

LaTeX hands-on tutorial

(Held on Nov. 10 2021)



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About lecturer

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3rd year)

Graduate School of Informatics

Statistical representation of word meanings

Goal

- You understand what is LaTeX
- You can use Overleaf (online LaTeX editor)
- You can write a document with text, title, headings, math formulas, figures & tables using LaTeX

What is LaTeX?

What is LaTeX?

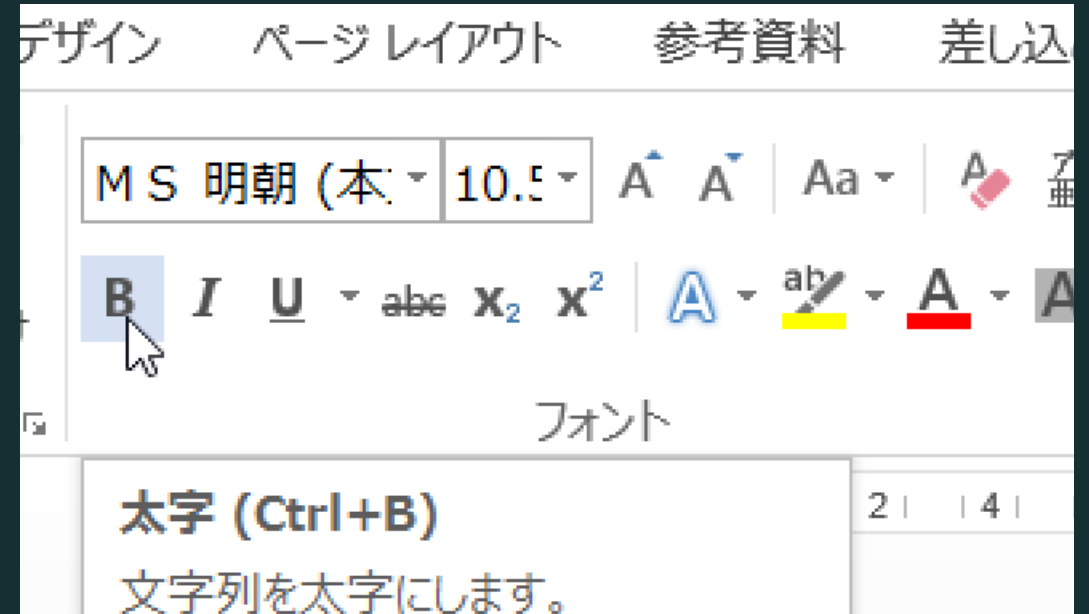
LaTeX is a typesetting software

Typesetting software:
making (layouting) reports, articles,
books

Microsoft Word vs. LaTeX

Word

Text formats specified
by GUI buttons etc.



LaTeX

Text formats specified
by plain text commands

```
3 \begin{document}
4 \textbf{Report writing is one}
5 \textbf{}
```

LaTeX is a converter

.tex file

PDF file

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Advances in the Report Writing}
\author{Hayato Hashimoto}
\date{April 2019}

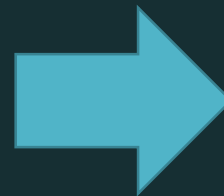
\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

convert



Your Paper

You

June 19, 2018

Abstract

Your abstract.

1 Introduction

Your introduction goes here! Some examples of commonly used commands and features are listed below, to help you get started. If you have a question, please use the help menu (?) on the top bar to search for help or ask us a question.

2 Some examples to get started

2.1 How to add Comments

Comments can be added to your project by clicking on the comment icon in the toolbar above. To reply to a comment, simply click the reply button in the lower right corner of the comment, and you can close them when you're done.

2.2 How to include Figures

First you have to upload the image file from your computer using the upload link in the project menu. Then use the includegraphics command to include it in your document. Use the figure environment and the caption command to add a number and a caption to your figure. See the code for Figure 1 in this section for an example.

2.3 How to add Tables

Use the table and tabular commands for basic tables — see Table 1, for example.




Figure 1: This frog was uploaded via the project menu.

LaTeX is a converter

.tex file

PDF file

Specifies

Title

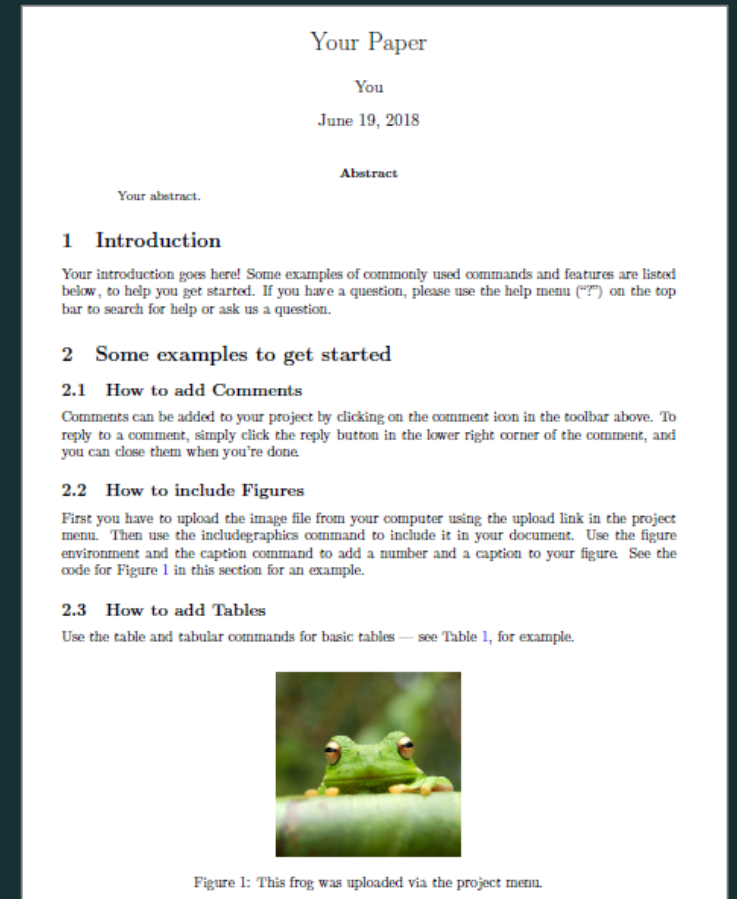
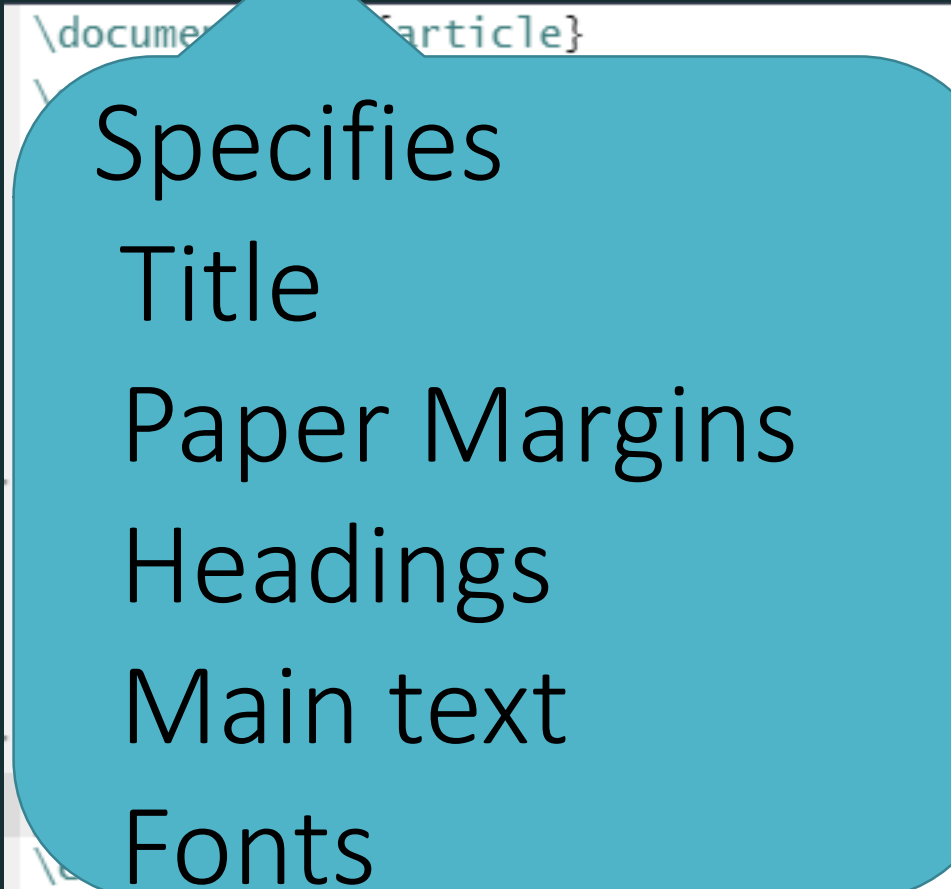
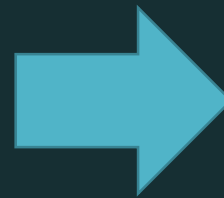
Paper Margins

Headings

Main text

Fonts

convert



Converter “What you MEAN is what you get” vs. GUI “What you SEE is what you get”

Pros:

- Good-looking auto-layouting by default
- Explicitly written styles
- No hassle required with buttons and windows: good at inputting math / reference

Cons:

- Manual adjustments require some hassle

LaTeX is ...

... was developed by a mathematician

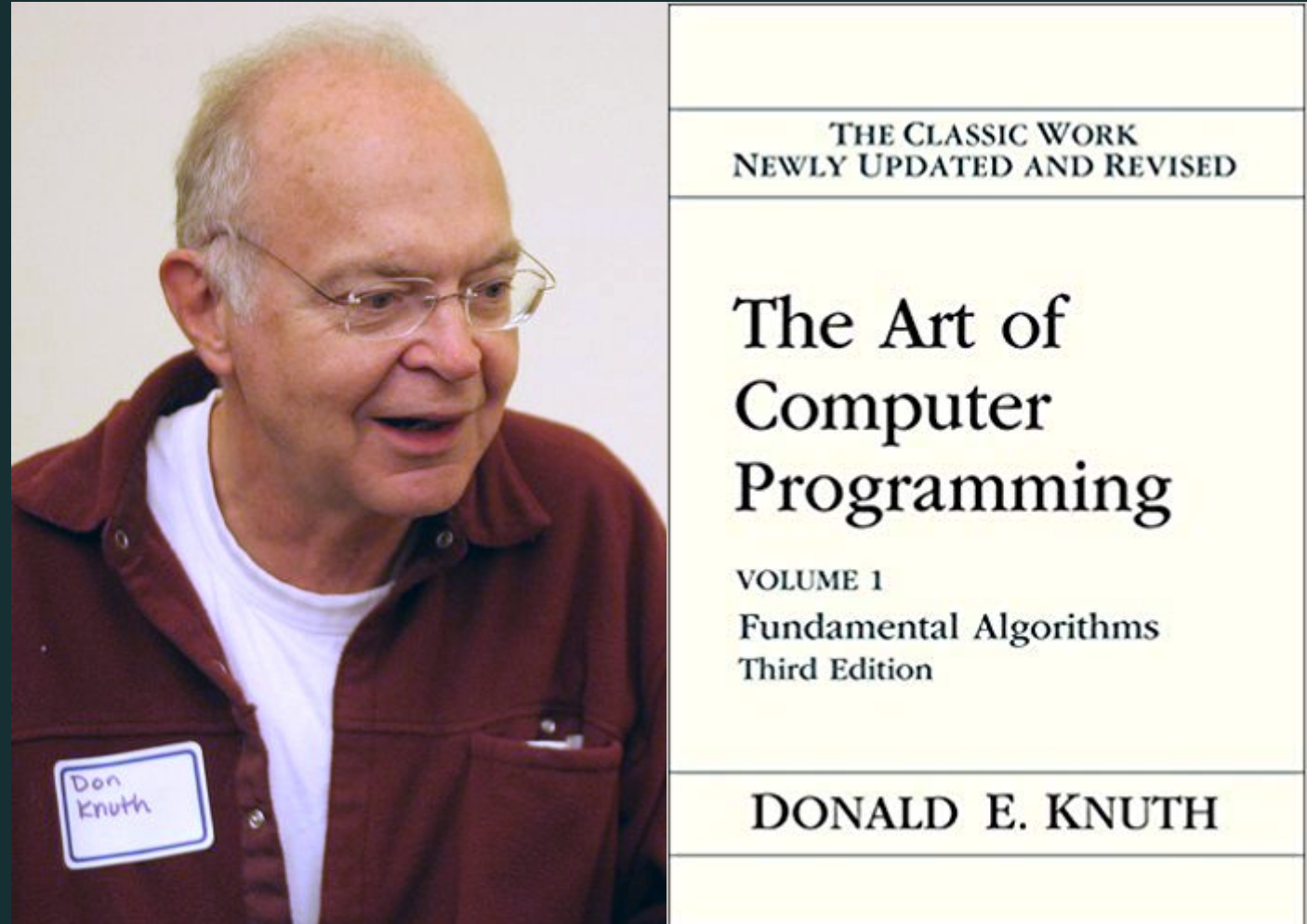
good display of math formula

... has long history

accepted by journals

functionalities

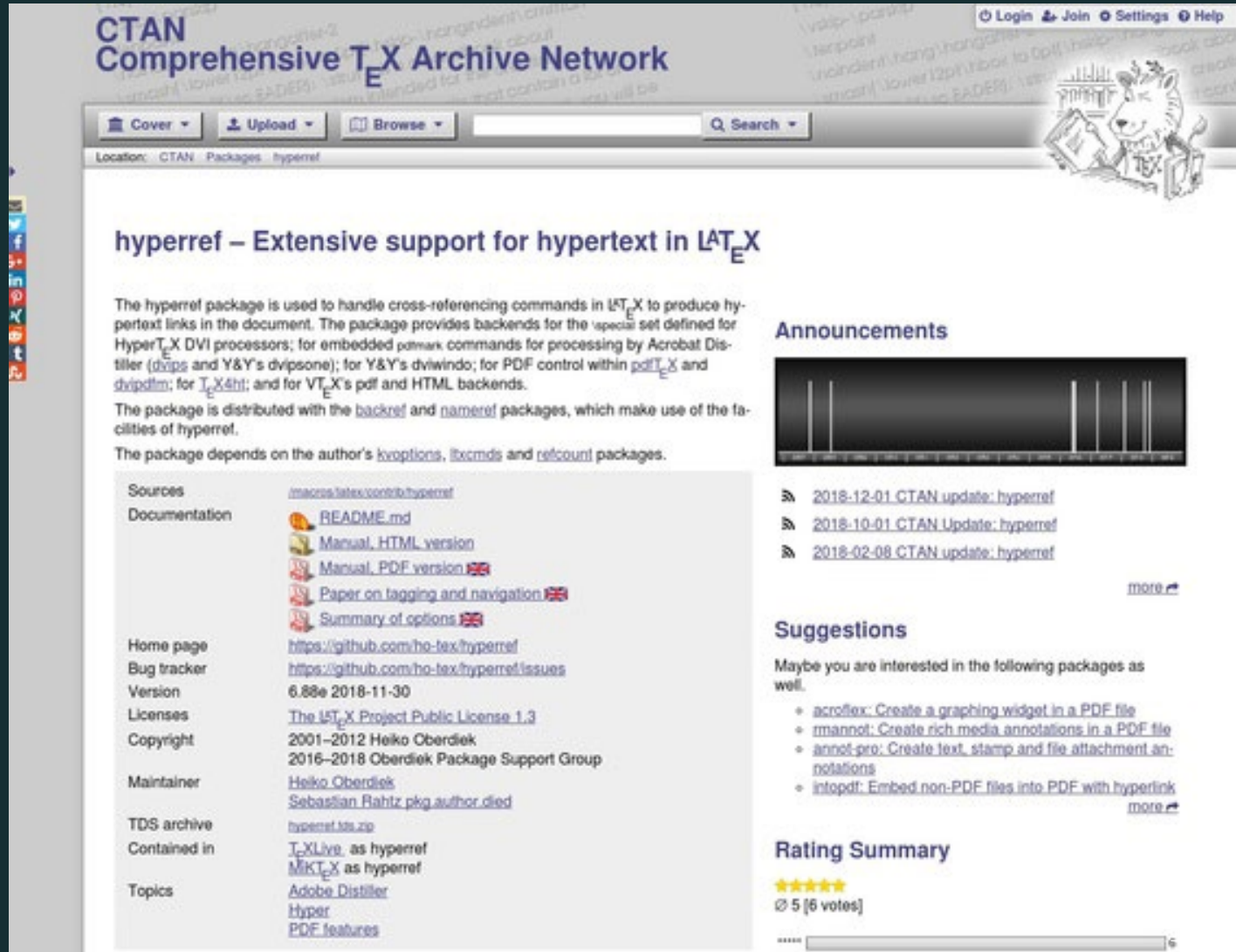
extended by users



LaTeX is ...

has “macro” extensions
users can add new
functionality

has various “packages”
Users can utilize ready-
to-use macro packages
shared by LaTeX users.



The screenshot shows the CTAN (Comprehensive T_EX Archive Network) website page for the `hyperref` package. The page title is "hyperref – Extensive support for hypertext in L^AT_EX". The page content includes a description of the package, its dependencies, and a list of sources and documentation. The right sidebar contains sections for "Announcements" and "Suggestions".

CTAN Comprehensive T_EX Archive Network

Location: CTAN Packages hyperref

hyperref – Extensive support for hypertext in L^AT_EX

The hyperref package is used to handle cross-referencing commands in L^AT_EX to produce hypertext links in the document. The package provides backends for the `special` set defined for HyperT_EX DVI processors; for embedded `pdfmark` commands for processing by Acrobat Distiller (`dvips` and Y&Y's `dvipson`); for Y&Y's `dvilwindo`; for PDF control within `pdfLEX` and `dvipdfm`; for T_EX₄ht; and for VT_EX's pdf and HTML backends.

The package is distributed with the `backref` and `nameref` packages, which make use of the facilities of hyperref.

The package depends on the author's `kvoptions`, `ltxcmds` and `refcount` packages.

Sources

- `/macros/latex/contrib/hyperref`

Documentation

- [README.md](#)
- [Manual, HTML version](#)
- [Manual, PDF version](#)
- [Paper on tagging and navigation](#)
- [Summary of options](#)

Home page <https://github.com/ho-tex/hyperref>

Bug tracker <https://github.com/ho-tex/hyperref/issues>

Version 6.88e 2018-11-30

Licenses [The L^AT_EX Project Public License 1.3](#)

Copyright 2001–2012 Heiko Oberdiek
2016–2018 Oberdiek Package Support Group

Maintainer [Heiko Oberdiek](#)
[Sebastian Rahtz pkg.author.died](#)

TDS archive [hyperref.tds.zip](#)

Contained in T_EXLive as hyperref
MikT_EX as hyperref

Topics [Adobe Distiller](#)
[Hyper](#)
[PDF features](#)

Announcements

- 2018-12-01 CTAN update: hyperref
- 2018-10-01 CTAN Update: hyperref
- 2018-02-08 CTAN update: hyperref

Suggestions

Maybe you are interested in the following packages as well.

- [acroffix](#): Create a graphing widget in a PDF file
- [rmannot](#): Create rich media annotations in a PDF file
- [annot-pro](#): Create text, stamp and file attachment annotations
- [intopdf](#): Embed non-PDF files into PDF with hyperlink

Rating Summary

★★★★★
5 [6 votes]

Start with Overleaf



Overleaf

Overleaf is a web application for editing LaTeX

- No installation needed
- Free of charge (basic plan)
- Multi-user collaborative editing
- Used by many academic authors (including me)

(just for reference) local PC installation

There are various *distributions* of LaTeX
(*distribution: LaTeX + packages + fonts + auxiliary softwares*)

Use: TeX Live 2019
(requires > 5GB of storage space for *full installation*)

Using

Overleaf

The Overleaf logo, featuring a stylized leaf icon to the left of the word "Overleaf" in a white, sans-serif font.

New Project

All Projects

Your Projects

Shared with
you

Title

Owner

Last Modified

Using

Overleaf

You can edit here

PDF preview

The screenshot displays the Overleaf web editor interface. At the top, the title "Advances in the Report Writing" is visible. The interface is split into two main sections: a source code editor on the left and a PDF preview on the right. The source code editor shows the following LaTeX code:

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3
4 \title{Advances in the Report Writing}
5 \author{Hayato Hashimoto}
6 \date{April 2019}
7
8 \begin{document}
9
10 \maketitle
11
12 \section{Introduction}
13
14 \end{document}
```

The PDF preview on the right shows the rendered output of the code, which includes the title "Advances in the Report Writing", the author "Hayato Hashimoto", the date "April 2019", and a section header "1 Introduction". The interface also features a top navigation bar with icons for Menu, Share, Submit, History, and Chat, and a bottom toolbar with icons for Source, Rich Text, and Recompile.

Using



PDF preview update button

A screenshot of the Overleaf web interface. The top navigation bar includes 'Menu', 'Advances in the Report Writing', 'Review', 'Share', 'Submit', 'History', and 'Chat'. Below this is a toolbar with 'Source' and 'Rich Text' tabs, and a 'Recompile' button with a circular refresh icon, which is circled in red. The left sidebar shows a file explorer with 'main.tex' selected. The main editor area displays LaTeX source code for a document titled 'Advances in the Report Writing' by 'Hayato Hashimoto', dated 'April 2019'. The right pane shows a preview of the document's title page and the start of the 'Introduction' section.

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3
4 \title{Advances in the Report Writing}
5 \author{Hayato Hashimoto}
6 \date{April 2019}
7
8 \begin{document}
9
10 \maketitle
11
12 \section{Introduction}
13
14 \end{document}
```

Advances in the Report Writing

Hayato Hashimoto

April 2019

1 Introduction

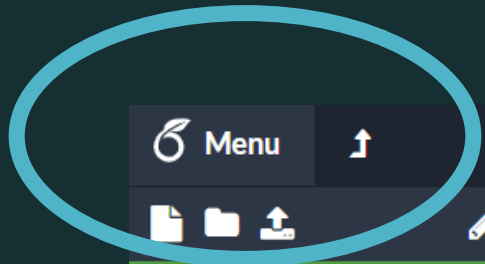
Tips: Include Japanese texts

pdfLaTeX Overleaf default, cannot handle non-Western characters

XeLaTeX can include Japanese text. (requires font setting)

LuaLaTeX Recommended when you use Japanese as a main language of the paper. Requires longer compile time.

Tips: use Japanese texts



Advances in the Report Writing

Source Rich Text

main.tex

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3 \pagestyle{headings}
4 \title{Advances in the Report Writing}
5 \begin{document}
6 \section{some section}
7 Report writing is one of the most important
  academic activities in universities.
8
9 Several technologies have been developed
  to help student to write reports.
  please give me A score!
10 \end{document}
11
```

Download

Source PDF

Actions

- Copy Project
- Word Count

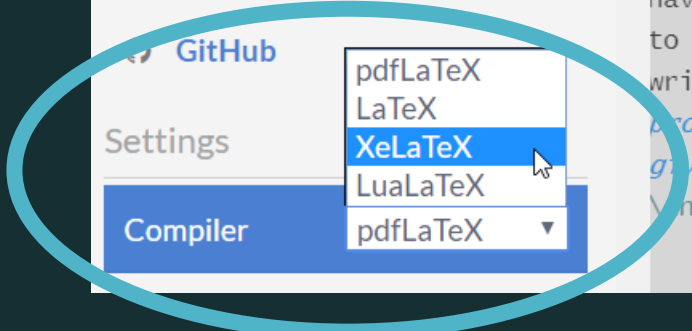
Sync

- Dropbox
- Git
- GitHub

Settings

Compiler pdfLaTeX

- pdfLaTeX
- LaTeX
- XeLaTeX
- LuaLaTeX
- pdfLaTeX



Structure of .tex file

Structure of a .tex file

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\title{Advances in the Report Writing}
\author{Hayato Hashimoto}
\date{April 2019}
```

```
\begin{document}
```

```
\maketitle
```

```
\section{Introduction}
```

```
\end{document}
```

\documentclass
“Preamble”

\begin{document}

main text

\end{document}

Structure of a .tex file

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Advances in the Report Writing}
\author{Hayato Hashimoto}
\date{April 2019}
```

`\documentclass`

Specifies the type of the document.

Short report:

```
\documentclass{article}
```

Long report (e.g. thesis):

```
\documentclass{report}
```

Structure of a .tex file

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Advances in the Report Writing}
\author{Hayato Hashimoto}
\date{April 2019}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Some paper receiving institute requires authors to use their own document class

In such cases, .cls file will be provided by the institution: authors need to place the provided file in the folder containing your .tex file

Structure of a .tex file

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Advances in the Report Writing}
\author{Hayato Hashimoto}
\date{April 2019}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Preamble

Loading packages

Setting the title

Setting margins

Setting whether to show

page numbers

etc.

Structure of .tex file

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Advances in the Report Writing}
\author{Hayato Hashimoto}
\date{April 2019}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Main text

Practice 1 : Try writing something in the main text

- Paragraphs are separated by blank lines
(= hit Enter key twice to start new paragraphs)
- Everything after % sign will be ignored
(to keep private memo like TODOs)
(Type \% to show % itself in the document)
- Symbols ¥ \ { } \$ have special meanings
- Multiple spaces are treated as a single space

Source

Rich Text



Recompile



```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3 \begin{document}
4 Report writing is one of the most
5 important academic activities in
6 universities.
7
8 several technologies have been
9 developed to help student to write
10 reports. % professor, please give me A
11 score!
12
13 \end{document}
```



Report writing is one of the most important academic activities in universities.
Several technologies have been developed to help student to write reports.

`\` is a special symbol

`\` is a symbol to start a *command*

Commands can change the style of document, formatting of the text, insert a math formula, etc.

Command the preamble, the main text or a math formula.

`\command` with *parameters*

Command with no
parameter

```
\newpage
```

Command with two
parameters

```
\rule{3cm}{1mm}
```


`\begin, \end`
(environment)

```
\begin{verbatim}  
sample text  
\end{verbatim}
```

Command with a *option*
parameter

```
\includegraphics  
[width=5cm]  
{test.png}
```

Tips: Using Japanese keyboards

In  Windows, some Japanese fonts confuse `\` (backslash) with ¥ (yen) (for some historical reasons)

On a Japanese keyboard, typing a `\` key and a ¥ key will input the same `\` (backslash) symbol.

In  Mac, ¥ and `\` are distinguished correctly.

When using a Japanese keyboard, hit **Option** + ¥ to input a `\` symbol.

Preamble commands

```
\title{Comprehensive LaTeX guide}  
\author{Hayato Hashimoto}  
\date{April 1st, 2020}  
\usepackage{amsmath}  
\usepackage{graphicx}  
\usepackage[top=1cm]{geometry}
```

Practice 2: Change titles and margins

```
\title \author \date  
\usepackage[top=1cm,bottom=...]{geometry}  
top bottom right left  
cm mm in(=inch) pt(=1/72.27 inch)  
em (width of "M") ex (height of  
"x")
```


Headings

Headings

These levels only appear in books or theses:

```
\part{Typesetting software: LaTeX}
```

```
\chapter{History of LaTeX}
```

Also in reports and journal papers:

```
\section{Initial development by Knuth}
```

```
\subsection{"Literate" programming}
```

```
\subsubsection{web}
```

```
\paragraph{web2c}
```

Headings

Sections will be numbered automatically

When section numbers are not needed, use command with a *

```
\section*{Preface}
```

Make a table of contents automatically

One command in the **main text** will generate table of contents in place:

```
\tableofcontents
```

Practice 3: Headings

Try using these commands:

```
\section \subsection  
\subsubsection \paragraph
```

Try writing more than **two sections** and confirm that the section number increases

Practice 3 solution

```
1 \documentclass[ja=standard,xelatex]{bxjsarticle}
2 \usepackage[utf8]{inputenc}
3 \pagestyle{headings}
4 \title{Advances in the Report Writing}
5 \begin{document}
6 \section{Knuthによる開発}
7 \subsection{文芸的プログラミングとは}
8 \subsubsection{web}
9 \paragraph{web2c} web2c
   はオリジナルのTeXの実装に用いられていたweb
   言語を、一般に普及したプログラミング環境であるC
   言語に変換するソフトウェアである。
10 \section{コミュニティによる進化}
11 \subsection{CTANとは}
12 \end{document}
13
```

1 Knuthによる開発

1 Knuthによる開発

1.1 文芸的プログラミングとは

1.1.1 web

■web2c web2c はオリジナルの TeX の実装に用いられていた w 環境である C 言語に変換するソフトウェアである。

2 コミュニティによる進化

2.1 CTANとは

Tip: Showing section title on each pages

The following command in the preamble

```
\pagestyle{headings}
```

will show section titles at the top of the each pages

Writing math formulas

Two types of math formulas

The total energy K of body of mass m moving with speed v is defined to be:

$$K = \frac{1}{2}mv^2.$$

Inline math formulas, embedded in the text
Displayed math formulas, in a separate line

Math formulas

Inline math formulas

are marked by surrounding $\$$ $\$$

Kinetic Energy K is ...

Displayed math formulas

are marked by surrounding \lbrack \rbrack

is defined to be: $\lbrack K = \frac{1}{2} mv^2 . \rbrack$

Math mode commands

Fractions

`\frac{x}{y}` {x **\over** y}

Greek letters

`\alpha` `\beta` `\gamma` ... `\pi` ...

`\omega`

Exponents and subscripts

`K=mv^2` `e^{-\lambda t}`

`m_{i,j}`

$$\frac{x}{y}$$

$$\alpha, \beta, \gamma, \dots, \pi, \dots, \omega$$

$$K = mv^2 \quad e^{-\lambda t} \quad m_{i,j}$$

Math formula extending multiple lines

Use `align` environment from `amsmath` package

```
... \usepackage{amsmath} ...
```

```
\begin{document} ...
```

```
\begin{align}
```

```
z & = & x^2 - y^2 \nonumber \\
```

```
& = & (x + y) (x - y)
```

```
\end{align}
```

`&` to align, `\\` to break lines

Practice 4: Describe the solution of the quadratic equation

Solutions of a quadratic equation $ax^2 + bx + c = 0$ ($x \neq 0$) are given by:

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

√ (square root) \sqrt{ }

± (plus minus) \pm

≠ (not equal) \neq

Practice 4 solution

Source

Rich Text



Recompile



13 solutions of a quadratic equation $ax^2 + bx + c = 0$ ($x \neq 0$) are given by:

14 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

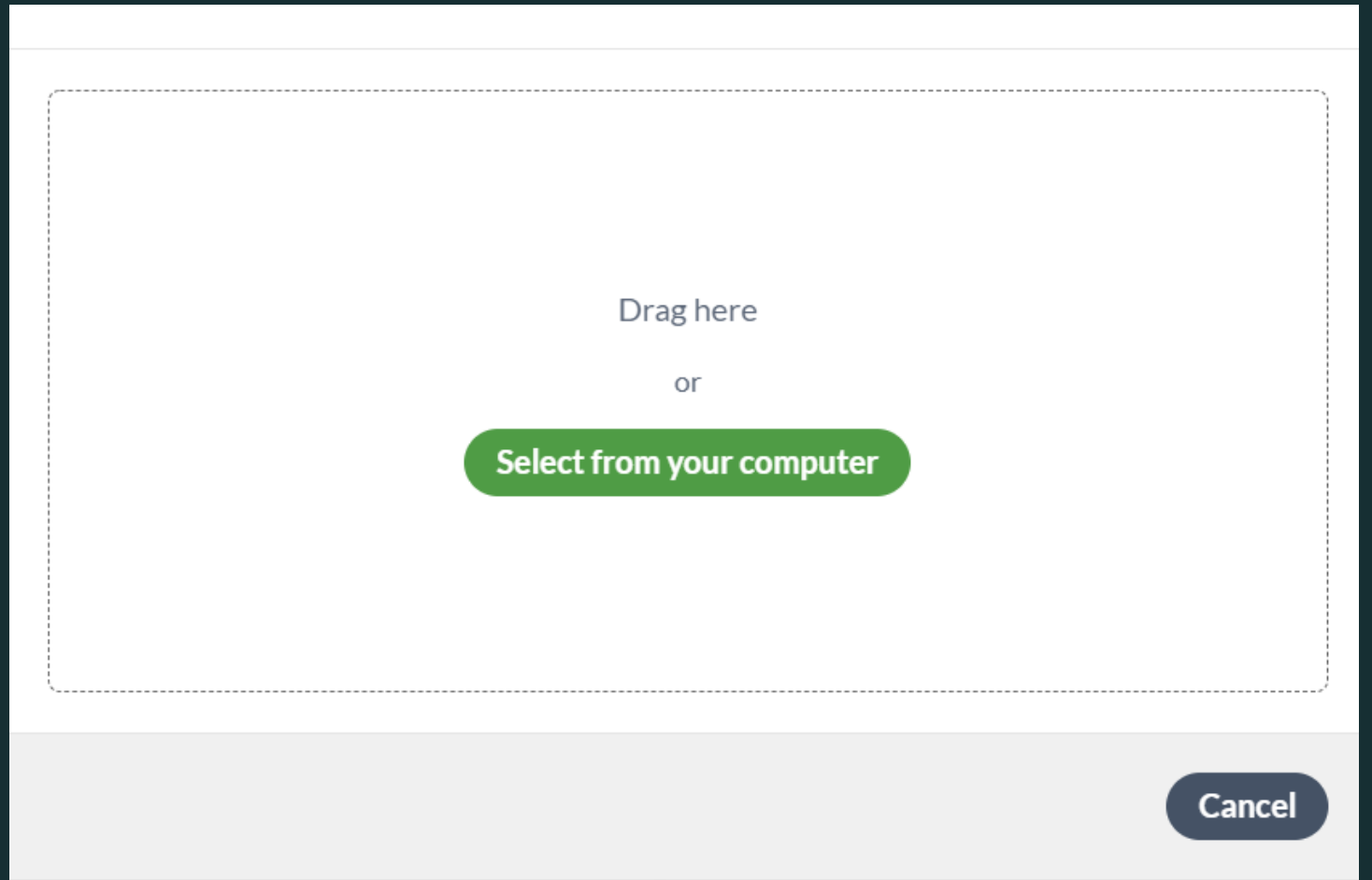
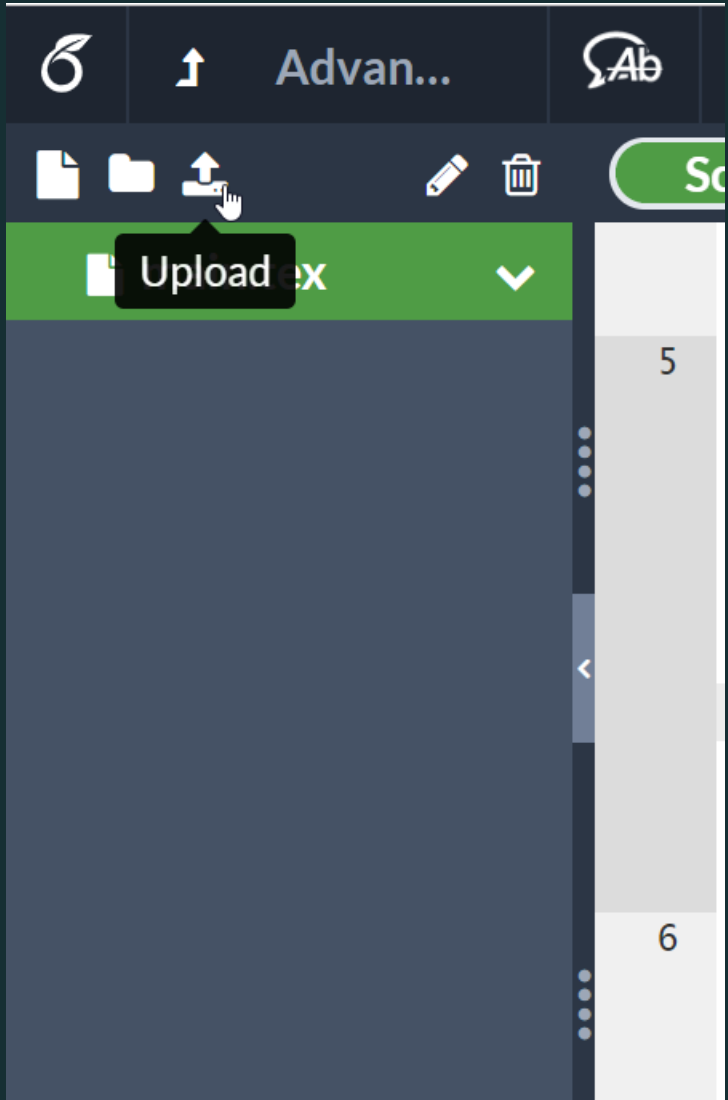
Solutions of a quadratic equation $ax^2 + bx + c = 0$ ($x \neq 0$) are given by:

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

Insert figures and tables

Include figures in the document

1. Prepare a photo file in JPEG format or a graph file in PDF or PNG format.
(PDF is recommended when your graphing software supports saving charts in PDF)
2. Upload to Overleaf
3. Insert into the LaTeX document



Inserting figures

```
\usepackage{graphicx}
...
\begin{figure}[tp]
\centering
\includegraphics[width=0.5\hsize]
{myfigure.png}
\caption{ the description of the
figure }
\label {Label for later reference }
\end{figure}
```

Practice 5: Insert Figure

Reproduce the following figure

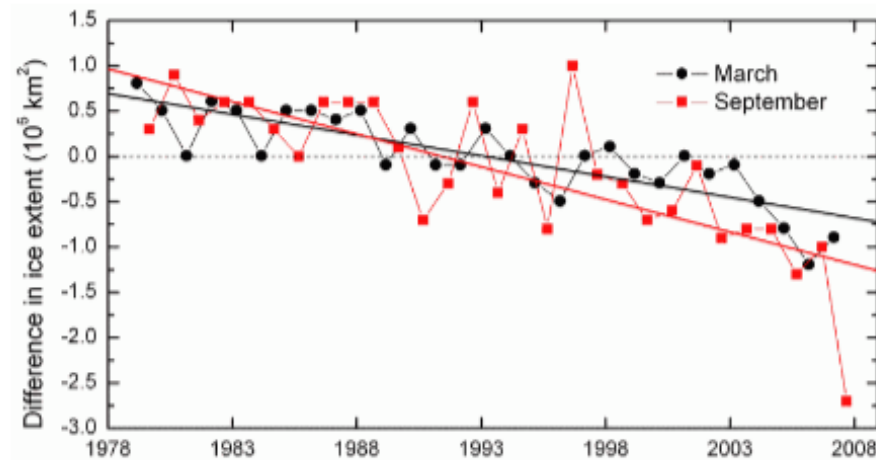


Figure 1: Ice extent changes observed in the Arctic.

1 Method

We examined satellite image of the Arctic Ocean and the percentage of area covered by ice is obtained by the standard procedure.

(Source of the image: NOAA)

Practice 5 solution

Source Rich Text

Recompile

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3 \usepackage{graphicx}
4 \begin{document}
5 \section{Method}
6 \begin{figure}
7   \centering
8   \includegraphics[width=0.8\hsize]{arctic_ice_extent.png}
9   \caption{Ice extent changes observed in the Arctic.}
10  \label{fig:arctic_ice}
11 \end{figure}
12 We examined satellite image of the Arctic Ocean and the percentage of area covered by ice is obtained by the standard procedure.
13 \end{document}
```

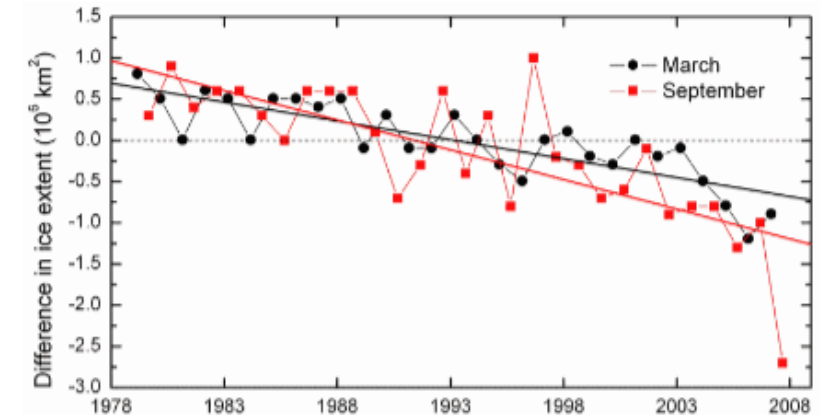


Figure 1: Ice extent changes observed in the Arctic.

1 Method

We examined satellite image of the Arctic Ocean and the percentage of area covered by ice is obtained by the standard procedure.

Tip: Floats

Bare `\includegraphics` command will insert the image embedded in the main text

Boxes like `figure` environment are called *Floats*

LaTeX may move floats to unexpected pages when there are too many floats per page.

Tip: figure referring label

Define a *label for reference*

```
\caption{...} \label{fig:a}
```

Use the *command for referencing the label* to insert figure numbers

```
Figure \label{fig:a} => Figure 1
```

Insert a table

```
\begin{table}  
\centering  
\begin{tabular}{|c|c|r|}  
A1 & B1 & C1 \\ \hline  
A2 & B2 & C2 \\ \hline  
\end{tabular}  
\caption{ description of the table }  
\end{table}
```

Practice 6: Create Tables

Reproduce the following table

	Taro	Hanako	Kyota
Height (cm)	174	166	159
Weight (kg)	67	59	57

Table 1: The height and weight of my family members

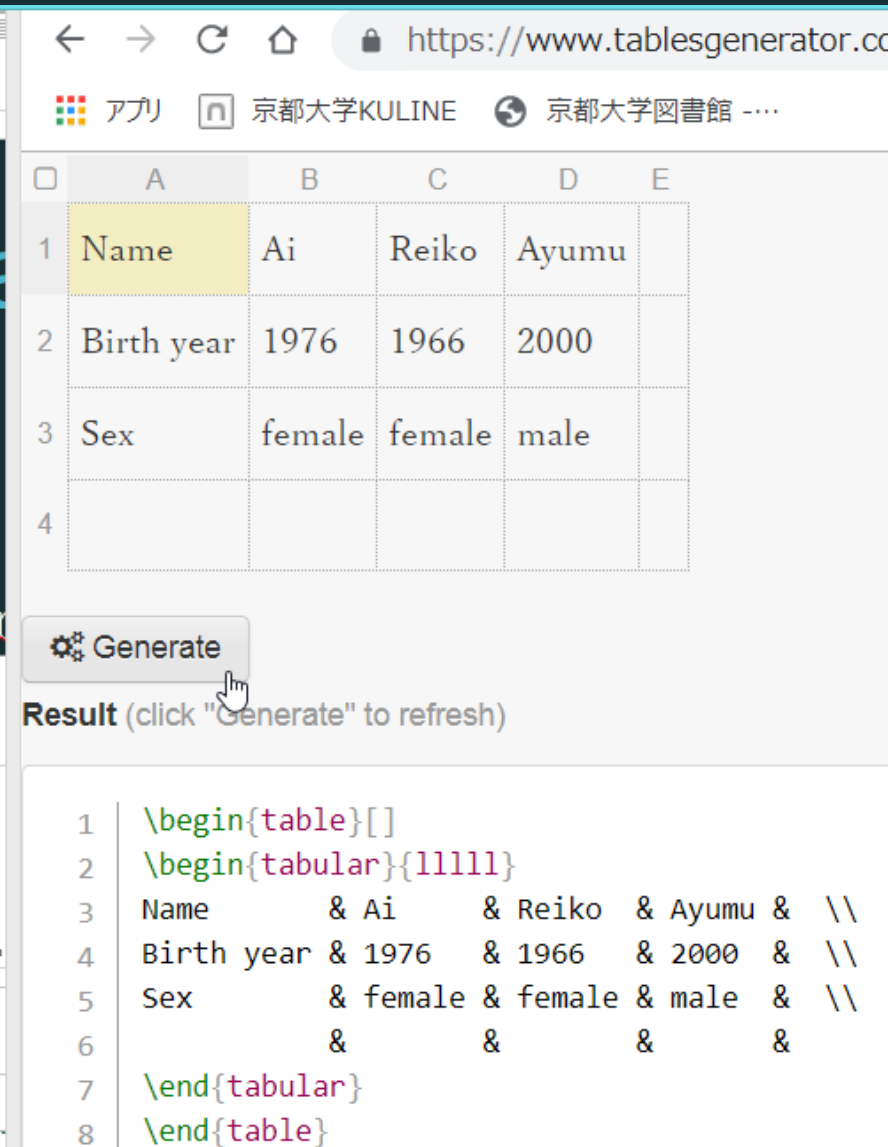
Practice 6 solution

```
¥begin{table}[h]
¥begin{tabular}{|c| | |c|r|} ¥hline
& Taro & Hanako & Kyota ¥¥ ¥hline
Height (cm) & 174 & 166 & 159 ¥¥ ¥hline
Weight (kg) & 67 & 59 & 57 ¥¥ ¥hline
¥end{tabular}
¥caption{The height and weight of my family
members}
¥end{table}
```

	Taro	Hanako	Kyota
Height (cm)	174	166	159
Weight (kg)	67	59	57

Table 1: The height and weight of my family members

Tip: making tables easily



The screenshot shows a web browser window with the URL <https://www.tablesgenerator.com>. The browser's address bar and tabs are visible. The main content area displays a table with 5 columns (A-E) and 4 rows. The first row is highlighted in yellow. Below the table is a 'Generate' button with a gear icon. Underneath the button, it says 'Result (click "Generate" to refresh)'. At the bottom, there is a code editor showing the generated LaTeX code for the table.

	A	B	C	D	E
1	Name	Ai	Reiko	Ayumu	
2	Birth year	1976	1966	2000	
3	Sex	female	female	male	
4					

Generate

Result (click "Generate" to refresh)

```
1 \begin{table}[]
2 \begin{tabular}{lllll}
3 Name & Ai & Reiko & Ayumu & \\
4 Birth year & 1976 & 1966 & 2000 & \\
5 Sex & female & female & male & \\
6 & & & & \\
7 \end{tabular}
8 \end{table}
```

You can use a web app to generate latex commands (*LaTeX Table Generator*)

Copy from Excel (or whatever spreadsheet app) and paste to the LaTeX Table Generator

Learning materials for latex

“Wikibooks for LaTeX”
is a concise guide for beginners

学習サポートデスク

Learning Support Desk

Learning Support Desk

場所：附属図書館1階
ラーニングcommons

学習相談受付中!

レポート・授業・調べもの

大学院生スタッフが、学習に関するご相談にお答えします。
事前予約もできます。お気軽にお尋ねください！ 2018/4

	月	火	水	木	金
13:00 ↓ 16:00	自己紹介 キーワード ↓ 所属 市民社会論 イスラーム 南アジア ウルドゥー語	教育社会学 文化研究 東アジア 中国語・韓国語	情報学 中国語	政治と宗教 移民 フランス語	法制史 台湾研究 中国語
16:00 ↓ 19:00	自己紹介 キーワード ↓ 所属 政治学 国際関係論	物理学 天文学 数値計算	ツーリズム 実用アジア インドネシア語	政治と宗教 移民 フランス語	経済法 米欧競争法
	人簡・農林学 研究科 博士12年	理学研究科 博士14年	アジア・アフリカ 地域研究科 博士14年	人簡・農林学 研究科 博士12年	法学研究科 博士3年 大学院研究員

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