An Example of LaTeX Usage

John Doe

***Abstract*—This document shows how to use LaTeX to typeset an academic paper.**

I. Basic Syntax

It does not matter whether you enter one or several spaces after a word.

An empty line starts a new paragraph.

You can force a line break without starting a new paragraph. Like this:
There will be a line break before this sentence.

You could also specify the vertical space after the line break.

It creates a line break with vertical space equaling to 2 times of the height of character 'x'.

II. Special Characters and Symbols

The following commands are used to typeset special characters: # $ % ^ & _ { } ~ \

Quotation marks should be typeset as following: 'single quoted text' and "double quoted text".

There are four kinds of dashes in LaTeX.

- hyphen: part-time.
- en-dash: pages 1–10.
- em-dash: yes—or no?
- minus sign: 0, 1, and −1.

Ellipsis can be typeset as following: New York, Tokyo, Budapest, ...

III. Font Face & Size

A. Font Face Commands

roman sans serif `typewriter` medium **bold face** upright *italic slanted* SMALL CAPS *emphasized* document font

B. Font Size Commands

tiny font

very small font

quite small font

small font

normal font

large font

large font

very large font

huge

largest

IV. Space and Alignment

Force an unbreakable space using tilde symbol. e.g. these spaces are unbreakable. They cannot be broken by line break or page break.

In addition to the normal space, a breakable space can be inserted using backslash following by a space. For example, there are three spaces inside this sentence.

You can also specify the space like this.

The above command create a vertical space.

To align the text.

text to be centered

text to be flushed left

text to be flushed right

V. List Structures

1) You can nest the list environments to your taste:
   - But it might start to look silly.
   - With a dash.
2) Therefore remember:
   Stupid things will not become smart because they are in a list.
   Smart things, though, can be presented beautifully in a list.

You can custom the list using `enumitem` package.

- A
- B

List environments can be inlined. The following `inlineenum` environment is defined in the `preamble.tex` file. (i) A (ii) B

VI. Math

Inline math: $\sum_i^k i$

Display math:

$$\sum_i^k$$

Math using the `equation` environment shown in Eq. (1).

$$E = mc^2 \tag{1}$$

Equations (2) and (3) use the `align` environment.

$$B' = -\nabla \times E, \tag{2}$$

$$E' = \nabla \times B - 4\pi j, \tag{3}$$

Disable numbering for some equation.

$$\begin{aligned} a &= b + c \\ &= d + e \end{aligned} \tag{4}$$

Keep equations aligned across text.

$$F = f_1 + f_2 + f_3 + ... + f_n$$

can be written as

$$F = \sum_{1}^{n} f_i$$

A list of equations without the alignment.

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

$$\lim_{x \to \infty} \exp(-x) = 0$$

$$a \bmod b$$

$$x \equiv a \pmod{b}$$

$$\log(N)$$

$$\arg\max_a f(a) = \arg\max_b f(b)$$

$$n^{22}$$

$$f(n) = n^5 + 4n^2 + 2|_{n=17}$$

$$\sum_{i=1}^{n} i$$

$$\lim_{x \to \infty} \frac{1}{x}$$

$$\frac{n!}{k!(n-k)!} = \binom{n}{k}$$

$$\sqrt{2}$$

$$\sqrt[n]{1 + x + x^2 + x^3 + \cdots + x^n}$$

$$\left(\frac{x^2}{y^3}\right)$$

$$P\left(A = 2 \middle| \frac{A^2}{B} > 4\right)$$

$$\left\{\frac{x^2}{y^3}\right\}$$

Typeset matrices.

$$\begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix} = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$$

$$\left(\begin{array}{cc|c} a & b & c \\ d & e & f \end{array}\right)$$

Matrices can be embed inside another matrix.

$$\begin{pmatrix} \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} & 0 & \cdots \\ 0 & \begin{pmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{pmatrix} & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

Code	Output
`\mathnormal{...}`	$ABCDEF\ abcdef\ 123456$
`\mathrm{...}`	ABCDEF abcdef 123456
`\mathit{...}`	$ABCDEF\ abcdef\ 123456$
`\mathbf{...}`	**ABCDEF abcdef 123456**
`\mathsf{...}`	ABCDEF abcdef 123456
`\mathtt{...}`	`ABCDEF abcdef 123456`
`\mathfrak{...}`	$\mathfrak{ABCDEF\ abcdef\ 123456}$
`\mathcal{...}`	$\mathcal{ABCDEF}$
`\mathbb{...}`	$\mathbb{ABCDEF}$

TABLE I: Math Fonts

Item		
Animal	Description	Price ($)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

TABLE II: An example of table

Cases:

$$f(x) = \begin{cases} x & \text{if } x > 0, \\ 0 & \text{otherwise.} \end{cases}$$

$$f(n) = \begin{cases} n/2 & \text{if } n \text{ is even} \\ -(n+1)/2 & \text{if } n \text{ is odd} \end{cases}$$

VII. Figure & Table

Table I lists a variety of fonts available in the math mode. Table II shows another example of table.

Figure 1 consists of two figures: Fig. 1a and Fig. 1b. An figure drawn by TikZ in shown in Fig. 2.

VIII. Theorems

Definition 1 (Prime)**.** A prime is a natural number greater than 1 that cannot be formed by multiplying two smaller natural numbers.

Theorem 1 (Euclid)**.** *For every prime p, there is a prime $p' > p$.*

Lemma 1. *According to Theorem 1, there are infinitely many primes.*

Theorem 2 (Fermat's Last Theorem)**.** *Diophantine Equation $x^n + y^n = z^n$, where x, y, z, and n are integers, has no nonzero solutions for $n > 2$.*

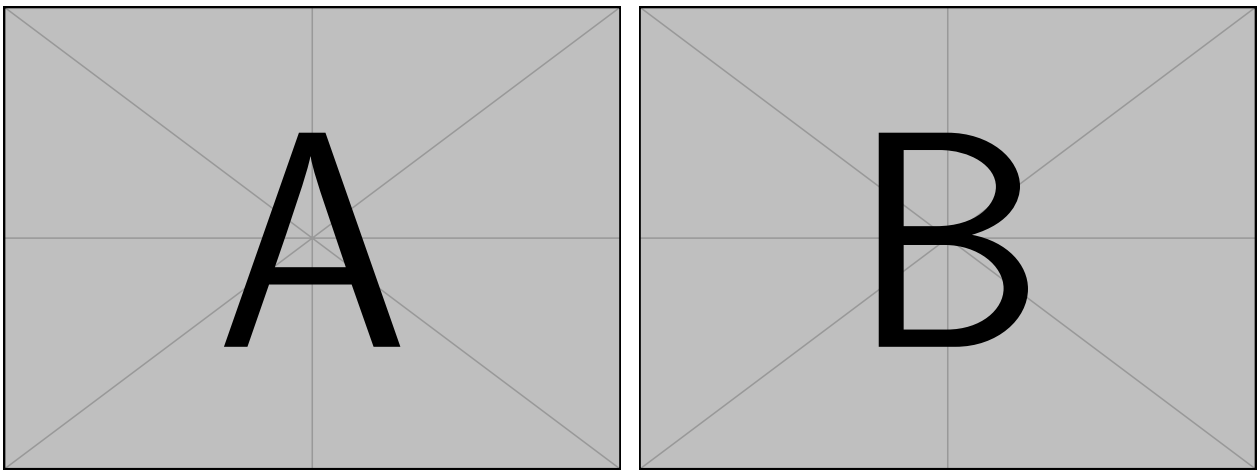
IX. Algorithms & Source Code

Algorithm 1 and Listing 1 show the example of pseudo algorithm and source code highlight.

X. Cross-references

You can reference to Section X. Or add some footnote [1]

[1] Use https://www.google.com when you encounter problems in LaTeX.



(a) Example Image A (b) Example Image B

Fig. 1: An example of figure

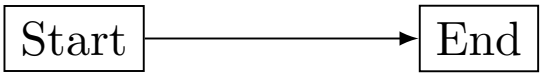


Fig. 2: TikZ Figure in Article

Algorithm 1: How to write algorithms

```
Data: this text
Result: learn to write algorithm
initialization;
while not at end of this document do
    read current;
    if understand then
        go to next section;
        current section becomes this one;
    else
        go back to the beginning;
```

XI. Bibliography

You can cite a paper like this [1]. Or cite multiple papers at the same time [2], [3]. It is also useful to cite the authors. For example, Roussopoulos *et al.* proposed a method to process nearest neighbor queries.

To add an item in the reference list but without direct citation using `\nocite{}` command.

Acknowledgment

Use `\section*{}` command to create a section without numbering. It is commonly to be used in the section of acknowledgment.

References

[1] C. E. Shannon, "A mathematical theory of communication," *Bell system technical journal*, vol. 27, no. 3, pp. 379–423, 1948.

Listing 1: A example of listing

```
def fib():
  a, b = 0, 1
  while 1:
    yield a
    a, b = b, a + b
```

[2] R. C. Merkle, "A certified digital signature," in *Advances in Cryptology — CRYPTO' 89 Proceedings*, 1989, pp. 218–238.

[3] N. Roussopoulos, S. Kelley, and F. Vincent, "Nearest neighbor queries," in *Proceedings of the 1995 ACM SIGMOD International Conference on Management of Data*, vol. 24, 1995, pp. 71–79.

[4] C. Xu, *Introduction to LaTeX, Writing papers the right way*, 2019. [Online]. Available: https://github.com/xu-cheng/latex-tutorial.

Appendix A
Proof of Theorem 2

Theorem 2 (Fermat's Last Theorem)**.** *Diophantine Equation $x^n + y^n = z^n$, where x, y, z, and n are integers, has no nonzero solutions for $n > 2$.*

Proof. There is a proof that was too large to fit in the margin. □