How to Use Google Colaboratory for Python Programming: A Hands On 1-Day Workshop

By

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29/7/2019

Who this workshop is for?

- M.Sc. or Ph.D. student who is working or will work on a machine learning-related problem, or
- You need high performance computing tool, or
- You need to use GPU in a research problem in hand.

What you will learn Today

1. Introduction
2. Getting familiar with CoLab
3. How to manage data and code in Colab.
4. How to install software on the cloud
5. How to run your python script
6. Examples and hands on

Introduction

- *"Where to train my models?"*
- Google released its internal research tool "*Colaboratory*" which is a tool for machine learning education and research.
- It's a **Jupyter notebook environment** that requires no setup to use.
- More than one person can work on the same code at the same time.
- **free computing power**

Overview of Colaboratory Features

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Cells

A notebook is a list of cells. Cells contain either explanatory text or executable code and its output. Click a cell to select it.

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.

```
[ ]  a = 10
     a
```

```
10
```

Text cells

This is a **text cell**. You can **double-click** to edit this cell. Text cells use markdown syntax. To learn more, see our markdown guide.

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 $\sqrt{3x-1}+(1+x)^2$.

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

Untitled1.ipynb - Colaboratory

https://colab.research.google.com/drive/1ZRI6TMSiIEPJpzR4LKi9Sj-R4UIkilvC

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- Evaluate a Javascript expression from P...
- Javascript to Python communication
- Open files from GCS with gsutil
- Open files from GCS with the Cloud Stor...

Camera Capture

INSERT

Using a webcam to capture images for processing on the runtime.

```
from IPython.display import display
from google.colab.output import eva
from base64 import b64decode

def take_photo(filename='photo.jpg'
  js = Javascript('''
    async function takePhoto(qualit
      const div = document.createEl
      const capture = document.crea
      capture.textContent = 'Captur
```

Untitled1.ipynb - Colaboratory

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```
# you can write Text Here
```

you can write Text Here

```
[ ]
```

Tutorial.ipynb - Colaboratory

https://colab.research.google.com/drive/1ZRI6TMSiIEPJpzR4LKi9Sj-R4UIkilvC#scrollTo=2m4VgWf7OseR

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RAM Disk | Editing

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      const capture = document.crea
      capture.textContent = 'Captur
```

you can write Text Here

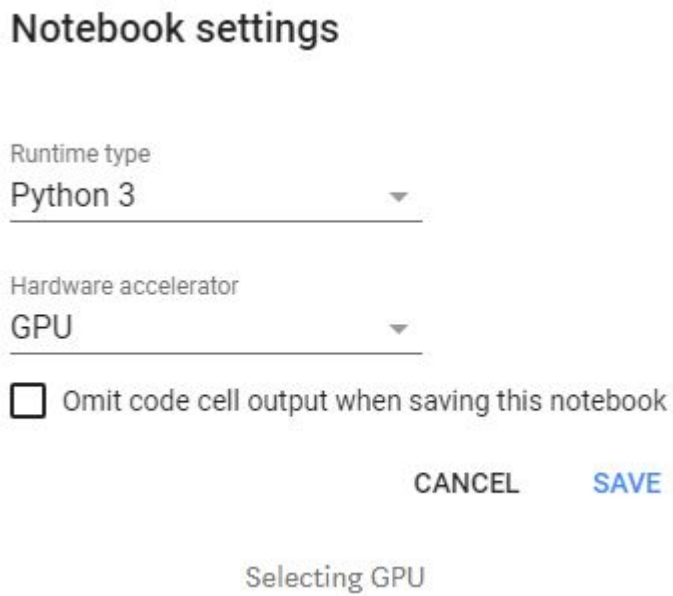
Write Your Code Here

```
!pip freeze
```

```
statsmodels==0.10.0
sympy==1.1.1
tables==3.4.4
tabulate==0.8.3
tblib==1.4.0
tensor2tensor==1.11.0
tensorboard==1.14.0
tensorboardcolab==0.0.22
tensorflow==1.14.0
tensorflow-estimator==1.14.0
tensorflow-hub==0.5.0
tensorflow-metadata==0.14.0
tensorflow-probability==0.7.0
termcolor==1.1.0
terminado==0.8.2
testpath==0.4.2
text-unidecode==1.2
textblob==0.15.3
textgenrnn==1.4.1
tfds-nightly==1.0.2.dev201907170105
tflearn==0.3.2
Theano==1.0.4
thinc==7.0.8
toolz==0.10.0
torch==1.1.0
torchsummary==1.5.1
torchtext==0.3.1
torchvision==0.3.0
```

How to select the type of GPU

- To select the GPU for training you need to go to: **Runtime > Change runtime type** or **Edit > Notebook settings**



Selecting GPU

Pros and Cons

- Pros: Google colaboratory currently offers the computing services of a **Tesla K80 GPU** for free.

- Cons: A **maximum of 12 hours at a time** (you can think of it in terms of a session)
  - all data, models parameters, as well as datasets that aren't saved to the Google drive before this period will be lost.

Tutorial.ipynb - Colaboratory

https://colab.research.google.com/drive/1ZRI6TMSiIEPJpzR4LKi9Sj-R4UIkilvC#scrollTo=ABivnKw7clhZ

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UPLOAD | REFRESH | MOUNT DRIVE

..

sample_data

you can write Text Here

[1] !pip freeze

[ ]

```
from google.colab import drive
drive.mount('/content/drive')
```

Run this cell to mount your Google Drive.

DISMISS

Disk 23.63 GB available

GPU FOR DEEP LEARNING

Google

Colaboratory

Google Drive File Stream wants to access your Google Account

sherin.aly.au@gmail.com

This will allow Google Drive File Stream to:

Google Account.

Learn about the risks

Cancel

Allow

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Go to this URL in a browser: https://
t8qdgf4n4g3pfee6491hc0brc4i.apps.googleuser

Enter your authorization code:
```

Google

Sign in

Please copy this code, switch to your application and paste it there:

4/jwGN42nNeTykQv-_6-D1eVRanPYpjjgJjHoDXKT-

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6qk8qdgf4n4g3pfee6491hc0brc4i.apps.googleuser

Enter your authorization code:
··········
Mounted at /content/drive
```

Installing Software

- !pip freeze
  - to see the list of installed libraries and frameworks
- Similar to what you use in Linux systems
- Use ! Before any command

Examples

- !apt-get install python3
- !apt-get install python3-pip
- !pip3 install virtualenv
- !virtualenv env
- !env/bin/pip3 install matplotlib
- !env/bin/pip3 install numpy
- !env/bin/pip3 install scipy
- !env/bin/pip3 install scikit-image
- !pip3 install tensorflow-gpu

Write directly on coLab code cells

GPU FOR DEEP LEARNING
Google
Colaboratory

Run Python code in a file

- Step 1: upload the code on your Google Drive [ex. On a folder called SampleFolder]
- Step 2: run this line of code from colab

```
!python3 '/content/drive/My Drive/ SampleFolder /SampleCode.py'
```

Google drive path

GPU FOR DEEP LEARNING

Google

Colaboratory

```
!python3 '/content/drive/My Drive/Workshop/main.py'
```

```
[1 2 3 4 5]
```

Classification example

- In class example…

Resources

- https://www.youtube.com/watch?v=inN8seMm7UI
- https://course.fast.ai/start_colab.html
- https://medium.com/@swapp19902/image-classifier-using-fastai-and-google-colab-87dfc4e90e63
- https://towardsdatascience.com/how-to-do-text-binary-classification-with-bert-f1348a25d905

- Many others on the web…

Conclusion

- Google Colab provides free GPU to run python code
- You can run a session up to 12 hours
- For more than 12 hours you will need to save your work on Google Drive
- Load and Save data
- Run Python code

Thank you

Questions?