CS6208 : Advanced Topics in Artificial Intelligence
Graph Machine Learning

Running Course Notebooks with
GitHub, Google Colab & Local Installation

Semester 2 2022/23

Xavier Bresson

https://twitter.com/xbresson

Department of Computer Science
National University of Singapore (NUS)

Outline

- Running course demos & coding exercises
  - Google Colab
  - Local installation

Outline

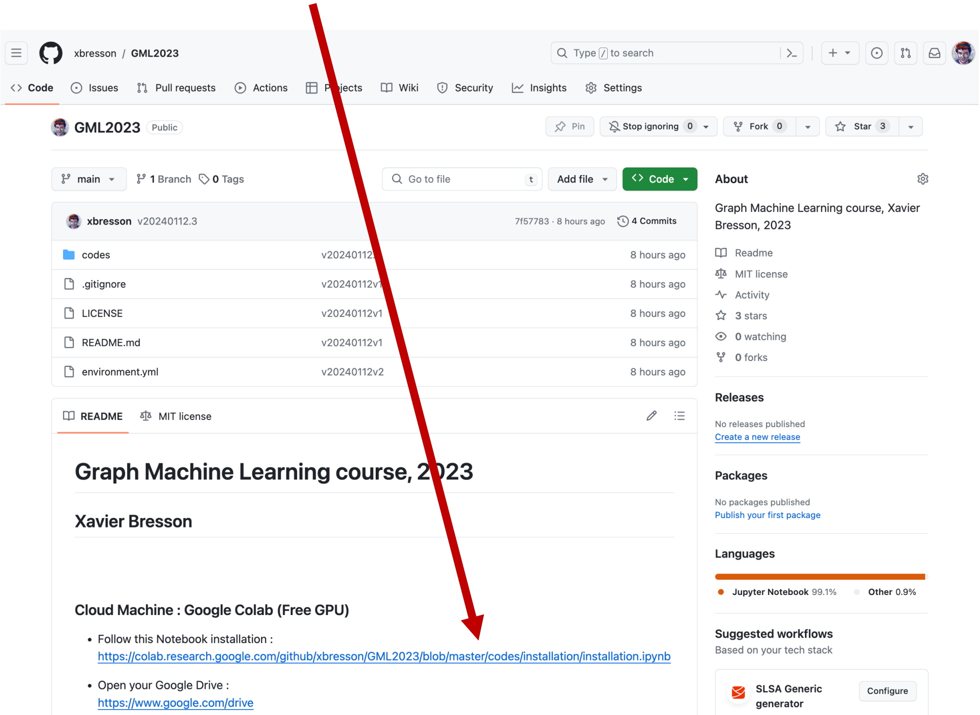
- Running demos & coding exercises
  - Google Colab
  - Local installation

Google Colab

- Follow these instructions :
  - Go to the GitHub folder of the course :

    https://github.com/xbresson/GML2023

    Click on this link.



xbresson v20240112.3 7f57783 · 8 hours ago 4 Commits

codes	v20240112	8 hours ago
.gitignore	v20240112v1	8 hours ago
LICENSE	v20240112v1	8 hours ago
README.md	v20240112v1	8 hours ago
environment.yml	v20240112v2	8 hours ago

Graph Machine Learning course, 2023

Xavier Bresson

Cloud Machine : Google Colab (Free GPU)

- Follow this Notebook installation :
  https://colab.research.google.com/github/xbresson/GML2023/blob/master/codes/installation/installation.ipynb
- Open your Google Drive :
  https://www.google.com/drive

About

Graph Machine Learning course, Xavier Bresson, 2023

Releases

No releases published
Create a new release

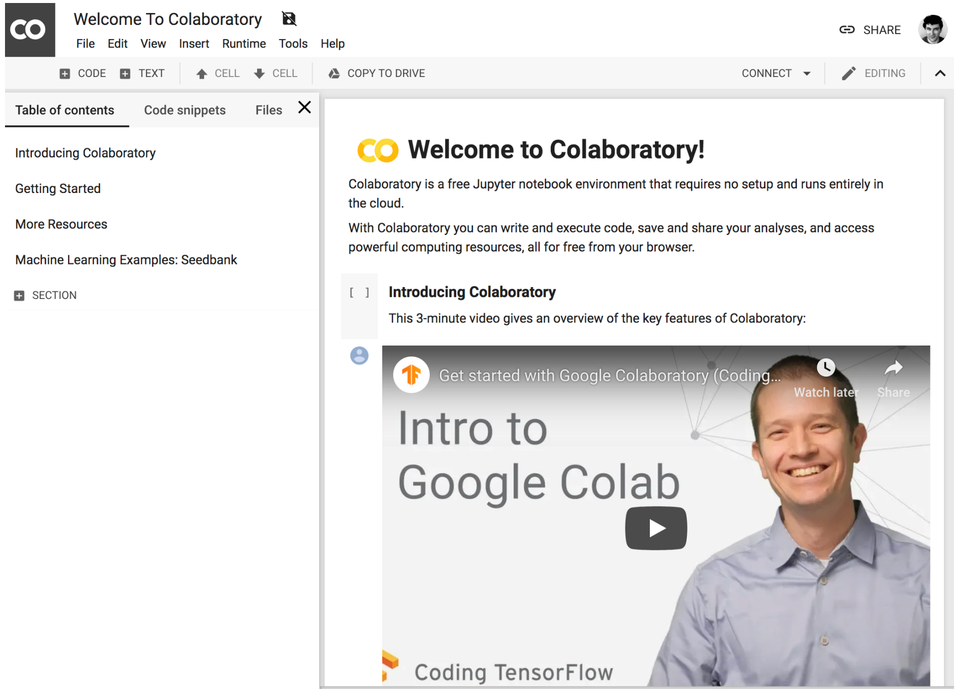
Packages

No packages published
Publish your first package

Languages

Jupyter Notebook 99.1% Other 0.9%

Suggested workflows
Based on your tech stack



Welcome to Colaboratory!

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.

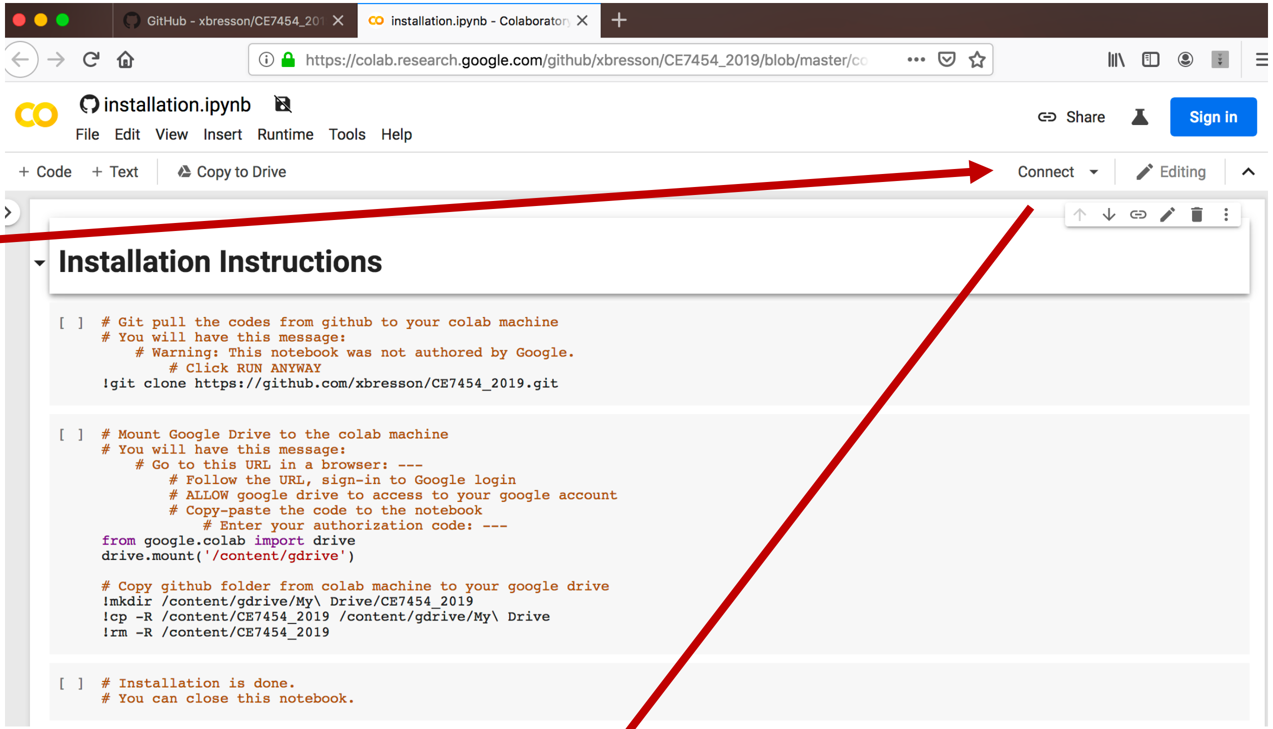
Introducing Colaboratory

This 3-minute video gives an overview of the key features of Colaboratory:

Google Colab

- Click on CONNECT.

- It will ask you to sign-in with your Gmail account.



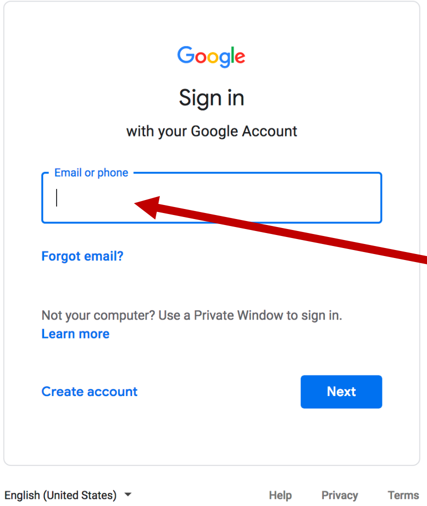
GitHub - xbresson/CE7454_201
installation.ipynb - Colaboratory
https://colab.research.google.com/github/xbresson/CE7454_2019/blob/master/co
installation.ipynb
File
Edit
View
Insert
Runtime
Tools
Help
Share
Sign in
+ Code
+ Text
Copy to Drive
Connect
Editing

Installation Instructions

```
# Git pull the codes from github to your colab machine
# You will have this message:
    # Warning: This notebook was not authored by Google.
        # Click RUN ANYWAY
!git clone https://github.com/xbresson/CE7454_2019.git
```

```
# Mount Google Drive to the colab machine
# You will have this message:
    # Go to this URL in a browser: ---
        # Follow the URL, sign-in to Google login
        # ALLOW google drive to access to your google account
        # Copy-paste the code to the notebook
            # Enter your authorization code: ---
from google.colab import drive
drive.mount('/content/gdrive')

# Copy github folder from colab machine to your google drive
!mkdir /content/gdrive/My\ Drive/CE7454_2019
!cp -R /content/CE7454_2019 /content/gdrive/My\ Drive
!rm -R /content/CE7454_2019
```

```
# Installation is done.
# You can close this notebook.
```



Google

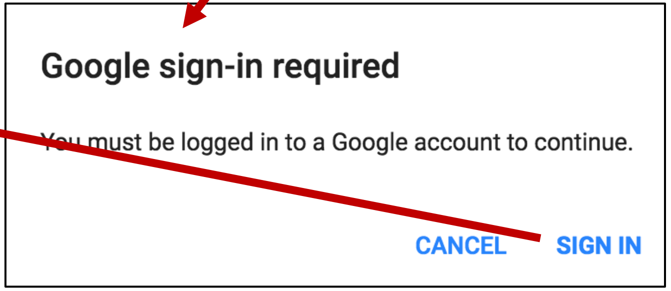
Sign in

with your Google Account

Email or phone

Forgot email?

Not your computer? Use a Private Window to sign in. Learn more



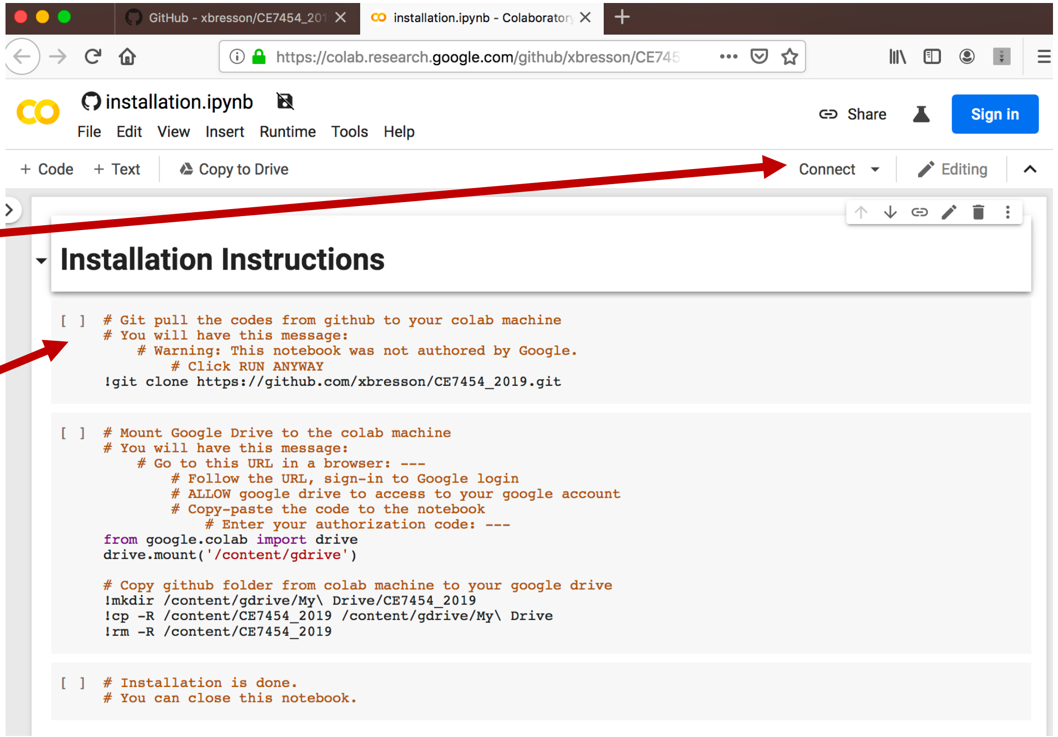
Google sign-in required

You must be logged in to a Google account to continue.

Google Colab

- Click on CONNECT again to start the Google Cloud machine.

- Run the first cell to clone the codes from GitHub to the Google Cloud machine.
    - It will give a warning, click on RUN ANYWAY.
    - Answer YES to the next question RESET ALL RUNTIMES.

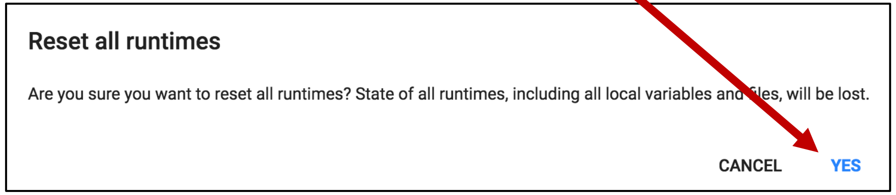

GitHub - xbresson/CE7454_201
installation.ipynb - Colaborator
https://colab.research.google.com/github/xbresson/CE745
installation.ipynb
File Edit View Insert Runtime Tools Help
Share
Sign in
+ Code
+ Text
Copy to Drive
Connect
Editing

Installation Instructions

```
[ ]  # Git pull the codes from github to your colab machine
     # You will have this message:
         # Warning: This notebook was not authored by Google.
             # Click RUN ANYWAY
     !git clone https://github.com/xbresson/CE7454_2019.git
```

```
[ ]  # Mount Google Drive to the colab machine
     # You will have this message:
         # Go to this URL in a browser: ---
             # Follow the URL, sign-in to Google login
             # ALLOW google drive to access to your google account
             # Copy-paste the code to the notebook
                 # Enter your authorization code: ---
     from google.colab import drive
     drive.mount('/content/gdrive')

     # Copy github folder from colab machine to your google drive
     !mkdir /content/gdrive/My\ Drive/CE7454_2019
     !cp -R /content/CE7454_2019 /content/gdrive/My\ Drive
     !rm -R /content/CE7454_2019
```

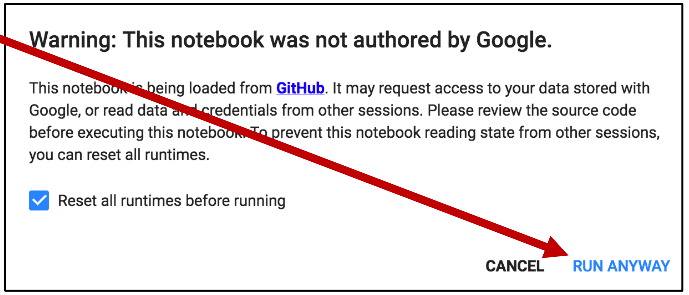
```
[ ]  # Installation is done.
     # You can close this notebook.
```



Reset all runtimes

Are you sure you want to reset all runtimes? State of all runtimes, including all local variables and files, will be lost.

CANCEL YES



Warning: This notebook was not authored by Google.

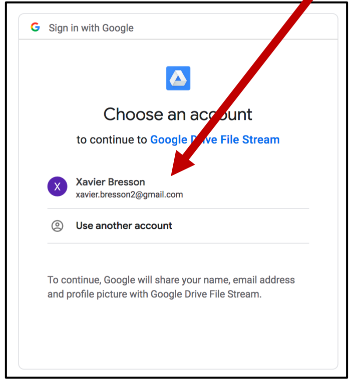
This notebook is being loaded from GitHub. It may request access to your data stored with Google, or read data and credentials from other sessions. Please review the source code before executing this notebook. To prevent this notebook reading state from other sessions, you can reset all runtimes.

☑ Reset all runtimes before running

CANCEL RUN ANYWAY

Google Colab

- Run the second cell to mount your Google Drive to the Google Cloud machine (all your codes will be saved in Google Drive).
  - Click on the provided URL.
  - Select your Gmail account.
  - ALLOW Google Drive File Stream.
  - Copy-paste the code to the notebook (Enter your authorization code) and press Return.



Sign in with Google

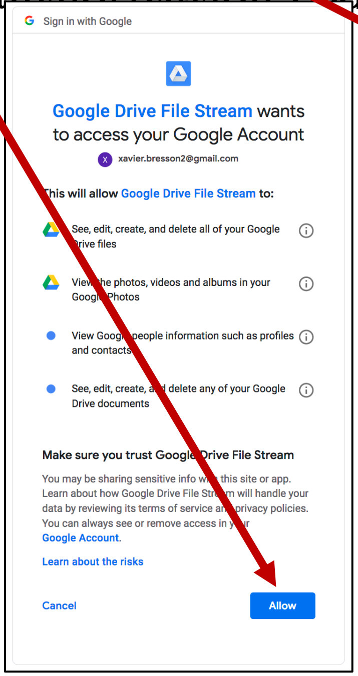
Choose an account

to continue to Google Drive File Stream

Xavier Bresson
xavier.bresson2@gmail.com

Use another account

To continue, Google will share your name, email address and profile picture with Google Drive File Stream.



Sign in with Google

Google Drive File Stream wants to access your Google Account

xavier.bresson2@gmail.com

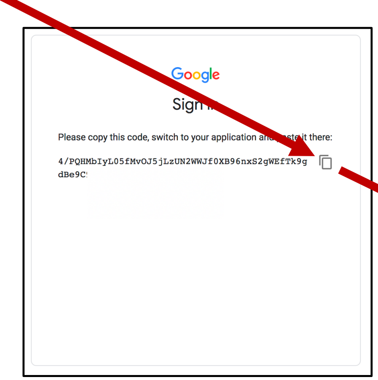
This will allow Google Drive File Stream to:

- See, edit, create, and delete all of your Google Drive files
- View the photos, videos and albums in your Google Photos
- View Google people information such as profiles and contacts
- See, edit, create, and delete any of your Google Drive documents

Make sure you trust Google Drive File Stream

You may be sharing sensitive info with this site or app. Learn about how Google Drive File Stream will handle your data by reviewing its terms of service and privacy policies. You can always see or remove access in your Google Account.

Learn about the risks

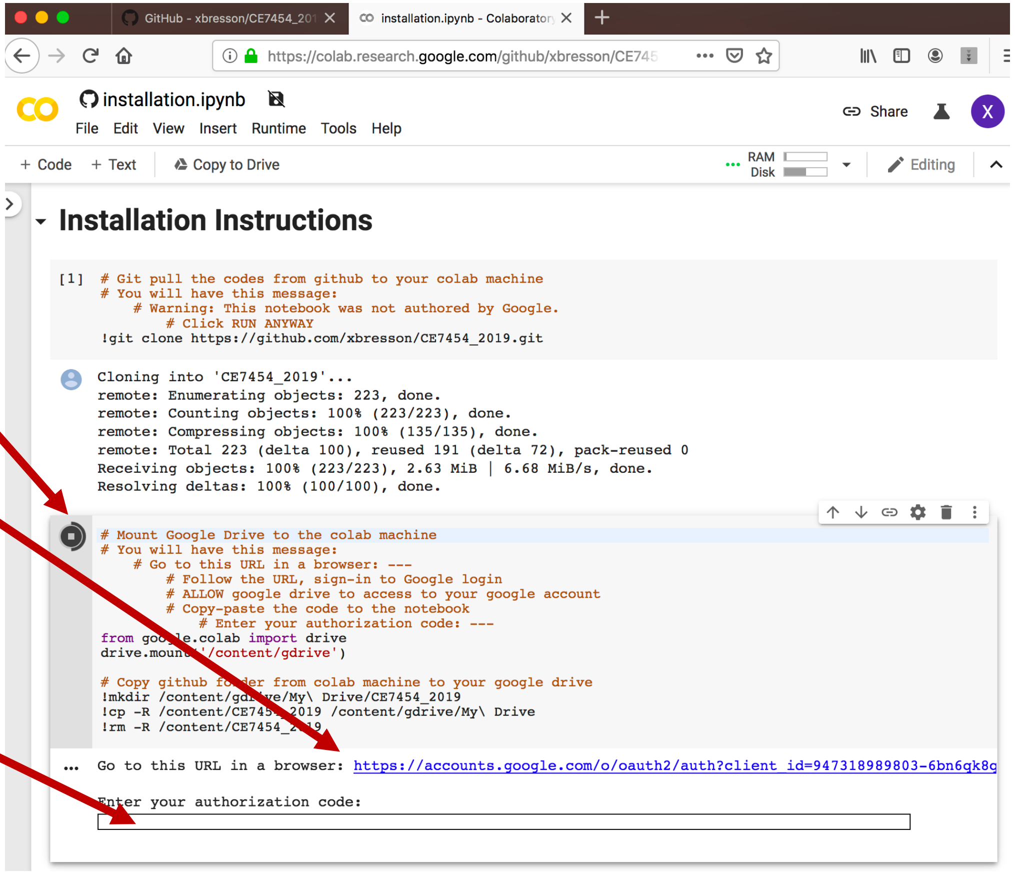


Google

Sign in

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

```
4/PQHMbIyL05fMvOJ5jLzUN2WWJf0XB96nxS2gWEfTk9g
dBe9C
```



GitHub - xbresson/CE7454_201
installation.ipynb - Colaboratory
https://colab.research.google.com/github/xbresson/CE745
installation.ipynb
File
Edit
View
Insert
Runtime
Tools
Help
Share
+ Code
+ Text
Copy to Drive
RAM
Disk
Editing

Installation Instructions

```
[1]  # Git pull the codes from github to your colab machine
     # You will have this message:
         # Warning: This notebook was not authored by Google.
             # Click RUN ANYWAY
     !git clone https://github.com/xbresson/CE7454_2019.git
```

```
Cloning into 'CE7454_2019'...
remote: Enumerating objects: 223, done.
remote: Counting objects: 100% (223/223), done.
remote: Compressing objects: 100% (135/135), done.
remote: Total 223 (delta 100), reused 191 (delta 72), pack-reused 0
Receiving objects: 100% (223/223), 2.63 MiB | 6.68 MiB/s, done.
Resolving deltas: 100% (100/100), done.
```

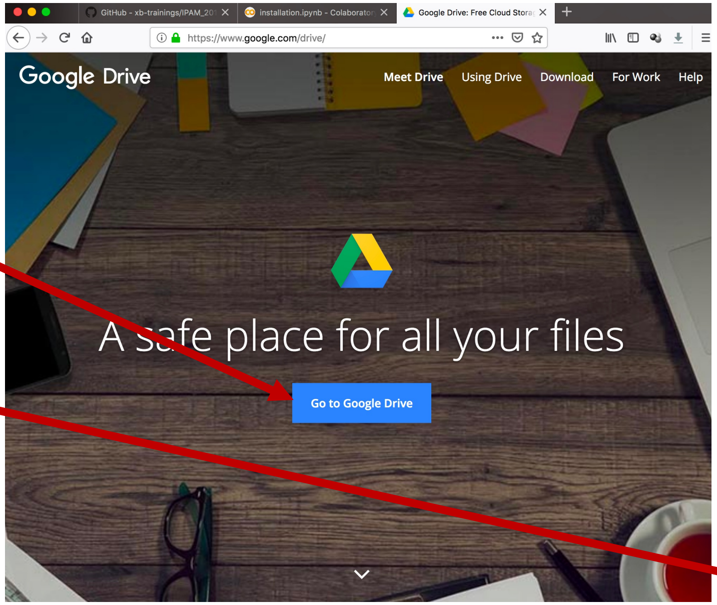
```
# Mount Google Drive to the colab machine
# You will have this message:
    # Go to this URL in a browser: ---
        # Follow the URL, sign-in to Google login
        # ALLOW google drive to access to your google account
        # Copy-paste the code to the notebook
            # Enter your authorization code: ---
from google.colab import drive
drive.mount('/content/gdrive')

# Copy github folder from colab machine to your google drive
!mkdir /content/gdrive/My\ Drive/CE7454_2019
!cp -R /content/CE7454_2019 /content/gdrive/My\ Drive
!rm -R /content/CE7454_2019
```

```
Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6qk8q

Enter your authorization code:
```

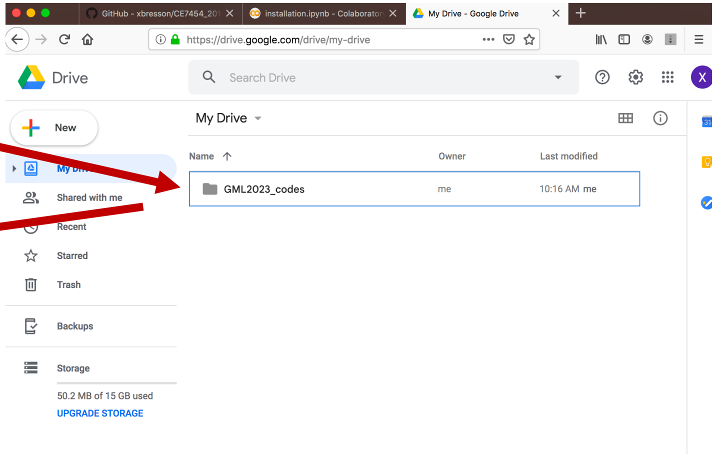
Google Colab

- Open your Google Drive :
  https://www.google.com/drive

- Go folder GML2023_codes/



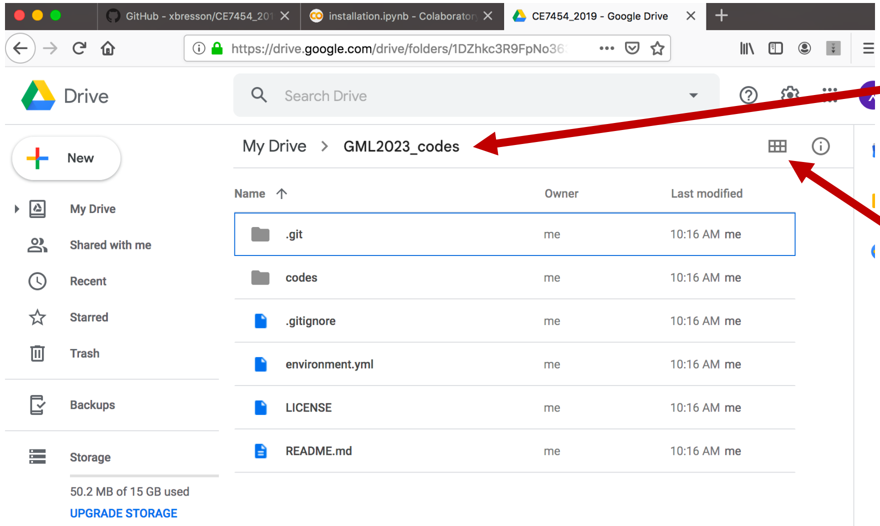
A safe place for all your files



My Drive

Name	Owner	Last modified
GML2023_codes	me	10:16 AM me

50.2 MB of 15 GB used



My Drive > GML2023_codes

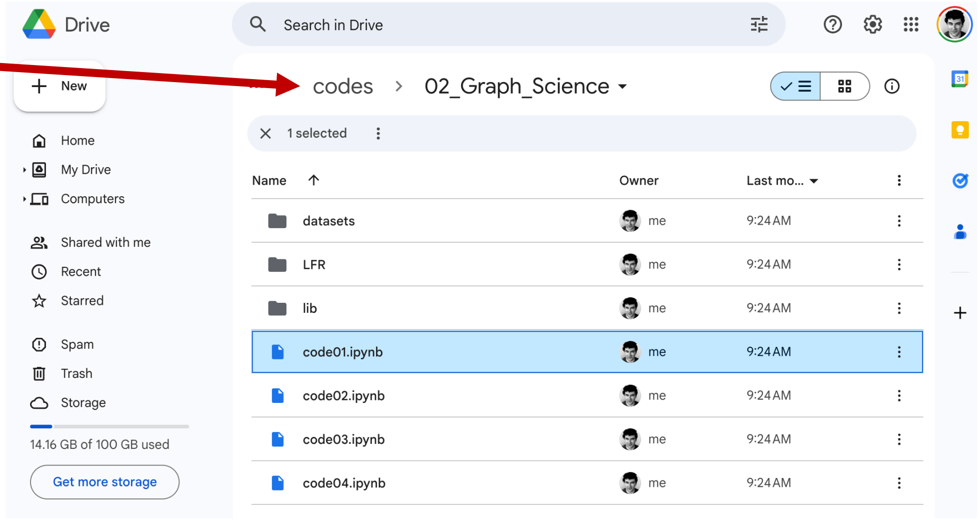
Name	Owner	Last modified
.git	me	10:16 AM me
codes	me	10:16 AM me
.gitignore	me	10:16 AM me
environment.yml	me	10:16 AM me
LICENSE	me	10:16 AM me
README.md	me	10:16 AM me

50.2 MB of 15 GB used

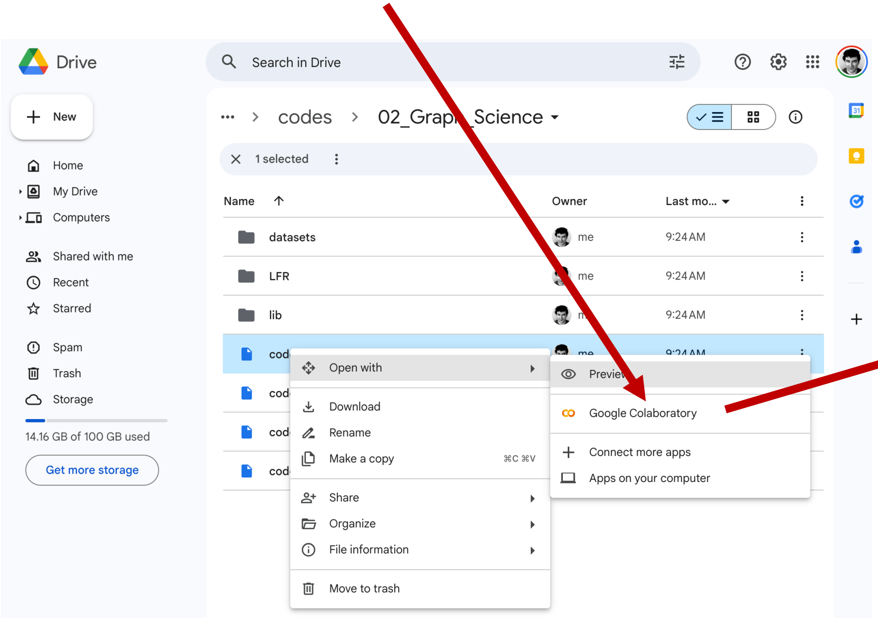
Click here for List View

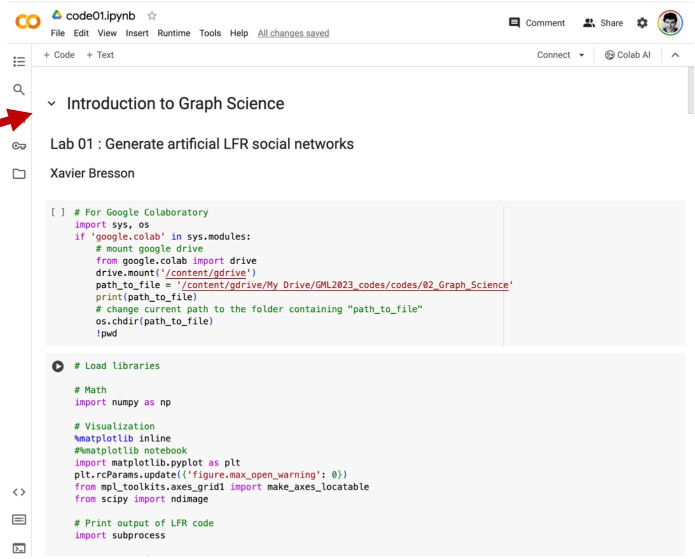
Google Colab

- Go folder GML2023_codes/
- Open notebook code01.pynb in folder codes/02_Graph_Science
  - Select the notebook and open it using Control Click + Open With Colaboratory



Name	Owner	Last mo...
datasets	me	9:24 AM
LFR	me	9:24 AM
lib	me	9:24 AM
code01.ipynb	me	9:24 AM
code02.ipynb	me	9:24 AM
code03.ipynb	me	9:24 AM
code04.ipynb	me	9:24 AM





Introduction to Graph Science

Lab 01 : Generate artificial LFR social networks

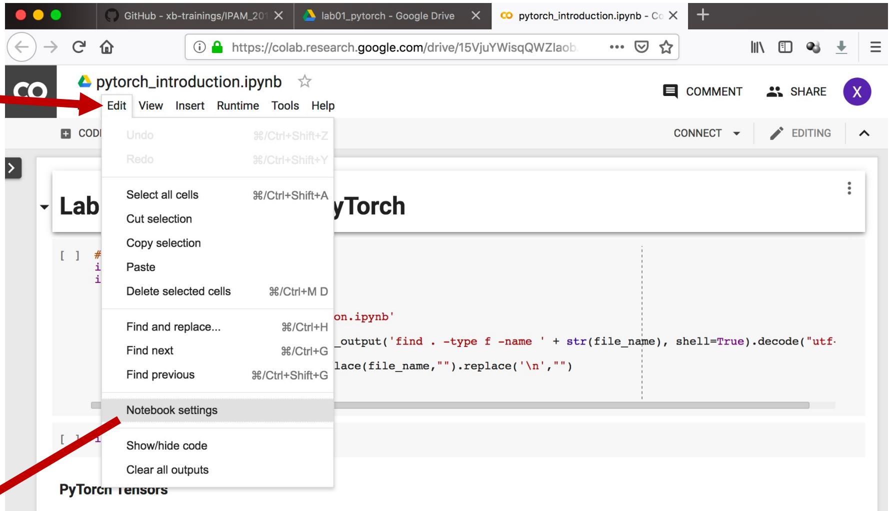
Xavier Bresson

```
# For Google Colaboratory
import sys, os
if 'google.colab' in sys.modules:
    # mount google drive
    from google.colab import drive
    drive.mount('/content/gdrive')
    path_to_file = '/content/gdrive/My Drive/GML2023_codes/codes/02_Graph_Science'
    print(path_to_file)
    # change current path to the folder containing "path_to_file"
    os.chdir(path_to_file)
    !pwd
```

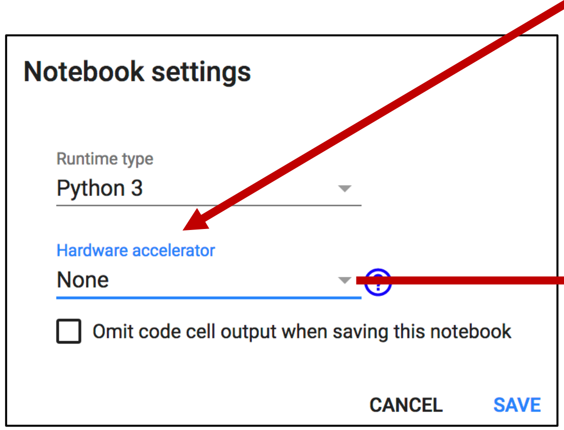
```
# Load libraries

# Math
import numpy as np

# Visualization
%matplotlib inline
#%matplotlib notebook
import matplotlib.pyplot as plt
plt.rcParams.update({'figure.max_open_warning': 0})
from mpl_toolkits.axes_grid1 import make_axes_locatable
from scipy import ndimage

# Print output of LFR code
import subprocess
```

Google Colab

- GPU acceleration :
  - Select Edit in the menu and Notebook settings.
  - Select GPU in Hardware accelerator.


GitHub - xb-trainings/IPAM_20
lab01_pytorch - Google Drive
pytorch_introduction.ipynb - Co
https://colab.research.google.com/drive/15VjuYWisqQWZlaob
pytorch_introduction.ipynb
COMMENT
SHARE
Edit
View
Insert
Runtime
Tools
Help
CONNECT
EDITING
Undo ⌘/Ctrl+Shift+Z
Redo ⌘/Ctrl+Shift+Y
Select all cells ⌘/Ctrl+Shift+A
Cut selection
Copy selection
Paste
Delete selected cells ⌘/Ctrl+M D
Find and replace... ⌘/Ctrl+H
Find next ⌘/Ctrl+G
Find previous ⌘/Ctrl+Shift+G
Notebook settings
Show/hide code
Clear all outputs
Lab
yTorch
PyTorch Tensors

```
on.ipynb'
_output('find . -type f -name ' + str(file_name), shell=True).decode("utf-
lace(file_name,"").replace('\n',"")
```

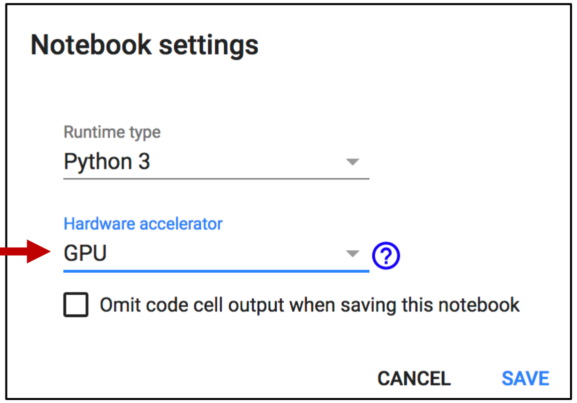


Notebook settings

Runtime type
Python 3

Hardware accelerator
None

☐ Omit code cell output when saving this notebook



Notebook settings

Runtime type
Python 3

Hardware accelerator
GPU

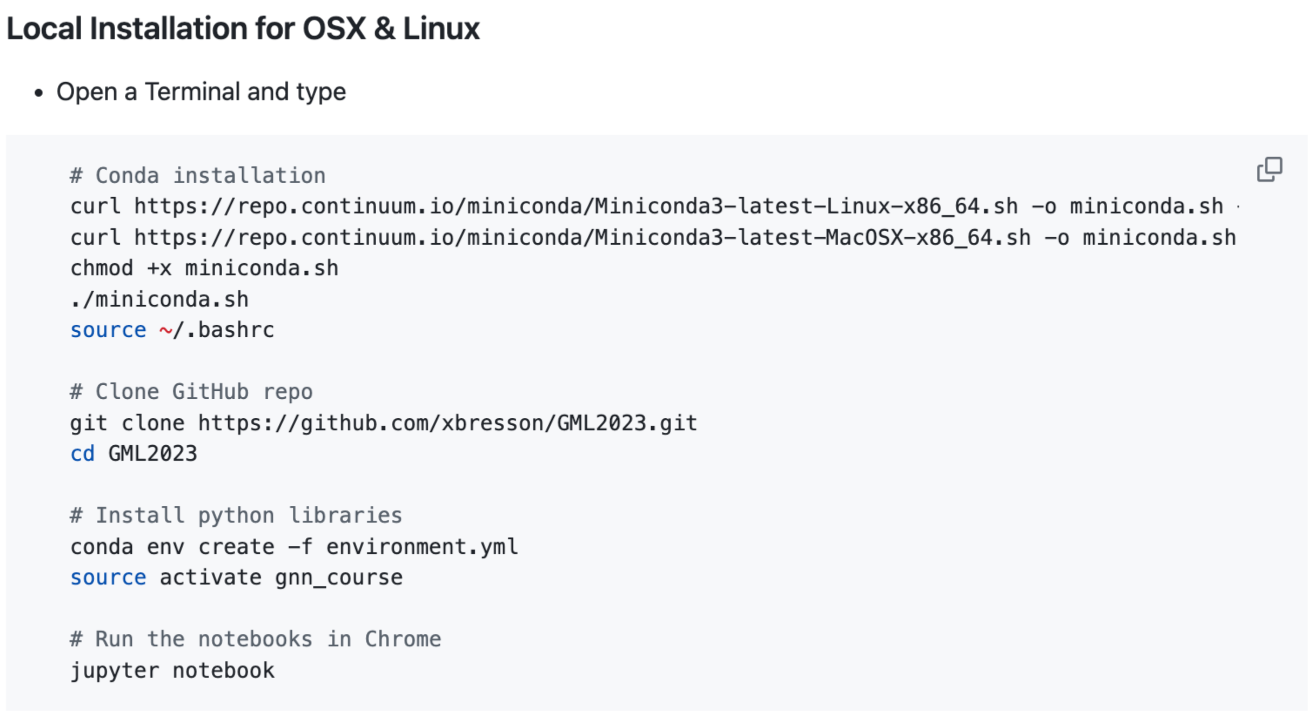
☐ Omit code cell output when saving this notebook

Outline

- **Running demos & coding exercises**
  - Google Colab
  - **Local installation**

Local Installation for OSX & Linux

- Install Python and run the notebooks on your OSX or Linux machine :



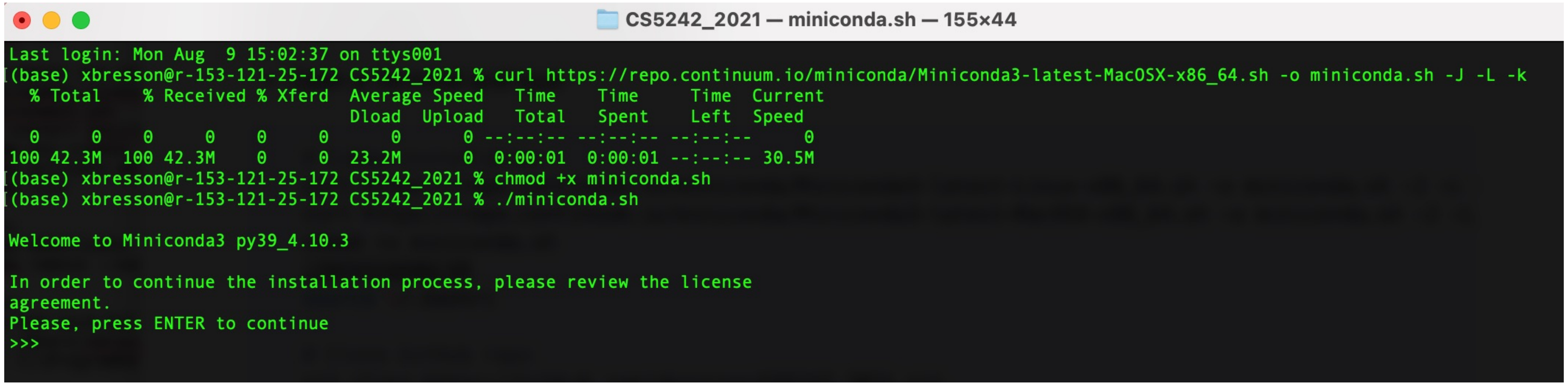
Local Installation for OSX & Linux

- Open a Terminal and type

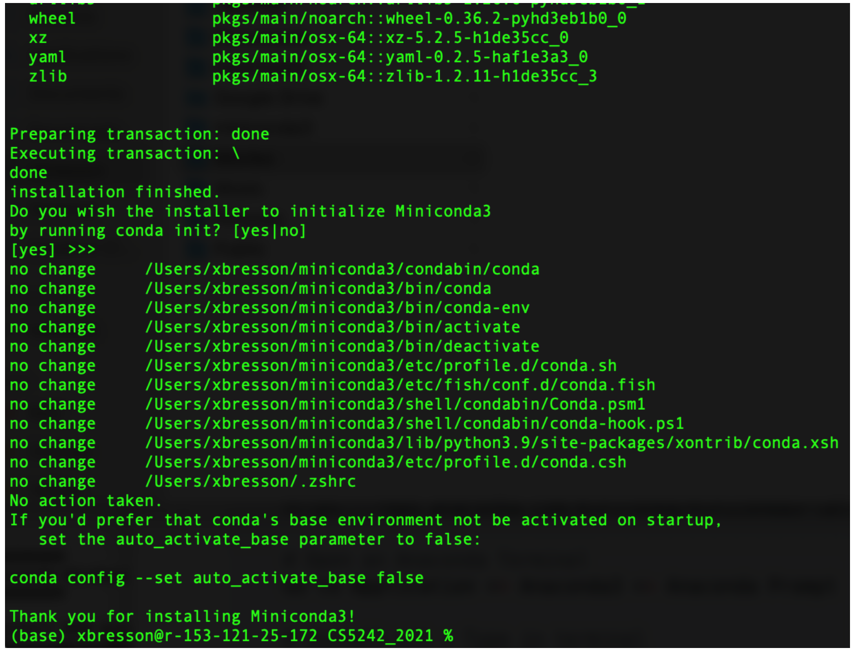
```
# Conda installation
curl https://repo.continuum.io/miniconda/Miniconda3-latest-Linux-x86_64.sh -o miniconda.sh
curl https://repo.continuum.io/miniconda/Miniconda3-latest-MacOSX-x86_64.sh -o miniconda.sh
chmod +x miniconda.sh
./miniconda.sh
source ~/.bashrc

# Clone GitHub repo
git clone https://github.com/xbresson/GML2023.git
cd GML2023

# Install python libraries
conda env create -f environment.yml
source activate gnn_course

# Run the notebooks in Chrome
jupyter notebook
```

https://github.com/xbresson/GML2023#local-installation-for-osx--linux

Local Installation for OSX & Linux

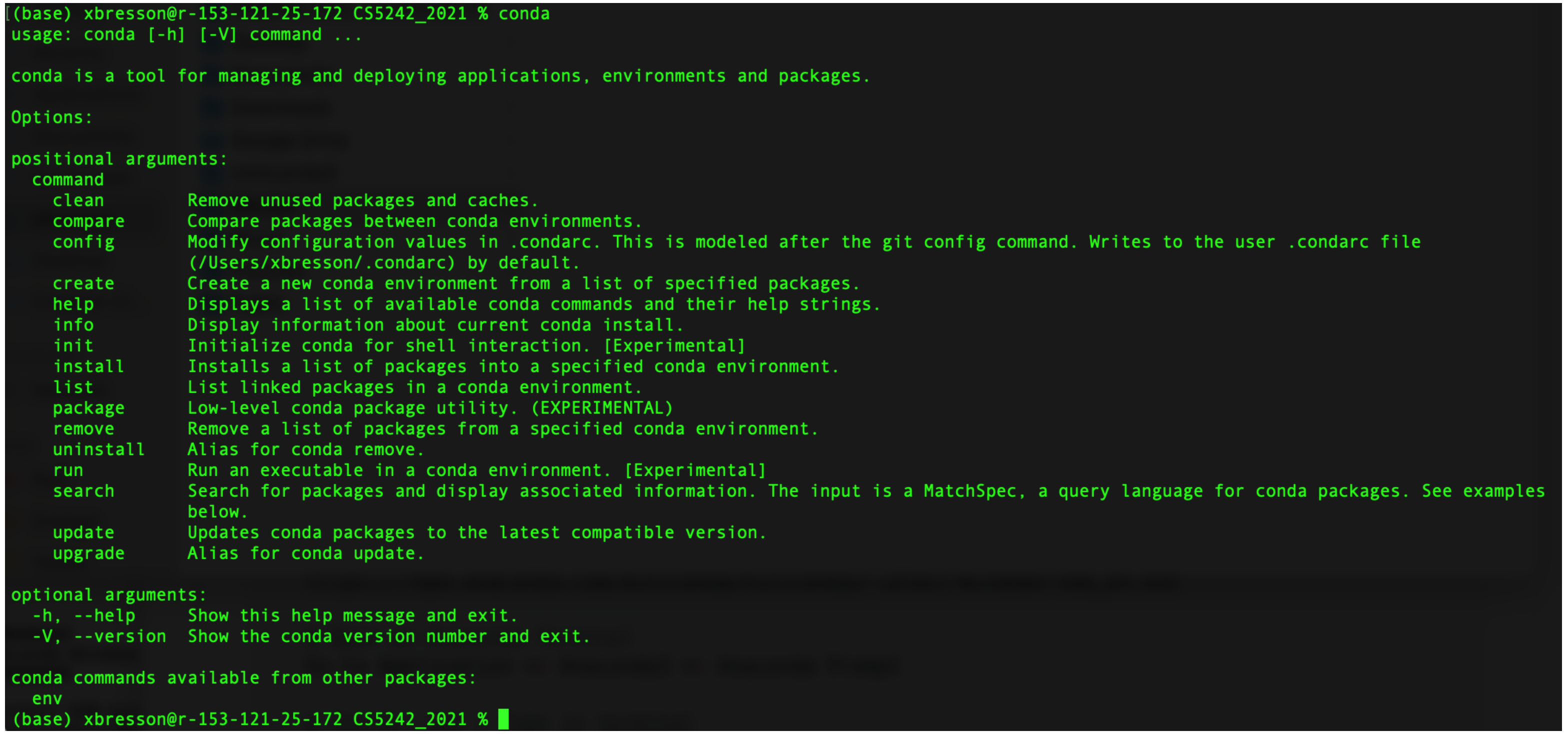


```
Last login: Mon Aug  9 15:02:37 on ttys001
(base) xbresson@r-153-121-25-172 CS5242_2021 % curl https://repo.continuum.io/miniconda/Miniconda3-latest-MacOSX-x86_64.sh -o miniconda.sh -J -L -k
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
  0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--     0
100 42.3M  100 42.3M    0     0  23.2M      0  0:00:01  0:00:01 --:--:-- 30.5M
(base) xbresson@r-153-121-25-172 CS5242_2021 % chmod +x miniconda.sh
(base) xbresson@r-153-121-25-172 CS5242_2021 % ./miniconda.sh

Welcome to Miniconda3 py39_4.10.3

In order to continue the installation process, please review the license
agreement.
Please, press ENTER to continue
>>>
```

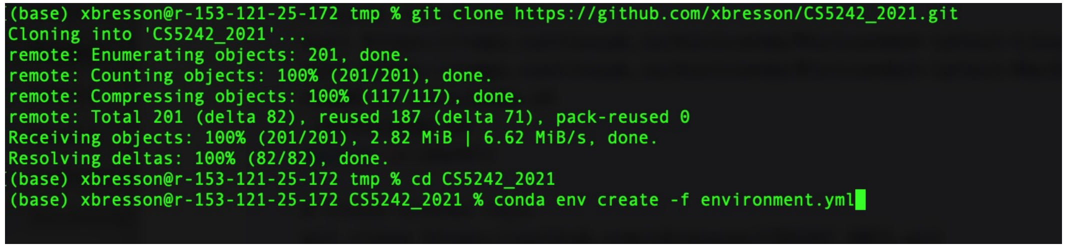


```
  wheel              pkgs/main/noarch::wheel-0.36.2-pyhd3eb1b0_0
  xz                 pkgs/main/osx-64::xz-5.2.5-h1de35cc_0
  yaml               pkgs/main/osx-64::yaml-0.2.5-haf1e3a3_0
  zlib               pkgs/main/osx-64::zlib-1.2.11-h1de35cc_3


Preparing transaction: done
Executing transaction: \
done
installation finished.
Do you wish the installer to initialize Miniconda3
by running conda init? [yes|no]
[yes] >>>
no change     /Users/xbresson/miniconda3/condabin/conda
no change     /Users/xbresson/miniconda3/bin/conda
no change     /Users/xbresson/miniconda3/bin/conda-env
no change     /Users/xbresson/miniconda3/bin/activate
no change     /Users/xbresson/miniconda3/bin/deactivate
no change     /Users/xbresson/miniconda3/etc/profile.d/conda.sh
no change     /Users/xbresson/miniconda3/etc/fish/conf.d/conda.fish
no change     /Users/xbresson/miniconda3/shell/condabin/Conda.psm1
no change     /Users/xbresson/miniconda3/shell/condabin/conda-hook.ps1
no change     /Users/xbresson/miniconda3/lib/python3.9/site-packages/xontrib/conda.xsh
no change     /Users/xbresson/miniconda3/etc/profile.d/conda.csh
no change     /Users/xbresson/.zshrc
No action taken.
If you'd prefer that conda's base environment not be activated on startup,
   set the auto_activate_base parameter to false:

conda config --set auto_activate_base false

Thank you for installing Miniconda3!
(base) xbresson@r-153-121-25-172 CS5242_2021 %
```

Local Installation for OSX & Linux

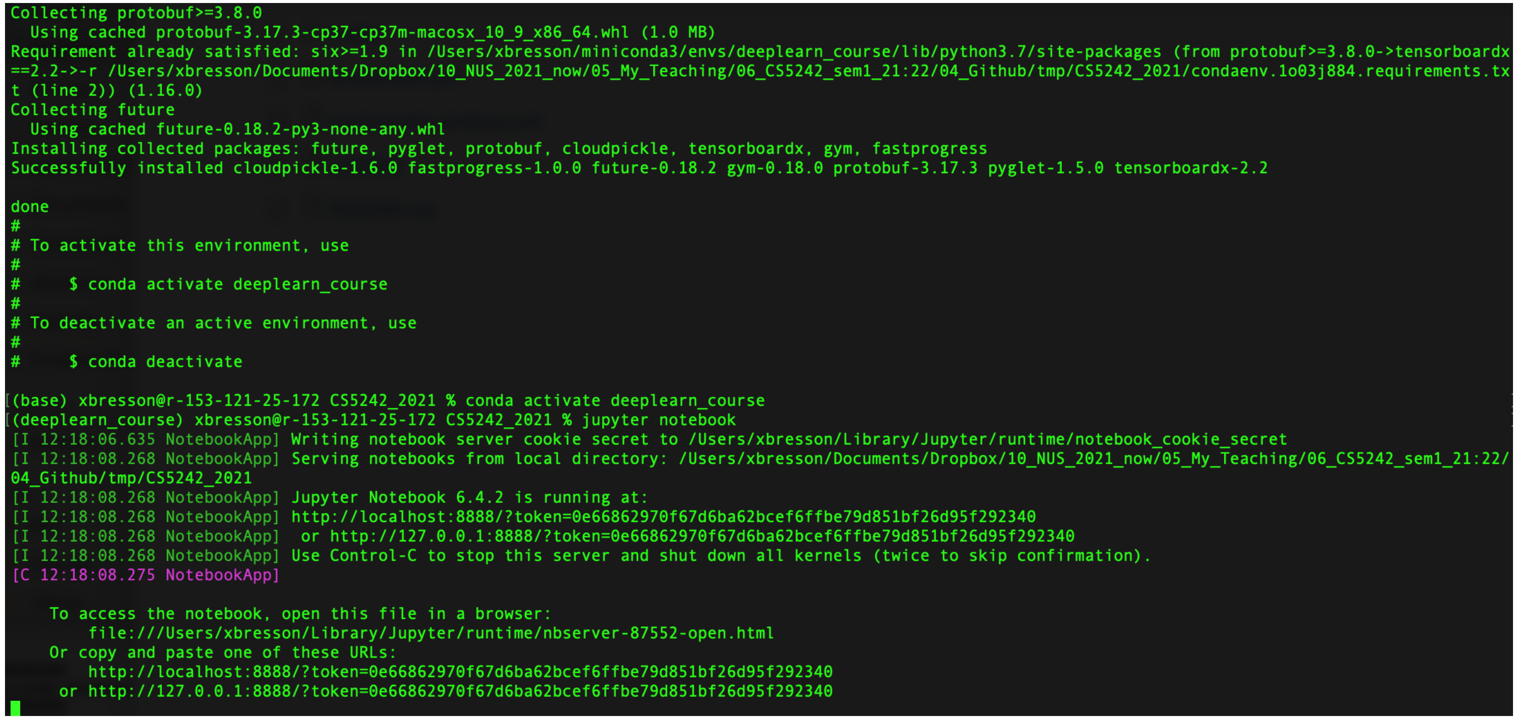


```
(base) xbresson@r-153-121-25-172 CS5242_2021 % conda
usage: conda [-h] [-V] command ...

conda is a tool for managing and deploying applications, environments and packages.

Options:

positional arguments:
  command
    clean        Remove unused packages and caches.
    compare      Compare packages between conda environments.
    config       Modify configuration values in .condarc. This is modeled after the git config command. Writes to the user .condarc file
                 (/Users/xbresson/.condarc) by default.
    create       Create a new conda environment from a list of specified packages.
    help         Displays a list of available conda commands and their help strings.
    info         Display information about current conda install.
    init         Initialize conda for shell interaction. [Experimental]
    install      Installs a list of packages into a specified conda environment.
    list         List linked packages in a conda environment.
    package      Low-level conda package utility. (EXPERIMENTAL)
    remove       Remove a list of packages from a specified conda environment.
    uninstall    Alias for conda remove.
    run          Run an executable in a conda environment. [Experimental]
    search       Search for packages and display associated information. The input is a MatchSpec, a query language for conda packages. See examples
                 below.
    update       Updates conda packages to the latest compatible version.
    upgrade      Alias for conda update.

optional arguments:
  -h, --help     Show this help message and exit.
  -V, --version  Show the conda version number and exit.

conda commands available from other packages:
  env
(base) xbresson@r-153-121-25-172 CS5242_2021 %
```

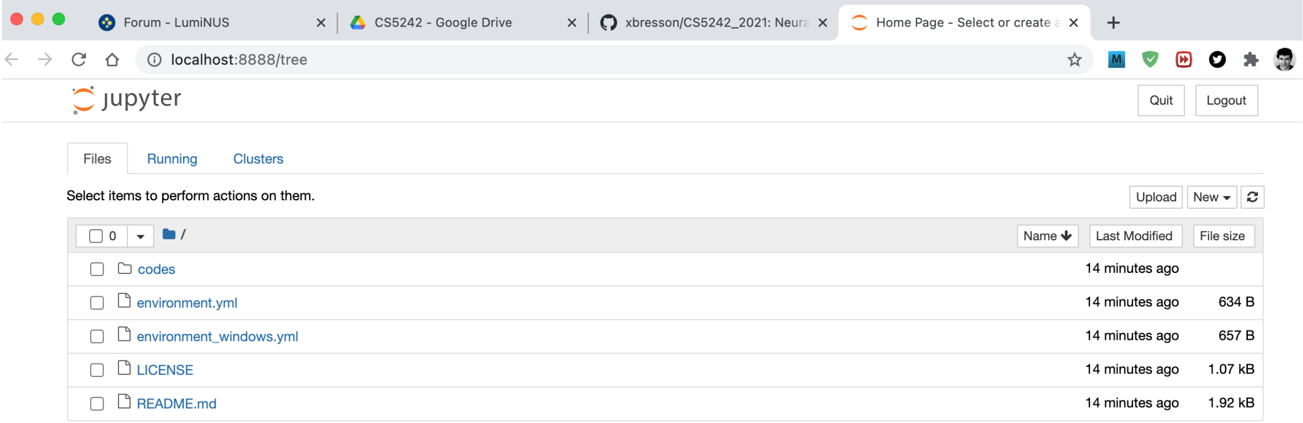


```
(base) xbresson@r-153-121-25-172 tmp % git clone https://github.com/xbresson/CS5242_2021.git
Cloning into 'CS5242_2021'...
remote: Enumerating objects: 201, done.
remote: Counting objects: 100% (201/201), done.
remote: Compressing objects: 100% (117/117), done.
remote: Total 201 (delta 82), reused 187 (delta 71), pack-reused 0
Receiving objects: 100% (201/201), 2.82 MiB | 6.62 MiB/s, done.
Resolving deltas: 100% (82/82), done.
(base) xbresson@r-153-121-25-172 tmp % cd CS5242_2021
(base) xbresson@r-153-121-25-172 CS5242_2021 % conda env create -f environment.yml
```

Local Installation for OSX & Linux



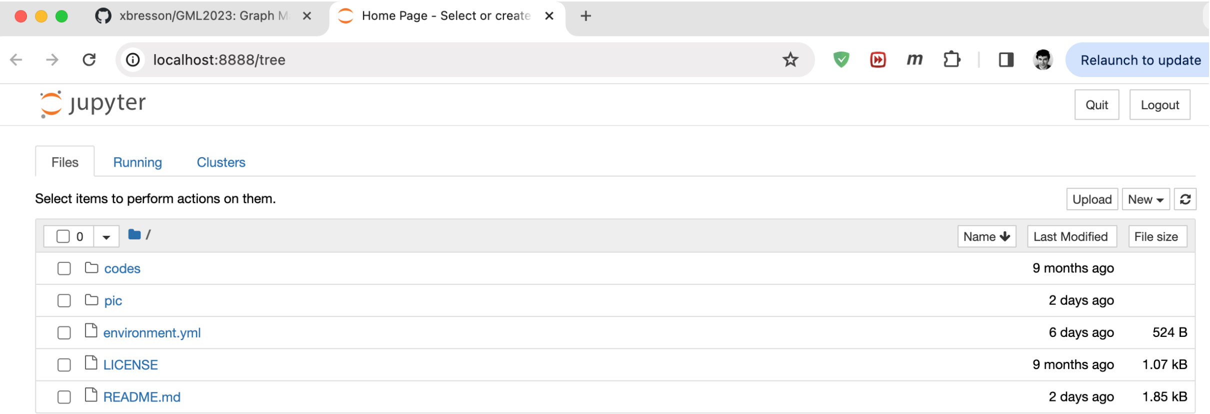
```
Collecting protobuf>=3.8.0
  Using cached protobuf-3.17.3-cp37-cp37m-macosx_10_9_x86_64.whl (1.0 MB)
Requirement already satisfied: six>=1.9 in /Users/xbresson/miniconda3/envs/deeplearn_course/lib/python3.7/site-packages (from protobuf>=3.8.0->tensorboardx
==2.2->-r /Users/xbresson/Documents/Dropbox/10_NUS_2021_now/05_My_Teaching/06_CS5242_sem1_21:22/04_Github/tmp/CS5242_2021/condaenv.1o03j884.requirements.tx
t (line 2)) (1.16.0)
Collecting future
  Using cached future-0.18.2-py3-none-any.whl
Installing collected packages: future, pyglet, protobuf, cloudpickle, tensorboardx, gym, fastprogress
Successfully installed cloudpickle-1.6.0 fastprogress-1.0.0 future-0.18.2 gym-0.18.0 protobuf-3.17.3 pyglet-1.5.0 tensorboardx-2.2

done
#
# To activate this environment, use
#
#     $ conda activate deeplearn_course
#
# To deactivate an active environment, use
#
#     $ conda deactivate

[(base) xbresson@r-153-121-25-172 CS5242_2021 % conda activate deeplearn_course
[(deeplearn_course) xbresson@r-153-121-25-172 CS5242_2021 % jupyter notebook
[I 12:18:06.635 NotebookApp] Writing notebook server cookie secret to /Users/xbresson/Library/Jupyter/runtime/notebook_cookie_secret
[I 12:18:08.268 NotebookApp] Serving notebooks from local directory: /Users/xbresson/Documents/Dropbox/10_NUS_2021_now/05_My_Teaching/06_CS5242_sem1_21:22/
04_Github/tmp/CS5242_2021
[I 12:18:08.268 NotebookApp] Jupyter Notebook 6.4.2 is running at:
[I 12:18:08.268 NotebookApp] http://localhost:8888/?token=0e66862970f67d6ba62bcef6ffbe79d851bf26d95f292340
[I 12:18:08.268 NotebookApp]  or http://127.0.0.1:8888/?token=0e66862970f67d6ba62bcef6ffbe79d851bf26d95f292340
[I 12:18:08.268 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 12:18:08.275 NotebookApp]

    To access the notebook, open this file in a browser:
        file:///Users/xbresson/Library/Jupyter/runtime/nbserver-87552-open.html
    Or copy and paste one of these URLs:
        http://localhost:8888/?token=0e66862970f67d6ba62bcef6ffbe79d851bf26d95f292340
     or http://127.0.0.1:8888/?token=0e66862970f67d6ba62bcef6ffbe79d851bf26d95f292340
```



Select items to perform actions on them.

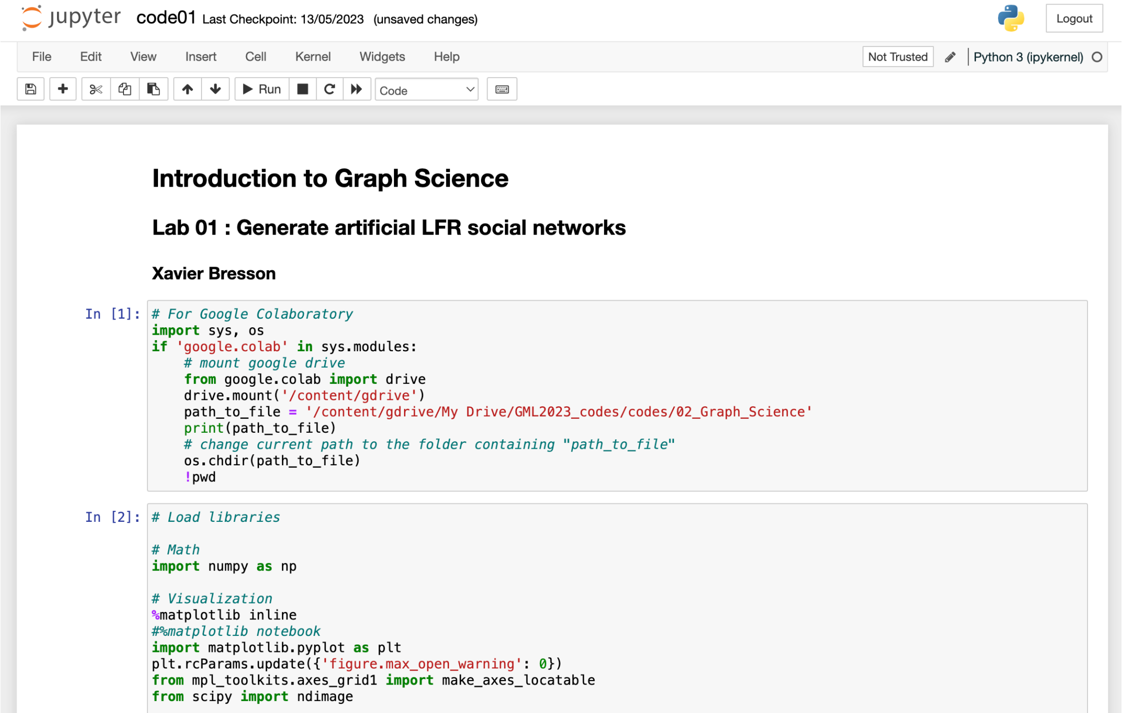
Name	Last Modified	File size
☐ codes	14 minutes ago	
☐ environment.yml	14 minutes ago	634 B
☐ environment_windows.yml	14 minutes ago	657 B
☐ LICENSE	14 minutes ago	1.07 kB
☐ README.md	14 minutes ago	1.92 kB

Local Installation for OSX & Linux



Select items to perform actions on them.

Name	Last Modified	File size
codes	9 months ago	
pic	2 days ago	
environment.yml	6 days ago	524 B
LICENSE	9 months ago	1.07 kB
README.md	2 days ago	1.85 kB



Introduction to Graph Science

Lab 01 : Generate artificial LFR social networks

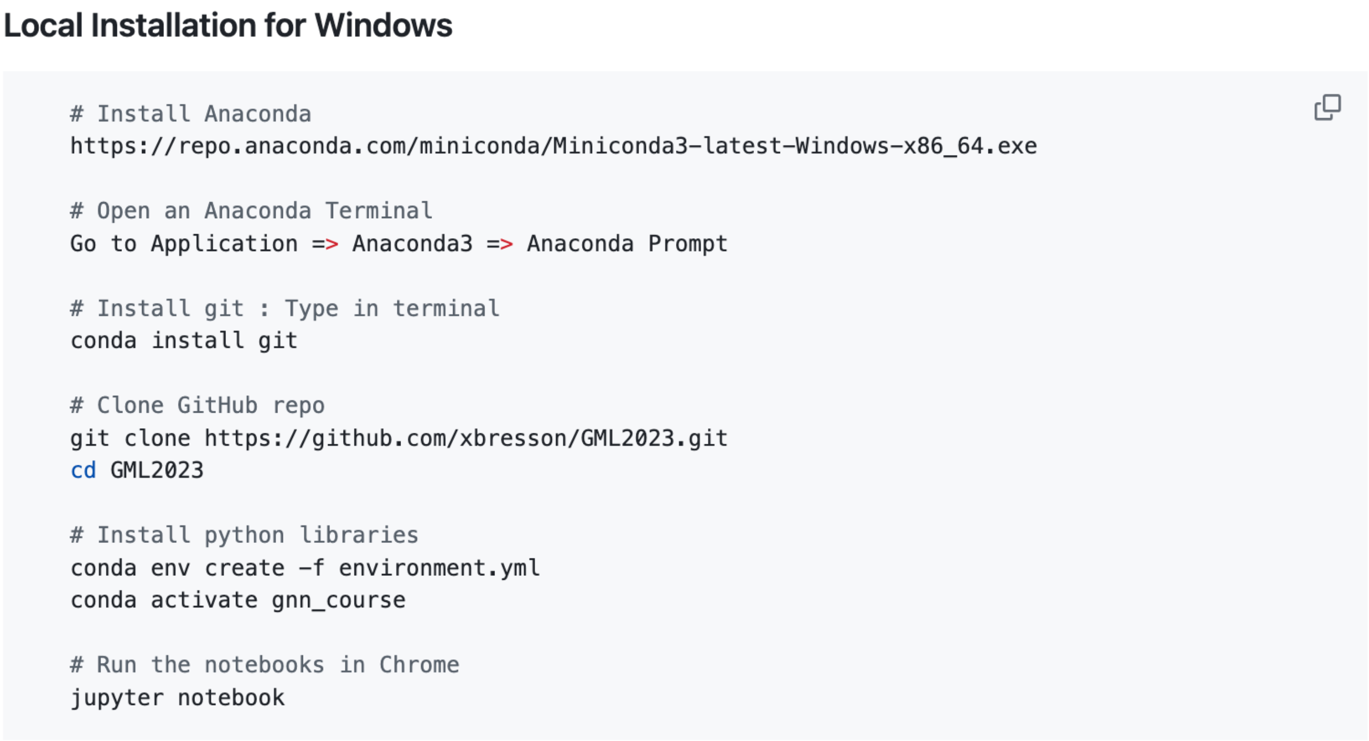
Xavier Bresson

```
In [1]: # For Google Colaboratory
        import sys, os
        if 'google.colab' in sys.modules:
            # mount google drive
            from google.colab import drive
            drive.mount('/content/gdrive')
            path_to_file = '/content/gdrive/My Drive/GML2023_codes/codes/02_Graph_Science'
            print(path_to_file)
            # change current path to the folder containing "path_to_file"
            os.chdir(path_to_file)
            !pwd
```

```
In [2]: # Load libraries

        # Math
        import numpy as np

        # Visualization
        %matplotlib inline
        #%matplotlib notebook
        import matplotlib.pyplot as plt
        plt.rcParams.update({'figure.max_open_warning': 0})
        from mpl_toolkits.axes_grid1 import make_axes_locatable
        from scipy import ndimage
```

Local Installation for Windows

- Install Anaconda and run the notebooks on your Windows machine :

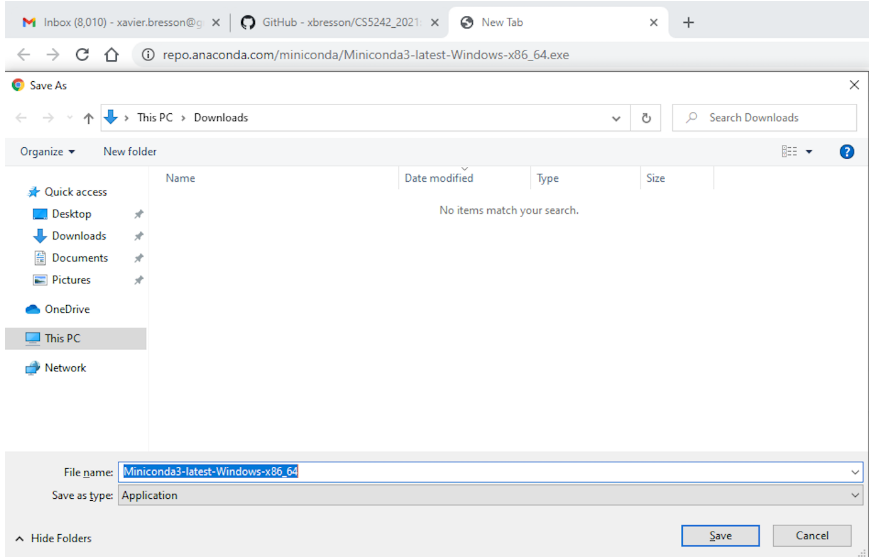


Local Installation for Windows

```
# Install Anaconda
https://repo.anaconda.com/miniconda/Miniconda3-latest-Windows-x86_64.exe

# Open an Anaconda Terminal
Go to Application => Anaconda3 => Anaconda Prompt

# Install git : Type in terminal
conda install git

# Clone GitHub repo
git clone https://github.com/xbresson/GML2023.git
cd GML2023

# Install python libraries
conda env create -f environment.yml
conda activate gnn_course

# Run the notebooks in Chrome
jupyter notebook
```

https://github.com/xbresson/GML2023#local-installation-for-windows

Local Installation for Windows



repo.anaconda.com/miniconda/Miniconda3-latest-Windows-x86_64.exe

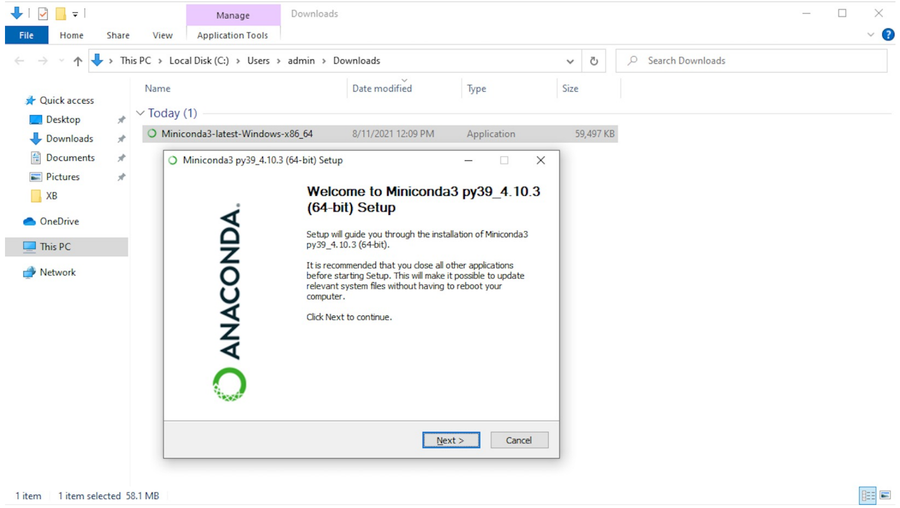
Save As

This PC › Downloads

No items match your search.

File name: Miniconda3-latest-Windows-x86_64

Save as type: Application



This PC › Local Disk (C:) › Users › admin › Downloads

Name	Date modified	Type	Size
Today (1)			
Miniconda3-latest-Windows-x86_64	8/11/2021 12:09 PM	Application	59,497 KB

Miniconda3 py39_4.10.3 (64-bit) Setup

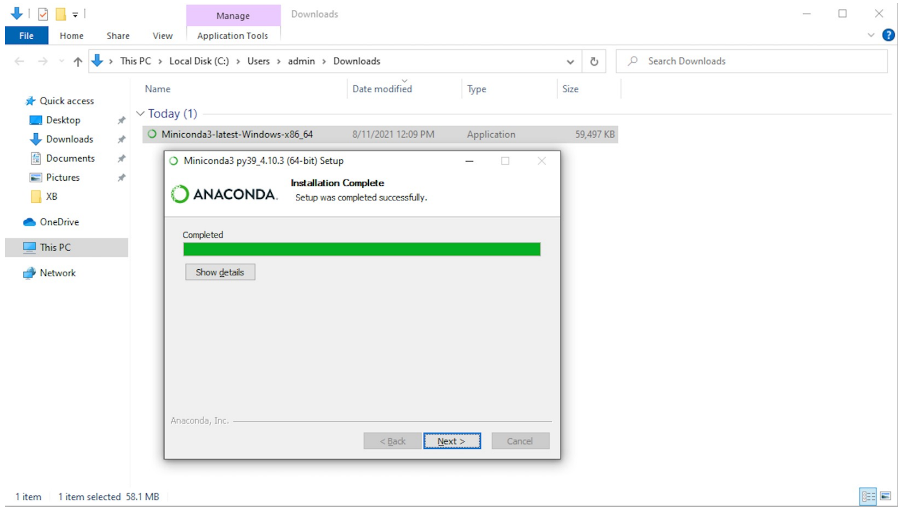
Welcome to Miniconda3 py39_4.10.3 (64-bit) Setup

Setup will guide you through the installation of Miniconda3 py39_4.10.3 (64-bit).

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

1 item   1 item selected 58.1 MB



This PC › Local Disk (C:) › Users › admin › Downloads

Name	Date modified	Type	Size
Today (1)			
Miniconda3-latest-Windows-x86_64	8/11/2021 12:09 PM	Application	59,497 KB

Miniconda3 py39_4.10.3 (64-bit) Setup

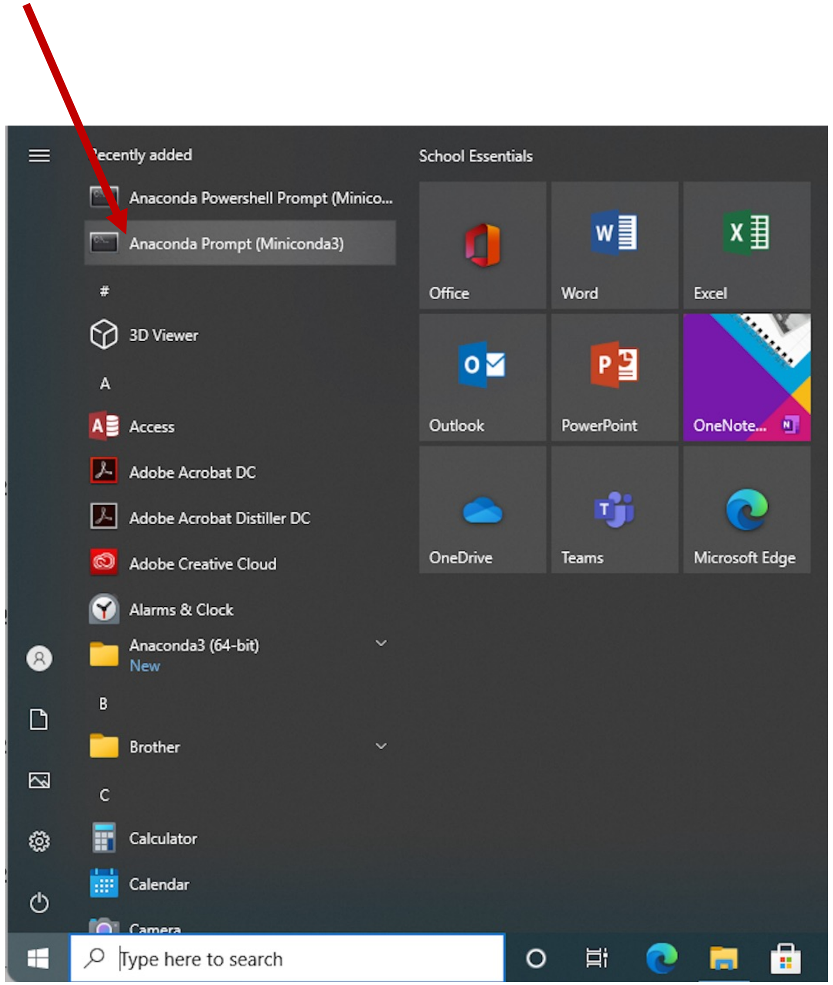
Installation Complete

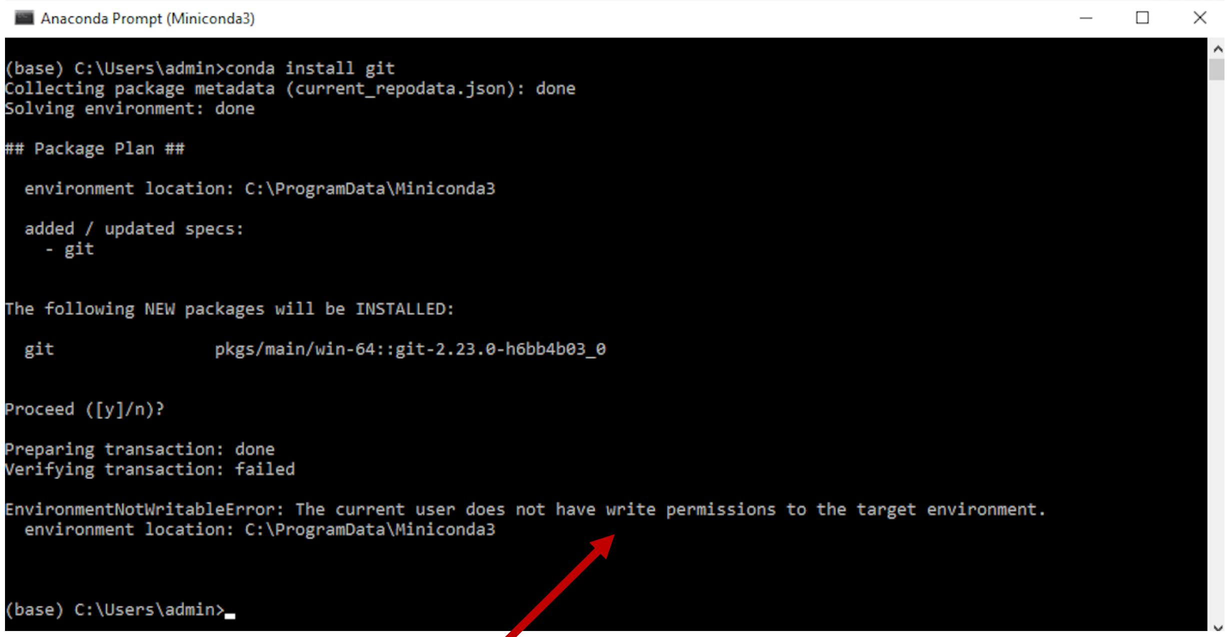
Setup was completed successfully.

Completed

1 item   1 item selected 58.1 MB

Local Installation for Windows



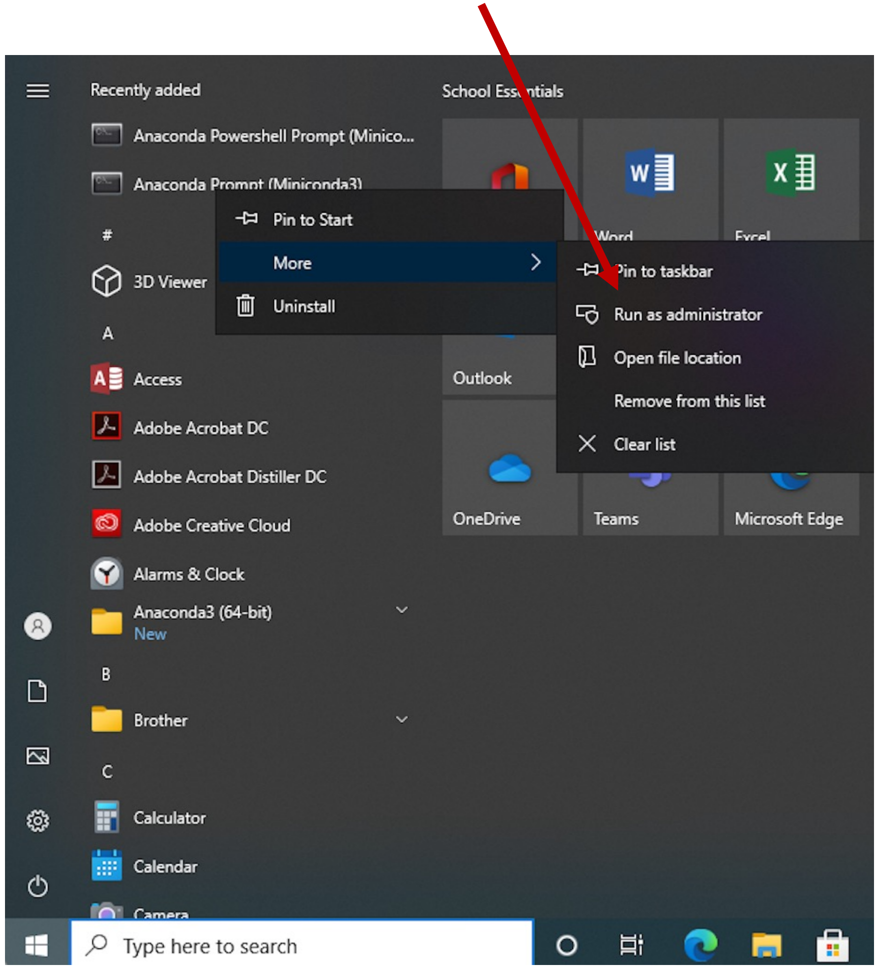


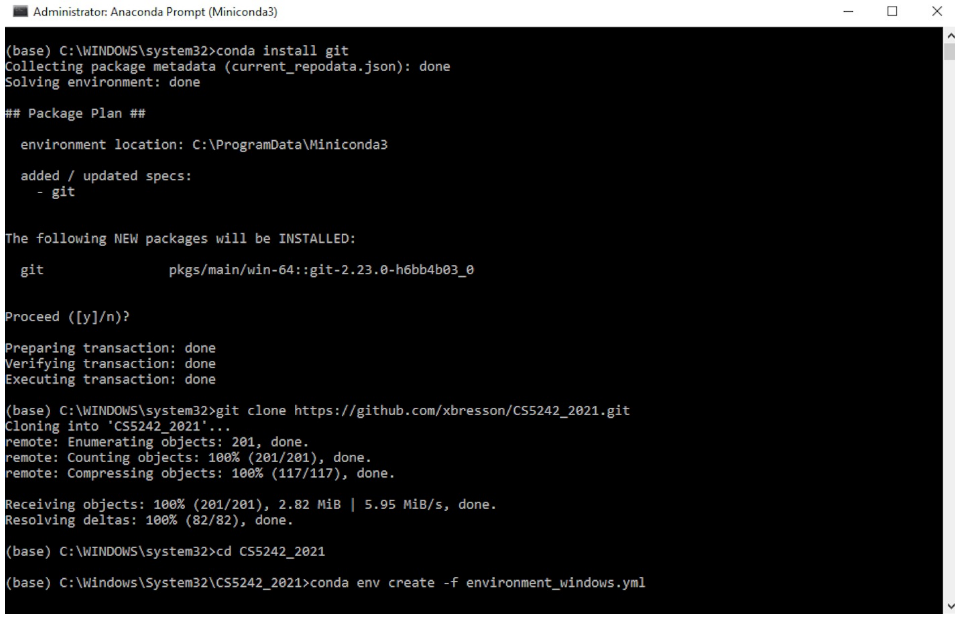
```
(base) C:\Users\admin>conda install git
Collecting package metadata (current_repodata.json): done
Solving environment: done

## Package Plan ##

  environment location: C:\ProgramData\Miniconda3

  added / updated specs:
    - git


The following NEW packages will be INSTALLED:

  git                pkgs/main/win-64::git-2.23.0-h6bb4b03_0


Proceed ([y]/n)?

Preparing transaction: done
Verifying transaction: failed

EnvironmentNotWritableError: The current user does not have write permissions to the target environment.
  environment location: C:\ProgramData\Miniconda3


(base) C:\Users\admin>_
```

If you need admin rights to run Miniconda,
then follow the next slide.

Local Installation for Windows

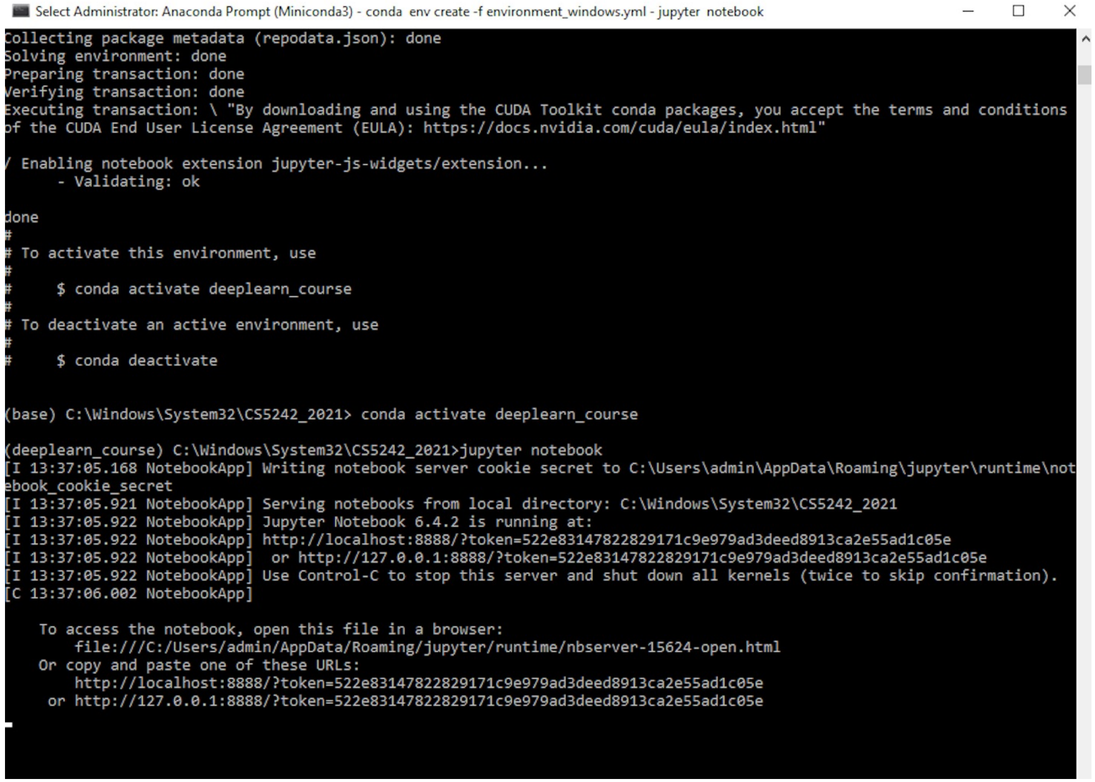
Secondary click then select “Run as administrator”.





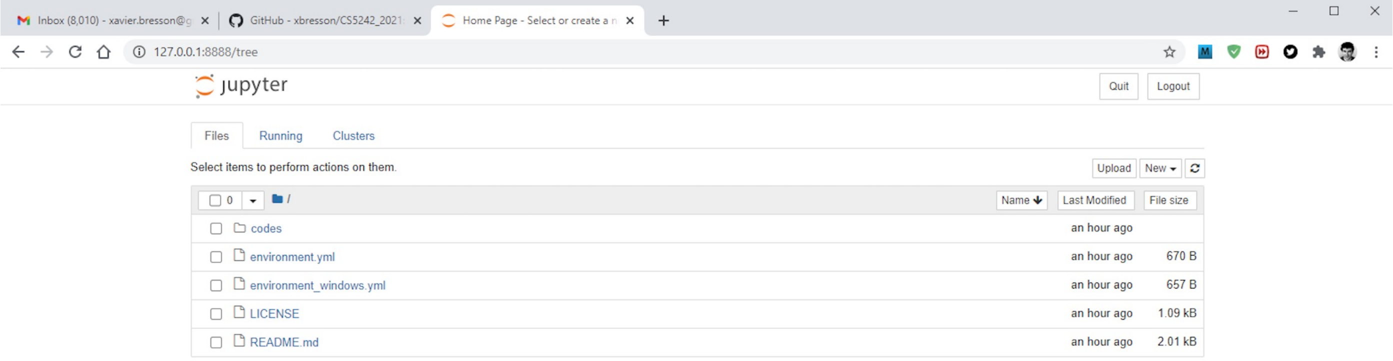
```
(base) C:\WINDOWS\system32>conda install git
Collecting package metadata (current_repodata.json): done
Solving environment: done

## Package Plan ##

  environment location: C:\ProgramData\Miniconda3

  added / updated specs:
    - git


The following NEW packages will be INSTALLED:

  git                pkgs/main/win-64::git-2.23.0-h6bb4b03_0


Proceed ([y]/n)?

Preparing transaction: done
Verifying transaction: done
Executing transaction: done

(base) C:\WINDOWS\system32>git clone https://github.com/xbresson/CS5242_2021.git
Cloning into 'CS5242_2021'...
remote: Enumerating objects: 201, done.
remote: Counting objects: 100% (201/201), done.
remote: Compressing objects: 100% (117/117), done.

Receiving objects: 100% (201/201), 2.82 MiB | 5.95 MiB/s, done.
Resolving deltas: 100% (82/82), done.

(base) C:\WINDOWS\system32>cd CS5242_2021

(base) C:\Windows\System32\CS5242_2021>conda env create -f environment_windows.yml
```

Local Installation for Windows



Select Administrator: Anaconda Prompt (Miniconda3) - conda env create -f environment_windows.yml - jupyter notebook

```
Collecting package metadata (repodata.json): done
Solving environment: done
Preparing transaction: done
Verifying transaction: done
Executing transaction: \ "By downloading and using the CUDA Toolkit conda packages, you accept the terms and conditions
of the CUDA End User License Agreement (EULA): https://docs.nvidia.com/cuda/eula/index.html"

/ Enabling notebook extension jupyter-js-widgets/extension...
      - Validating: ok

done
#
# To activate this environment, use
#
#     $ conda activate deeplearn_course
#
# To deactivate an active environment, use
#
#     $ conda deactivate


(base) C:\Windows\System32\CS5242_2021> conda activate deeplearn_course

(deeplearn_course) C:\Windows\System32\CS5242_2021>jupyter notebook
[I 13:37:05.168 NotebookApp] Writing notebook server cookie secret to C:\Users\admin\AppData\Roaming\jupyter\runtime\not
ebook_cookie_secret
[I 13:37:05.921 NotebookApp] Serving notebooks from local directory: C:\Windows\System32\CS5242_2021
[I 13:37:05.922 NotebookApp] Jupyter Notebook 6.4.2 is running at:
[I 13:37:05.922 NotebookApp] http://localhost:8888/?token=522e83147822829171c9e979ad3deed8913ca2e55ad1c05e
[I 13:37:05.922 NotebookApp]  or http://127.0.0.1:8888/?token=522e83147822829171c9e979ad3deed8913ca2e55ad1c05e
[I 13:37:05.922 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 13:37:06.002 NotebookApp]

    To access the notebook, open this file in a browser:
        file:///C:/Users/admin/AppData/Roaming/jupyter/runtime/nbserver-15624-open.html
    Or copy and paste one of these URLs:
        http://localhost:8888/?token=522e83147822829171c9e979ad3deed8913ca2e55ad1c05e
     or http://127.0.0.1:8888/?token=522e83147822829171c9e979ad3deed8913ca2e55ad1c05e
```

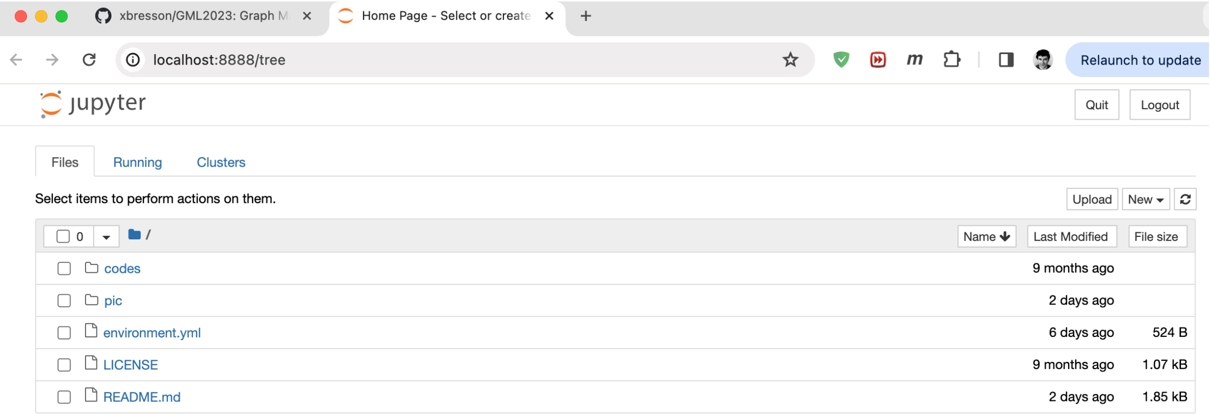


Inbox (8,010) - xavier.bresson@g
GitHub - xbresson/CS5242_2021
Home Page - Select or create a n
127.0.0.1:8888/tree
jupyter
Quit
Logout
Files
Running
Clusters
Upload
New
0
/

Select items to perform actions on them.

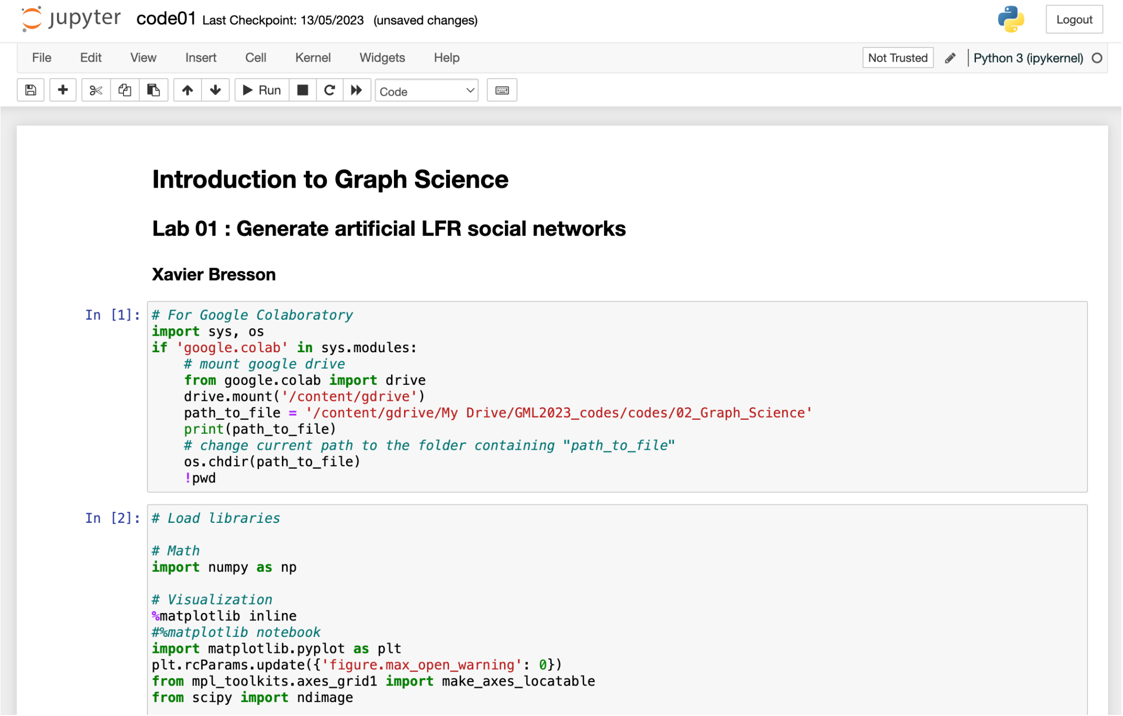
Name	Last Modified	File size
□ codes	an hour ago	
□ environment.yml	an hour ago	670 B
□ environment_windows.yml	an hour ago	657 B
□ LICENSE	an hour ago	1.09 kB
□ README.md	an hour ago	2.01 kB

Local Installation for Windows



Select items to perform actions on them.

Name	Last Modified	File size
codes	9 months ago	
pic	2 days ago	
environment.yml	6 days ago	524 B
LICENSE	9 months ago	1.07 kB
README.md	2 days ago	1.85 kB



Introduction to Graph Science

Lab 01 : Generate artificial LFR social networks

Xavier Bresson

In [1]:

```
# For Google Colaboratory
import sys, os
if 'google.colab' in sys.modules:
    # mount google drive
    from google.colab import drive
    drive.mount('/content/gdrive')
    path_to_file = '/content/gdrive/My Drive/GML2023_codes/codes/02_Graph_Science'
    print(path_to_file)
    # change current path to the folder containing "path_to_file"
    os.chdir(path_to_file)
    !pwd
```

In [2]:

```
# Load libraries

# Math
import numpy as np

# Visualization
%matplotlib inline
#%matplotlib notebook
import matplotlib.pyplot as plt
plt.rcParams.update({'figure.max_open_warning': 0})
from mpl_toolkits.axes_grid1 import make_axes_locatable
from scipy import ndimage
```

Questions?