

Introduction to Google Colaboratory Notebooks

Jupyter Notebook

- It is an open-source web application.
- It allows you to create and share documents that contain live code, equations, visualizations and narrative text.
- It is used for data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.
- These documents provide a complete and self-contained record of a computation that can be converted to various formats and shared with others using email, Dropbox, version control systems (GitHub).

Google Colaboratory Jupyter Notebook

- Colaboratory is a free Jupyter notebook environment that requires no setup and runs entirely in the cloud.
- With Colaboratory you can write and execute code, save and share your analyses, and access powerful computing resources, all for free from your browser.
- Colaboratory is `simplified` version of pure Jupyter notebook.
- It has added more functionality while removing some of the features of pure Jupyter notebook.
- Provides more than 12GB of RAM, 100GB of disk space, offer free GPUs and TPUs.

Notebook Dashboard UI Components

- Menu
- Toolbar
- Notebook area and cells

Notebook Area and Cells

These contain the inputs and outputs of an *interactive session as well as narrative text* that accompanies the code but is not meant for execution. Rich output generated by running code, including images, video, and plots, is embeddeed in the notebook, which makes it a complete and self-contained record of a computation.

Notebooks consist of a linear sequence of cells. There are basic cell types:

- Code cells: Input and output of live code that is run in the Kernel
- Text/Markdown cells: Narrative text with embedded *LaTeX* equations

Code cells

Below is a **code cell**. Once the toolbar button indicates CONNECTED, click in the cell to select it and execute the contents in the following ways:

- Click the **Play icon** in the left gutter of the cell;
- Type **Cmd/Ctrl+Enter** to run the cell in place;
- Type **Shift+Enter** to run the cell and move focus to the next cell (adding one if none exists); or
- Type **Alt+Enter** to run the cell and insert a new code cell immediately below it.

There are additional options for running some or all cells in the **Runtime** menu.

In [3]:

```
a = 10
a
```

10

Runtime menu

The “Runtime” menu has a number of menu items for running code in different ways. These includes:

- Run All
- Run before
- Run the focussed cell
- Run Selection
- Run after

Text/ Markdown Cells

- This is a **text cell**. You can **double-click** to edit this cell. Text can be added to Jupyter Notebooks using markdown syntax.
- You can also add math to text cells using [LaTeX](#) to be rendered by [MathJax](#). Just place the statement within a pair of **\$** signs. For example `$\sqrt{3x-1}+(1+x)^2$` becomes $\sqrt{3x-1}+(1+x)^2$.
- Markdown is a popular markup language that is a superset of HTML. Its specification can be found at <https://daringfireball.net/projects/markdown/>

Adding and moving cells

- You can add new cells by using the **+ CODE** and **+ TEXT** buttons that show when you hover between cells.
- These buttons are also in the toolbar above the notebook where they can be used to add a cell below the currently selected cell.

You can move a cell by selecting it and clicking **Cell Up** or **Cell Down** in the top toolbar.

Consecutive cells can be selected by "lasso selection" by dragging from outside one cell and through the group. Non-adjacent cells can be selected concurrently by clicking one and then holding down Ctrl while clicking another. Similarly, using Shift instead of Ctrl will select all intermediate cells.

Markdown basics

Heading

- To see the markdown source, double-click a text cell.
- Headers are created using `#`. Use multiple `###` for less emphasis. For example:

```
# This is equivalent to an <h1> tag

#### This is equivalent to an <h5> tag
```

- Following markdown source can with double-click on this cell: `# Heading 1 # Heading 2 ## Heading 2.1 ## Heading 2.2`

Emphasis

- To make text **bold** surround it with `**two asterisks**`.
- To make text *italic* use a "single asterisk" or `_underscore_`.
- ~~Strikethrough~~ uses `~~two tildes~~` while `monospace` (such as code) uses ``backtick``.

Mathematical symbols

LaTeX equations are surrounded by `$`. For example, `$y = 0.1 x$` renders as the following inline equation: $y = 0.1x$. Double the `$` to set the contents off on its own centered line.

Indenting

Blocks are indented with `>`, and multiple levels of indentation are indicated by repetition: `>>>` indents three levels.

For example:

```
> This text that will be indented when the Markdown is rendered. Any subsequent text is indented until the next carriage return.
>> This text is at second level of indentation.
```

Bullets

To create a circular bullet point, use one of the following methods. Each bullet point must be on its own line.

- A hyphen (`-`) followed by one or two spaces, for example: `- Bulleted item`
- An asterisk (`*`) followed by one or two spaces, for example: `* Bulleted item`

To create a sub bullet, press `Tab` before entering the bullet point using one of the methods described above.

For example:

- Main bullet point
 - Sub bullet pointCopy

Numbered lists

To create a numbered list, enter `1.` followed by a space, for example:

1. Numbered item
2. Numbered item

For simplicity, you use `1.` before each entry. The list will be numbered correctly when you run the cell.

To create a substep, press `Tab` before entering the numbered item, for example:

1. Numbered item
 - A. Substep

Links

- [Links](#) are created with `[brackets around the linked text](and-parentheses-around-the-url.html)`.
- Naked URLs, like <https://google.com>, will automatically be linkified.