

Preprocessing and data QC 2

Nipype (2) : Docker installation and Basic

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Nipype (2) : Docker installation and Basic

For preprocessing, you need to install multiple software.

Such as, Python, SPM, FSL, AFNI, FreeSurfer, etc.

Each of those software has its own version : Python = 3.6.7, SPM = 12, FSL = 6.0, etc.



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Sometimes, one software version depends on other software.

Let's say FSL 6.0 needs Python 2.7, but you have Python 3.6.7 instead.

In this case, you can fail installation.

This kind of dependency always makes it hard for the setting.

Also, sometimes you don't know whether your dependency is correct until the error appears.



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Then how can we manage all dependencies?

Python users usually experience dependency problems.

Using package manager like Anaconda, you can make multiple version of python on your computer.

Example:

Environment1 : Python 3.6.7, Numpy 1.14.6, Tensorflow 1.14

Environment2 : Python 3.7.3, Numpy 1.20.0, Tensorflow 2.1.0



ANACONDA®



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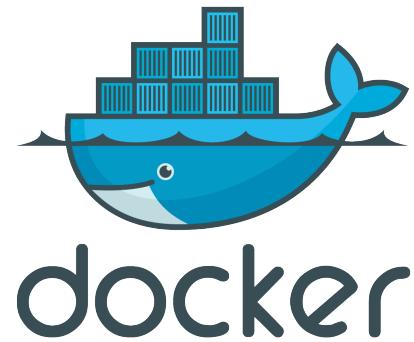
But what if you need multiple OS version, like ubuntu 18.04 and 16.04?

Docker can make you have multiple virtual OS on your computer.

Example:

Environment1 : Ubuntu 16.04, Python 3.6.7, Numpy 1.14.6, Tensorflow 1.14

Environment2 : Ubuntu 18.04, Python 3.7.3, Numpy 1.20.0, Tensorflow 2.1.0



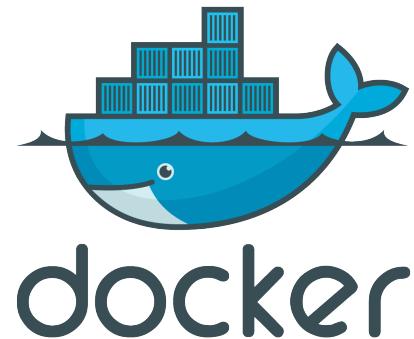
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Since docker can make different virtual environment types, it will be much easier to match all versions.

One more powerful thing of docker is you can download pre-installed environment from docker-hub.

Which means, you don't have to struggle for setting!

For Nipype tutorial, we will use docker.



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How to install docker on Mac?

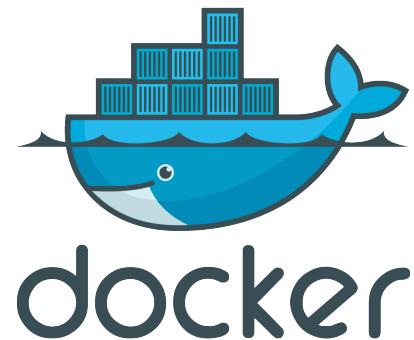
<https://docs.docker.com/docker-for-mac/install/>

How to install docker on Windows?

<https://docs.docker.com/docker-for-windows/install/>

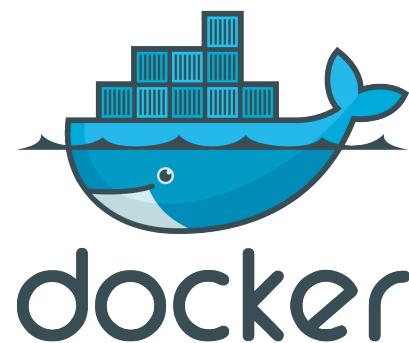
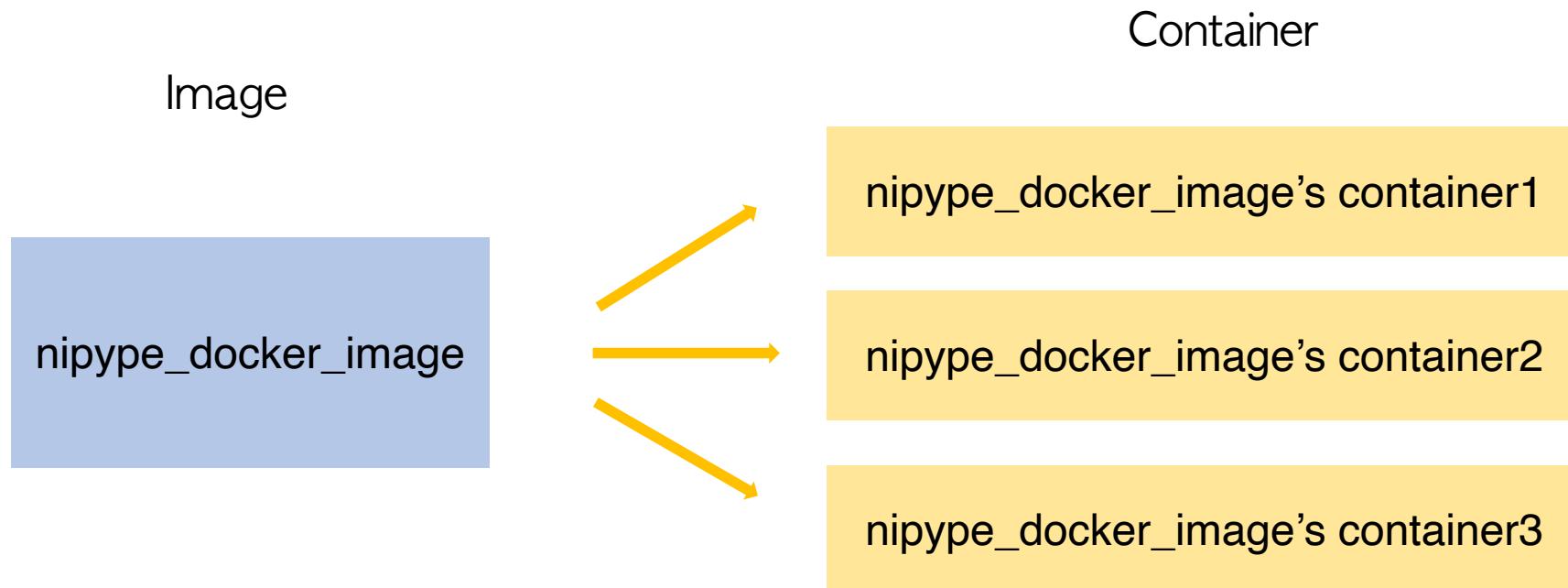
How to install docker on Linux?

<https://docs.docker.com/engine/install/>



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Basic concept



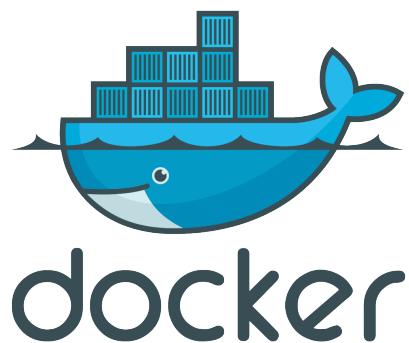
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Getting docker image from docker-hub(<https://hub.docker.com/>)

Command: docker pull [image name] : [version]

Example: docker pull miykael/nipype_tutorial:latest

```
(base) sungwoo320@x86_64-apple-darwin13 ~ ➤ docker pull miykael/nipype_tutorial:latest
latest: Pulling from miykael/nipype_tutorial
1c6172af85ee: Pull complete
d5bc711e0b64: Pull complete
7fc0814f0634: Pull complete
54a78d65675b: Pull complete
c5304af64785: Pull complete
82d1f67cbd44: Pull complete
be114a904b2f: Pull complete
21b5c8da6b59: Pull complete
e654ef9dcda8: Pull complete
527400966c76: Pull complete
3560d4f439f9: Pull complete
90348b19633d: Pull complete
c998c4d8645c: Pull complete
1cf7e93849c4: Pull complete
2719e20d2ffa: Pull complete
d1bf62ca0184: Pull complete
51b987ac4048: Pull complete
2ab77def1de2: Pull complete
77aac18e3a35: Pull complete
f6d44366667b: Pull complete
fae074fb0f16: Pull complete
12f515004b8d: Pull complete
Digest: sha256:0fd8e0b13452b7dfb6ba391eddc3b7bf8bb884cb759f6ed0430c1491d89fd3af
Status: Downloaded newer image for miykael/nipype_tutorial:latest
docker.io/miykael/nipype_tutorial:latest
```



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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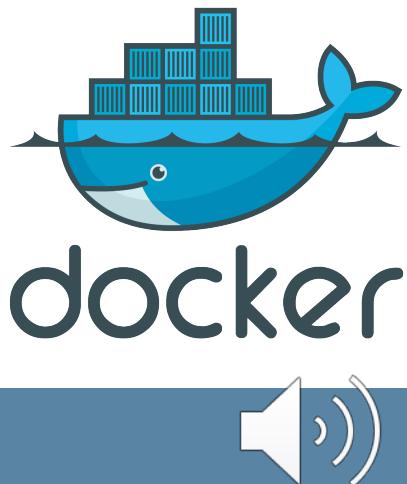


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Checking downloaded docker images

Command: docker images

```
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker images
REPOSITORY          TAG      IMAGE ID      CREATED        SIZE
miykael/nipype tutorial  latest  429288dcf095  10 months ago  5.03GB
```



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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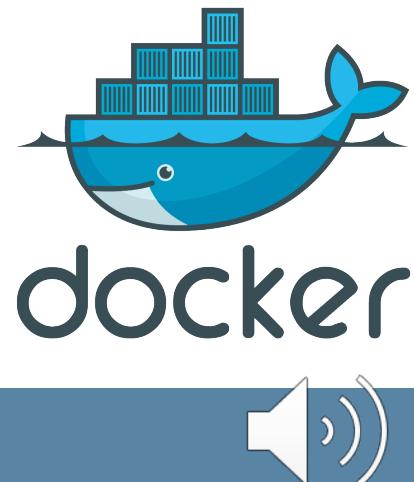
Running docker image -> Making container instance

Command: docker run [options] image[:TAG] [COMMAND] [ARG...]

Example: docker run -it miykael/nipype_tutorial bash

```
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker run -it miykael/nipype_tutorial bash
neuro@d075f5d2cd9e:~/nipype_tutorial$ ls
casts           Dockerfile   index.ipynb  README.md  test_notebooks.py
CODE_OF_CONDUCT.md  docs        LICENSE    Singularity  update_pages.sh
CONTRIBUTING.md   generate.sh notebooks  static
neuro@d075f5d2cd9e:~/nipype_tutorial$
```

- The -it flag tells docker that it should open an interactive container instance.



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



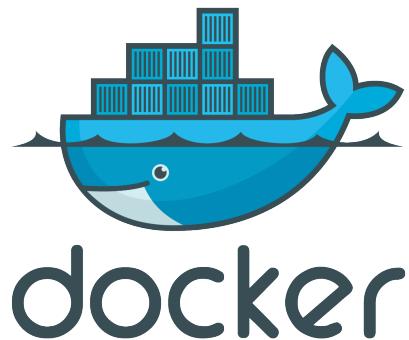
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Getting out from docker

Command: Ctrl + D (or exit)

```
neuro@d075f5d2cd9e:~/nipype_tutorial$ exit  
(base) sungwoo320@x86_64-apple-darwin13 ➤ ~ |
```



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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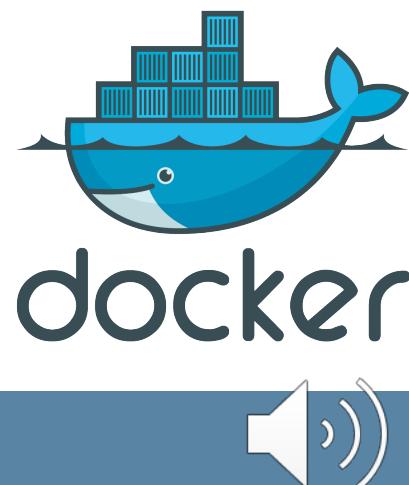
Checking docker container

Command : docker ps

```
(base) sungwoo320@x86_64-apple-darwin13 ~ docker ps  
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
```

Command : docker ps -a

```
(base) sungwoo320@x86_64-apple-darwin13 ~ docker ps -a  
CONTAINER ID IMAGE COMMAND CREATED STATUS  
PORTS NAMES  
d075f5d2cd9e miykael/nipype_tutorial "/neurodocker/startu..." 6 minutes ago Exited (0) 5 m  
inutes ago jovial_lederberg
```



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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Get into docker container again

Command: docker start {Container id or name}

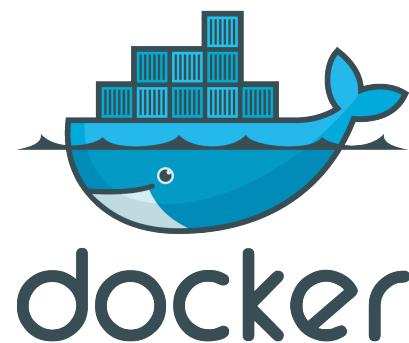
Example : docker start d075f5d2cd9e

```
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS
      PORTS NAMES
d075f5d2cd9e miykael/nipype_tutorial "/neurodocker/startu..." 6 minutes ago Exited (0) 5 m
inutes ago      jovial_lederberg
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker start d075f5d2cd9e
d075f5d2cd9e
```

Command: docker attach {Container id or name}

Example : docker attach d075f5d2cd9e

```
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker attach d075f5d2cd9e
neuro@d075f5d2cd9e:~/nipype_tutorial$ ls
casts           Dockerfile   index.ipynb  README.md    test_notebooks.py
CODE_OF_CONDUCT.md  docs        LICENSE     Singularity  update_pages.sh
CONTRIBUTING.md   generate.sh notebooks  static
neuro@d075f5d2cd9e:~/nipype_tutorial$
```



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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Delete docker container

Command: docker stop [Container id or name]

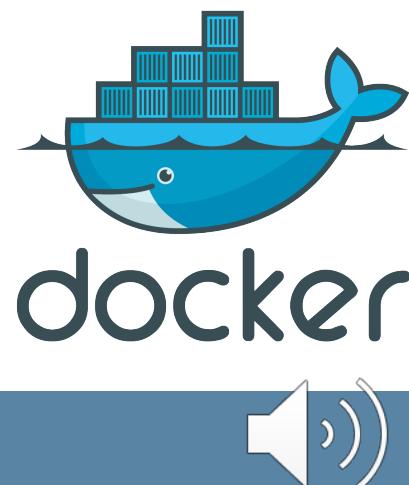
Example: docker stop d075f5d2cd9e

```
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS
              PORTS          NAMES
d075f5d2cd9e   miykael/nipype_tutorial   "/neurodocker/startu..."   13 minutes ago   Exited (0) 24
                seconds ago           jovial_lederberg
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker stop d075f5d2cd9e
d075f5d2cd9e
```

Command: docker rm [Container id or name]

Example: docker rm d075f5d2cd9e

```
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker rm d075f5d2cd9e
d075f5d2cd9e
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS
              PORTS          NAMES
(base) sungwoo320@x86_64-apple-darwin13 ~ ➔ █
```



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



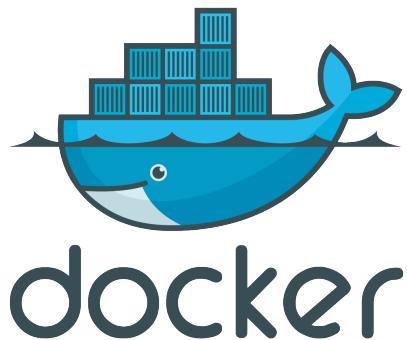
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More commands

<https://docs.docker.com/engine/reference/commandline/docker/>



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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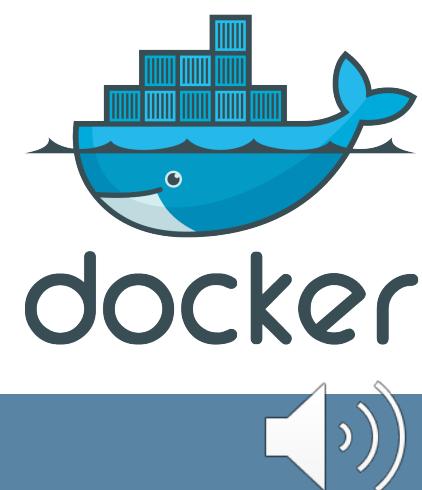
For Nipype tutorial

Command: docker run -it --rm -v [/path/to/data/](#):/data -v [/path/to/output/](#):/output -p 8888:8888 miykael/nipype_tutorial jupyter notebook

Example: docker run -it --rm -v [/Users/sungwoo320/Documents/fmriprep/data/](#):/data -v [/Users/sungwoo320/Documents/fmriprep/output/](#):/output -p 8888:8888 miykael/nipype_tutorial jupyter notebook

```
(base) * sungwoo320@x86_64-apple-darwin13 ~ /Documents/fmriprep > docker run -it --rm -v /Users/sungwoo320/Documents/fmriprep/data/:/data -v /Users/sungwoo320/Documents/fmriprep/output/:/output -p 8888:8888 miykael/nipype_tutorial jupyter notebook
[I 10:20:37.941 NotebookApp] [nb_conda_kernels] enabled, 1 kernels found
[I 10:20:37.958 NotebookApp] Writing notebook server cookie secret to /home/neuro/.local/share/jupyter/runtime/notebook_cookie_secret
[I 10:20:38.561 NotebookApp] [jupyter_nbextensions_configurator] enabled 0.4.1
[I 10:20:38.804 NotebookApp] JupyterLab extension loaded from /opt/miniconda-latest/envs/neuro/lib/python3.6/site-packages/jupyterlab
[I 10:20:38.805 NotebookApp] JupyterLab application directory is /opt/miniconda-latest/envs/neuro/share/jupyter/lab
[I 10:20:39.015 NotebookApp] [nb_conda] enabled
[I 10:20:39.017 NotebookApp] Serving notebooks from local directory: /home/neuro/nipype_tutorial
[I 10:20:39.018 NotebookApp] The Jupyter Notebook is running at:
[I 10:20:39.019 NotebookApp] http://ddb44c9fda56:8888/?token=bb8ed07ce09225cd77a335e16587afb99b05ab402a2037d5
[I 10:20:39.019 NotebookApp] or http://127.0.0.1:8888/?token=bb8ed07ce09225cd77a335e16587afb99b05ab402a2037d5
[I 10:20:39.020 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[W 10:20:39.026 NotebookApp] No web browser found: could not locate runnable browser.
[C 10:20:39.027 NotebookApp]

To access the notebook, open this file in a browser:
  file:///home/neuro/.local/share/jupyter/runtime/nbserver-29-open.html
Or copy and paste one of these URLs:
  http://ddb44c9fda56:8888/?token=bb8ed07ce09225cd77a335e16587afb99b05ab402a2037d5
  or http://127.0.0.1:8888/?token=bb8ed07ce09225cd77a335e16587afb99b05ab402a2037d5
```



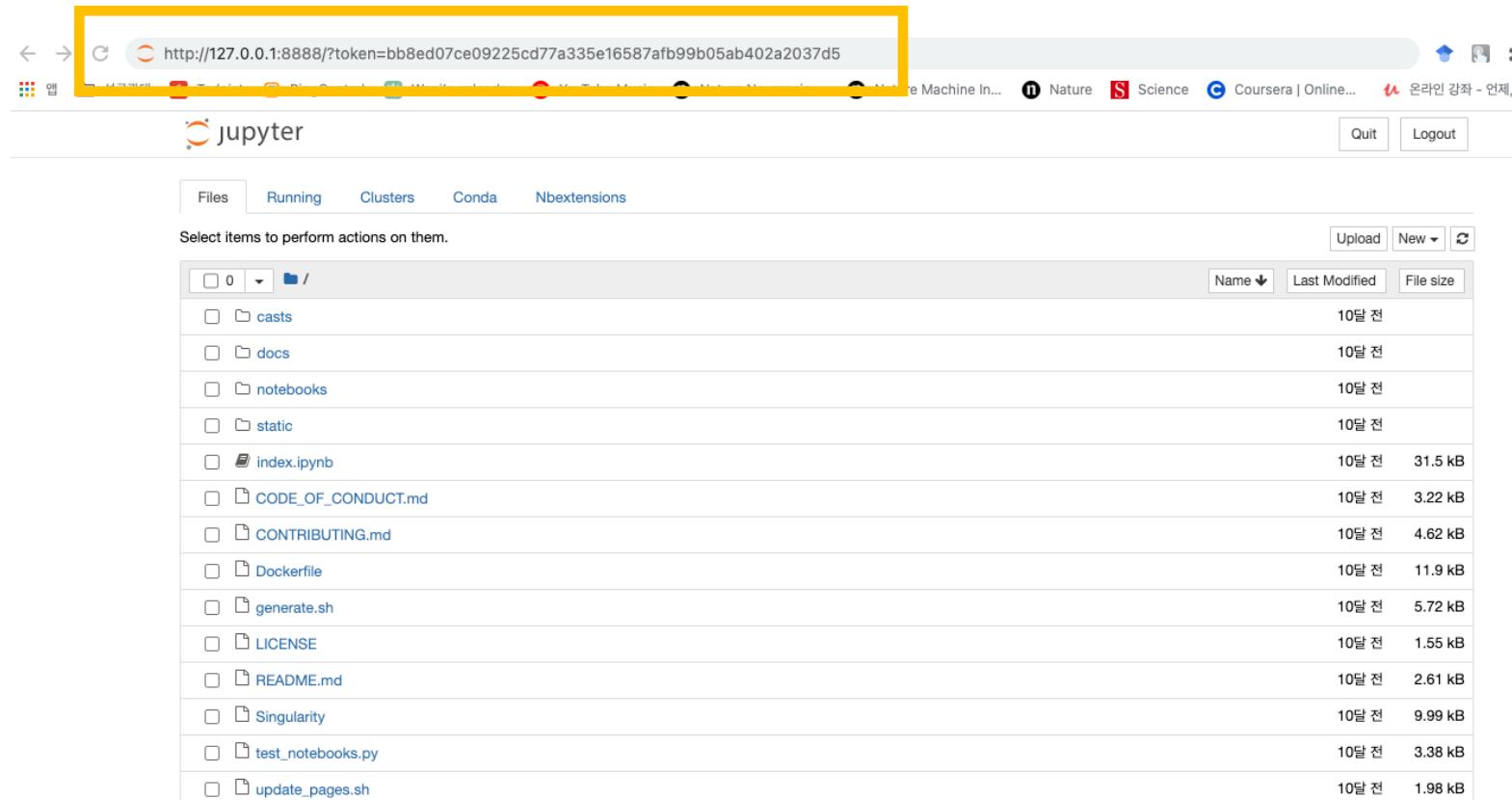
https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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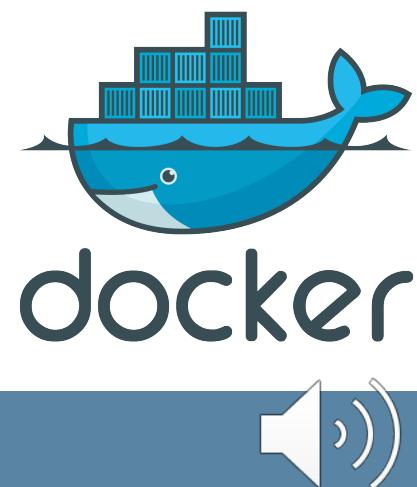
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The screenshot shows a Jupyter Notebook interface running locally at <http://127.0.0.1:8888/?token=bb8ed07ce09225cd77a335e16587afb99b05ab402a2037d5>. The browser address bar is highlighted with a yellow box. The interface includes a navigation bar with tabs for Files, Running, Clusters, Conda, and Nbextensions. Below the navigation bar is a file list table showing the contents of the root directory. The table has columns for Name, Last Modified, and File size. All files and directories listed were modified 10 days ago.

	Name	Last Modified	File size
<input type="checkbox"/>	0		
	/		
<input type="checkbox"/>	casts	10달 전	
<input type="checkbox"/>	docs	10달 전	
<input type="checkbox"/>	notebooks	10달 전	
<input type="checkbox"/>	static	10달 전	
<input type="checkbox"/>	index.ipynb	10달 전	31.5 kB
<input type="checkbox"/>	CODE_OF_CONDUCT.md	10달 전	3.22 kB
<input type="checkbox"/>	CONTRIBUTING.md	10달 전	4.62 kB
<input type="checkbox"/>	Dockerfile	10달 전	11.9 kB
<input type="checkbox"/>	generate.sh	10달 전	5.72 kB
<input type="checkbox"/>	LICENSE	10달 전	1.55 kB
<input type="checkbox"/>	README.md	10달 전	2.61 kB
<input type="checkbox"/>	Singularity	10달 전	9.99 kB
<input type="checkbox"/>	test_notebooks.py	10달 전	3.38 kB
<input type="checkbox"/>	update_pages.sh	10달 전	1.98 kB



https://miykael.github.io/nipype_tutorial/notebooks/introduction_docker.html



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