



# **NHERI SIMCENTER PROGRAMMING BOOTCAMP**

JULY 30 THROUGH AUGUST 3, 2018, AT UC BERKELEY'S RICHMOND  
FIELD STATION

- **VirtualBox**
- **Unix Basics**
- **Using GitHub**

# CONFIGURING YOUR VIRTUAL MACHINE

- Do You need the VirtualBox provided with this course?
  - NO, but it is highly recommended on Windows and MacOS.
  - The virtual machine is ready to use without extra install
  
- What if I do not want to use VirtualBox?
  - You need to install
    - Developer tools (compiler, debugger, make utilities, git utilities)
    - Qt 5.11.1 with proper bindings to your compiler and debugger
  - We cannot support and service every private configuration, so you need to work a bit more on your own if you take this route.

# CONFIGURING YOUR VIRTUAL MACHINE

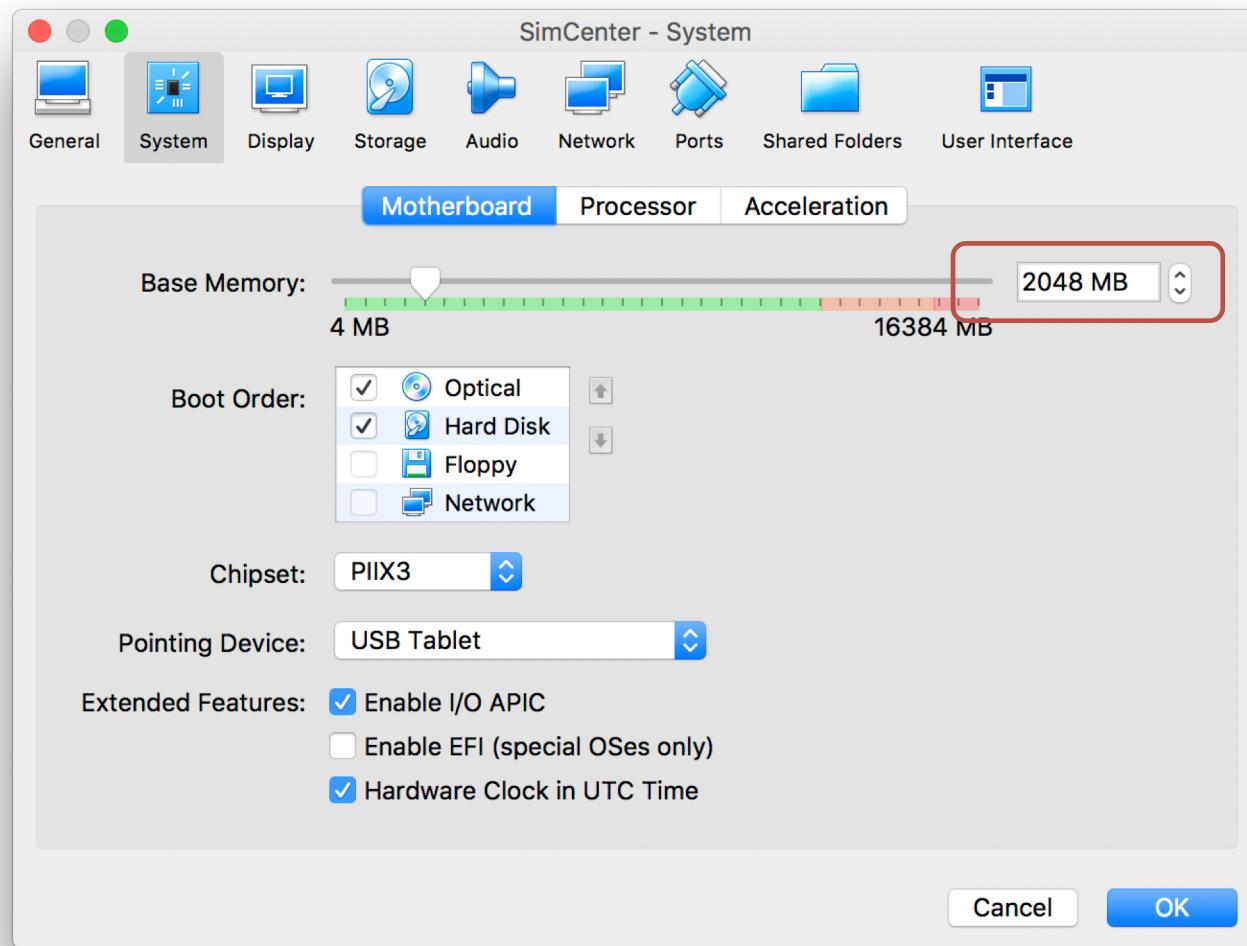
- Check your system resources (Option-apple-system info OR settings system (?))

The screenshot shows the 'Hardware Overview' section of the System Information application for a MacBook Pro. The left sidebar lists various hardware components under the 'Hardware' heading. The right pane displays detailed information for each component. Several fields are highlighted with red boxes:

Hardware Component	Value	Notes
Model Name	MacBook Pro	
Model Identifier	MacBookPro14,3	
Processor Name	Intel Core i7	
Processor Speed	3.1 GHz	
Number of Processors	1	
Total Number of Cores	4	x2 for Core i5 and i7
L2 Cache (per Core)	256 KB	
L3 Cache	8 MB	
Memory	16 GB	
Boot ROM Version	MBP143.0175.B00	
SMC Version (system)		
Serial Number (system)		
Hardware UUID		

Peter's MacBook Pro 15 > Hardware

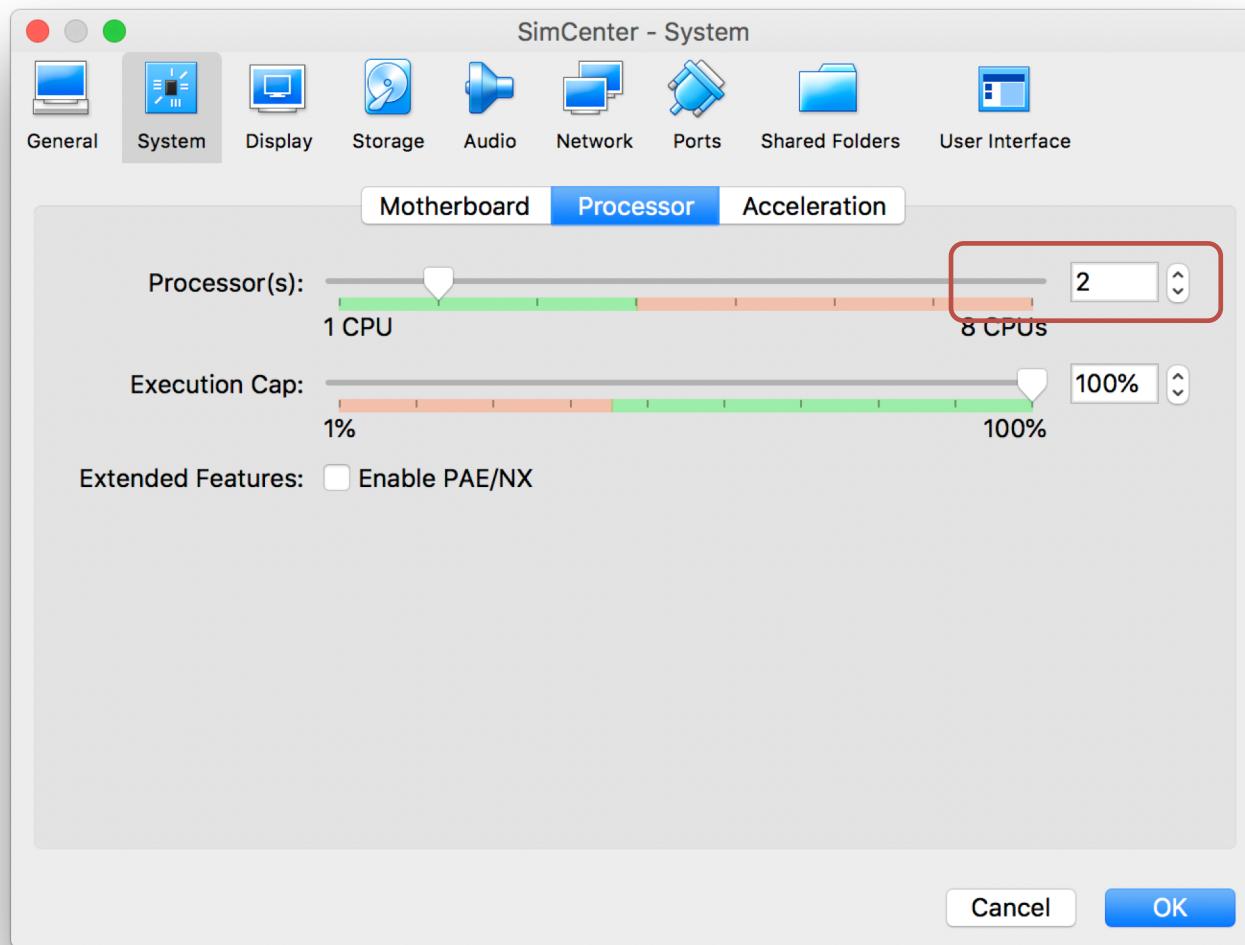
# CONFIGURING YOUR VIRTUAL MACHINE



Half of your physical memory.

$\geq 4096$  MB,  
if available

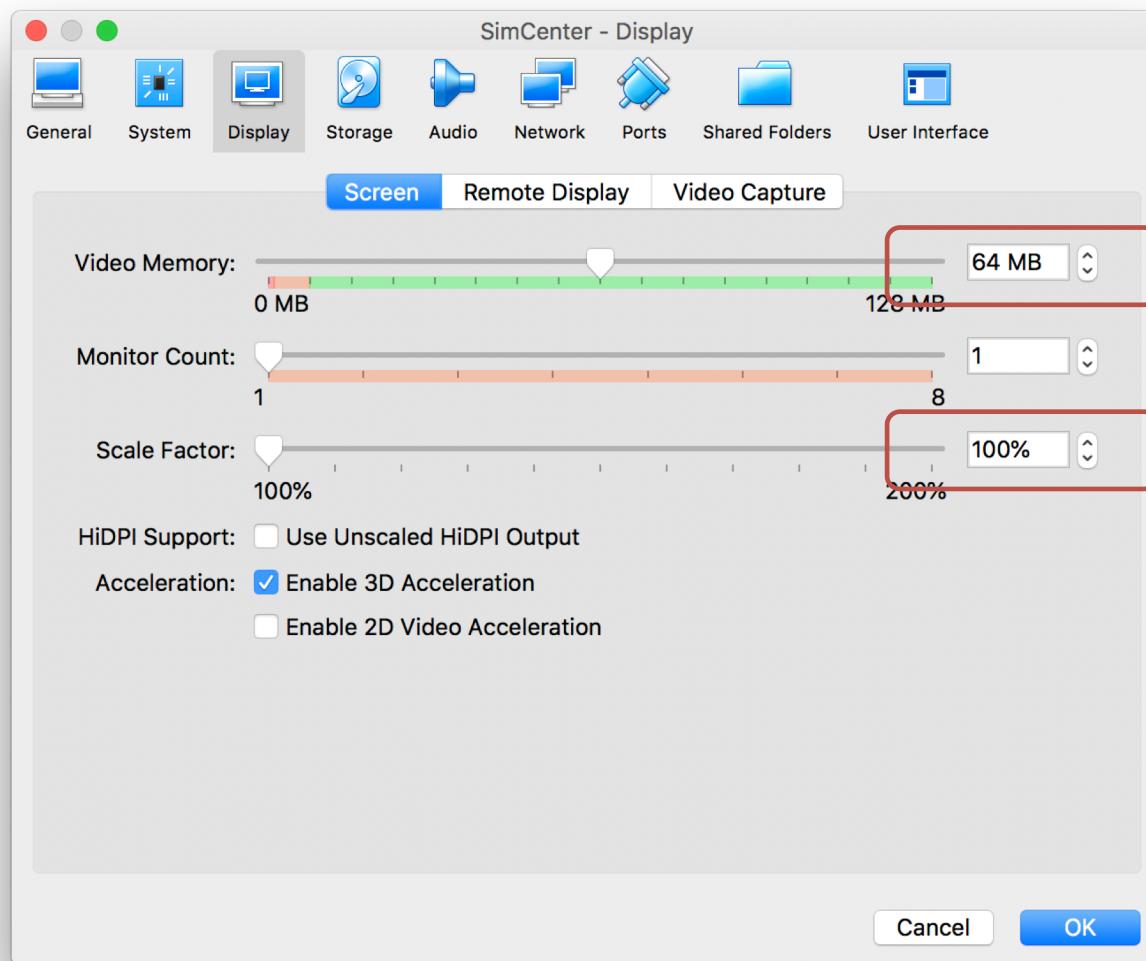
# CONFIGURING YOUR VIRTUAL MACHINE



Half of your physical threads  
(=cores \* 2 for i5 and i7)

$\geq 2$ ,  
4 if available

# CONFIGURING YOUR VIRTUAL MACHINE



$\geq$  half of  
your physical  
memory.

Set to 200% on  
Windows laptops  
with high  
resolution displays.  
(fixes tiny fonts)

# USING THE UNIX COMMAND LINE

- Start a terminal:



- Command prompt:

A screenshot of a terminal window titled "simcenter@SimCenter-VirtualBox: ~". The window has a dark theme with a red border. The title bar shows the user's name, the host name, and the current directory (~). The menu bar includes "File", "Edit", "View", "Search", "Terminal", and "Help". Below the menu bar, the command prompt "simcenter@SimCenter-VirtualBox:~\$" is visible. The main area of the terminal is currently empty, showing a dark gray background.

# USING THE UNIX COMMAND LINE

■ \$ ls

```
simcenter@SimCenter-VirtualBox:~$ ls
Desktop Documents Downloads Music Pictures Public Qt Templates Videos
simcenter@SimCenter-VirtualBox:~$ █
```

■ \$ ls -l

```
simcenter@SimCenter-VirtualBox:~$ ls -l
total 36
drwxr-xr-x 2 simcenter simcenter 4096 Jul 11 19:36 Desktop
drwxr-xr-x 3 simcenter simcenter 4096 Jul 22 21:42 Documents
drwxr-xr-x 2 simcenter simcenter 4096 Jul 11 22:39 Downloads
drwxr-xr-x 2 simcenter simcenter 4096 Jul 11 19:36 Music
drwxr-xr-x 2 simcenter simcenter 4096 Jul 11 19:36 Pictures
drwxr-xr-x 2 simcenter simcenter 4096 Jul 11 19:36 Public
drwxr-xr-x 8 simcenter simcenter 4096 Jul 11 22:42 Qt
drwxr-xr-x 2 simcenter simcenter 4096 Jul 11 19:36 Templates
drwxr-xr-x 2 simcenter simcenter 4096 Jul 11 19:36 Videos
simcenter@SimCenter-VirtualBox:~$ ll
```

# USING THE UNIX COMMAND LINE

## ■ Getting help:

■ \$ man ls

```
LS(1)                               User Commands                         LS(1)
NAME
    ls - list directory contents
SYN
MAN(1)                               Manual pager utils                  MAN(1)
NAME
DES
    man - an interface to the on-line reference manuals
SYNOPSIS
    man [-C file] [-d] [--warnings[=warnings]] [-R encoding] [-L
    locale] [-m system[,...]] [-M path] [-S list] [-e extension] [-i|-I]
    [--regex|--wildcard] [--names-only] [-a] [-u] [--no-subpages] [-P
    pager] [-r prompt] [-7] [-E encoding] [--no-hyphenation] [--no-justifi-
    cation] [-p string] [-t] [-T[device]] [-H[browser]] [-X[dpi]] [-Z]
    [[section] page[.section] ...] ...
    man -k [apropos options] regexp ...
    man -K [-w|-W] [-S list] [-i|-I] [--regex] [section] term ...
    man -f [whatis options] page ...
    man -l [-C file] [-d] [-D] [--warnings[=warnings]] [-R encoding] [-L
    locale] [-P pager] [-r prompt] [-7] [-E encoding] [-p string] [-t]
    [-T[device]] [-H[browser]] [-X[dpi]] [-Z] file ...
    man -w|-W [-C file] [-d] [-D] page ...
    man -c [-C file] [-d] [-D] page ...
    man [-?V]

Manual page man(1) line 1 (press h for help or q to quit)
```

## ■ Getting help on the man command?

■ \$ man man

# NAVIGATING THE FILE SYSTEM

## ■ Changing directories (folders)

■ \$ cd DIR\_NAME

## ■ Creating a directory

■ \$ mkdir DIR\_NAME

## ■ Deleting an empty directory

■ \$ rmdir DIR\_NAME

### Remarks:

- Space separates keywords
- DO NOT use space in filenames
- Space in filename or directory name needs to be quoted:
  - “My Folder”
  - My\ Folder

# WORKING WITH FILES

- Creating an empty file
  - \$ touch FILE\_NAME
- Copying an existing file
  - \$ cp SOURCE\_FILE\_NAME TARGET\_FILE\_NAME
- Deleting an existing file
  - \$ rm FILE\_NAME
- Renaming a file
  - \$ mv CURRENT\_FILE\_NAME NEW\_FILE\_NAME

# VIEWING FILES

## ■ Quick viewing

- \$ cat FILE\_NAME

## ■ View and search

- \$ less FILE\_NAME

## ■ Filter a file based on keywords

- \$ grep KEY FILE\_NAME # case sensitive

- \$ grep -i KEY FILE\_NAME # case insensitive

# NAVIGATING THE FILE SYSTEM

## ■ Special directories:

- .      This directory
  - ./FILE\_NAME
- ..     One up in the hierarchy
  - ../FILE\_NAME
  - ../OTHER\_FOLDER/FILE\_NAME
  - ../../FILE\_NAME

# CONFIGURATION AND HIDDEN FILES

■ \$ ls -la OR \$ ll

```
simcenter@SimCenter-VirtualBox:~$ ll
total 112
drwxr-xr-x 18 simcenter simcenter 4096 Jul 28 14:41 .
drwxr-xr-x  3 root    root    4096 Jul 11 19:32 ..
-rw-----  1 simcenter simcenter 1382 Jul 22 22:18 .bash_history
-rw-r--r--  1 simcenter simcenter  220 Jul 11 19:32 .bash_logout
-rw-r--r--  1 simcenter simcenter 3771 Jul 22 21:53 .bashrc
drwx----- 16 simcenter simcenter 4096 Jul 11 23:14 .cache/
drwx----- 16 simcenter simcenter 4096 Jul 22 22:14 .config/
drwxr-xr-x  2 simcenter simcenter 4096 Jul 11 19:36 Desktop/
drwxr-xr-x  3 simcenter simcenter 4096 Jul 22 21:42 Documents/
drwxr-xr-x  2 simcenter simcenter 4096 Jul 11 22:39 Downloads/
drwx----- 2 simcenter simcenter 4096 Jul 11 22:50 .gconf/
drwx----- 3 simcenter simcenter 4096 Jul 22 22:02 .gnupg/
-rw-----  1 simcenter simcenter 2984 Jul 28 14:41 .ICEauthority
drwx----- 3 simcenter simcenter 4096 Jul 11 19:36 .local/
drwx----- 5 simcenter simcenter 4096 Jul 11 20:27 .mozilla/
drwxr-xr-x  2 simcenter simcenter 4096 Jul 11 19:36 Music/
drwxr-xr-x  2 simcenter simcenter 4096 Jul 11 19:36 Pictures/
-rw-r--r--  1 simcenter simcenter 807 Jul 11 19:32 .profile
drwxr-xr-x  2 simcenter simcenter 4096 Jul 11 19:36 Public/
drwxr-xr-x  8 simcenter simcenter 4096 Jul 11 22:42 Qt/
drwx----- 2 simcenter simcenter 4096 Jul 22 22:02 .ssh/
-rw-r--r--  1 simcenter simcenter  0 Jul 11 21:56 .sudo_as_admin_successful
drwxr-xr-x  2 simcenter simcenter 4096 Jul 11 19:36 Templates/
-rw-r----- 1 simcenter simcenter  5 Jul 28 14:41 .vboxclient-clipboard.pid
-rw-r----- 1 simcenter simcenter  5 Jul 28 14:41 .vboxclient-display.pid
-rw-r----- 1 simcenter simcenter  5 Jul 28 14:41 .vboxclient-draganddrop.pid
-rw-r----- 1 simcenter simcenter  5 Jul 28 14:41 .vboxclient-seamless.pid
drwxr-xr-x  2 simcenter simcenter 4096 Jul 11 19:36 Videos/
-rw-----  1 simcenter simcenter 1816 Jul 22 21:53 .viminfo
simcenter@SimCenter-VirtualBox:~$
```

# PIPES

- Every program (and command) has three (3) standard data stream:
  - STDIN == 0 ... standard input (usually the keyboard)
  - STDOUT == 1 ... standard output (usually the terminal)
  - STDERR == 2 ... standard error (usually the terminal)
- Redirecting standard streams:
  - `$ my_program < INPUT_FILE > OUTPUT_FILE 2> ERROR_FILE`
- Connecting programs: output of program1 as input of program2
  - `$ program1 | program2`
  - `$ program1 <INPUT_FILE | program2 >RESULT_FILE`

# MODIFYING CONTENT

- Many cool editors out there: `gedit`, `pica`, `vim`, `emacs`, ...
- Which one to pick?
  - The one you've been using most and, thus, know most useful tricks.
  - Trying a new, more powerful one? Expect a learning phase!
- Which one NOT to use (**they do text & formatting mix-up/mess-up**):
  - MS Word
  - LibreWord
- This course:
  - `$ gedit` ... basic text editing
  -  Qt Creator ... C++ and Qt coding and debugging

# REVISION CONTROL / SHARED DEVELOPMENT

## ■ Problem:

### ■ You develop software:

- Using office computer and home computer
- Want to try a new feature without breaking the code
- Want to incorporate help from colleagues; share with advisor; ...
- Need to reuse portions in other projects
- Want to keep backups of all changes
- Need to review changes

## ■ Solution:

### ■ Use a Revision control system

# REVISION CONTROL: GITHUB

## ■ GitHub

- Get your free account on <http://github.com>

## ■ Basic Idea (simplified):

- Store change sets (do not copy files or directory trees)
- Preserve and make every stage of your development accessible
- Store those change sets on the cloud (backup of everything ☺)

## ■ Key Features:

- Automated merging (push/pull/fetch/merge)
- Branching: try something without breaking the main development
- Integrate or share changes by others without manual work

# REVISION CONTROL: GITHUB

The screenshot shows a GitHub user profile for [pmackenz](https://github.com/pmackenz). The profile includes a photo of a man with glasses, his name, email, and affiliation with the University of Washington. It also shows pinned repositories and a heatmap of his contribution activity.

**Pinned repositories:**

- AgaveClientInterface**: Forked from NHERI-SimCenter/AgaveClientInterface. Qt Library for HTTPS communication with SimCenter agave. Not a standalone program, but can be used by Qt applications. (C++)
- AgaveExplorer**: Forked from NHERI-SimCenter/AgaveExplorer. UI program for accessing Agave resources. (C++)
- CWE-Simulation-Tool**: Forked from NHERI-SimCenter/CWE-Simulation-Tool. SimCenter CFD Agave Client Program for NHERI. (C++)
- PileGroupTool**: Forked from NHERI-SimCenter/PileGroupTool. An Application for Understanding Behaviour of Laterally Loaded Piles. (C++)
- PyPCFD**: Particle flow formulation for incompressible flow. (Python) 2 contributions
- SimCenterCommon**: Forked from NHERI-SimCenter/SimCenterCommon. (C++)

**Activity:** 1,310 contributions in the last year. Contribution settings ▾

Less More

Projects

Activity

# REVISION CONTROL: GITHUB

GitHub, Inc. [US] | https://github.com/pmackenz/PileGroupTool

pmackenz / PileGroupTool  
forked from NHERI-SimCenter/PileGroupTool

Code Pull requests 0 Projects 0 Wiki Insights Settings

An Application for Understanding Behaviour of Laterally Loaded Piles

470 commits 3 branches 0 releases 5 contributors

Branch: develop New pull request Create new file Upload files Find file Clone or download

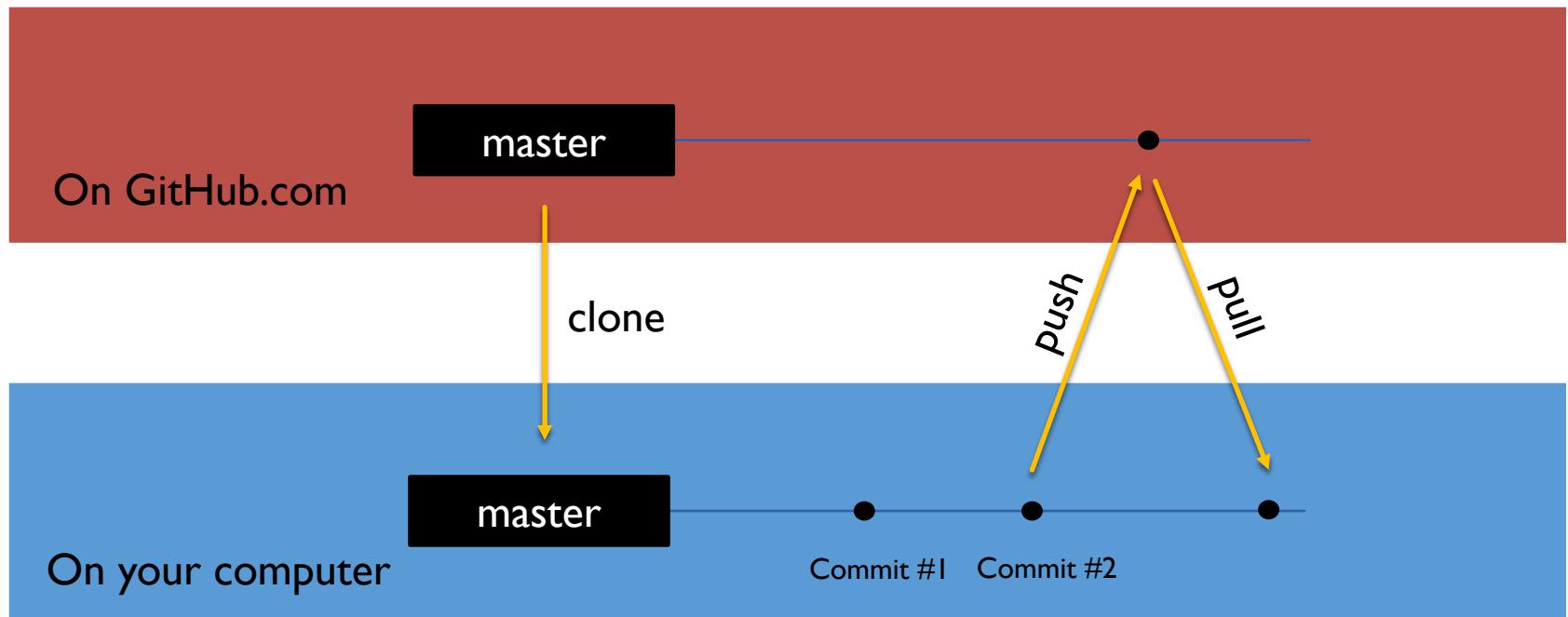
This branch is 2 commits ahead, 12 commits behind NHERI-SimCenterdevelop.

File	Description	Commit Date
FEA	Fixing load placement to center of pile cap	2 months ago
build-qwt-Desktop_Qt_5_10_1_MS...	Fixing Windows fonts and other style features	2 months ago
dialogs	simplifying version check for model file	2 months ago
docs	Adding images for documentation	3 months ago
help	get rid of mac-generated indeces	2 months ago
images	get rid of mac-generated indeces	2 months ago
imagesCommon	Adding the SimCenter layout	a year ago
includes	Completed and tested recorder	3 months ago
lib-deprecated	marked blas.lib and lapack.lib as deprecated.	3 months ago
mainWindow	simplifying version check for model file	2 months ago
ops	Far into generating an OpenSees input file	3 months ago
plots	Fixing Windows fonts and other style features	2 months ago
src	Organizing the source	5 months ago

Project

Files  
And  
Folders

# GITHUB (SIMPLE)



# REVISION CONTROL: GITHUB

pmackenz / PileGroupTool  
forked from NHERI-SimCenter/PileGroupTool

An Application for Understanding Behaviour of Laterally Loaded Piles

470 commits 3 branches 0 releases 5 contributors

Branch: develop New pull request Create new file Upload files Find file Clone or download

This branch is 2 commits ahead, 12 commits behind NHERI-SimCenterdevelop.

pmackenz Adjustment for renaming the widget packet Latest commit 4622f42 20 days ago

FEA Fixing load placement to center of pile cap 2 months ago

build-qwt-Desktop\_Qt\_5\_10\_1\_MS... Fixing Windows fonts and other style features 2 months ago

dialogs simplifying version check for model file 2 months ago

docs Adding images for documentation 3 months ago

help get rid of mac-generated indeces 2 months ago

images get rid of mac-generated indeces 2 months ago

imagesCommon Adding the SimCenter layout a year ago

includes Completed and tested recorder 3 months ago

lib-deprecated marked blas.lib and lapack.lib as deprecated. 3 months ago

mainWindow simplifying version check for model file 2 months ago

ops Far into generating an OpenSees input file 3 months ago

plots Fixing Windows fonts and other style features 2 months ago

src Organizing the source 5 months ago

Clone  
(fetch a  
local copy)

Files  
And  
Folders

# REVISION CONTROL: GITHUB

## ■ What goes on GitHub?

- Everything needed to build/compile your code
  - .c, .cpp, .h, .pro, .tex
  - documentation

## ■ What does NOT go onto GitHub?

- Everything the compiler generates
  - .o, .aux, .log, .pdf

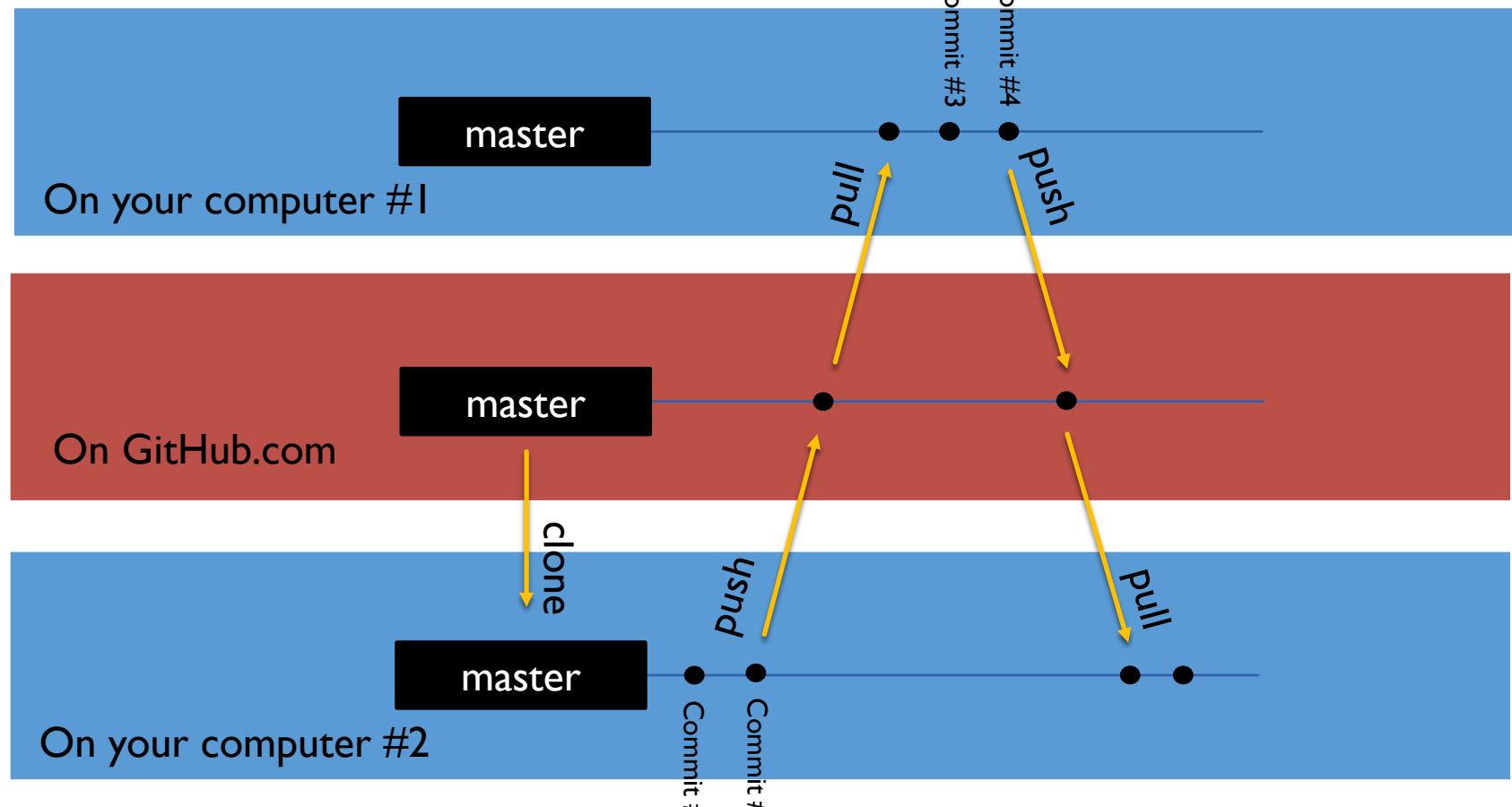
# GITHUB DESKTOP

The screenshot shows the GitHub Desktop application interface. At the top, there are three dropdown menus: 'Current Repository' set to 'PileGroupTool', 'Current Branch' set to 'develop', and 'Fetch origin' with a note 'Last fetched Jul 11, 2018'. Below these are two tabs: 'Changes' (selected) and 'History'. A sidebar on the left lists several commit history items, each with a small profile picture, the author's name, the commit message, and a timestamp. The main area displays a diff view for a pull request titled 'Adjustment for renaming the widget packet'. The diff shows changes in 'PileGroupTool.pro', 'qwt-6.2/lib/pkgconfig/Qt5Qwt6.pc', and 'qwt-6.2/lib/qwtmathml.pc'. The changes involve renames and additions of files like 'FooterWidget.cpp', 'HeaderWidget.cpp', and 'SimCenterCommon/Common/FooterWidget.cpp'. The commit hash shown is 4622f42.

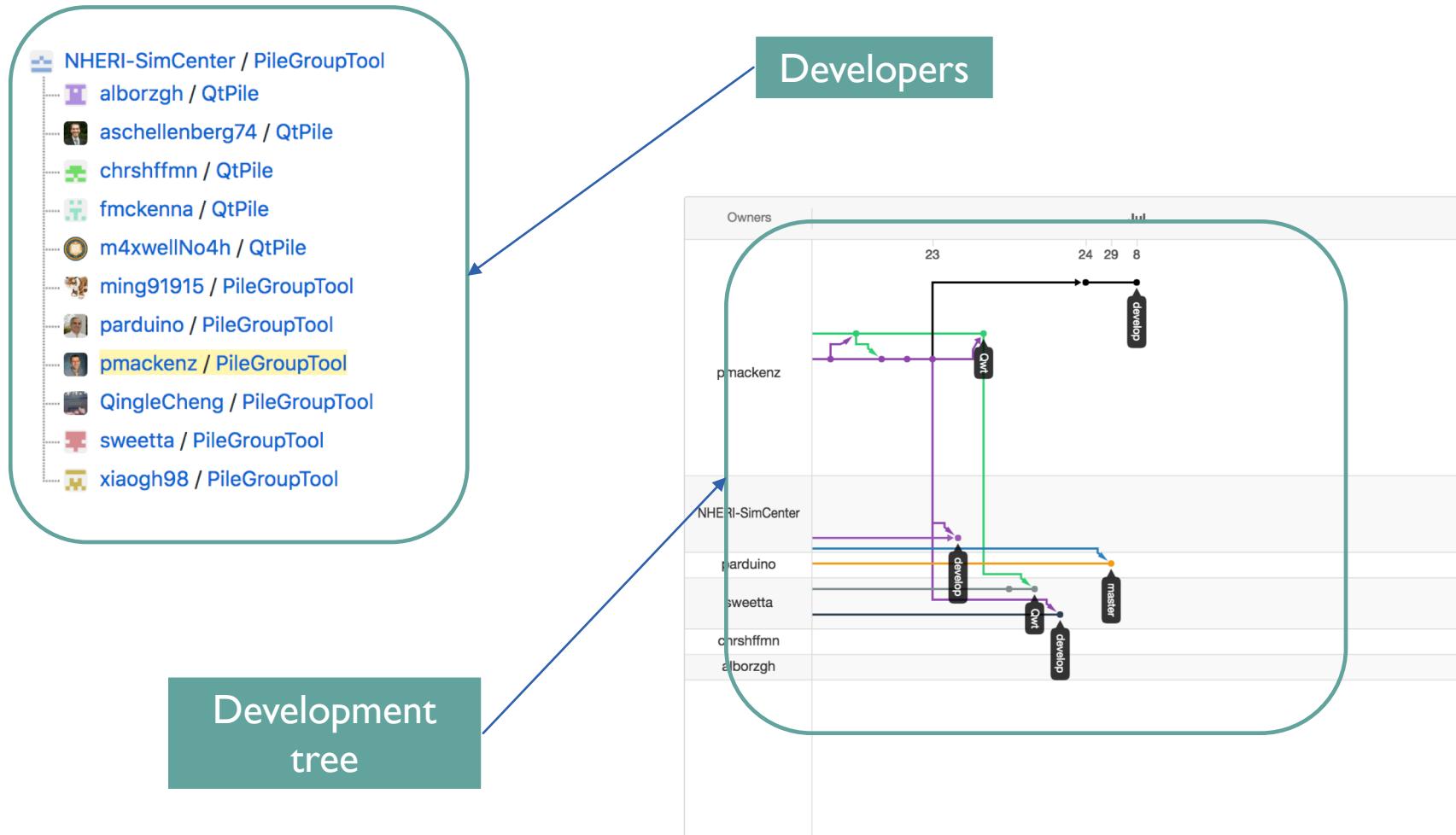
Performs most functions to communicate between your local computer and [github.com](https://github.com)

Guides you through the process and enforces comments on commit 😊

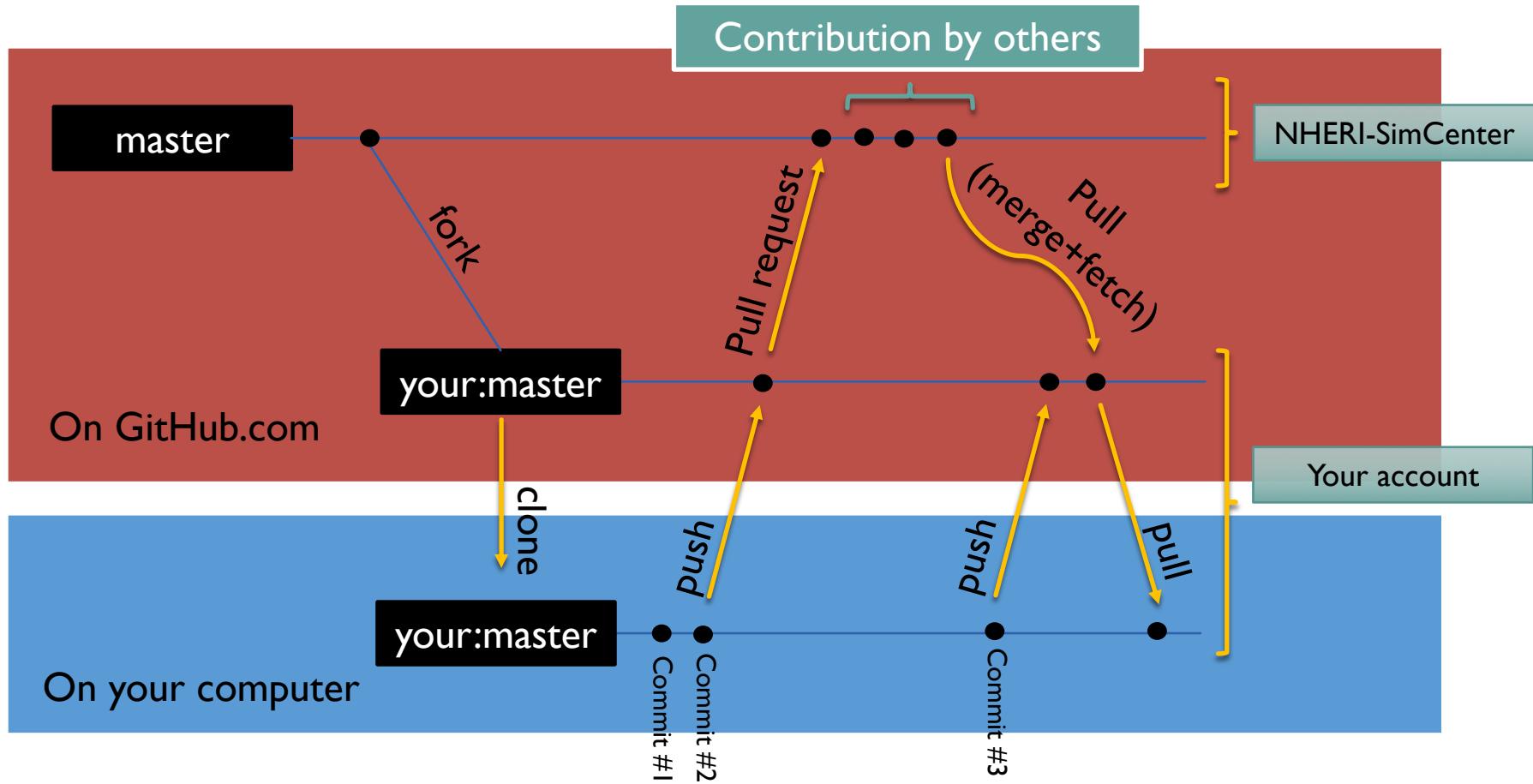
# GITHUB (2 COMPUTERS)



# REVISION CONTROL: GITHUB



# GITHUB (MONITORED PROJECT)



# REVISION CONTROL: GITHUB

The screenshot shows a GitHub project page for 'pmackenz / PileGroupTool'. A green box labeled 'Project' highlights the repository name at the top. A blue arrow points from the 'Fork' button (which is highlighted with a green box) to a green box labeled 'Fork (create a private fork)'. Another blue arrow points from the commit list area to a green box labeled 'Files And Folders'.

An Application for Understanding Behaviour of Laterally Loaded Piles

470 commits 3 branches 0 releases 5 contributors

Branch: develop New pull request Create new file Upload files Find file Clone or download

This branch is 2 commits ahead, 12 commits behind NHERI-SimCenter.develop.

pmackenz Adjustment for renaming the widget packet Latest commit 4622f42 20 days ago

- FEA Fixing load placement to center of pile cap 2 months ago
- build-qwt-Desktop\_Qt\_5\_10\_1\_MS... Fixing Windows fonts and other style features 2 months ago
- dialogs simplifying version check for model file 2 months ago
- docs Adding images for documentation 3 months ago
- help get rid of mac-generated indeces 2 months ago
- images get rid of mac-generated indeces 2 months ago
- imagesCommon Adding the SimCenter layout a year ago
- includes Completed and tested recorder 3 months ago
- lib-deprecated marked blas.lib and lapack.lib as deprecated. 3 months ago
- mainWindow simplifying version check for model file 2 months ago
- ops Far into generating an OpenSees input file 3 months ago
- plots Fixing Windows fonts and other style features 2 months ago
- src Organizing the source 5 months ago

Fork  
(create a  
private fork)

Files  
And  
Folders

# REVISION CONTROL: GITHUB

## ■ Collaboration Guidelines

- In the code: **Comments, comments, comments**
- **Commit frequently** and sync frequently to avoid conflicts
- Every commit deserves a proper description. **NO commit without comments!**
- Only **commit IF code compiles** (or use private branch)
- **WHO BREAKS THE CODE HAS TO HANG A RUBBER CHICKEN OVER THE DOOR TILL BUG IS FIXED** (blame game)
- Unstable development belongs into a branch
- Branches need to be reintegrated into main development once stable and compatible.

# GITHUB.COM

## ■ When to use the web interface?

- Creating pull requests to the monitored project
- Submitting and reviewing issues
- Statistics
- Viewing revision tree details

## ■ Other options:

- Use the git command line tool (most powerful but most complex)

# EXERCISE

1. Create a private fork of  
<https://github.com/NHERI-SimCenter/SimCenterBootcamp>
2. Clone to your machine
3. Add a folder (your\_name\_without\_spaces) to your branch
4. Add a README.txt file to this folder
5. Commit (locally)
6. Push to your fork on github.com