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Learn How to Write Markdown & LaTeX in The Jupyter Notebook

Not only Jupyter. Google Colab, R Markdown, and much more.

Khelifi Ahmed Aziz   Apr 4, 2020 · 6 min read ★

Background by JESHOOTS.COM on Unsplash

provides the ability to perform data visualization in the same environment. *Which interactive notebooks should I use?* I recommend:

- **The Jupyter Notebook** is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations, and narrative text.

- **Colaboratory** is a free Jupyter notebook environment that requires no setup and runs entirely in the cloud.

Both of them support

1. **Markdown** which is a markup language that is a superset of HTML.

2. **Latex** to render mathematical and scientific writing.

Markdown

It's a very simple language that allows you to write HTML in a shortened way. It can be used on some websites like Stack Overflow or to write documentations (essentially on GitHub).

Markdown file extension is .md

When you write in Markdown, you use shortened notations which are replaced by the corresponding HTML tags. Each time, I will tell you the HTML equivalent of the Markdown notation to show you how Markdown made our life easier than ever.

Even web developers, now, use Markdown then convert it to HTML using some websites.

• Headings

You make titles using hashtags `#` . A single hashtag gives you a title (h1), two hashtags give you a subtitle (h2) and so on as shown below:

```
# Heading 1
## Heading 2
### Heading 3
#### Heading 4
```

HTML equivalent:

```
1    <h1>Heading 1</h1>
2    <h2>Heading 2</h2>
3    <h3>Heading 3</h3>
4    <h4>Heading 4</h4>
5    <h5>Heading 5</h5>
6    <h6>Heading 6</h6>
```

heading.html hosted with ❤ by **GitHub**　　　　　　　　　　　view raw

Heading 1

Heading 2

Heading 3

Heading 4

Heading 5

Heading 6

headings.md hosted with ❤ by **GitHub**　　　　　　　　　　　view raw

Output Result : Colab Notebook

• Paragraphs

Paragraphs are represented by the `<p>` tag in HTML. In Markdown, they're separated by one or more blank lines. Like HTML, whitespace is ignored. So if you add 10 blank lines, you're still only going to have one paragraph.

```
This is a paragraph of text.

This is another paragraph of text.
```

HTML equivalent:

Get started   Open in app

paragraph.html hosted with ❤ by **GitHub**   view raw

This is a paragraph of text.

This is another paragraph of text.

paragraph.md hosted with ❤ by **GitHub**   view raw

Output Result: <u>Colab Notebook</u>

• Line breaks

Just end a line with two or more spaces   , then type return. Or leave an empty line.

```
This is a text.      <!-- spaces -->
This is another text.
```

HTML equivalent:

```
1    <p>This is a text. <br> This is another text.</p>
```

line_break.html hosted with ❤ by **GitHub**   view raw

This is a text.
This is another text.

breakline.md hosted with ❤ by **GitHub**   view raw

Output Result: <u>Colab Notebook</u>

• Mark emphasis

You can add emphasis by making text bold or italic.

```
Emphasis, aka italics, with *asterisks* or _underscores_.

Strong emphasis, aka bold, with **asterisks** or __underscores__.

Combined emphasis with **asterisks and _underscores_**.

Strikethrough uses two tildes ~ . ~~Scratch this.~~
```

```
1    <p>Emphasis, aka italics, with  <i> i or em tag</i></p>
2    <p>Strong emphasis, aka bold, <b>b or strong tag</b></p>
3    <p>Combined emphasis with <b><i> both tags </b></i></p>
4    <p>Strikethrough uses <strike> strike tag </strike> </p>
```

emphasis.html hosted with ❤ by **GitHub**   **view raw**

Emphasis, aka italics, with *asterisks* or *underscores*.

Strong emphasis, aka bold, with **asterisks** or **underscores**.

Combined emphasis with **asterisks and *underscores***.

Strikethrough uses two tildes ~ . ~~Scratch this.~~

emphasis.md hosted with ❤ by **GitHub**   **view raw**

Output Result: Colab Notebook

• Lists

Creating lists in Markdown is a real pleasure, you will see that there is nothing simpler!

```
1. Item 1
2. Item 2 ( we can type 1. and the markdown will automatically
numerate them)
* First Item
  * Nested item 1
  * Nested item 2
    1. Keep going
    1. Yes

* Second Item
- First Item
- Second Item
```

HTML equivalent:

```
1    <ol>
2    <li>Item 1</li>
3    <li>Item 2 ( we can type 1. and the markdown will automatically numerate them) </li>
4    <li><p>First Item</p>
5    <ul>
```

Get started   Open in app

```
 9    <li>Yes</li>
10    </ol>
11    </li>
12    </ul>
13    </li>
14    <li><p>Second Item</p>
15    </li>
16    <li>First Item</li>
17    <li>Second Item</li>
18    </ol>
```

list.html hosted with ❤ by **GitHub**   **view raw**

1. Item 1
2. Item 2 (we can type 1. and the markdown will automatically numerate them)

- First Item

    - Nested item 1
    - Nested item 2
        1. Keep going
        2. Yes

- Second Item

- First Item
- Second Item

list.md hosted with ❤ by **GitHub**   **view raw**

Output Result: Colab Notebook

• Links and Images

To create a link, you must place the text of the link in square brackets followed by the URL in parentheses. Images are almost inserted in the same way as links, add an exclamation mark (!), followed by alt text in brackets, and the path or URL to the image asset in parentheses.

```
<!-- [Text](link) -->
[Link Text](https://medium.com/@ahmedazizkhelifi "Optional Title")
```

Get started   Open in app

```
<!-- Linking Image -->
<!-- [![Alt Text](image path "title")](link) -->[![Alt Text]
(https://miro.medium.com/max/80/0*PRNVc7bjff0Jj1pm.png "Optional
Title")](https://medium.com/@ahmedazizkhelifi)
```

HTML equivalent:

```
1  <!-- [Text](link) -->
2  <p><a href="https://medium.com/@ahmedazizkhelifi" title="Optional Title">Link Text</a></
3  <!-- ![Alt Text](image path "title") -->
4  <p><img src="https://miro.medium.com/max/80/0*PRNVc7bjff0Jj1pm.png" alt="Alt Text" title
5  <!-- [![Alt Text](image path "title")](link) -->
6  <p><a href="https://medium.com/@ahmedazizkhelifi"><img src="https://miro.medium.com/max/
```

LinkImage.html hosted with ❤ by **GitHub**   **view raw**

[Link Text](#)

LinkImage.md hosted with ❤ by **GitHub**   **view raw**

Output Result: Colab Notebook

• Horizontal Rule

To create a horizontal rule, use three or more asterisks (***), dashes (---), or
underscores (___) on a line by themselves.

```
Reading articles on Medium is awesome.
---
Sure !!
```

Get started   Open in app

```
1    <p>Reading articles on Medium is awesome.</p>
2    <hr>
3    <p>Sure !!</p>
```

hr.html hosted with ❤ by **GitHub**   **view raw**

Reading articles on Medium is awesome.

Sure !!

hr.md hosted with ❤ by **GitHub**   **view raw**

Output Result: Colab Notebook

• Table

It's so freaking easy. And you can use this website to generate them.

Use \ before the dollar signs $, on your Notebook, otherwise, you'll enter the math display mode (check it out on the LaTeX side).

```
| Id | Label     | Price |
|--- |----------| ------|
| 01 | Markdown |\$1600 |
| 02 | is       |  \$12 |
| 03 | AWESOME  | \$999 |
```

HTML Equivalent:

```
1     <table>
2     <thead>
3     <tr>
4     <th>Id</th>
5     <th>Label</th>
6     <th>Price</th>
7     </tr>
8     </thead>
9     <tbody>
10    <tr>
11    <td>01</td>
12    <td>Markdown</td>
13    <td>$1600</td>
14    </tr>
```

```html
17     <td>13</td>
18     <td>$12</td>
19     </tr>
20     <tr>
21     <td>03</td>
22     <td>AWESOME</td>
23     <td>$999</td>
24     </tr>
25     </tbody>
26     </table>
```

table.html hosted with ❤ by **GitHub**   **view raw**

Id	Label	Price
01	Markdown	$1600
02	is	$12
03	AWESOME	$999

table.md hosted with ❤ by **GitHub**   **view raw**

Output Result: Colab Notebook

• Code and Syntax Highlighting

```python
```python
def staySafe(Coronavirus)
  if not home:
    return home
```
```

HTML Equivalent:

```html
1    <pre><code class="lang-python"><span class="hljs-function"><span class="hljs-keyword">de
2        <span class="hljs-keyword">if</span> <span class="hljs-keyword">not</span> <span cla
3            <span class="hljs-keyword">return</span> home
4    </code></pre>
```

code.html hosted with ❤ by **GitHub**   **view raw**

code.md hosted with ❤ by **GitHub**   **view raw**

Output Result: Colab Notebook

• Blockquotes

Blockquotes work like replies to e-mails: you must precede the quoted lines with a `>` .

```
> This is a blockquote.
>
> This is part of the same blockquote.

Quote break

> This is a new blockquote.
```

HTML Equivalent:

```
1    <blockquote>
2    <p>This is a blockquote.</p>
3    <p>This is part of the same blockquote.</p>
4    </blockquote>
5    <p>Quote break</p>
6    <blockquote>
7    <p>This is a new blockquote.</p>
8    </blockquote>
```

blockquote.html hosted with ❤ by **GitHub**   **view raw**

> This is a blockquote.
>
> This is part of the same blockquote.

Quote break

> This is a new blockquote.

blockquote.md hosted with ❤ by **GitHub**   **view raw**

Output Result: Colab Notebook

Have you ever asked yourself, how they write complex maths and physics equations using computer? Well, it's all about LaTeX.

The Jupyter Notebook uses <u>MathJax</u> to render LaTeX inside HTML / Markdown. Just put your LaTeX math inside `$ $`. Or enter in *display* math mode by writing between `$$ $$`.

```
1   To insert a mathematical formula we use the dollar symbol $, as follows:
2
3   Euler's identity: $ e^{i \pi} + 1 = 0 $
4
5   To isolate and center the formulas and enter in math display mode, we use 2 dollars syn
6   $$
7   ...
8   $$
9
10
11  Euler's identity: $$ e^{i \pi} + 1 = 0 $$
12
```

introLatex.tex hosted with ❤ by **GitHub**　　　**view raw**

To insert a mathematical formula we use the dollar symbol $, as follows:

Euler's identity: $e^{i\pi} + 1 = 0$

To isolate and center the formulas and enter in math display mode, we use 2 dollars symbol:

. . .

Euler's identity:

$$e^{i\pi} + 1 = 0$$

Output Result: <u>Colab Notebook</u>

<u>Important Notes</u>:

1. To add **little spacing** in math mode use `\,`

Get started   Open in app

3. To display **fraction** use `\frac{arg 1}{arg 2}`

4. For **power** (superscripts text) use `^{}`

5. For **indices** (subscripts) use `_{}`

6. For **roots** use `\sqrt[n]{arg}`

   The `[n]` is optional.

```
1   $$
2   \frac{arg 1}{arg 2} \\
3   x^2\\
4   e^{i\pi}\\
5   A_i\\
6   B_{ij}\\
7   \sqrt[n]{arg}
8   $$
```

Note1.tex hosted with ❤ by **GitHub**   view raw

$$\frac{arg1}{arg2}$$
$$x^2$$
$$e^{i\pi}$$
$$A_i$$
$$B_{ij}$$
$$\sqrt[n]{arg}$$

Output Example: Colab Notebook

LaTeX file extension is .tex

• Greek Letters

To write greek letters, type `\` and the letter name:

```
1   Given : $\pi = 3.14$ , $\alpha = \frac{3\pi}{4}\, rad$
2   $$
3   \omega = 2\pi f \\
4   f = \frac{c}{\lambda}\\
```

greek.tex hosted with ❤ by **GitHub**   view raw

$$\text{Given} : \pi = 3.14, \alpha = \frac{3\pi}{4} \, rad$$

$$\omega = 2\pi f$$

$$f = \frac{c}{\lambda}$$

$$\lambda_0 = \theta^2 + \delta$$

$$\Delta\lambda = \frac{1}{\lambda^2}$$

Output Result: Colab Notebook

Important Note:

To write **Capital Greek Letter**, type the first case after the backslash \ as an uppercase, for example:

```
\delta >>> δ
\Delta >>> Δ

\omega >>> ω
\Omega >>> Ω
```

Uppercase	LaTeX	Lowercase	LaTeX
Δ	\Delta	δ	\delta
Ω	\Omega	ω	\omega

Output Example: Colab Notebook

As shown in this figure:

α	\alpha	ξ, Ξ	\xi, \Xi
β	\beta	o	o
γ, Γ	\gamma, \Gamma	π, Π	\pi, \Pi
δ, Δ	\delta, \Delta	ϖ	\varpi
ϵ	\epsilon	ρ	\rho
ε	\varepsilon	ϱ	\varrho
ζ	\zeta	σ, Σ	\sigma, \Sigma
η	\eta	ς	\varsigma
θ, Θ	\theta, \Theta	τ	\tau

λ Λ \lambda, \Lambda χ \chi
μ \mu ψ, Ψ \psi, \Psi
ν \nu ω, Ω \omega, \Omega

Full Greek Letter List. Source

• Roman Names:

```
1   $$
2   \sin(-\alpha)=-\sin(\alpha)\\
3   \arccos(x)=\arcsin(u)\\
4   \log_n(n)=1\\
5   \tan(x) = \frac{\sin(x)}{\cos(x)}
6   $$
```

roman.tex hosted with ❤ by **GitHub**   **view raw**

$$
\sin(-\alpha) = -\sin(\alpha)
$$
$$
\arccos(x) = \arcsin(u)
$$
$$
\log_n(n) = 1
$$
$$
\tan(x) = \frac{\sin(x)}{\cos(x)}
$$

Output Result: Colab Notebook

$\sin$	\sin	$\sinh$	\sinh	$\arcsin$	\arcsin
$\cos$	\cos	$\cosh$	\cosh	$\arccos$	\arccos
$\tan$	\tan	$\tanh$	\tanh	$\arctan$	\arctan
$\sec$	\sec	$\coth$	\coth	$\min$	\min
$\csc$	\csc	$\det$	\det	$\max$	\max
$\cot$	\cot	$\dim$	\dim	$\inf$	\inf
$\exp$	\exp	$\ker$	\ker	$\sup$	\sup
$\log$	\log	$\deg$	\deg	$\liminf$	\liminf
$\ln$	\ln	$\arg$	\arg	$\limsup$	\limsup
$\lg$	\lg	$\gcd$	\gcd	$\lim$	\lim

Source

• Other Symbols

```
1   #Other Symbols
2   ## Angles:
```

```
 6
 7    Angle between two vectors u and v      : $\langle \vec{u},\vec{v}\rangle$
 8
 9    $$ \vec{AB} \, \cdot \, \vec{CD} =0  \Rightarrow  \vec{AB} \, \perp\, \vec{CD}$$
10
11    ##Sets and logic
12    $$\mathbb{N} \subset \mathbb{Z} \subset \mathbb{D} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{
```

other.tex hosted with ❤ by **GitHub**   **view raw**

Angles:

Left angle : $\langle$

Right angle : $\rangle$

Angle between two vectors u and v : $\langle \vec{u}, \vec{v} \rangle$

$$\vec{AB} \cdot \vec{CD} = 0 \Rightarrow \vec{AB} \perp \vec{CD}$$

Sets and logic

$$\mathbb{N} \subset \mathbb{Z} \subset \mathbb{D} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}$$

Output Result: Colab Notebook

∪	\cup	ℝ	\mathbb{R}	∀	\forall
∩	\cap	ℤ	\mathbb{Z}	∃	\exists
⊂	\subset	ℚ	\mathbb{Q}	¬	\neg
⊆	\subseteq	ℕ	\mathbb{N}	∨	\vee
⊃	\supset	ℂ	\mathbb{C}	∧	\wedge
⊇	\supseteq	∅	\varnothing	⊢	\vdash
∈	\in	∅	\emptyset	⊨	\models
∋	\ni	ℵ	\aleph	⇒	\Rightarrow
∉	\notin	\	\setminus	⇏	\nRightarrow
∉	\not\in	≡	\equiv		

Sets and Logic: Source

→	\rightarrow, \to	↦	\mapsto
↛	\nrightarrow	⟼	\longmapsto
⟶	\longrightarrow	←	\leftarrow
⇒	\Rightarrow	↔	\leftrightarrow
⇏	\nRightarrow	↓	\downarrow

Arrows: Source

Other Symbols: Source

• Vertical curly braces:

To define a left vertical curly brace we use the attribute

```
\left\{
```

to close it we use

```
\right\}
```

Output Result: Colab Notebook

• Horizontal curly braces

For horizontal curly braces, we use :

```
\underbrace{...}
\overbrace{...}
```

Output Result: Colab Notebook

• Derivative

Output Result: Colab Notebook

• Limit

Output Result: Colab Notebook

- Sum

Output Result: Colab Notebook

• **Product**

Output Result: Colab Notebook

- **Integral**

- **Matrix**

Output Result: Colab Notebook

Resources:

- https://www.datasciencecentral.com/profiles/blogs/all-about-using-jupyter-notebooks-and-google-colab

- https://oeis.org/wiki/List_of_LaTeX_mathematical_symbols

- https://jupyter.org/

- https://en.wikipedia.org/wiki/Project_Jupyter

- https://en.wikipedia.org/wiki/Markdown

- http://tug.ctan.org/info/undergradmath/

- https://openclassrooms.com/en/courses/1304236-redigez-en-markdown

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Khelifi Ahmed Aziz

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