

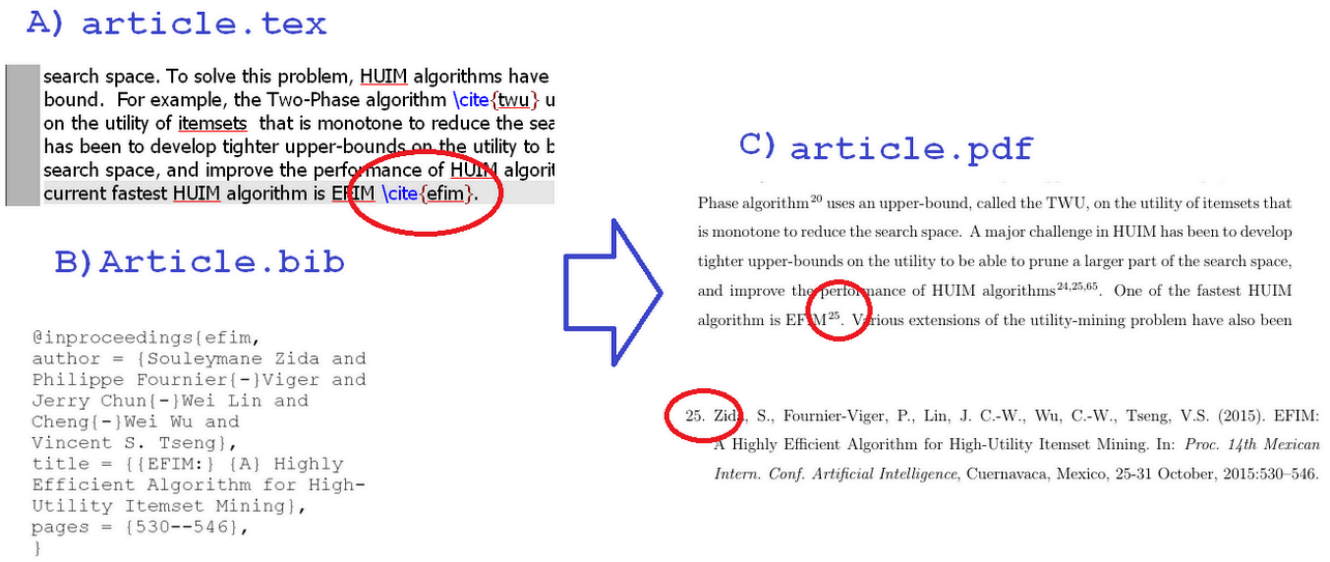
input : α: an itemset, α-D: the α projected database, $Primary(\alpha)$: the primary items of α, $Secondary(\alpha)$: the secondary items of α, the *minutil* threshold

output: the set of high-utility itemsets that are extensions of α

```
1 foreach item i ∈ Primary(α) do
2     β = α ∪ {i};
3     Scan α-D to calculate u(β) and create β-D; // uses transaction merging
4     if u(β) ≥ minutil then output β;
5     Calculate su(β, z) and lu(β, z) for all item z ∈ Secondary(α) by scanning
      β-D once, using two utility-bin arrays;
6     Primary(β) = {z ∈ Secondary(α)|su(β, z) ≥ minutil};
7     Secondary(β) = {z ∈ Secondary(α)|lu(β, z) ≥ minutil};
8     Search (β, β-D, Primary(β), Secondary(β), minutil);
9 end
```

LaTeX for scientific publication

- All formatting is almost done automatically usually with the publisher's template i.e. changing publisher is as easy as replacing the template file.
- LaTeX can generate and update bibliography automatically.



LaTeX for scientific publication

- LaTeX works very well for large documents. Input files can be split into sections / chapters for better organizing the documents.
- Tables of contents, table of figures, references to figures, tables and equations are done automatically.
- A lot of free online documents, tutorials or forums to ask questions.

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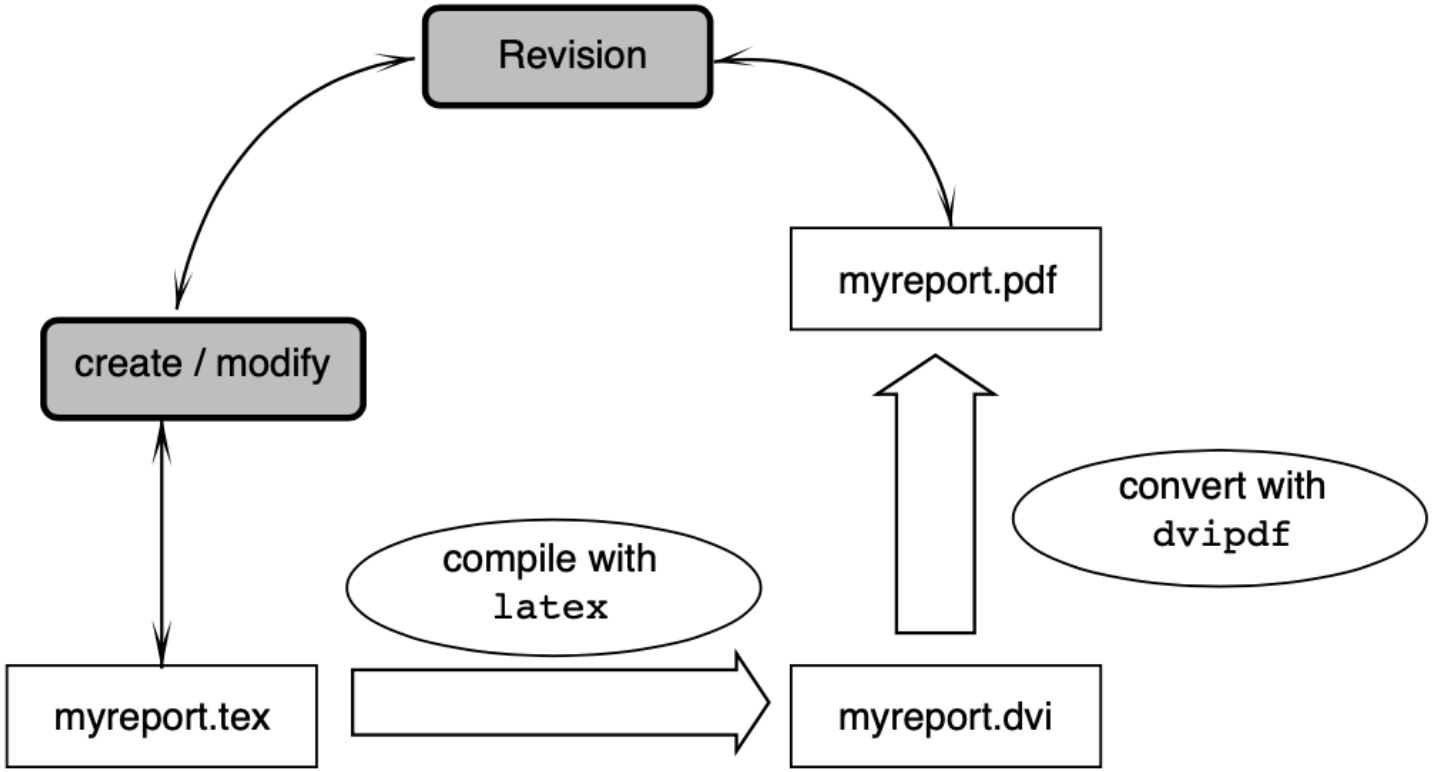
LaTeX for scientific publication

In this workshop, we will

- Learn the command for typesetting using LaTeX ie. through Overleaf.
- Creating tables and inserting figures with LaTeX.
- Typeset mathematical equations with LaTeX.
- Bibliography and references using LaTeX.
- Using journal's template.

Running LaTeX



See example1-1.tex & example1-2.tex

Special Characters in LaTeX

- LaTeX use \ (backslash) as commands.

```
\command[options]{arguments}
```

- Some characters have special meaning in LaTeX.

#, $, %, &

To typeset them we need \ (backslash).

character	LaTeX command	character	LaTeX command
#	\#	_	_{}
$	\$	{	\{
%	\%	}	\}
^	\^{}	~	\~{}
&	\&	\	\textbackslash

See example1-3.tex

Accent character in LaTeX

accent character	LaTeX command	accent character	LaTeX command
Ää	\"{A} \"{a}	A͟a	\b{A} \b{a}
Áá	\'{A} \'{a}	Ąą	\c{A} \c{a}
Ȧȧ	\.{A} \.{a}	Ạạ	\d{A} \d{a}
Āā	\={A} \={a}	A̋a̋	\H{A} \H{a}
Ââ	\^{A} \^{a}	Ąą	\k{A} \k{a}
Àà	\`{A} \`{a}	˚Aå	\r{A} \r{a}
Ãã	\~{A} \~{a}		

Some special symbols in LaTeX

special symbol	LaTeX command	special symbol	LaTeX command
$	\$	£	\pounds
§	\S	¶	\P
†	\dag	‡	\ddag
©	\copyright	®*	\circledR
✓*	\checkmark	✠*	\maltese

* need \usepackage{amssymb}

https://en.wikibooks.org/wiki/LaTeX/Special_Characters

See example1-4.tex

Document Structure

LaTeX commands to create the structure of the documents

```
\section{title}
\subsection{title}
\subsubsection{title}
\paragraph{texts…}
\subparagraph{texts…}
```

```
\section*{title}
\subsection*{title}
```

Document Structure

Without section number

```
\section*{title}

\subsection*{title}
```

Setting the counters

```
\setcounter{counter}{value}
```

See example1-5.tex & example1-6.tex

Environment Group

In LaTeX, there are two ways to create an environment group

```
\begin{environment-name}[options]{arguments}
    ⋮
\end{environment-name}
```

or

```
{\environment-command  texts... }
```

See example1-7.tex

Text Size

Displayed text	LaTeX command
This is a sentence.	`\tiny{This is a sentence.}`
This is a sentence.	`\scriptsize{This is a sentence.}`
This is a sentence.	`\footnotesize{This is a sentence.}`
This is a sentence.	`\small{This is a sentence.}`
This is a sentence.	`\normalsize{This is a sentence.}`
This is a sentence.	`\large{This is a sentence.}`
This is a sentence.	`\Large{This is a sentence.}`
This is a sentence.	`\LARGE{This is a sentence.}`
This is a sentence.	`\huge{This is a sentence.}`
This is a sentence.	`\Huge{This is a sentence.}`

Text formatting commands

Displayed text	LaTeX command
This is normal.	`This is \textnormal{normal}.`
This is **boldface.**	`This is \textbf{boldface}.`
This is *italic.*	`This is \textit{italic}.`
This is roman.	`This is \textrm{roman}.`
This is medium.	`This is \textmd{capshape}.`
This is small caps.	`This is \textsc{small caps}.`
This is *slanted.*	`This is \textsl{slanted}.`
This is upshape.	`This is \textup{upshape}.`

https://en.wikibooks.org/wiki/LaTeX/Fonts

See example1-8.tex

Line manipulation commands

LaTeX commands to manipulate lines and paragraphs.

- `\newpage` start a new page
- `\newline or \\` start a new line
- `\vspace{`*`length`*`}` set vertical distance
- `\hspace{`*`length`*`}` set horizontal distance
- `\indent` indent paragraph
- `\noindent` unindent paragraph

See example1-9.tex & example1-10.tex

Document Title

LaTeX commands to make the title of the document

- `\title{`*name*`}` document title
- `\date{`*date*`}` set date
- `\author{`*name*`}` author
- `\maketitle` make the document title

See example1-11.tex