Demo Article

Single Title Page

Second Edition

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January 1, 2024

CAMBRIDGE UNIVERSITY PRESS

Taipei, Tokyo, New York

In memory of my brother, John Nash

Risk is our business.

You would have enjoyed it.

Are you ready?

Let's go!

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Chapter 1

Basic Usage

Here we would like to show you some basic structures including paragraphs, links, lists, verbatims (usually for code blocks), tables, figures, footnotes, index, and bibliography. If you want to force to make a newline, you can add an empty line or use the command `\newline`. If you want to force to start a whole new page, you can use the command `\clearpage` before your new content.

1.1 Paragraph

The following is a paragraph.
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis ullamcorper neque sit amet lectus facilisis sed luctus nisl iaculis.
If you use a `\label{start-paragraph}` in the section/chapter title, then you could use a `\ref{start-paragraph}` to refer to this section/chapter. For example, please refer to 1.1.

1.2 Link

Here is a link => A link to Google

1.3 List

The following is a list.

- The 1st main item
  - A sub item 1 of the 1st main item
  - A sub item 2 of the 1st main item
- The 2nd main item
  - A sub item 1 of the 2nd main item
  - A sub item 2 of the 2nd main item
- The 3rd main item
  - A sub item 1 of the 3rd main item
  - A sub item 2 of the 3rd main item

1.4 Verbatim

The following is a verbatim which is usually to show a code block (use `python` as an example).

```
print 'Hello World!'

for i in [ 'Hello', 'World!' ]:
  print i
```

```
if True:
  print 'Hello World!'
else:
  print 'Stay at home.'
```

1.5 Table

1.5.1 Standard Markdown Table

A standard markdown table supports single line only in each column and its width can not be modified. This table can also be rendered well on common markdown platforms (ex: GitHub).

Table 1.1: A Standard Markdown Table

Right	Left	Default	Center
12	12	12	12
123	123	123	123
1	1	1	1

If you use a `\label{sm-table}` in the table caption, then you could use a `\ref{sm-table}` to refer to this table. For example, please refer to Table. 1.1.

1.5.2 Extended Markdown Table

An extended markdown table supports multiple lines in each column. This table can **not** be rendered well on common markdown platforms (ex: GitHub).

Table 1.2: An Extended Markdown Table

Centered Header	Default Aligned	Right Aligned
First	row, long content	12.0
Second	row	5.0

If you use a `\label{em-table}` in the table caption, then you could use a `\ref{em-table}` to refer to this table. For example, please refer to Table. 1.2.

1.5.3 How to Make an Extended Markdown Table Wider?

For an extended markdown table, you can also modify its width by adding more hyphens "-".

Table 1.3: A Wider Extended Markdown Table

Centered Header	Default Aligned	Right Aligned
First	row, long content, long content, long content, long content, long content, long content, long content, long content, long content, long content	12.0
Second	row	5.0

If you use a `\label{wem-table}` in the table caption, then you could use a `\ref{wem-table}` to refer to this table. For example, please refer to Table. 1.3.

1.6 Figure

The following is a figure.

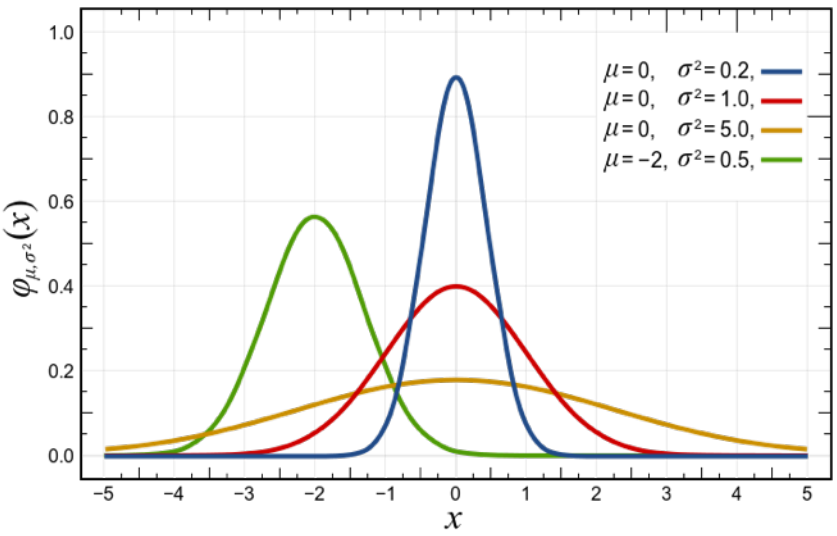

Figure 1.1: Normal Distribution

If you use a `\label{fig:normal-distribution}` in the figure caption, then you could use a `\ref{fig:normal-distribution}` to refer to this figure. For example, please refer to Fig. 1.1.

1.7 Footnote

In a paragraph, sometimes you need to make a further (but short) explanation for some keywords. You could use footnotes to do this. The following are 2 footnotes examples.
The normal distribution is found by Carl Friedrich Gauss[1].
The student's t distribution is found by William Sealy Gosset[2].

1.8 Assign index for keyworkds

You can assign index for keyworks by using `Keywords\index{Keywords}`. The following are 2 examples.
The normal distribution is found by Carl Friedrich Gauss.
The student's t distribution is found by William Sealy Gosset.
You can go to "Index" part in the last page to check if indexes are generated.

1.9 Cite from bibliography/references

You have to define bibliography in the `yaml` header of the `md` first and then you can use `\cite` to refer to it. The following is a paragraph with 3 items cited.
This paragraph is an example of **`thebibliography`** environment using in bibliography management. Three items are cited: *The LaTeXCompanion* book [1], the Einstein journal paper [2], and the Donald Knuth's website [3]. The LaTeXrelated items are [1, 3].

[1] Carl Friedrich Gauss (30 April 1777 – 23 February 1855) was a German mathematician and physicist.
[2] William Sealy Gosset (13 June 1876 – 16 October 1937) was an English statistician.

Chapter 2

Math Equations

The following are 2 examples for equations.

2.1 Normal distribution

The normal distribution is a continuous probability distribution with probability density function (pdf) defined as

$$f(x;\mu,\sigma^2) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}, \quad -\infty < x < \infty \tag{2.1}$$

where

- μ is the mean or expectation of the distribution.
- σ is the standard deviation of the distribution.
- σ^2 is the variance of the distribution.

If you use a `\label{eqn:normal-distribution}` in this equation, then you could use a `\ref{eqn:normal-distribution}` to refer to this equation. For example, please refer to Eq. 2.1.

2.2 t-distribution

The t-distribution is a continuous probability distribution with probability density function defined as

$$f(x;\nu) = \frac{\Gamma(\frac{\nu+1}{2})}{\sqrt{\nu\pi}\Gamma(\frac{\nu}{2})} \left(1 + \frac{x^2}{\nu}\right)^{-\frac{\nu+1}{2}}, \quad -\infty < x < \infty \tag{2.2}$$

where

- ν is the degrees of freedom and is a positive integer.
- Γ is the gamma function.

If you use a `\label{eqn:student-t}` in this equation, then you could use a `\ref{eqn:student-t}` to refer to this equation. For example, please refer to Eq. 2.2.

Chapter 3

Advance Math for Align, Theorems and Proofs

Examples in this section/chapter needs the following option turned on in the `yaml` header of `md`

```
---
enable-adv-math-packages: true
.
.
.
...
```

3.1 Multi-line equation which aligns to the equal sign

$$\begin{aligned} dP &= \frac{e^{-Q/2}}{(2\pi)^{k/2}} \frac{2\pi^{k/2}}{\Gamma(\frac{k}{2})} Q^{(k-1)/2} \frac{dQ}{2Q^{1/2}} \\ &= \frac{1}{2^{k/2}\Gamma(k/2)} Q^{k/2-1} e^{-Q/2} dQ \qquad (3.1) \\ &= f(Q)dQ \qquad (3.2) \end{aligned}$$

You can refer to one of its formula after the equal sign like this => Eq. 3.1

3.2 Theorem

Theorem 1. *If a random variable $Y = X^2$ where $X \sim N(0,1)$, then $Y \sim \chi_1^2$.*

You can refer to this theorem like this => Theorem 1

3.3 Proof

Proof. Let $P(Y)$ be the cumulative distribution function of the random variable Y, then for $y < 0$, $P(Y < y) = 0$ (since $Y = X^2 \geq 0$ for all X)

for $y > 0$:

$$\begin{aligned}
P(Y < y) &= P(X^2 < y) = P(|X| < \sqrt{y}) = P(-\sqrt{y} < X < \sqrt{y} \\
&= F_x(\sqrt{y}) - F_x(-\sqrt{y}) = F_x(\sqrt{y}) - (1 - F_x(\sqrt{y})) \\
&= 2F_x(\sqrt{y}) - 1 \\
f_Y(y) &= 2\frac{d}{dy}F_x(\sqrt{y}) - 0 = 2\frac{d}{dy}(\int_{-\infty}^{\sqrt{y}} \frac{1}{\sqrt{2\pi}} e^{\frac{-t^2}{2}} dt) \\
&= 2\frac{1}{\sqrt{2\pi}} e^{-\frac{y}{2}} \frac{d}{dy}(\sqrt{y}) = 2\frac{1}{\sqrt{2}\sqrt{\pi}} e^{-\frac{y}{2}} (\frac{1}{2} y^{-\frac{1}{2}}) \\
&= \frac{1}{2^{\frac{1}{2}}\Gamma(\frac{1}{2})} y^{-\frac{1}{2}} e^{-\frac{y}{2}} \qquad (3.3)
\end{aligned}$$

where F and f are the cdf and pdf of the corresponding random variables.
Eq. 3.3 is just the pdf of χ_1^2-distribution, then we have proved that $Y \sim \chi_1^2$. □

You can refer to this proof like this => Proof 3.3

Bibliography

[1] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The LaTeXCompanion*. Addison-Wesley, Reading, Massachusetts, 1993.

[2] Albert Einstein. *Zur Elektrodynamik bewegter Körper*. (German) [*On the electrodynamics of moving bodies*]. Annalen der Physik, 322(10): 891–921, 1905.

[3] Knuth: Computers and Typesetting,
`http://www-cs-faculty.stanford.edu/~uno/abcde.html`

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