

COMPUTATIONAL NEUROSCIENCE

ICT FOR LIFE AND HEALTH - Department of Information Engineering

PHYSICS OF DATA - Department of Physics and Astronomy

COGNITIVE NEUROSCIENCE AND CLINICAL NEUROPSYCHOLOGY

- Department of Psychology

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Lab resources

◆ DEI GitLab

- ▶ Web user interface: <https://gitlab.dei.unipd.it/>
- ▶ SSH: `git@gitlab.dei.unipd.it:chiariot/nndl_1920.git`
- ▶ HTTPS: https://gitlab.dei.unipd.it/chiariot/nndl_1920.git

◆ Access with your DEI account

- ▶ Please verify your access to the server `login.dei.unipd.it`
 - ◆ `ssh deiuser@login.dei.unipd.it`

◆ You can also create your own project to safely store your code

◆ Useful commands

- ▶ `git clone https://gitlab.dei.unipd.it/chiariot/nndl_1920.git`
- ▶ `git pull`

Setting up Anaconda

- 1. Install Anaconda from the website: <https://www.anaconda.com/>**
- 2. Set up pytorch environment**

```
~$ conda create --name torch
```

```
~$ conda info --envs
```

```
~$ conda install -n torch pytorch
```

```
~$ conda list
```

```
~$ conda search pytorch
```

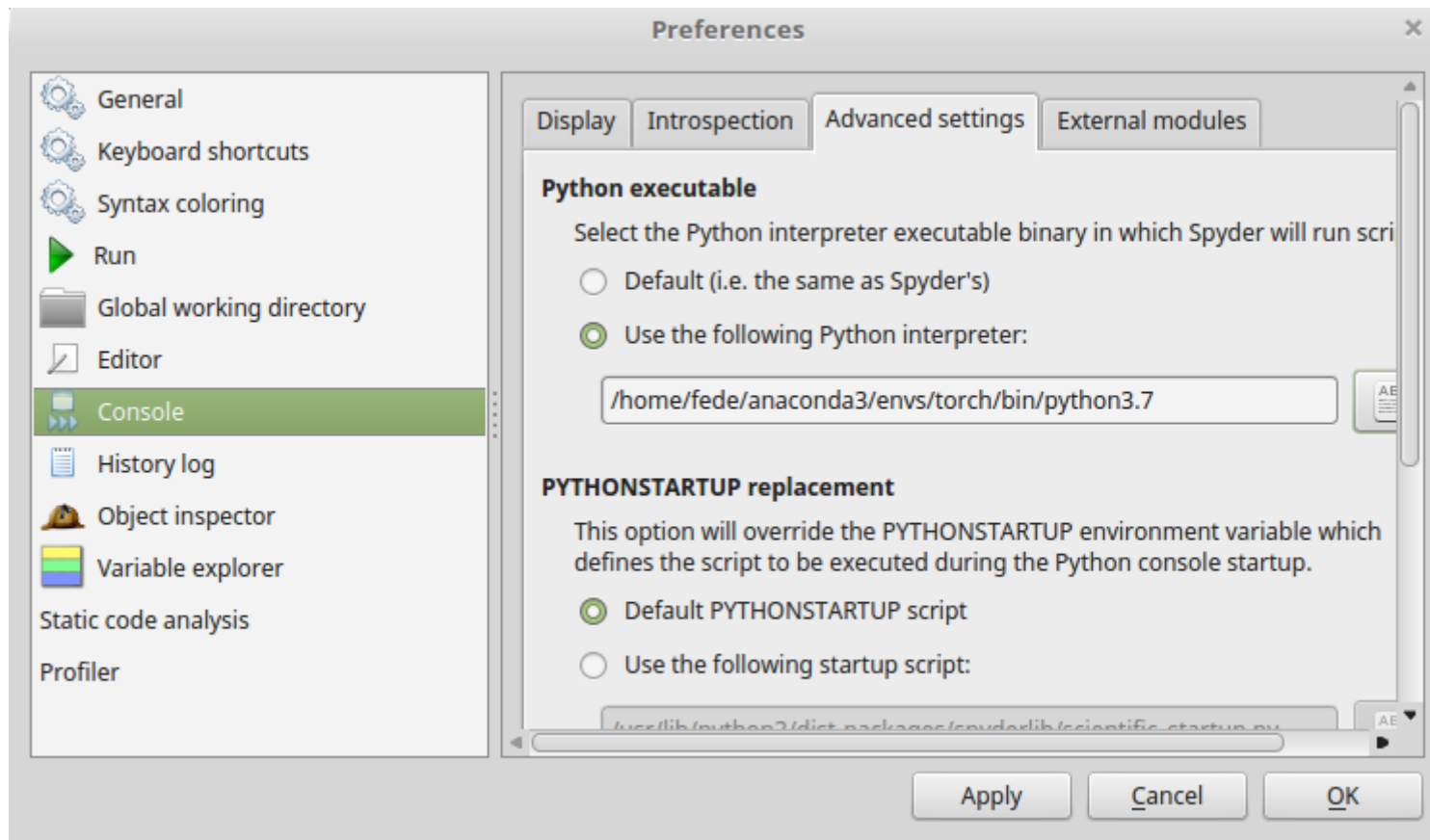
```
~$ conda install -n torch pytorch torchvision cudatoolkit=10.0 -c pytorch
```

```
~$ conda list -n torch
```

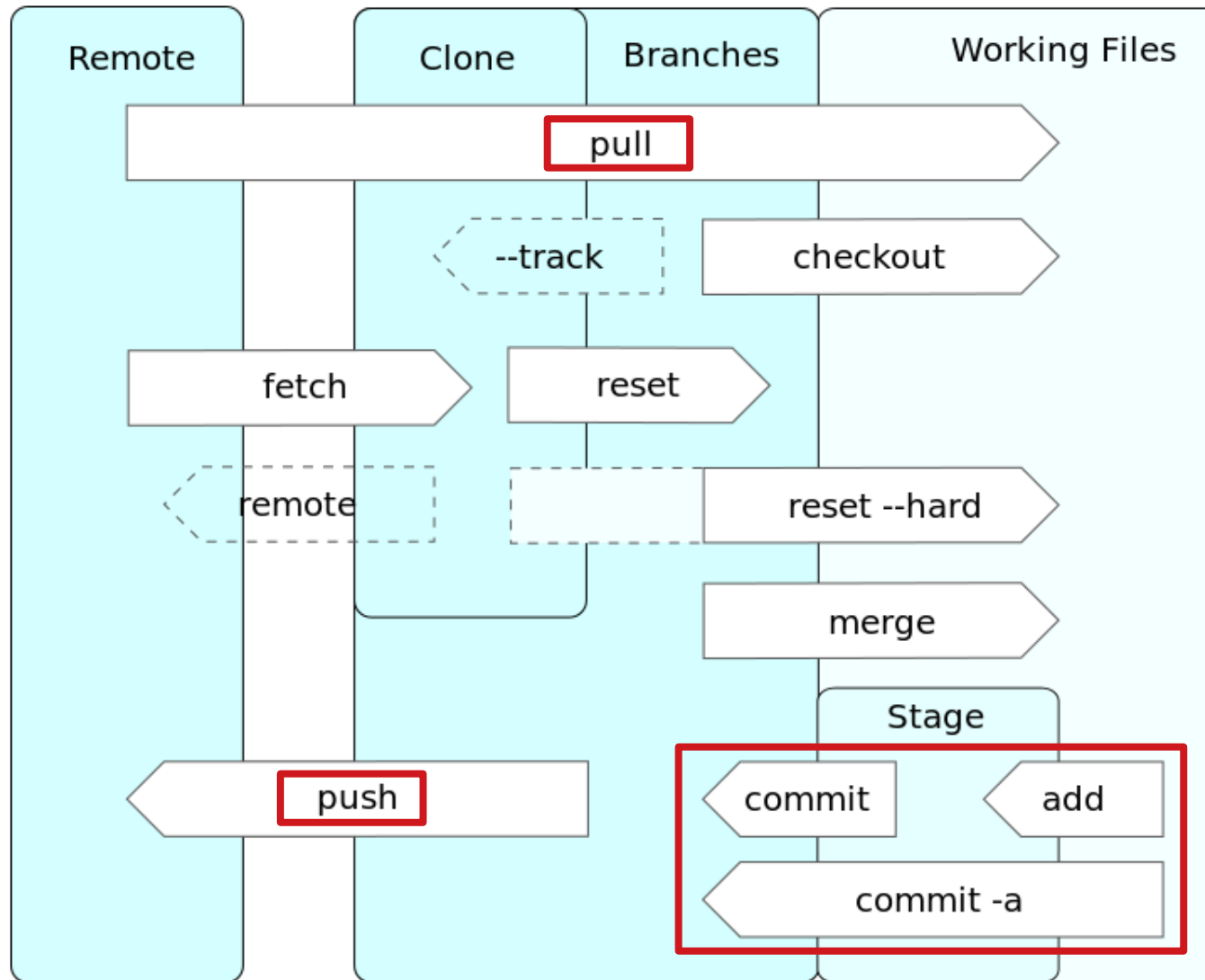
```
~$ source activate torch
```

Setting up Spyder

Set Anaconda interpreter in Spyder



Git



LOCAL

Git



FROM REMOTE TO LOCAL

- Clone remote repo to local
`git clone https://gitlab.dei.unipd.it/gadaleta/compneuro.git`
- Update local repo (default branch)
`git pull`

LOCAL

- Show the working tree status
`git status`
- Stage a new or modified file to commit
`add filepath`
- Stage all local files (new and modified) to commit
`add -A`
- Commit staged files
`commit -m "message"`
- Add modified files (not new) and commit in a single command
`commit -am "message"`

EMERGENCY RESET (same as new clone)

```
git fetch origin  
git reset --hard origin/master
```

FROM LOCAL TO REMOTE

- Upload staged changes to remote repo
`git push`

Ordinary Least Square

$$y = a + bx + cx^2 + \text{noise} \longrightarrow \mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \text{noise}$$

$$\mathbf{Y} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{bmatrix} \quad \mathbf{X} = \begin{bmatrix} x_1^0 & x_1^1 & x_1^2 \\ x_2^0 & x_2^1 & x_2^2 \\ \vdots & \vdots & \vdots \\ x_N^0 & x_N^1 & x_N^2 \end{bmatrix} = \begin{bmatrix} 1 & x_1 & x_1^2 \\ 1 & x_2 & x_2^2 \\ \vdots & \vdots & \vdots \\ 1 & x_N & x_N^2 \end{bmatrix} \quad \boldsymbol{\beta} = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$$\hat{\boldsymbol{\beta}} = \arg \min_{\boldsymbol{\beta}} \|\mathbf{Y} - \mathbf{X}\boldsymbol{\beta}\|^2 \longrightarrow \hat{\boldsymbol{\beta}} = (\mathbf{X}^T \mathbf{X})^{-1} \mathbf{X}^T \mathbf{Y}$$

Regularized Least Squares

Regularization term

$$\hat{\beta} = \arg \min_{\beta} \quad \|\mathbf{Y} - \mathbf{X}\beta\|^2 + \alpha \sum_{\beta \in \beta} |\beta|^2$$

L2 penalty

↓

$$\hat{\beta} = (\mathbf{X}^T \mathbf{X} + \alpha \mathbf{I})^{-1} \mathbf{X}^T \mathbf{Y}$$