An Introduction to TEX and LATEX

(A WORKSHOP PRESENTED AT DCSI 2021)

Vlado Keselj (vlado@dnlp.ca)
with a lot of material from other sources, such as slides by
LianTze Lim (Ph.D.) http://liantze.penguinattack.org

Illustration by Duane Bibby

About Material in this Presentation

- Some of my material from before and prepared for this workshop
- LianTze Lim has an amazing presentation on Overleaf titled "LATEX: More than Just Academic Papers and Theses" under the Creative Commons license, and many of her slides are used here, including the overall template: `https://www.overleaf.com/read/cyfvvyfrpmyn`
  or
  
  as produced with
  `\qrcode[height=2cm]{https://www.overleaf.com/read/cyfvvyfrpmyn}`

Contents

1 What are TEX, LATEX and Friends?

2 Basic Overleaf Tutorial

3 Document Types

4 Main Syntax Features

5 Special Material

6 Conclusion

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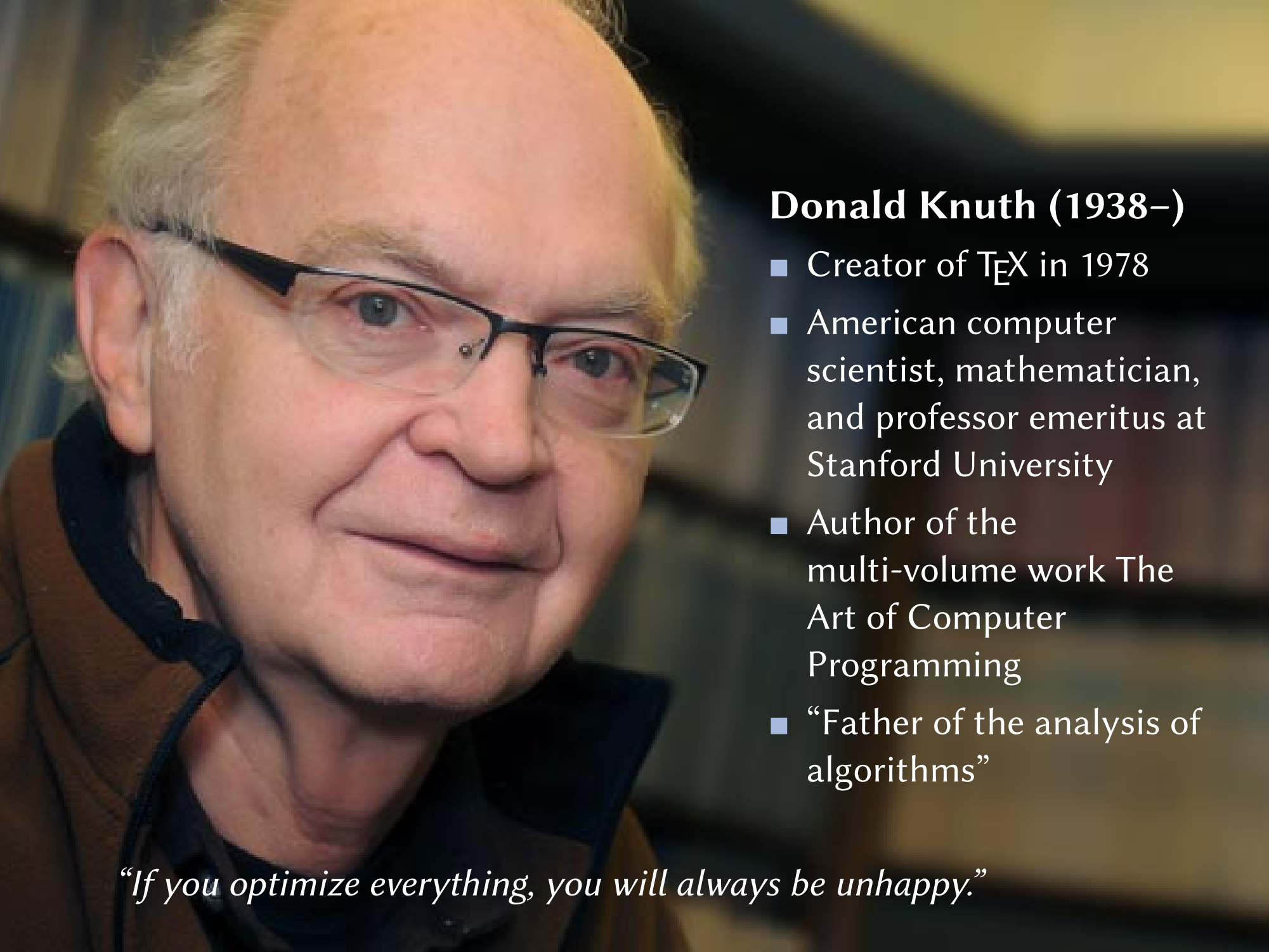


Donald Knuth (1938–)

- Creator of TEX in 1978
- American computer scientist, mathematician, and professor emeritus at Stanford University
- Author of the multi-volume work The Art of Computer Programming
- "Father of the analysis of algorithms"

"If you optimize everything, you will always be unhappy."

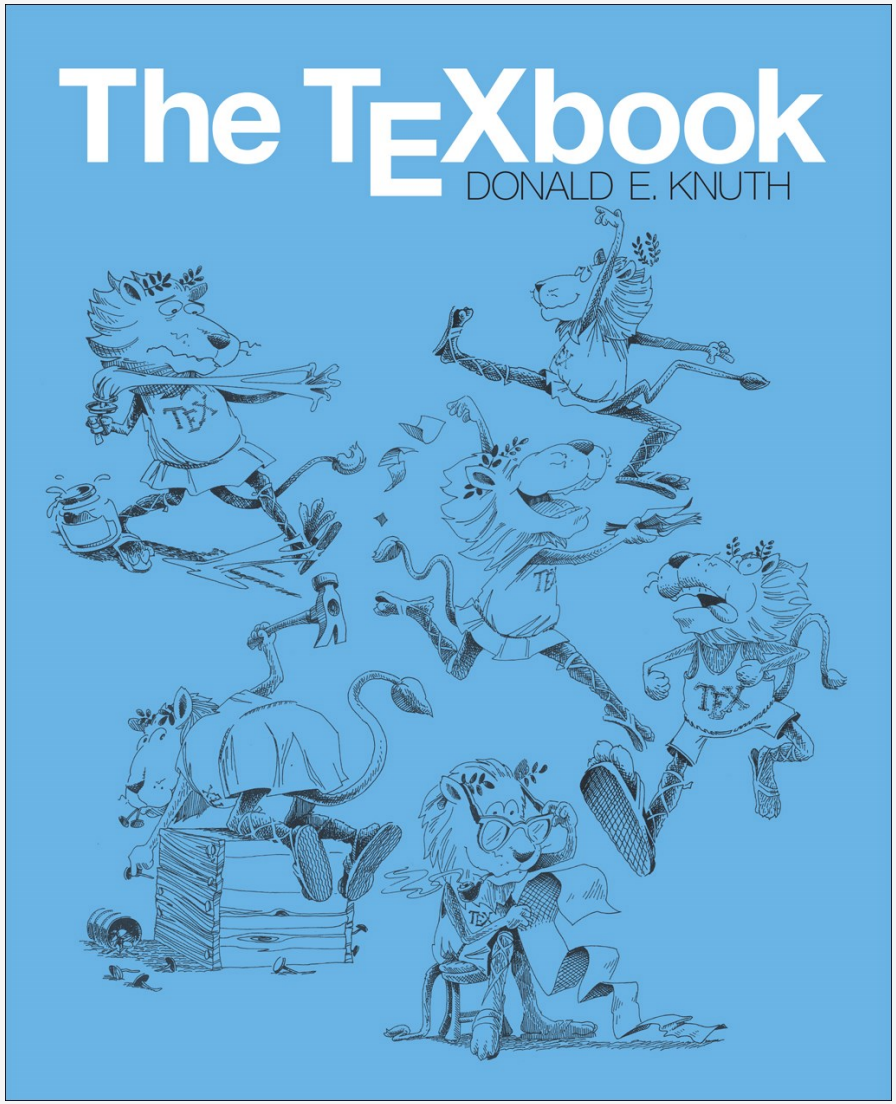
What is TEX?

- A computer typesetting system created by Donald Knuth in 1978
- Knuth also designed METAFONT language for font description, and developed the Computer Modern family of typefaces
- for 'the creation of beautiful books', as a reaction to decline in typesetting quality after change from traditional typesetting to computer-based typesetting
- TEX is pronounced /tɛk/ after Greek τεχ, similarly to the word 'technique'; typed as `TeX` in ASCII, file extension `.tex`
- Somewhat similar to HTML (1991): source written as plain text → `.dvi` → PDF or similar (DVI — device independent file format)

Basic TEX Principles

- Plain text in source, and empty line marks new paragraph
- Commands start with backslash (\), such as switching fonts; e.g.,
  `This is \it italic, \rm and this is \bf bold \rm font.`
- Line comments start with `%` and grouping is done by `{` and `}`
  as in: `This is {\it italic,} and this is {\bf bold} font.`
- TEX low-level constructs are boxes and 'glue' used to connect them, and there are commands to access them and manipulate them
- Commands can have parameters in TEX and are also called macros
- TEX-based macro language is a Turing-complete programming language

The TEXbook



http://ctex.org/documents/shredder/src/texbook.pdf

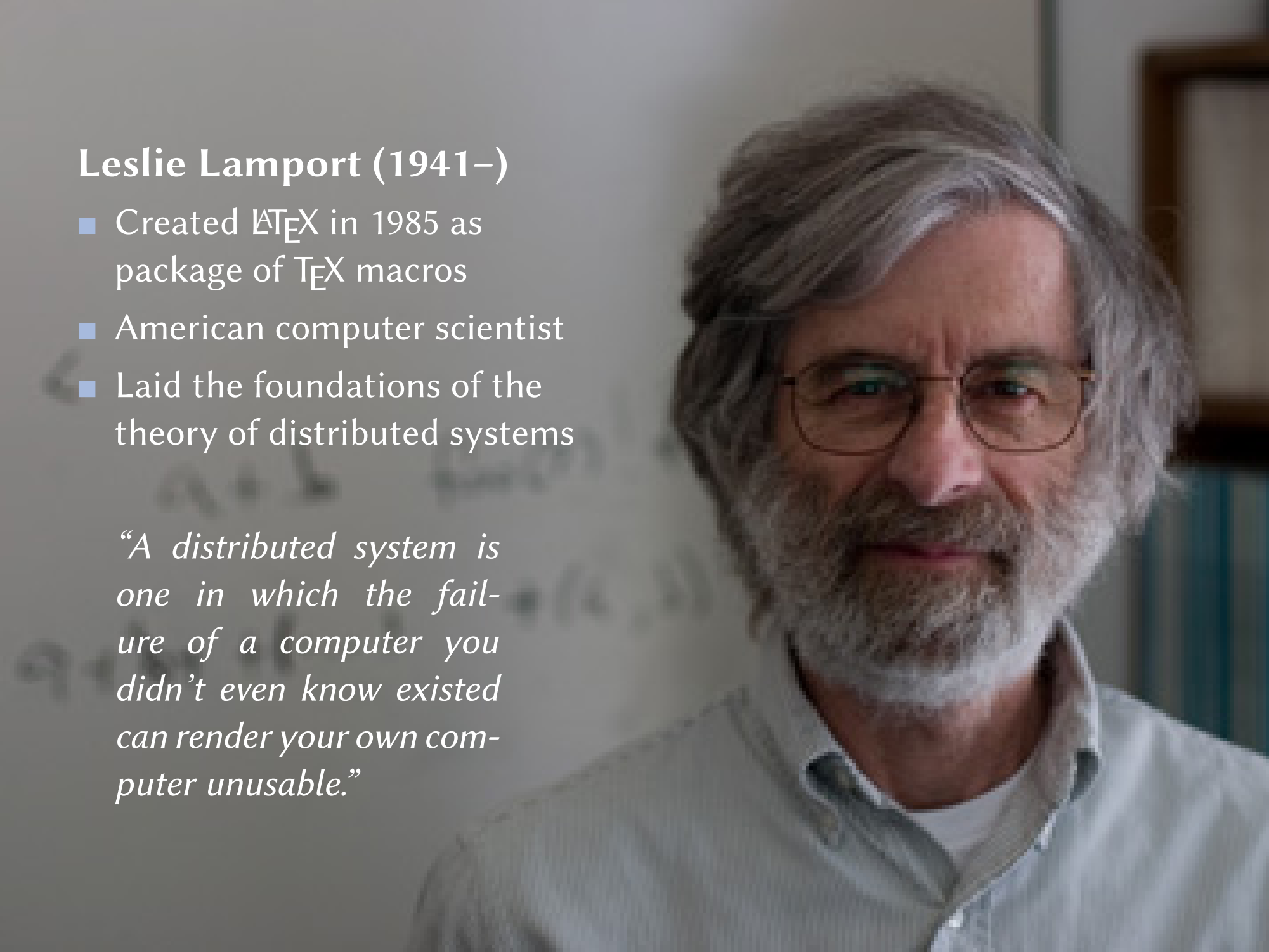
TEXbook as a Reference

- There are many references, including free on Internet, on TEX and LATEX, but at least parts of TEXbook are still very relevant
- Includes important style and typesetting notes
- ... includes also some technical parts of which may be less important, and some are very difficult
- Examples of important notes: quotes, hyphens and dashes, and ties (non-breakable spaces)

Leslie Lamport (1941–)

- Created LaTeX in 1985 as package of TeX macros
- American computer scientist
- Laid the foundations of the theory of distributed systems

"A distributed system is one in which the failure of a computer you didn't even know existed can render your own computer unusable."



What is LATEX, BibTEX, and some other Software?

LATEX

- ASCII LaTeX, /ˈleɪtɛk/, /ˈlɑːtɛk/
- A document preparation system by Leslie Lamport (1985)
- Set of TEX macros to define mostly higher level commands, environments, document classes, etc.
- Concept of environment such as `\begin{....}` and `\end{...}`

BibTEX

- Language and system to describe and include references
- Oren Patashnik and Leslie Lamport in 1985

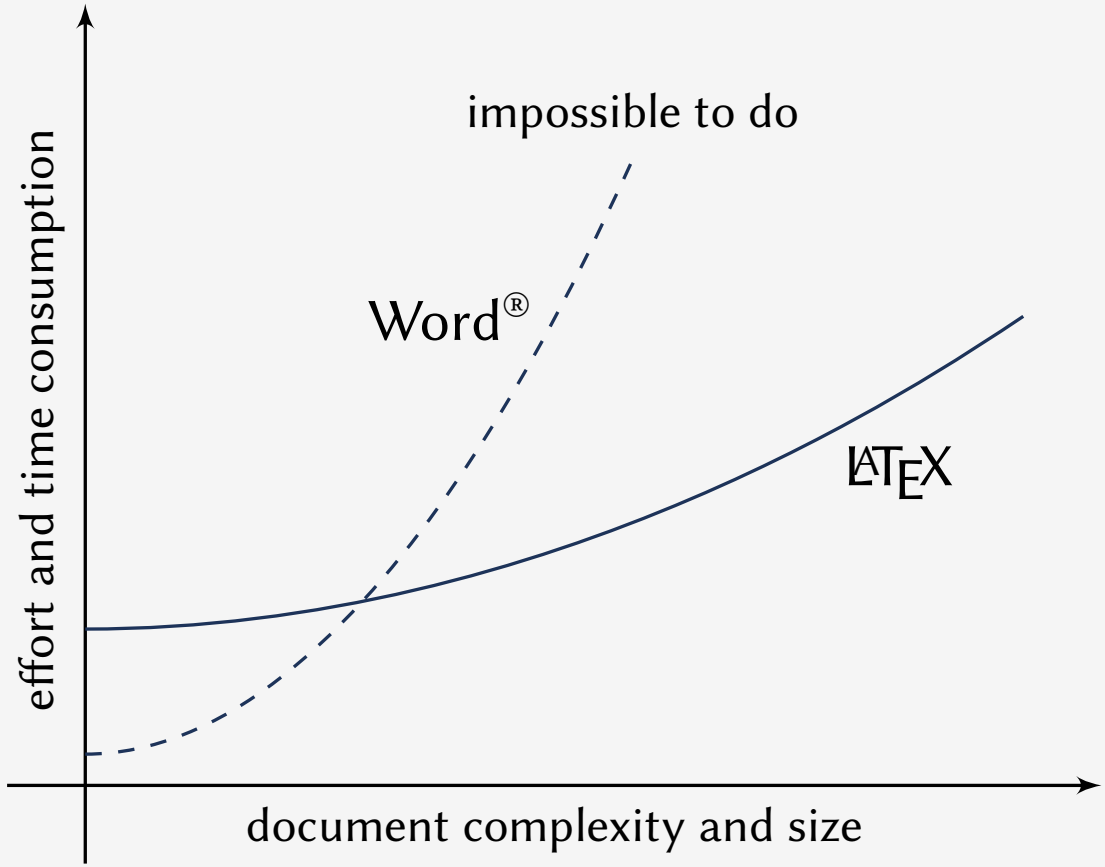
Other

- MakeIndex, METAPOST, ...
- `http://www.ctan.org/what_is_tex.html`

Comparing LATEX with Word and other Software

- LATEX vs. Word: you can come across sometimes passionate discussion
- LATEX is better for some type of uses, and Word for other
- Could be seen as Word processors vs. Typesetting software
- Word is meant to be quick and intuitive, commercially maintained
- LATEX is more open and open-sourced, stable, with massive crowd contribution
- Word is accepted frequently as a standard in business
- LATEX is accepted frequently as a standard in Computer Science, Math, and Engineering
- Best advice: you need to make a choice when to use which, and you should be familiar with both to some level

Scalability



Scalability of LATEX and Microsoft Word® against document size and complexity (redrawn from Marko Pinteric's original at `http://www.pinteric.com/miktex.html`)

Professional Typesetting Quality Output

- Typesetting quality and legibility
  - good kerning hinting and correct ligatures
  - inter-word, line and paragraph spacing
  - context-sensitive hyphenation

Table fiery fluffy

This paper outlines an approach to produce a prototype WordNet system for Malay semi-automatically, by using bilingual dictionary data and resources provided by the original English WordNet system. Senses from an English-Malay bilingual dictionary were first aligned to English WordNet senses, and a set of Malay synsets were then derived. Semantic relations between the English WordNet synsets were extracted and re-applied to the Malay synsets, using the aligned synsets as a guide. A small Malay WordNet prototype with 12429 noun synsets and 5805 verb synsets was thus produced. This prototype is a first step towards building a full-fledged Malay WordNet.

Table fiery fluffy

This paper outlines an approach to produce a prototype WordNet system for Malay semi-automatically, by using bilingual dictionary data and resources provided by the original English WordNet system. Senses from an English-Malay bilingual dictionary were first aligned to English WordNet senses, and a set of Malay synsets were then derived. Semantic relations between the English WordNet synsets were extracted and re-applied to the Malay synsets, using the aligned synsets as a guide. A small Malay WordNet prototype with 12429 noun synsets and 5805 verb synsets was thus produced. This prototype is a first step towards building a full-fledged Malay WordNet.

- Correct mathematical typesetting (spacing etc)

$$W_\psi(f)(a,b) = \frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} f(t)\psi\left(\frac{t-b}{a}\right) dt$$

$$W_\psi(f)(a,b) = \frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} f(t)\psi\left(\frac{t-b}{a}\right) dt$$

Where to get LATEX?

Un*x, Linux TEX Live, e.g.: `$ dnf install texlive -y`

```
$ dnf search silence
$ dnf install texlive-silence -y
```

Use your OS' package manager (or download manually)

Windows MikTEX, TEX Live

Mac OS X MacTEX (based on TEX Live)

LATEX Packages Use MikTEX or TEX Live's package manager

Editors emacs, vi, Texmaker, TeXworks, Texstudio, TeXshop...

Online Overleaf (`www.overleaf.com`)

Documentation (Online) `http://texdoc.net/pkg/<packagename>`

(TEX Live) `$ texdoc <package name>`

(MikTEX) `$ mthelp <package name>`

How to use LATEX?

1. Write a plain text LATEX file (`.tex`)
2. Run it through `pdflatex` or `xelatex` → PDF output
   (or `latex + dvips + ps2pdf` for DVI + PS + PDF)
3. Run `bibtex` if you need to process bibliographies
4. `makeindex` is used to make indices (for books mostly)
5. Re-run `pdflatex` to resolve references and pointers

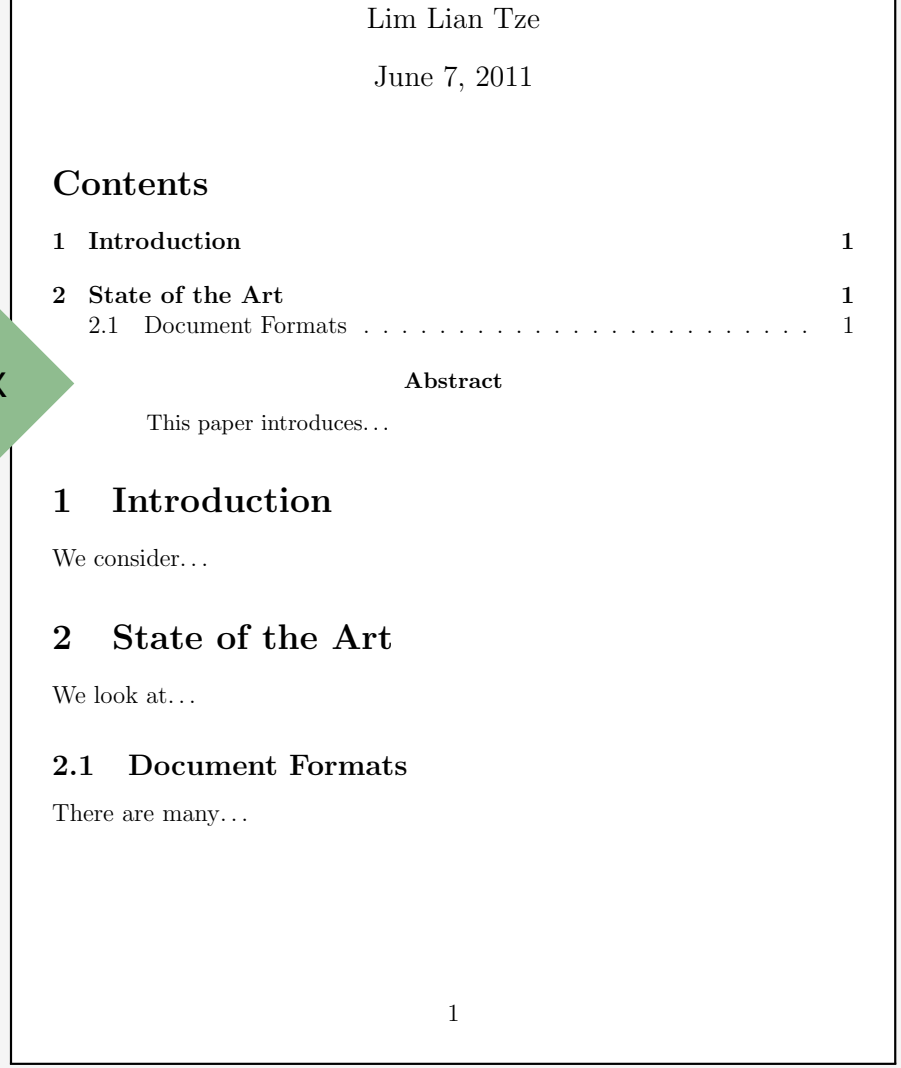
One setup that I use:

- Use `emacs` in terminal mode in a terminal, with key binding F5 (or F6) to run `make` to save source and remake `pdf` file
- Run `okular` viewer of the PDF file in another window, which gets updated

Example .tex File

```
\documentclass[a4paper,11pt]{
article}
\author{Lim Lian Tze}
\title{An Introductory Paper}
\date{\today}
\usepackage[english]{babel}

\begin{document}
\maketitle
\tableofcontents

\begin{abstract}
This paper introduces\ldots
\end{abstract}

\section{Introduction}
We consider\ldots

\section{State of the Art}
We look at\ldots

\subsection{Document Formats}
There are many\ldots
\end{document}
```

pdflatex



An Introductory Paper

Lim Lian Tze

June 7, 2011

Contents

1 Introduction 1

2 State of the Art 1

2.1 Document Formats 1

Abstract

This paper introduces...

1 Introduction

We consider...

2 State of the Art

We look at...

2.1 Document Formats

There are many...

1

Easy to Learn, Hard to Master

- Customising may not be straightforward (vs word processors)
- Intentionally so: Style guidelines should be followed strictly
  - Publisher/organisation provides document class or style files
  - Use these to take care of formatting and styling, focus on the content

So, if you have not tried LATEX before, let us try it!

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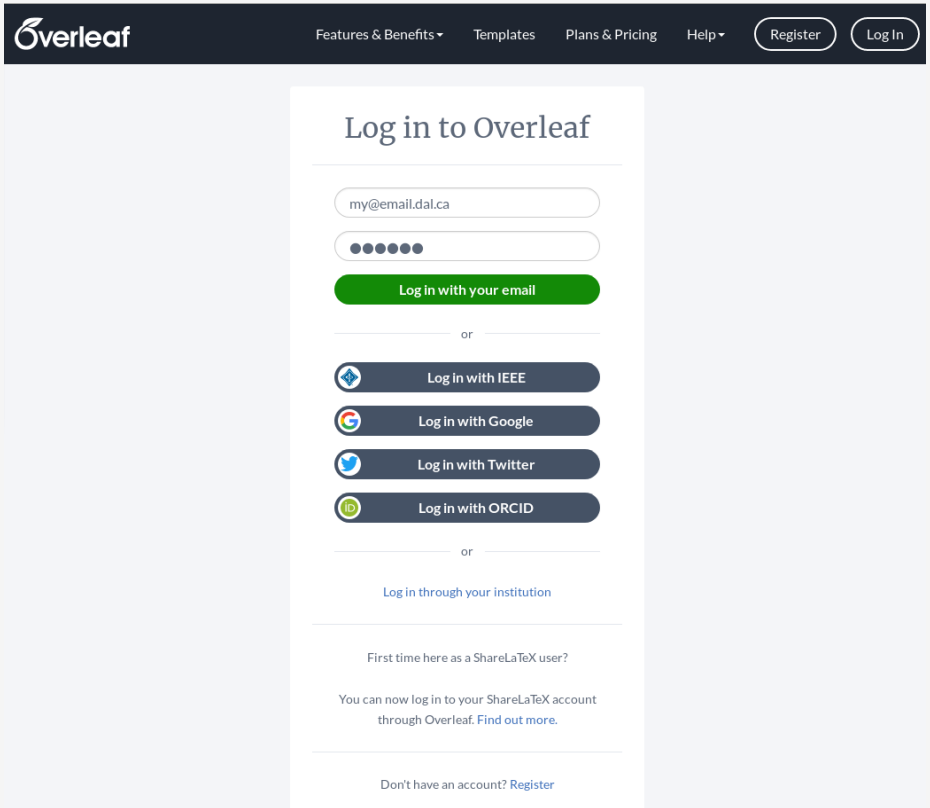
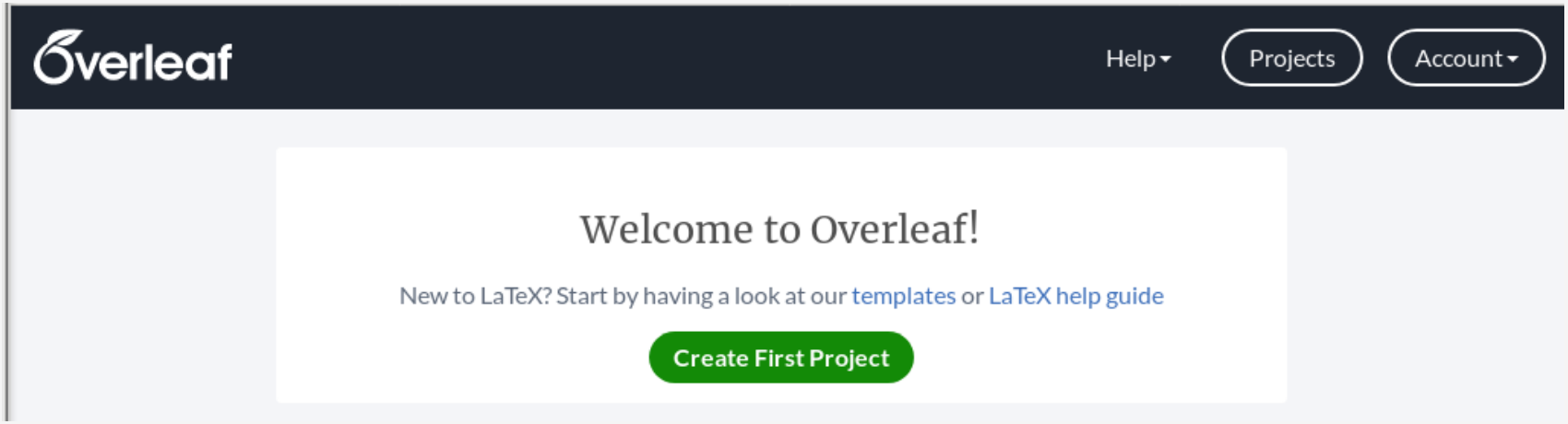
Overleaf

- Convenient, third-party site to use LATEX, to share, and to collaborate
  `https://overleaf.com`
- To register new account:
  `https://overleaf.com/register`
- FCS Dal has a local installation of the community version
  `https://overleaf.cs.dal.ca`
- Tradeoff: features and templates vs. confidentiality
- `overleaf.com` will be used further



Overleaf Registration

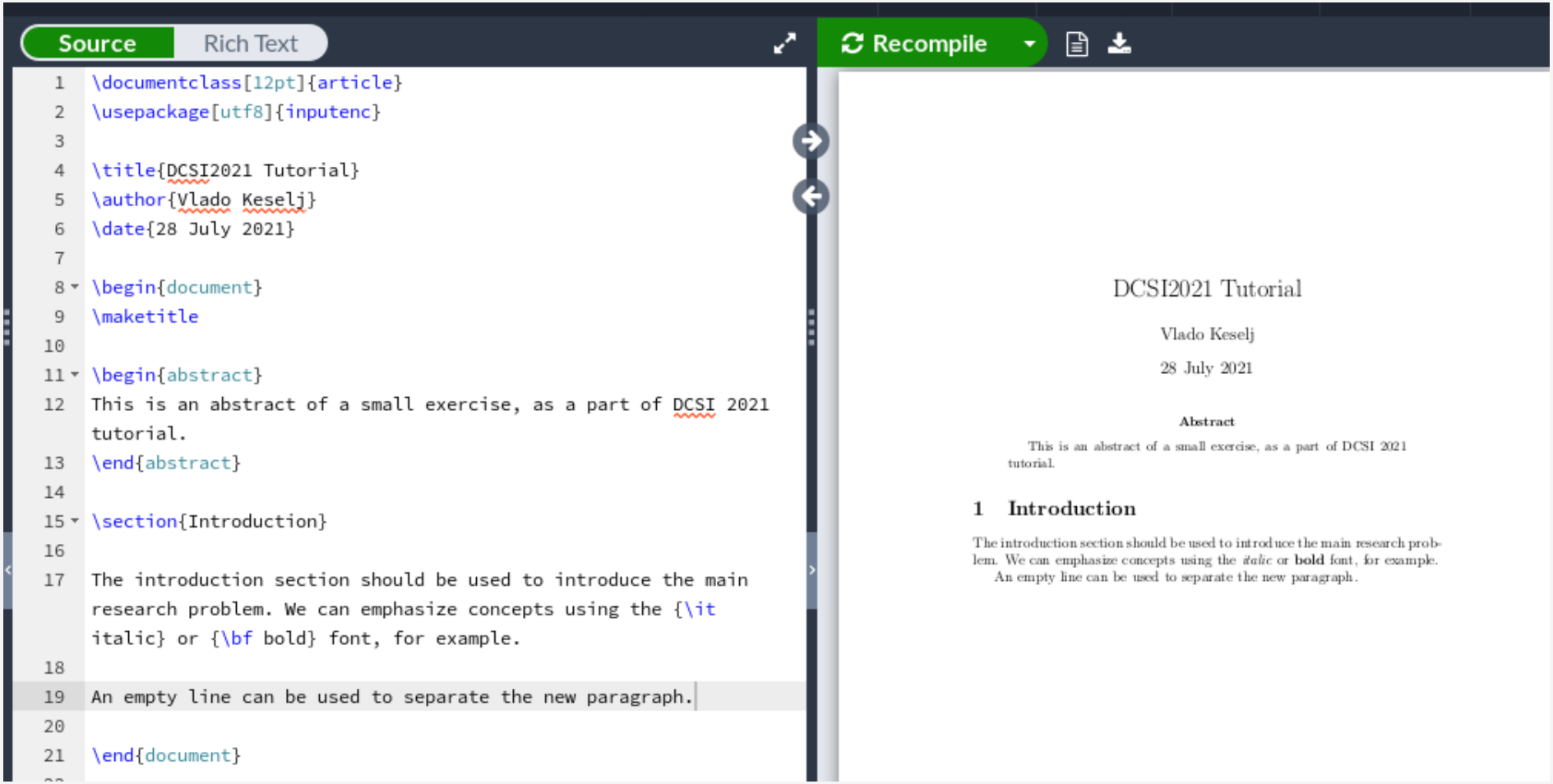
- After the registration, you should see:



- Click 'Create First Project' and a number of options shows up (Blank Project, Example Project, Upload Project, Import from GitHub; templates: Academic Journal, Book, Formal Letter, Homework Assignment, Poster, Presentation, Project / LabReport, Résumé / CV, Thesis, View All)
- Click 'Blank Project'
- A 'New Project' window shows up, promting for name; enter 'DCSI2021 Tutorial'

Overleaf: Simple Project 1

Update your name or other details if you need and Recompile:



Some Basic Overleaf Functionality

Some Overleaf functionality to explore later:

- Sharing your project with others using email or link
- Downloading and uploading files
- Downloading complete project from your project list
- Starting project based on one of the provided templates
- Uploading project
- Renaming a project

We will now look at some document templates and packages available in LATEX.

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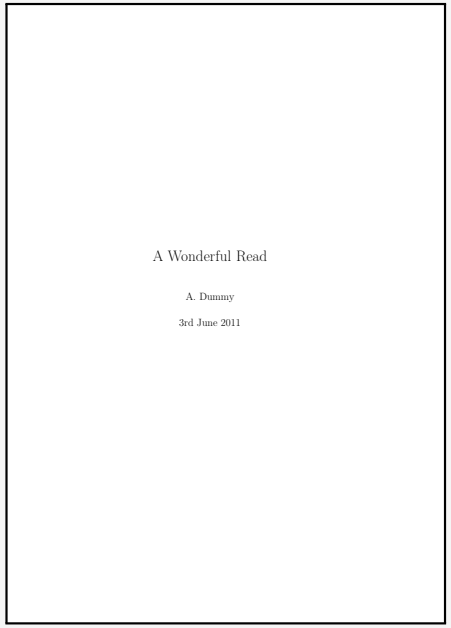
Basic Types

Books

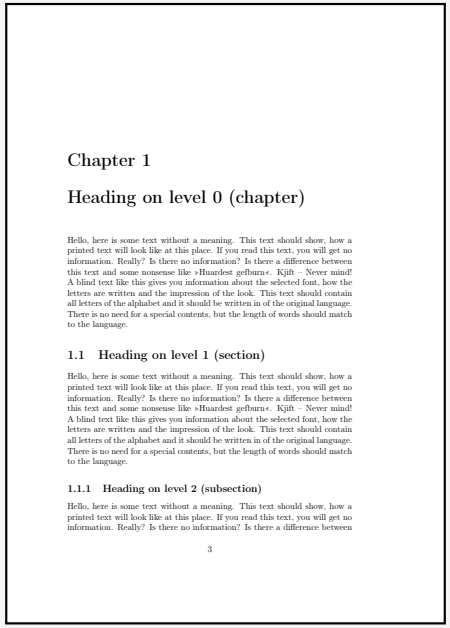
```
\documentclass{book}
\author{...}
\title{...}

\begin{document}
\maketitle
\chapter{...}
\section{...}
...
\subsection{...}
\end{document}
```


A Wonderful Read

A. Dummy

3rd June 2011


Chapter 1

Heading on level 0 (chapter)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

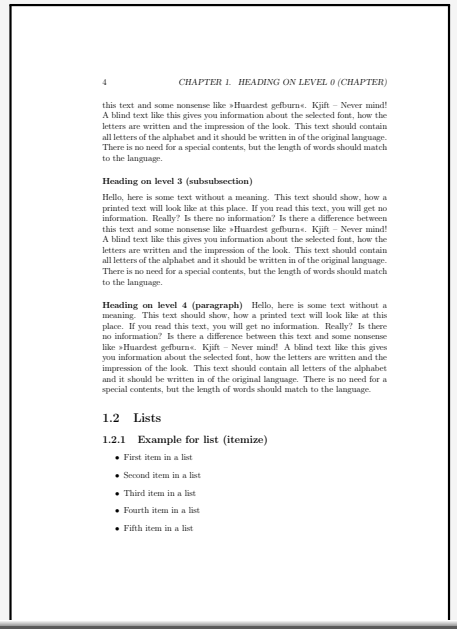
1.1 Heading on level 1 (section)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1.1.1 Heading on level 2 (subsection)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between

3


4 CHAPTER 1. HEADING ON LEVEL 0 (CHAPTER)

this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

Heading on level 3 (subsubsection)

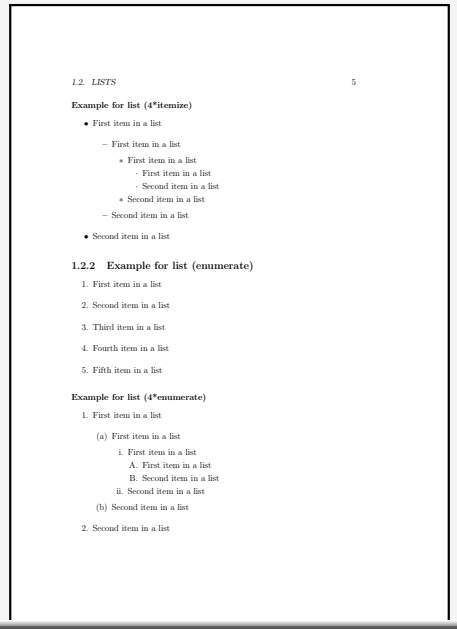
Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

Heading on level 4 (paragraph) Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1.2 Lists

1.2.1 Example for list (itemize)

- First item in a list
- Second item in a list
- Third item in a list
- Fourth item in a list
- Fifth item in a list


1.2. LISTS 5

Example for list (4*itemize)

- First item in a list
  - First item in a list
    - First item in a list
      - First item in a list
      - Second item in a list
    - Second item in a list
  - Second item in a list
- Second item in a list

1.2.2 Example for list (enumerate)

1. First item in a list
2. Second item in a list
3. Third item in a list
4. Fourth item in a list
5. Fifth item in a list

Example for list (4*enumerate)

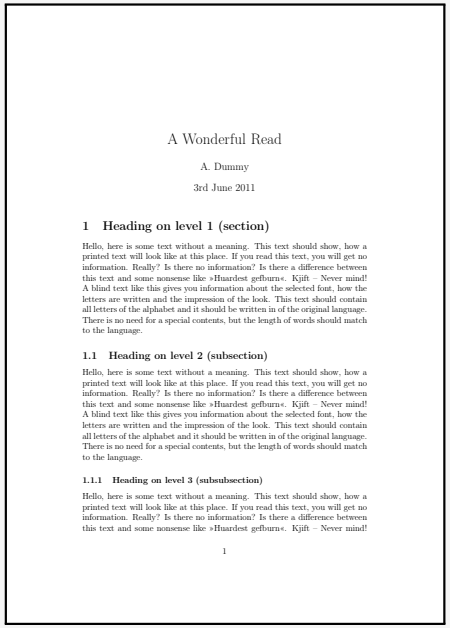
1. First item in a list
   (a) First item in a list
      i. First item in a list
         A. First item in a list
         B. Second item in a list
      ii. Second item in a list
   (b) Second item in a list
2. Second item in a list

Basic Types (cont'd)

Articles

```
\documentclass{article}
\author{...}
\title{...}

\begin{document}
\maketitle
\section{...}
...
\subsection{...}
\end{document}
```


A Wonderful Read

A. Dummy

3rd June 2011

1 Heading on level 1 (section)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

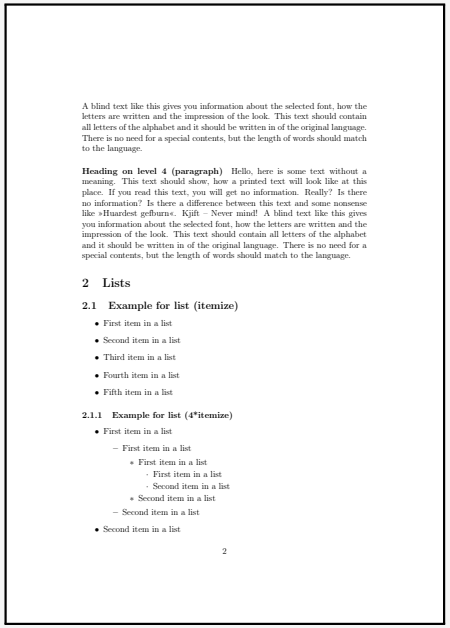
1.1 Heading on level 2 (subsection)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1.1.1 Heading on level 3 (subsubsection)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind!

1


A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

Heading on level 4 (paragraph) Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

2 Lists

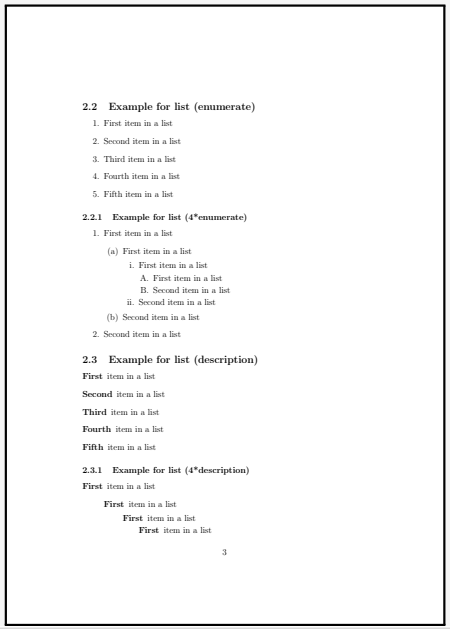
2.1 Example for list (itemize)

- First item in a list
- Second item in a list
- Third item in a list
- Fourth item in a list
- Fifth item in a list

2.1.1 Example for list (4*itemize)

- First item in a list
  - First item in a list
    - First item in a list
      - First item in a list
      - Second item in a list
    - Second item in a list
  - Second item in a list
- Second item in a list

2


2.2 Example for list (enumerate)

1. First item in a list
2. Second item in a list
3. Third item in a list
4. Fourth item in a list
5. Fifth item in a list

2.2.1 Example for list (4*enumerate)

1. First item in a list
   (a) First item in a list
      i. First item in a list
         A. First item in a list
         B. Second item in a list
      ii. Second item in a list
   (b) Second item in a list
2. Second item in a list

2.3 Example for list (description)

First item in a list

Second item in a list

Third item in a list

Fourth item in a list

Fifth item in a list

2.3.1 Example for list (4*description)

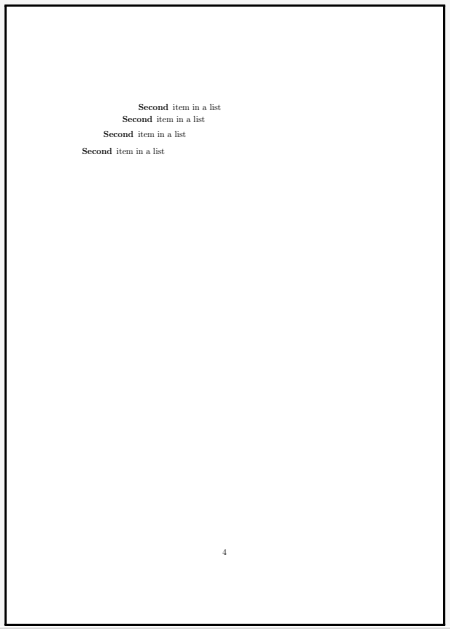
First item in a list

First item in a list

First item in a list

First item in a list

3


Second item in a list

Second item in a list

Second item in a list

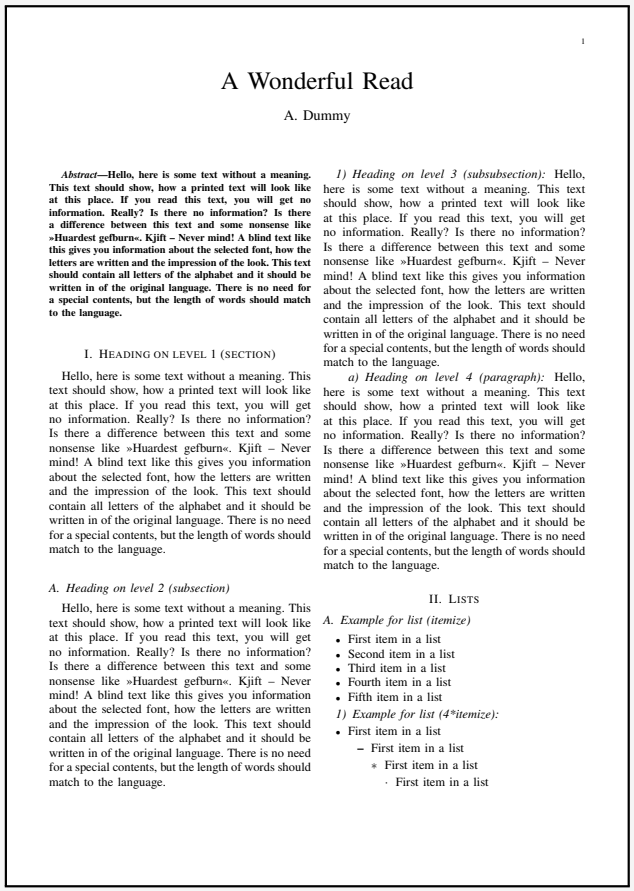
Second item in a list

4

Journal and Conference Proceedings Articles

IEEE

`\documentclass{IEEEtran}`



A Wonderful Read

A. Dummy

***Abstract*—Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.**

I. Heading on level 1 (section)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

A. Heading on level 2 (subsection)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1) Heading on level 3 (subsubsection): Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

a) Heading on level 4 (paragraph): Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

II. Lists

A. Example for list (itemize)

- First item in a list
- Second item in a list
- Third item in a list
- Fourth item in a list
- Fifth item in a list

*1) Example for list (4*itemize):*

- First item in a list
  - First item in a list
    - First item in a list
      - First item in a list

ACM

`\documentclass{sig-alternate}`

A Wonderful Read

A. Dummy

ABSTRACT

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1. Heading on level 1 (SECTION)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1.1 Heading on level 2 (subsection)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1.1.1 Heading on level 3 (subsubsection)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

Heading on level 4 (paragraph).

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

2. Lists

2.1 Example for list (itemize)

- First item in a list
- Second item in a list
- Third item in a list
- Fourth item in a list
- Fifth item in a list

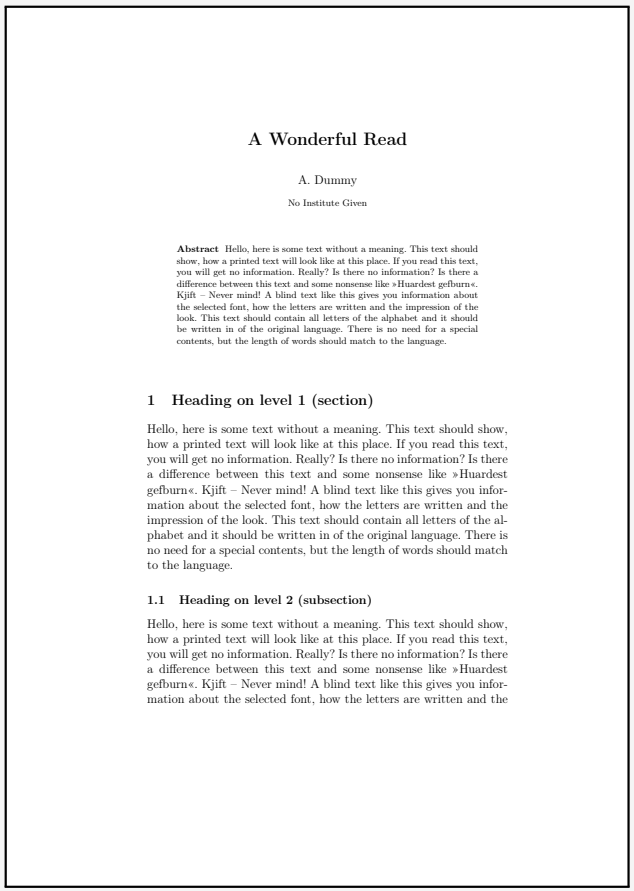
*2.1.1 Example for list (4*itemize)*

- First item in a list
  - First item in a list
    - First item in a list
      - First item in a list
      - Second item in a list
    - Second item in a list
  - Second item in a list
- Second item in a list

MOSC 2011, July 3–5, 2011, Penang, Malaysia.

LLNCS

`\documentclass{llncs}`



A Wonderful Read

A. Dummy

No Institute Given

Abstract Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

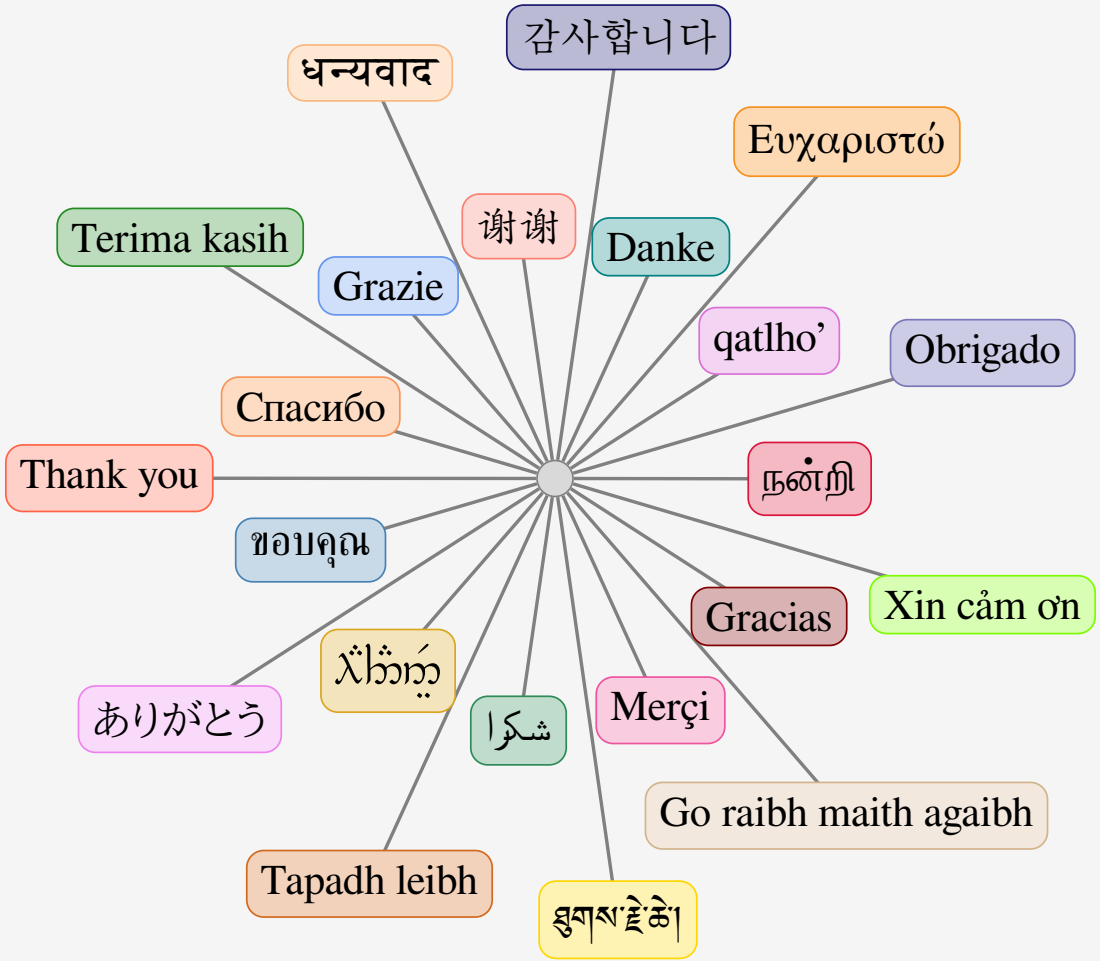
1 Heading on level 1 (section)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for a special contents, but the length of words should match to the language.

1.1 Heading on level 2 (subsection)

Hello, here is some text without a meaning. This text should show, how a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like »Huardest gefburn«. Kjift – Never mind! A blind text like this gives you information about the selected font, how the letters are written and the

Multilingual LATEX

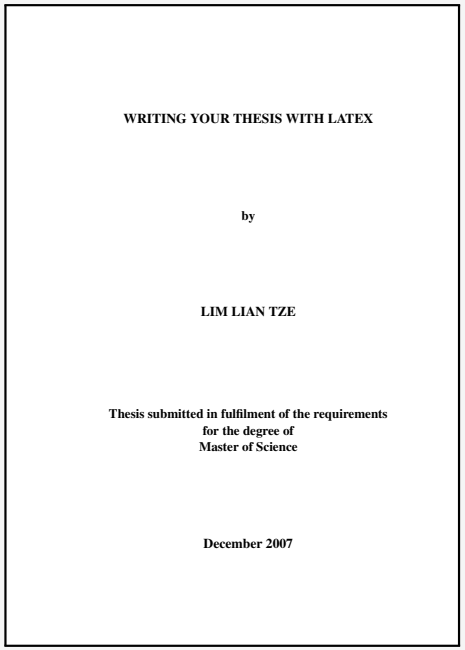


XeLATEX, LuaLATEX Unicode input

LATEX Various packages (sometimes with transcriptions: `nan^ri`, `salAm`)

University Theses

Universiti Sains Malaysia \documentclass{usmthesis}



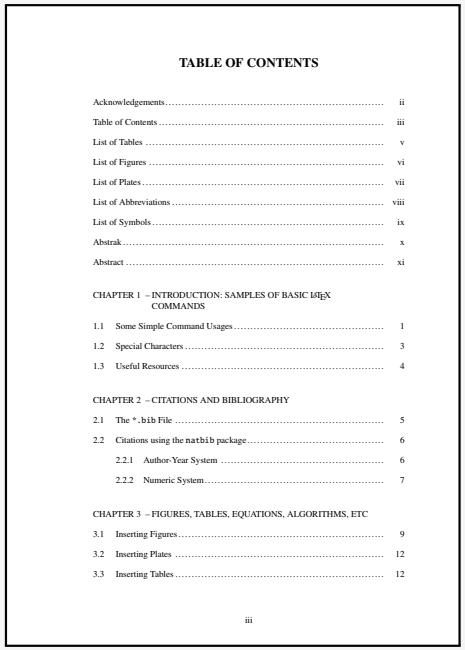
WRITING YOUR THESIS WITH LATEX

by

LIM LIAN TZE

Thesis submitted in fulfilment of the requirements
for the degree of
Master of Science

December 2007



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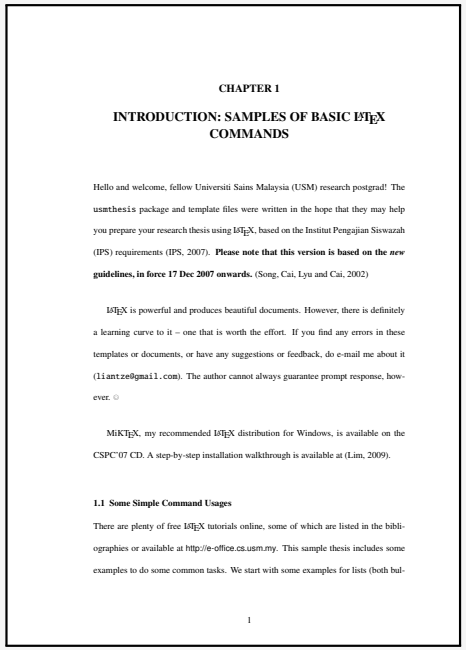


CHAPTER 1

INTRODUCTION: SAMPLES OF BASIC LATEX COMMANDS

Hello and welcome, fellow Universiti Sains Malaysia (USM) research postgrad! The usmthesis package and template files were written in the hope that they may help you prepare your research thesis using LaTeX, based on the Institut Pengajian Siswazah (IPS) requirements (IPS, 2007). **Please note that this version is based on the *new* guidelines, in force 17 Dec 2007 onwards.** (Song, Cai, Lyu and Cai, 2002)

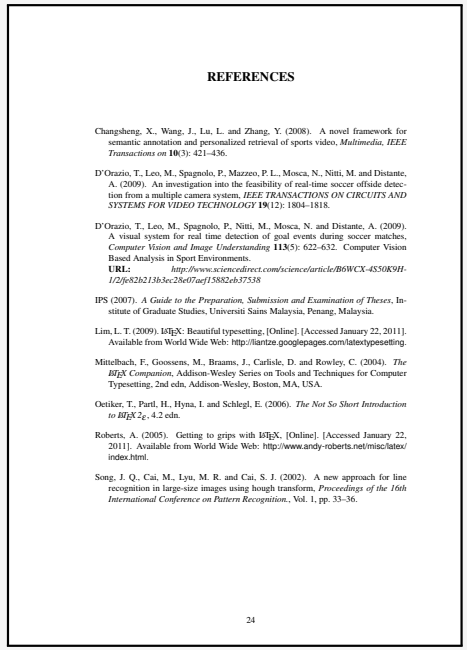
LaTeX is powerful and produces beautiful documents. However, there is definitely a learning curve to it – one that is worth the effort. If you find any errors in these templates or documents, or have any suggestions or feedback, do e-mail me about it (liantze@gmail.com). The author cannot always guarantee prompt response, however. ☺

MiKTeX, my recommended LaTeX distribution for Windows, is available on the CSPC'07 CD. A step-by-step installation walkthrough is available at (Lim, 2009).

1.1 Some Simple Command Usages

There are plenty of free LaTeX tutorials online, some of which are listed in the bibliographies or available at http://e-office.cs.usm.my. This sample thesis includes some examples to do some common tasks. We start with some examples for lists (both bul-

1



REFERENCES

Changsheng, X., Wang, J., Lu, L. and Zhang, Y. (2008). A novel framework for semantic annotation and personalized retrieval of sports video, *Multimedia, IEEE Transactions on* **10**(3): 421–436.

D'Orazio, T., Leo, M., Spagnolo, P., Mazzeo, P. L., Mosca, N., Nitti, M. and Distante, A. (2009). An investigation into the feasibility of real-time soccer offside detection from a multiple camera system, *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY* **19**(12): 1804–1818.

D'Orazio, T., Leo, M., Spagnolo, P., Nitti, M., Mosca, N. and Distante, A. (2009). A visual system for real time detection of goal events during soccer matches, *Computer Vision and Image Understanding* **113**(5): 622–632. Computer Vision Based Analysis in Sport Environments.
URL: *http://www.sciencedirect.com/science/article/B6WCX-4S50K9H-1/2/fe82b213b3ec28e07aef15882eb37538*

IPS (2007). *A Guide to the Preparation, Submission and Examination of Theses*, Institute of Graduate Studies, Universiti Sains Malaysia, Penang, Malaysia.

Lim, L. T. (2009). LaTeX: Beautiful typesetting, [Online]. [Accessed January 22, 2011]. Available from World Wide Web: http://liantze.googlepages.com/latextypesetting.

Mittelbach, F., Goossens, M., Braams, J., Carlisle, D. and Rowley, C. (2004). *The LaTeX Companion*, Addison-Wesley Series on Tools and Techniques for Computer Typesetting, 2nd edn, Addison-Wesley, Boston, MA, USA.

Oetiker, T., Partl, H., Hyna, I. and Schlegl, E. (2006). *The Not So Short Introduction to LaTeX 2ε*, 4.2 edn.

Roberts, A. (2005). Getting to grips with LaTeX, [Online]. [Accessed January 22, 2011]. Available from World Wide Web: http://www.andy-roberts.net/misc/latex/index.html.

Song, J. Q., Cai, M., Lyu, M. R. and Cai, S. J. (2002). A new approach for line recognition in large-size images using hough transform, *Proceedings of the 16th International Conference on Pattern Recognition.*, Vol. 1, pp. 33–36.

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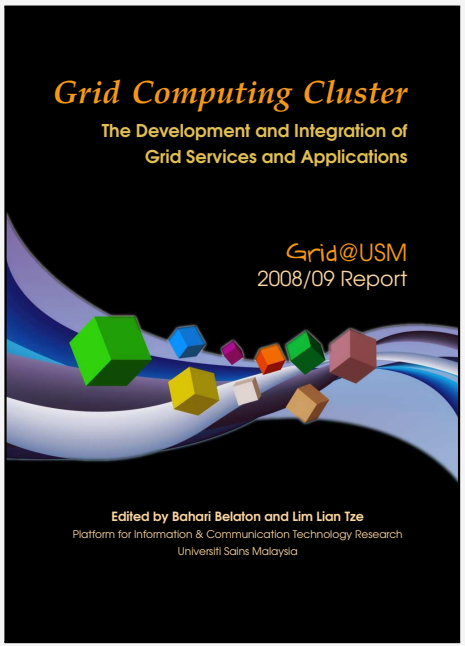
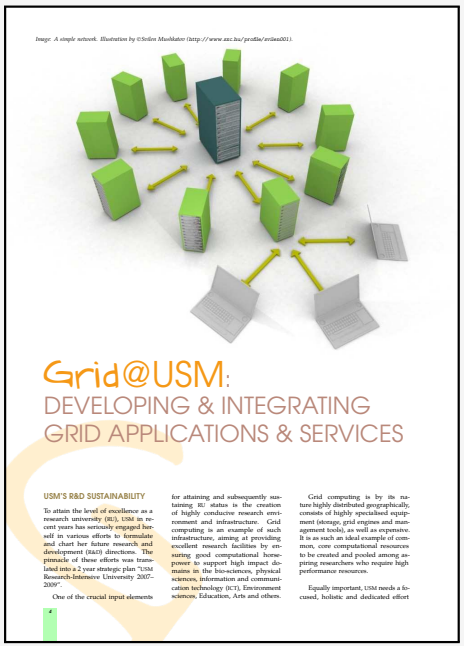
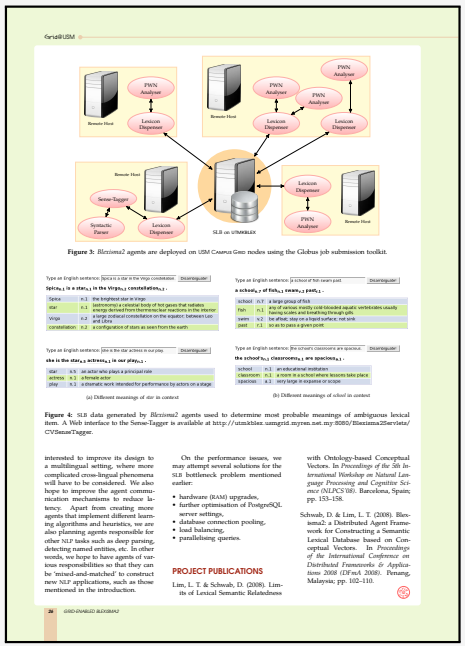
Highly Configurable Documents

memoir and KOMA-Script Classes

- Sectional headings
- Running headers and footers
- Good font, colour and illustration choices
- http://latex-my.blogspot.com/search/label/bookdesign







Presentation Slides

- This presentation was made with LATEX!
- Many possible classes: powerdot, beamer

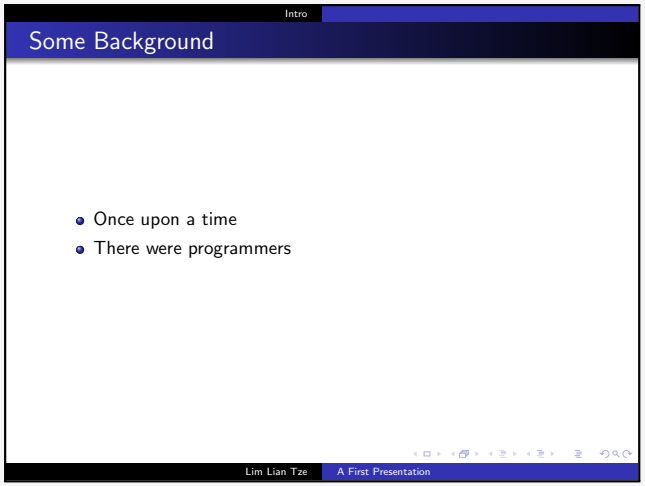
```
\documentclass{beamer}
\usetheme{Warsaw}

\author ...

\begin{document}
\titleframe

\section{Intro}

\begin{frame}
\frametitle{Some Background}
...
\end{frame}
\end{document}
```

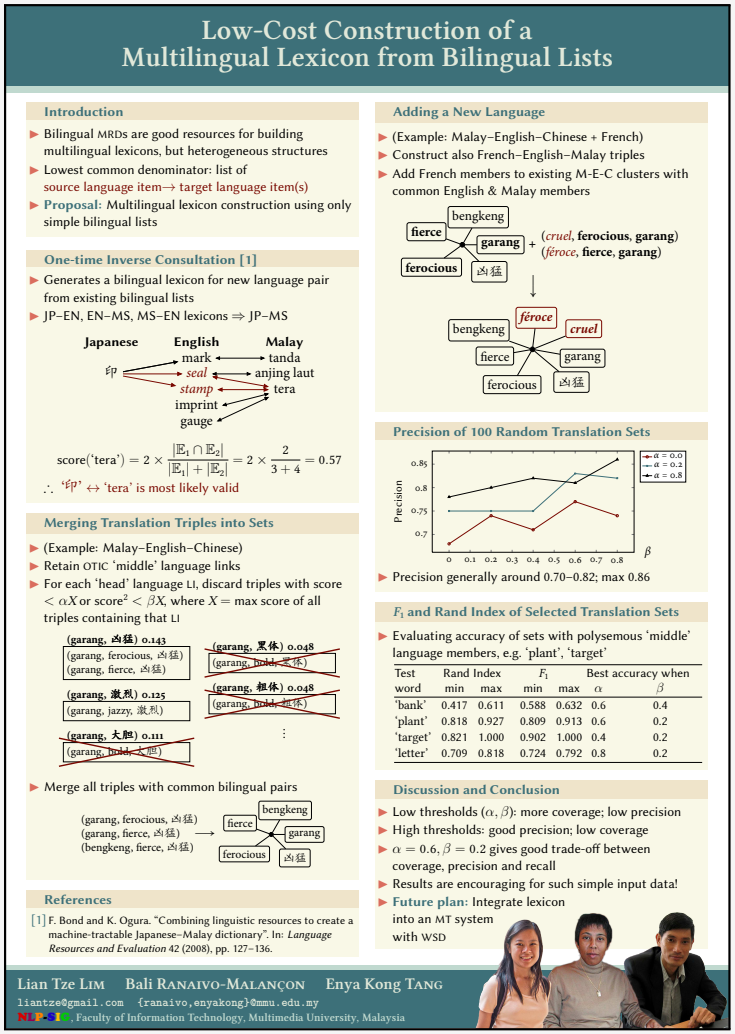


Oversized Posters

- Many possible solutions:
  sciposter, flowfram, beamerposter, tikzposter

```
\documentclass{beamer}
\usepackage[orientation=portrait,
size=a0]
  {beamerposter}
\usetheme{...}
\author ...  % Meta-information

\begin{document}
\begin{frame}
...  % Poster contents goes here
\end{frame}
\end{document}
```

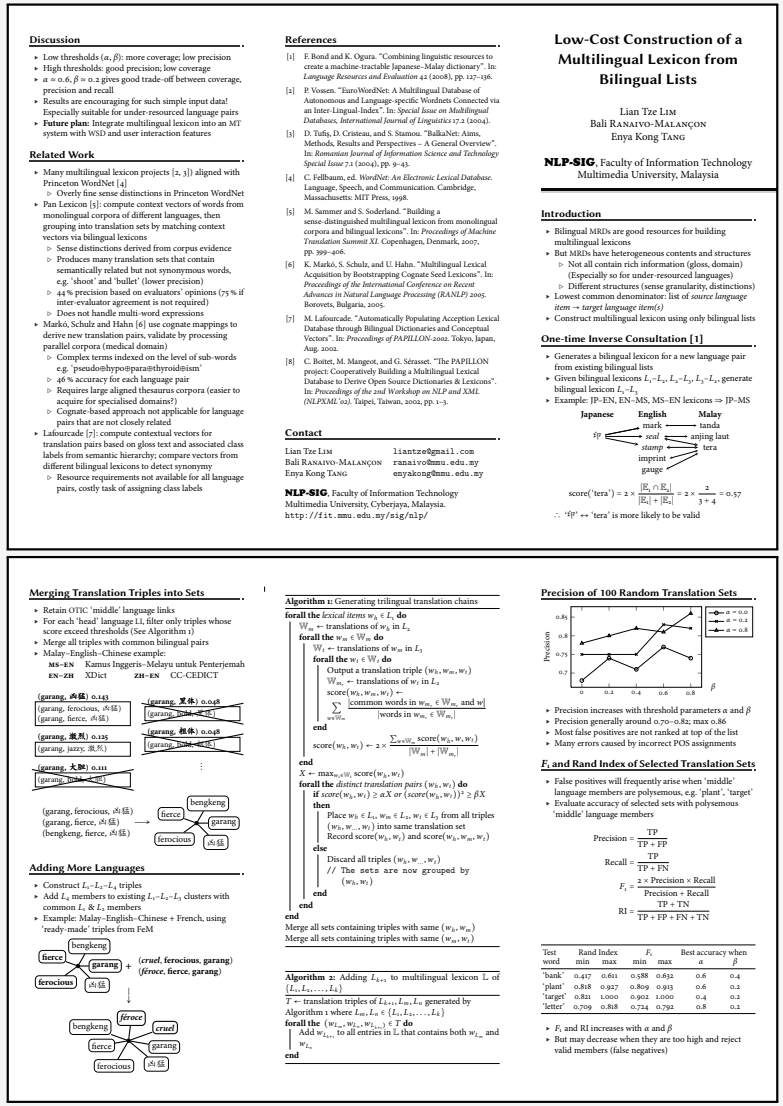


Leaflets

- `leaflet`: arrange contents into 6 pages on a foldable double-sided sheet

```
\documentclass[foldmark,a4paper]
{leaflet}
\author ...  % Meta-information

\begin{document}
\maketitle
\section ...
... % Leaflet contents
\end{document}
```



Discussion

- Low thresholds (α, β): more coverage; low precision
- High thresholds: good precision; low coverage
- $\alpha \approx 0.6$, $\beta \approx 0.2$ gives good trade-off between coverage, precision and recall
- Results are encouraging for such simple input data! Especially suitable for under-resourced language pairs
- **Future plan:** Integrate multilingual lexicon into an MT system with WSD and user interaction features

Related Work

- Many multilingual lexicon projects [2, 3]) aligned with Princeton WordNet [4]
  - Overly fine sense distinctions in Princeton WordNet
- Pan Lexicon [5]: compute context vectors of words from monolingual corpora of different languages, then grouping into translation sets by matching context vectors via bilingual lexicons
  - Sense distinctions derived from corpus evidence
  - Produces many translation sets that contain semantically related but not synonymous words, e.g. 'shoot' and 'bullet' (lower precision)
  - 44 % precision based on evaluators' opinions (75 % if inter-evaluator agreement is not required)
  - Does not handle multi-word expressions
- Markò, Schulz and Hahn [6] use cognate mappings to derive new translation pairs, validate by processing parallel corpora (medical domain)
  - Complex terms indexed on the level of sub-words e.g. 'pseudo@hypo@para@thyroid@ism'
  - 46 % accuracy for each language pair
  - Requires large aligned thesaurus corpora (easier to acquire for specialised domains?)
  - Cognate-based approach not applicable for language pairs that are not closely related
- Lafourcade [7]: compute contextual vectors for translation pairs based on gloss text and associated class labels from semantic hierarchy; compare vectors from different bilingual lexicons to detect synonymy
  - Resource requirements not available for all language pairs, costly task of assigning class labels

References

[1] F. Bond and K. Ogura. "Combining linguistic resources to create a machine-tractable Japanese–Malay dictionary". In: *Language Resources and Evaluation* 42 (2008), pp. 127–136.

[2] P. Vossen. "EuroWordNet: A Multilingual Database of Autonomous and Language-specific Wordnets Connected via an Inter-Lingual-Index". In: *Special Issue on Multilingual Databases, International Journal of Linguistics* 17.2 (2004).

[3] D. Tufiş, D. Cristeau, and S. Stamou. "BalkaNet: Aims, Methods, Results and Perspectives – A General Overview". In: *Romanian Journal of Information Science and Technology Special Issue* 7.1 (2004), pp. 9–43.

[4] C. Fellbaum, ed. *WordNet: An Electronic Lexical Database*. Language, Speech, and Communication. Cambridge, Massachusetts: MIT Press, 1998.

[5] M. Sammer and S. Soderland. "Building a sense-distinguished multilingual lexicon from monolingual corpora and bilingual lexicons". In: *Proceedings of Machine Translation Summit XI*. Copenhagen, Denmark, 2007, pp. 399–406.

[6] K. Markò, S. Schulz, and U. Hahn. "Multilingual Lexical Acquisition by Bootstrapping Cognate Seed Lexicons". In: *Proceedings of the International Conference on Recent Advances in Natural Language Processing (RANLP) 2005*. Borovets, Bulgaria, 2005.

[7] M. Lafourcade. "Automatically Populating Acception Lexical Database through Bilingual Dictionaries and Conceptual Vectors". In: *Proceedings of PAPILLON-2002*. Tokyo, Japan, Aug. 2002.

[8] C. Boitet, M. Mangeot, and G. Sérasset. "The PAPILLON project: Cooperatively Building a Multilingual Lexical Database to Derive Open Source Dictionaries & Lexicons". In: *Proceedings of the 2nd Workshop on NLP and XML (NLPXML'02)*. Taipei, Taiwan, 2002, pp. 1–3.

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NLP-SIG, Faculty of Information Technology
Multimedia University, Cyberjaya, Malaysia.
http://fit.mmu.edu.my/sig/nlp/

Low-Cost Construction of a Multilingual Lexicon from Bilingual Lists

Lian Tze Lim
Bali Ranaivo-Malançon
Enya Kong Tang

NLP-SIG, Faculty of Information Technology
Multimedia University, Malaysia

Introduction

- Bilingual MRDs are good resources for building multilingual lexicons
- But MRDs have heterogeneous contents and structures
  - Not all contain rich information (gloss, domain) (Especially so for under-resourced languages)
  - Different structures (sense granularity, distinctions)
- Lowest common denominator: list of *source language item* → *target language item(s)*
- Construct multilingual lexicon using only bilingual lists

One-time Inverse Consultation [1]

- Generates a bilingual lexicon for a new language pair from existing bilingual lists
- Given bilingual lexicons L_1–L_2, L_2–L_3, L_3–L_4, generate bilingual lexicon L_1–L_3
- Example: JP–EN, EN–MS, MS–EN lexicons ⇒ JP–MS

$$\text{score}(\text{'tera'}) = 2 \times \frac{|\mathbb{E}_s \cap \mathbb{E}_t|}{|\mathbb{E}_s| + |\mathbb{E}_t|} = 2 \times \frac{2}{3+4} = 0.57$$

$\therefore$ 'cap' ↔ 'tera' is more likely to be valid

Merging Translation Triples into Sets

- Retain OTIC 'middle' language links
- For each 'head' language LI, filter only triples whose score exceed thresholds (See Algorithm 1)
- Merge all triples with common bilingual pairs
- Malay–English–Chinese example:
  - MS–EN Kamus Inggeris–Melayu untuk Penterjemah
  - EN–ZH XDict
  - ZH–EN CC-CEDICT

Adding More Languages

- Construct L_1–L_2–L_4 triples
- Add L_4 members to existing L_1–L_2–L_3 clusters with common L_1 & L_2 members
- Example: Malay–English–Chinese + French, using 'ready-made' triples from FeM

Algorithm 1: Generating trilingual translation chains

forall the *lexical items* $w_k \in L_k$ **do**
  $\mathbb{W}_m \leftarrow$ translations of w_k in L_2
  forall the $w_m \in \mathbb{W}_m$ **do**
    $\mathbb{W}_l \leftarrow$ translations of w_m in L_3
    forall the $w_l \in \mathbb{W}_l$ **do**
      Output a translation triple (w_k, w_m, w_l)
      $\mathbb{W}_{m_s} \leftarrow$ translations of w_l in L_2
      $\text{score}(w_k, w_m, w_l) \leftarrow \frac{|\text{common words in } w_{m_s} \in \mathbb{W}_{m_s} \text{ and } w|}{|\text{words in } w_{m_s} \in \mathbb{W}_{m_s}|}$
    end
    $\text{score}(w_k, w_l) \leftarrow 2 \times \frac{\sum_{w \in \mathbb{W}_m} \text{score}(w_k, w, w_l)}{|\mathbb{W}_m| + |\mathbb{W}_{m_s}|}$
  end
end
$X \leftarrow \max_{w_k \in \mathbb{W}} \text{score}(w_k, w_l)$
forall the *distinct translation pairs* (w_k, w_l) **do**
  if $\text{score}(w_k, w_l) \geq \alpha X$ *or* $(\text{score}(w_k, w_l))^2 \geq \beta X$ **then**
    Place $w_k \in L_1$, $w_m \in L_2$, $w_l \in L_3$ from all triples (w_k, w_m, w_l) into same translation set
    Record $\text{score}(w_k, w_l)$ and $\text{score}(w_k, w_m, w_l)$
  else
    Discard all triples (w_k, w_m, w_l)
    // The sets are now grouped by (w_k, w_l)
  end
end
Merge all sets containing triples with same (w_k, w_m)
Merge all sets containing triples with same (w_m, w_l)

Algorithm 2: Adding L_{k+1} to multilingual lexicon $\mathbb{L}$ of $\{L_1, L_2, \ldots, L_k\}$

$T \leftarrow$ translation triples of L_{k+1}, L_m, L_n generated by Algorithm 1 where $L_m, L_n \in \{L_1, L_2, \ldots, L_k\}$
forall the $(w_{l_m}, w_{l_n}, w_{L_{k+1}}) \in T$ **do**
  Add $w_{L_{k+1}}$ to all entries in $\mathbb{L}$ that contains both w_{l_m} and w_{l_n}
end

Precision of 100 Random Translation Sets

- Precision increases with threshold parameters α and β
- Precision generally around 0.70–0.82; max 0.86
- Most false positives are not ranked at top of the list
- Many errors caused by incorrect POS assignments

F_i and Rand Index of Selected Translation Sets

- False positives will frequently arise when 'middle' language members are polysemous, e.g. 'plant', 'target'
- Evaluate accuracy of selected sets with polysemous 'middle' language members

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}}$$

$$\text{Recall} = \frac{\text{TP}}{\text{TP} + \text{FN}}$$

$$F_i = \frac{2 \times \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

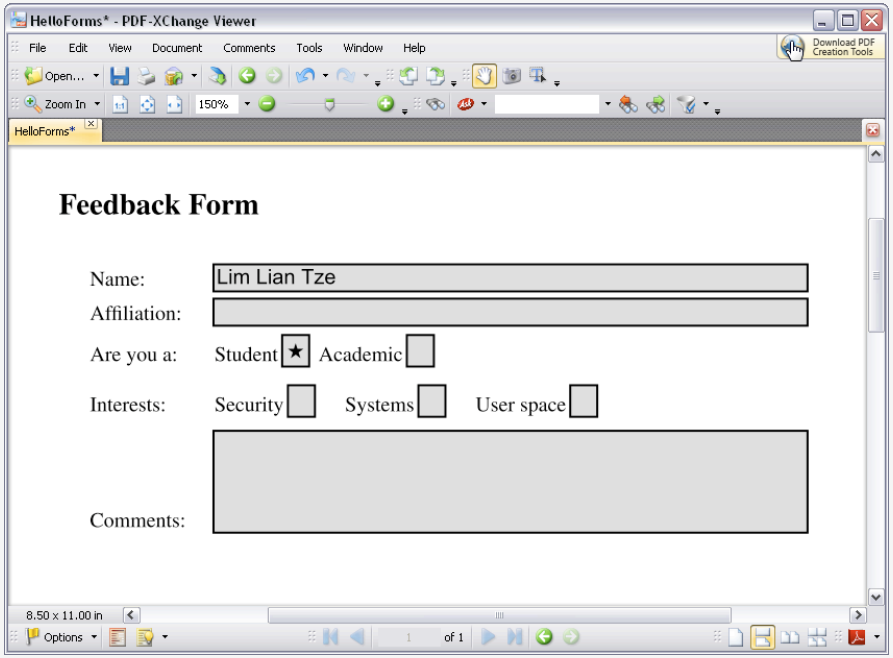
$$\text{RI} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{FP} + \text{FN} + \text{TN}}$$

Test word	Rand Index min	Rand Index max	F_i min	F_i max	Best accuracy when α	Best accuracy when β
'bank'	0.417	0.611	0.588	0.632	0.6	0.4
'plant'	0.818	0.927	0.809	0.913	0.6	0.2
'target'	0.821	1.000	0.902	1.000	0.4	0.2
'letter'	0.709	0.818	0.724	0.792	0.8	0.2

- F_i and RI increases with α and β
- But may decrease when they are too high and reject valid members (false negatives)

Fillable PDF Forms

```
\usepackage{hyperref}
... % various settings skipped
\TextField{Name:}\\
\TextField{Affiliation:}\\
\ChoiceMenu[radio=true]
{Are you a:}{Student, Academic}\\
Interest:
\CheckBox{Security}
\CheckBox{Systems}
\CheckBox{User space}\\
\TextField[multiline=true]
{Comments:}\\
```



Flash Cards

```
\documentclass[avery5388,frame]
{flashcards}
\cardfrontstyle{headings}
\cardfrontfoot{Linux}

\begin{document}
\begin{flashcard}[Security]
{Certificate}
...
\end{flashcard}

\begin{flashcard}[Security]
{MAC ...}
...
\end{flashcard}
\end{document}
```

Examination Paper

```
\documentclass{exam}
...
\begin{questions}\printanswers
\question[5]
What is Paul McCartney's middle name?
\begin{oneparchoices}
\choice John \CorrectChoice Paul
\choice Ringo \choice James
\end{oneparchoices}

\question[10] What was the Beatles'
first single
  in 1962?
\begin{solution}Love Me Do\end{solution}

\question
\begin{parts}
\part[5] What was George's inspiration
for
  `While My Guitar Gently Weeps'?
\begin{solution}
He opened a random book and saw the
words
  ``gently weep''.
\end{solution}
```

1. What is Paul McCartney's middle name? (5)

   A. John **B. Paul** C. Ringo D. James

2. What was the Beatles' first single in 1962? (10)

   Solution: Love Me Do

3. (a) What was George's inspiration for 'While My Guitar Gently Weeps'? (5)

   Solution: He opened a random book and saw the words "gently weep".

   (b) Who guest-performed for the song and why? (5)

   Solution: Eric Clapton; he wanted a spiffy guitar solo.

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Very Simple LATEX Document

```
\documentclass{article}

\begin{document}
This is a very simple \LaTeX\ document. We did not use any additional
options or any additional packages.
\end{document}
```

This is a very simple LATEX document. We did not use any additional options or any additional packages.

Ligatures

- Some symbols are interpeted in a special way (e.g., \), and also some sequences of symbols known as *ligatures*
- Consider ‘`fiery fluffy`’, typeset as: fiery fluffy
- For proper double quotes normally do not use double-quote symbol (") but use ligatures of two backquotes for start, and two quotes for end; e.g., ``` ``I understand.'' ``` is typeset as “I understand.”
- Different types of dashes, hyphens or minuses:
  - a hyphen (-) is used in a word such as X-ray and typed with one minus sign (-)
  - an en-dash (–) is used for number ranges; e.g., pages 13–34, and typed with two minus signs (--)
  - an em-dash (—) is used for inter-sentence punctuation—like this—and typed with three minus signs (---)
  - a mathematical minus (−) is obtained in math mode such as `$-$`

Lines and Paragraphs

- TEX automatically inserts paragraph indents, and forms justified lines, hyphenating words if necessary
- `\-` can be used to suggest hyphenation place
- `~` tie, also known as non-breakable space, can be used to prevent line break at certain points
- For example, the following places are recommended for ties:
  - before citation: `the paper~\cite{knuth78}`
  - In references to named parts of a document:

    ```
    Chapter~12  Theorem~1.2  Appendix~A  Table~\hbox{B-8}
    Figure~3    Lemmas 5 and~6
    ```

  - Between a person's forenames and between multiple surnames:

    ```
    Donald~E. Knuth                    Luis~I. Trabb~Pardo
    Bartel~Leendert van~der~Waerden    Charles~XII
    ```

More Tie Examples

- Between math symbols in apposition with nouns:

```
dimension~$d$   width~$w$    function~$f(x)$
string~$s$ of length~$l$
```

- Between symbols in series:

```
1,~2, or~3    $a$,~$b$, and~$c$.    1,~2, \ldots,~$n$.
```

- When a symbol is a tightly bound object of a preposition:

```
of~$x$
from 0 to~1
increase $z$ by~1
in common with~$m$.
```

Mathematics

- TEX had an excellent math typesetting support from the start

```
The well-known Pythagorean theorem $x^2+y^2=z^2$, or equivalently
\(a^2+b^2=c^2\), has infinitely many integer solutions, but for
$n\ge 3$ the following equation does not: \[ x^n + y^n = z^n \]
```

The well-known Pythagorean theorem $x^2 + y^2 = z^2$, or equivalently $a^2 + b^2 = c^2$, has infinitely many integer solutions, but for $n \geq 3$ the following equation does not:

$$x^n + y^n = z^n$$

Mathematics: Example

Equation (1) relates the golden ratio and the Fibonacci series. Recall that the golden ratio, $\varphi = \frac{1}{2}(1 + \sqrt{5})$.

$$\varphi = 1 + \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{F_n F_{n+1}} \tag{1}$$

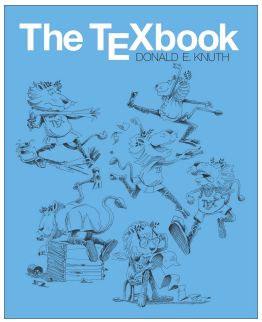
```
Equation~\eqref{eq:gratio} relates the golden ratio and the Fibonacci
series.
Recall that the golden ratio, $\phi = \frac{1}{2} (1 + \sqrt{5})$.

\begin{equation}\label{eq:gratio}
\phi = 1 + \sum^{\infty}_{n=1}
                \frac{ (-1)^{n+1} }{ F_n F_{n+1} }
\end{equation}
```

Including Images

- Package `graphicx` for inclusion of images of different types
- In preamble: `\usepackage{graphicx}`

```
This is the cover of the \TeX{}book:\\
\centerline{\includegraphics[height=2cm]{img/texbook-cover.jpg}}
```

This is the cover of the TEXbook:



Creating a Table (not float)

```
\begin{center}
\begin{tabular}{ |c|c|c| }
 \hline
 cell1 & cell2 & cell3 \\ \hline
 cell4 & cell5 & cell6 \\ \hline
 cell7 & cell8 & cell9 \\ \hline
\end{tabular}
\end{center}
```

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Figures and Tables as Floats

- As floats, figures and tables take a piece of "stuff", set caption, number and find a location
- Use `\begin{figure}...\end{figure}` or `\begin{table}...\end{table}`

```
\begin{figure}[h]
   \centering
   \includegraphics[width=0.25
\textwidth]{neuron.png}
   \caption{A neuron (from Wikipedia
      File:Blausen\_0657\_
MultipolarNeuron.png)}
   \label{fig:neuron}
\end{figure}
Figure~\ref{fig:neuron} shows a
neuron structure.
```

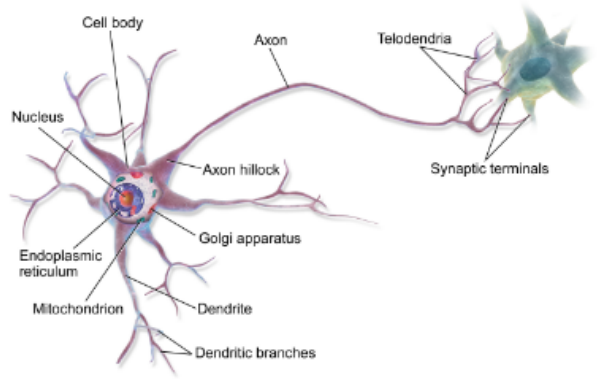


Figure 1: A neuron (from Wikipedia File:Blausen_0657_MultipolarNeuron.png)

Figure 1 shows a neuron structure.

Unordered and Ordered Lists

```
\begin{itemize}
\item First item
\item Second item, etc.
\end{itemize}
```

```
\begin{enumerate}
\item First item
\item Second item, etc.
\end{enumerate}
```

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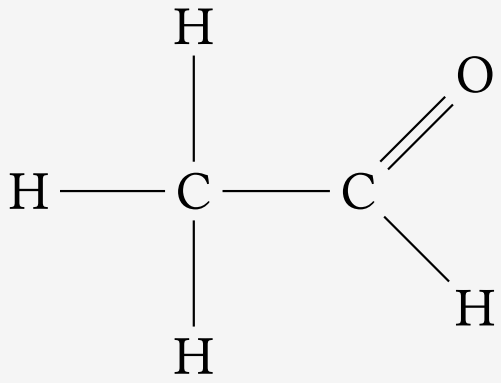
Chemical Equations and Molecules

$$\mathrm{Zn^{2+}} \underset{+2\,\mathrm{H^+}}{\overset{+2\,\mathrm{OH^-}}{\rightleftharpoons}} \underset{\text{amphoteres Hydroxid}}{\mathrm{Zn(OH)_2}\downarrow} \underset{+2H+}{\overset{+2\,\mathrm{OH^-}}{\rightleftharpoons}} \underset{\text{Hydroxozikat}}{\mathrm{[Zn(OH)_4]^{2-}}}$$

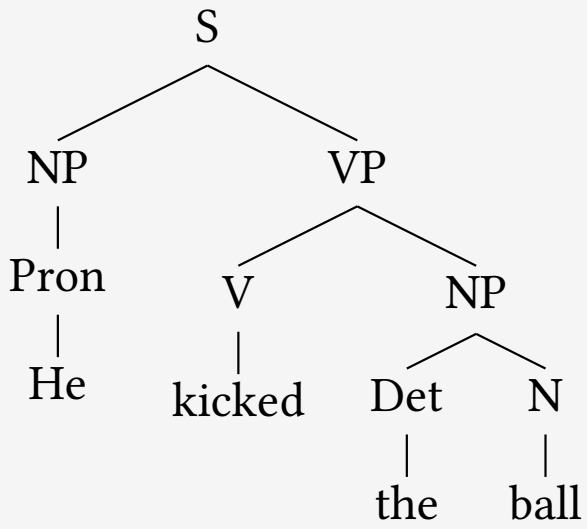



```
\usepackage[version=3]{mhchem}      % sufficient for chemical equations
\usepackage{chemfig}      % for 2-D molecule drawings
...
\ce{Zn^2+ <=>[\ce{+ 2OH-}][\ce{+ 2H+}]
$\underset{\text{amphoteres Hydroxid}}{\ce{Zn(OH)2 v}}$
<=> C[+2OH-][{+ 2H+}]
$\underset{\text{Hydroxozikat}}{\cf{[Zn(OH)4]^2-}}$ }

\chemfig{H-C(-[2]H)(-[6]H)-C(-[7]H)=[1]O}
```

Linguistics

(1) *%*Wen liebt seine Mutter?*
Whom loves his mother
‘Who does his mother

```
\usepackage{linguex,qtree}
...
\ex
\begingl
\gla \%*Wen liebt seine Mutter?//
\glb Whom loves his mother//
\glc `Who does his mother love?'//
\endgl
\xe
```




```
\usepackage{qtree}
...
\Tree [ .S [.NP [.Pron He ] ] [.
VP [.V kicked ] [.NP [.Det the ]
 [.N ball ] ] ] ]
```

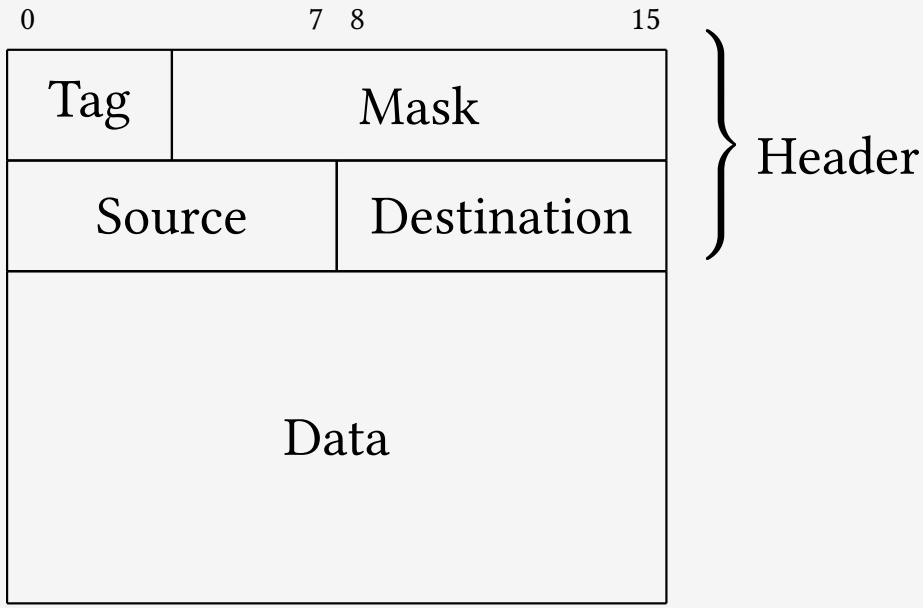
Program Listings

```
\usepackage{listings,xcolor}
...
\begin{lstlisting}
[language=C,columns=fullflexible,
basicstyle=\ttfamily,
keywordstyle=\bfseries\color{red},
commentstyle=\sffamily\color{green},
stringstyle=\rmfamily\color{orange}]
#include <stdio.h>
/*
 | Prints "hello world"
 */
int main(void)
{
    printf("hello, world\n");
    return 0;
}
\end{lstlisting}
```

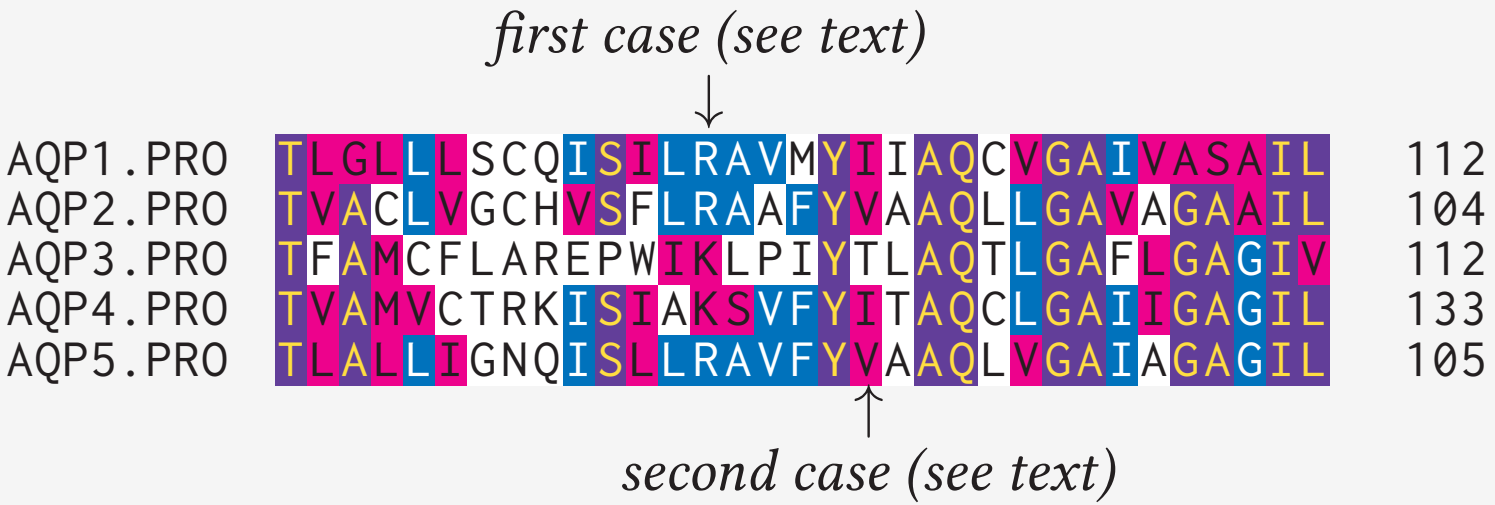
```c
#include <stdio.h>

/*
 | Prints "hello world"
 */
int main(void)
{
    printf("hello, world\n");
    return 0;
}
```

Network Protocols

```
\usepackage{bytefield}
...
\begin{bytefield}{16}
\bitheader{0,7,8,15} \\
\begin{rightwordgroup}{Header}
\bitbox{4}{Tag} & \bitbox{12}{Mask} \\
\bitbox{8}{Source} &
\bitbox{8}{Destination}
\end{rightwordgroup} \\
\wordbox{3}{Data}
\end{bytefield}
```

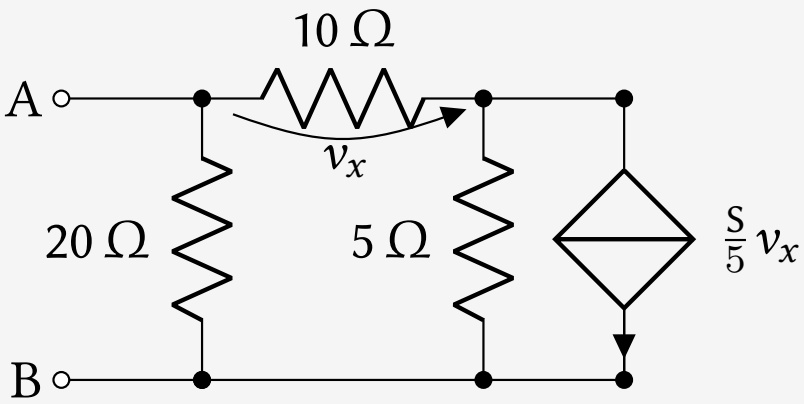


Life Sciences




```
\usepackage{texshade}    % for nucleotide and peptide alignments
...
\begin{texshade}{AQPpro.MSF.txt}
\shadingmode{similar}
\threshold[80]{50}
\setends{1}{80..112}
\hideconsensus
\feature{top}{1}{93..93}{fill:$\downarrow$}{first case (see text)}
\feature{bottom}{1}{98..98}{fill:$\uparrow$}{second case (see text)}
\end{texshade}
```

Circuits and SI Units



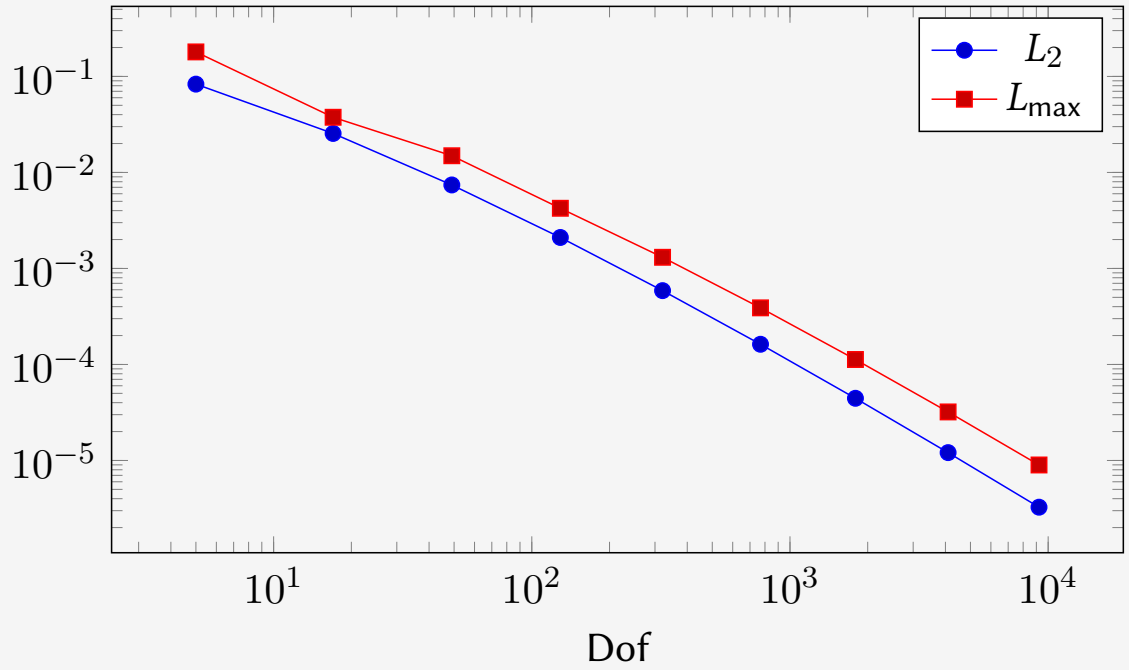
- $3.45 \times 10^4\ \mathrm{V^2\,lm^3\,F^{-1}}$
- 40 km/h, 85 km/h and 103 km/h

```
\usepackage{siunitx}
\usepackage[siunitx]{circuitikz}
...
\begin{circuitikz}
\draw (0,0) node[anchor=east] {B}
  to[short, o-*] (1,0)    to[R=20<\ohm>, *-*] (1,2)
  to[R=10<\ohm>, v=$v_x$] (3,2) -- (4,2)
  to[ cI=$\frac{\si{\siemens}}{5} v_x$, *-*] (4,0) -- (3,0)
  to[R=5<\ohm>, *-*] (3,2)
  (3,0) -- (1,0)   (1,2) to[short, -o] (0,2) node[anchor=east]{A}
;\end{circuitikz}

\SI{3.45d4}{\square\volt\cubic\lumen\per\farad}
\SIlist[per-mode=symbol]{40;85;103}{\kilo\metre\per\hour}
```

Bar Codes

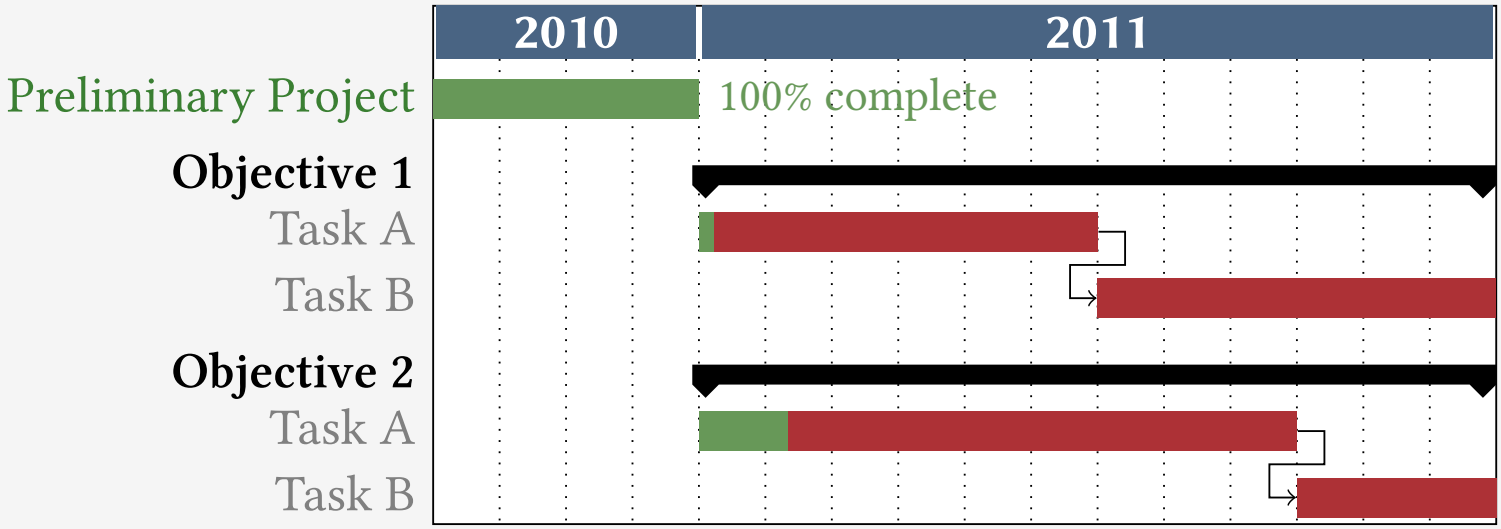

```
\usepackage{auto-pst-pdf}   % Needed if running pdflatex; must use option -shell-escape
\usepackage{pstricks,pst-barcode}
...
\begin{pspicture}
\psbarcode{MECARD:N:Malaysia Open Source Conference...}{eclevel=L}{qrcode}
\psbarcode{9781860742712}{includetext guardwhitespace}{ean13}
\psbarcode{978-3-86541-114}{includetext guardwhitespace}{isbn}
\psbarcode{LE28HS9Z}{includetext}{royalmail}
\psbarcode{^453^178^121^239}{columns=2 rows=10}{pdf417}
\end{pspicture}
```

Graph Plots



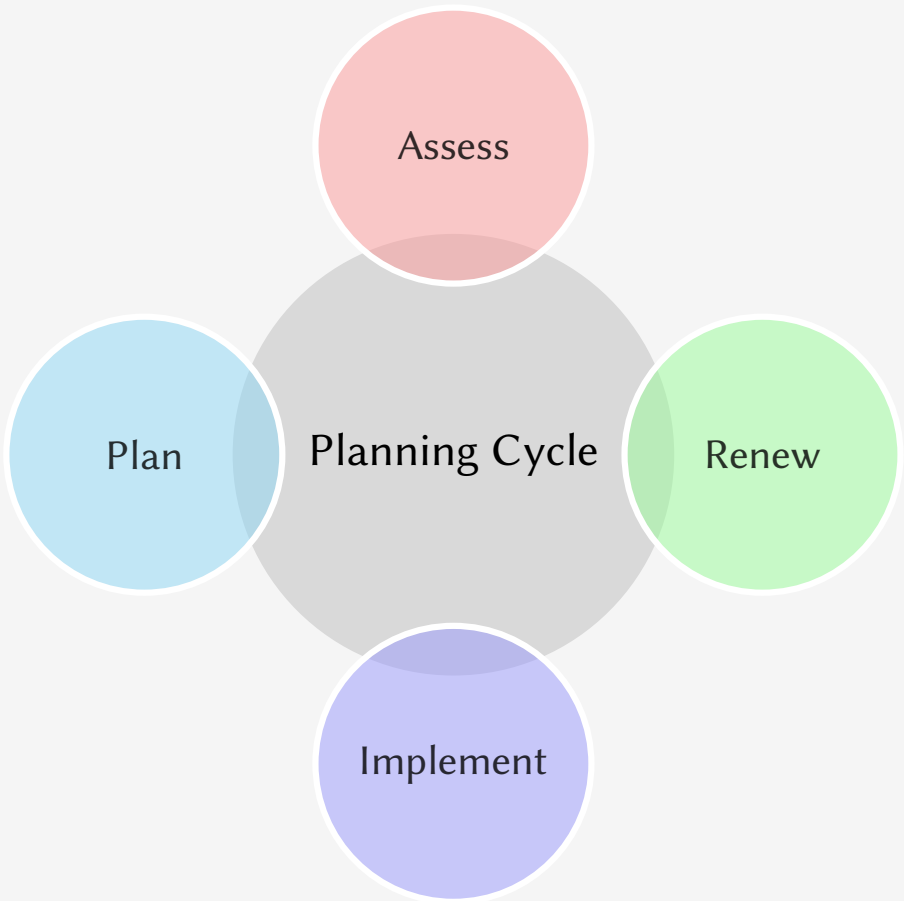

```
\usepackage{pgfplots}
...
\begin{tikzpicture}
\begin{loglogaxis}[xlabel=Dof]
\addplot table[x=dof,y=L2]{datafile.dat}; \addlegendentry{$L_2$};
\addplot table[x=dof,y=Lmax]{datafile.dat};  \addlegendentry{$L_\text{max}$};
\end{loglogaxis}
\end{tikzpicture}
```

Gantt Charts

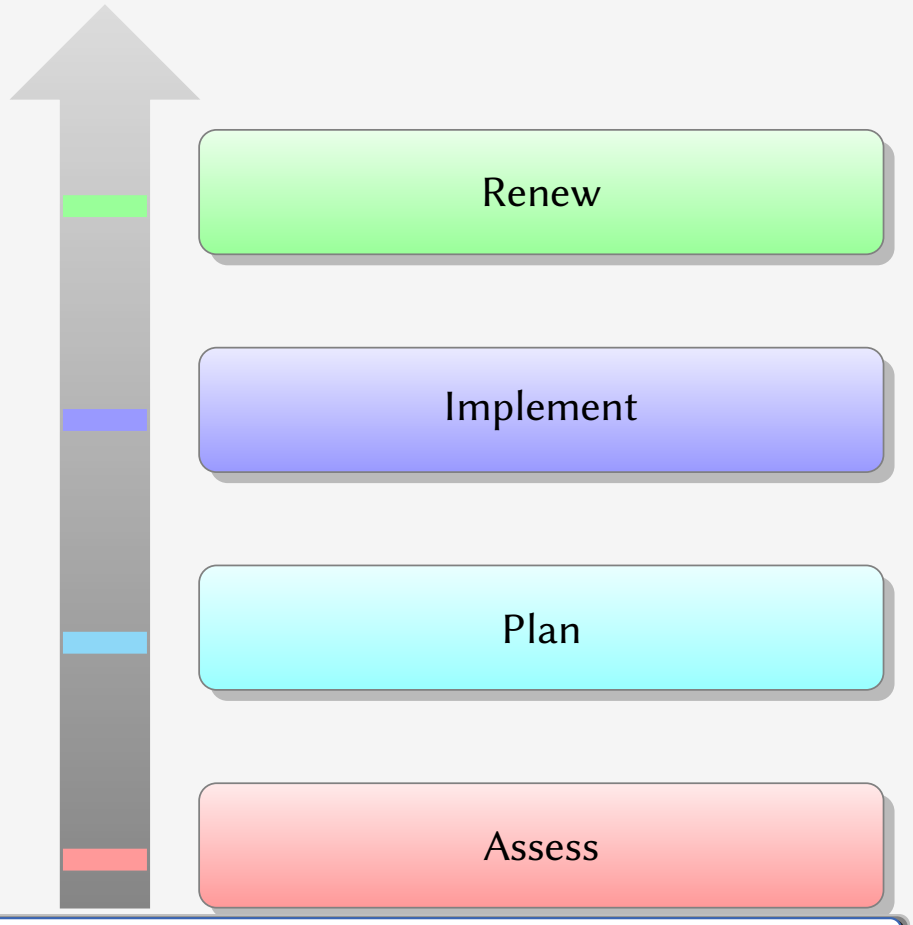



```
\usepackage{pgfgantt}
...
\begin{ganttchart}[...settings...]{1}{16}
\ganttitle{2010}{4} \ganttitle{2011}{12} \\
\ganttbar[progress=100]{Preliminary Project}{1}{4} \\
\ganttgroup{Objective 1}{5}{16} \\
\ganttbar[progress=4, name=T1A]{Task A}{5}{10} \\
\ganttlinkedbar[progress=0]{Task B}{11}{16} \\
...
\end{ganttchart}
```

'Smart Diagrams'




```
\usepackage{smartdiagram}
\smartdiagram[bubble diagram]{
  Planning Cycle,Assess,Plan,
  Implement,Renew}
```

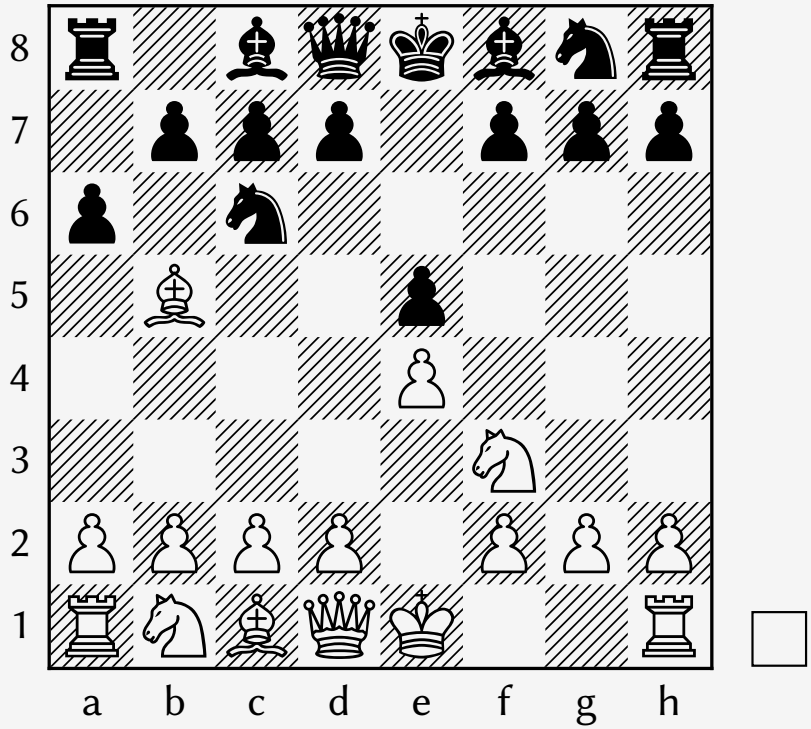



```
\usepackage{smartdiagram}
\smartdiagram
  [priority descriptive diagram]{
  Assess,Plan,Implement,Renew}
```

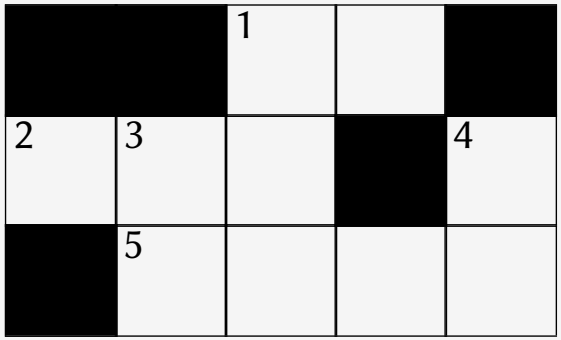
Chess games

```
\usepackage[skaknew]%
{skak,chessboard}
...
\newgame
\mainline{1. e4 e5 2. Nf3 Nc6 3.
Bb5 a6}
\chessboard[smallboard]
```

1 e4 e5 2 ♘f3 ♘c6 3 ♗b5 a6



Crossword Puzzles

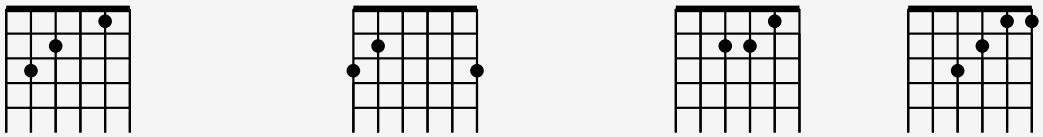


Across: 1 unit of measure
2 $*$ 5 sectioning unit

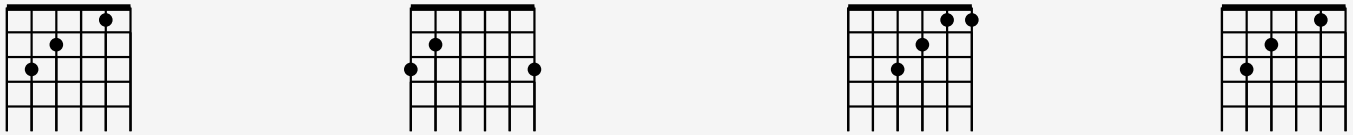
Down: 1 η 3 unit of measure 4 nonproportional font

```
\usepackage{cwpuzzle}
...
\begin{Puzzle}{5}{3}
|* |* |[1]E|X |* |.
|[2]A|[3]S|T |* |[4]T|.
|* |[5]P|A |R |T |.
\end{Puzzle}
\begin{PuzzleClues}{
\textbf{Across:} }
  \Clue{1}{EX}{unit of measure}
  \Clue{2}{AST}{\(\ast\)}
  \Clue{5}{PART}{sectioning unit}
\end{PuzzleClues}
\begin{PuzzleClues}{
\textbf{Down:} }
  \Clue{1}{ETA}{\(\eta\)}
  \Clue{3}{SP}{unit of measure}
  \Clue{4}{TT}{nonproportional font}
\end{PuzzleClues}
```

Song Books with Guitar Tabs



Country road, take me home, to the place I belong.



West Virginia, mountain momma, take me home, country road.

```
\usepackage{gchords,guitar}
...
\begin{guitar}
\newcommand{\CMaj}{\chord{t}{n,p3,p2,n,p1,n}{C}}
\newcommand{\Amin}...
Country [\CMaj]road, take me [\GMaj]home, ...
\end{guitar}
```

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Conclusion

- TEX and LATEX
  - a document preparation system
  - professional quality typesetting output
- Output artefacts
  - Academic: papers, theses, books
  - Dedicated document types
  - Domain-specific material
- Different usage scenarios
  - Individual installation
  - Overleaf

References

- LianTze Lim, "LATEX: More than Just Academic Papers and Theses", https://www.overleaf.com/read/cyfvvyfrpmyn
- Overleaf, "Learn LATEX in 30 minutes", https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes
- Donald Knuth, "The TEXbook", http://ctex.org/documents/shredder/src/texbook.pdf