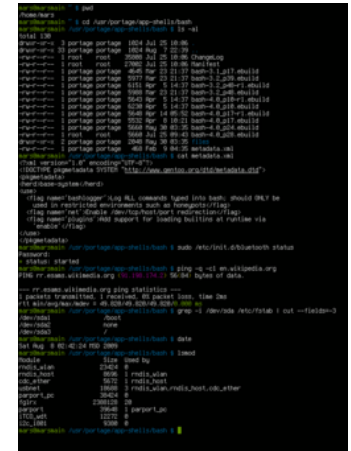


Bash and IPython Notebook

Courtesy by
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What is Bash

- ***Bourne-again shell***
 - Linux / OS X operating system (OS) (default)
 - Interact with OS using commands
 - Command -> similar to mouse click
 - Send command on command-line (“black box”)
- **Bash Script**
 - List of commands in a file



```
root@kali:~# cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/usr/sbin:/usr/sbin/nologin
games:x:5:60000:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/lib/manuel:/usr/sbin/nologin
lxd:x:100:100:libvirt:/var/lib/lxd:/bin/sh
ubuntu:x:1000:1000:ubuntu:/home/ubuntu:/usr/bin/zsh
root@kali:~#
```

Bash basics

> **echo**

```
participant@black-sheep:~$ echo 'Hello, world!'  
Hello, world!
```

> **pwd (print working directory)**

```
participant@black-sheep:~$ pwd  
/home/participant
```

> **cd (change directory)**

```
participant@black-sheep:~$ cd ngs-course  
participant@black-sheep:~/ngs-course$ pwd  
/home/participant/ngs-course
```

Bash basics

> **ls** (list items in current folder)

```
participant@black-sheep:~/ngs-course$ pwd
/home/participant/ngs-course
participant@black-sheep:~/ngs-course$ ls
01_QualityControl 02_Alignment 03_VariantCalling 04_VariantAnnotation scripts
```

> **ls -l** (list in long format with more details)

```
participant@black-sheep:~/ngs-course$ ls -l
total 20
drwxrwxr-x 2 participant participant 4096 Apr  5 19:32 01_QualityControl
drwxrwxr-x 3 participant participant 4096 Apr  7 09:23 02_Alignment
drwxrwxr-x 2 participant participant 4096 Apr  5 19:32 03_VariantCalling
drwxrwxr-x 3 participant participant 4096 Apr  5 19:49 04_VariantAnnotation
drwxrwxr-x 2 participant participant 4096 Apr  5 19:26 scripts
```

Bash help

> man ls

```
LS(1) User Commands LS(1)
mh719@login-sand4:~/scratch/teaching/ngs-course
NAME
ls - list directory contents
SYNOPSIS
ls [OPTION]... [FILE]...
DESCRIPTION
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.
Mandatory arguments to long options are mandatory for short options too.
-a, --all do not ignore entries starting with .
```

Bash help

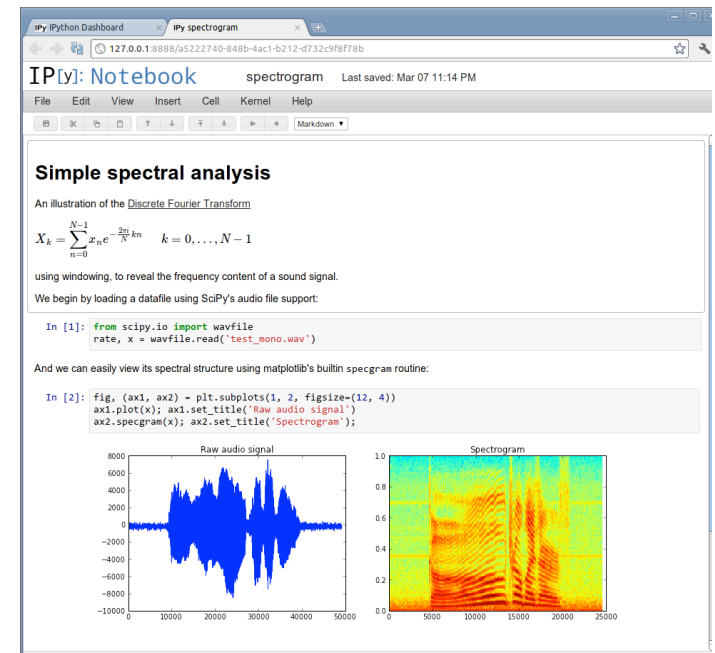
> **cp --help**

```
participant@black-sheep:~/ngs-course$ cp --help
Usage: cp [OPTION]... [-T] SOURCE DEST
or: cp [OPTION]... SOURCE... DIRECTORY
or: cp [OPTION]... -t DIRECTORY SOURCE...
Copy SOURCE to DEST, or multiple SOURCE(s) to DIRECTORY.
Mandatory arguments to long options are mandatory for short options too.
-a, --archive                same as -dR --preserve=all
--attributes-only            don't copy the file data, just the attributes
--backup[=CONTROL]         make a backup of each existing destination file
-b                           like --backup but does not accept an argument
--copy-contents             copy contents of special files when recursive
-d, --dereference            same as --no-dereference --preserve=links
-f, --force                 if an existing destination file cannot be
                             opened, remove it and try again (this option
                             is ignored when the -n option is also used)
```

IP[y]: Notebook

IPython Notebook

- IPython
 - command shell for interactive computing
 - multiple programming languages
- IPython Notebook
 - Web-based interactive computational environment
 - Combine documentation, code and results



IP[y]: Notebook

Ipython Notebook

- Start IPython notebook from command line?
 - > **ipython --help**

```
participant@black-sheep:~/ngs-course$ ipython --help
=====
IPython
=====
Tools for Interactive Computing in Python
=====
A Python shell with automatic history (input and output), dynamic object
introspection, easier configuration, command completion, access to the
system shell and more. IPython can also be embedded in running programs.
Usage
ipython [subcommand] [options] [-c cmd | -m mod | file] [--] [arg] ...
```


IP[y]: Notebook

Ipython Notebook

- **St** Subcommands are launched as ``ipython cmd [args]``. For information on using subcommand 'cmd', do: ``ipython cmd -h``.

```
Subcommands
-----
wxr-xr-x 4 mh719 staff 136 7 Apr 14:31 01_QualityControl
wxr-xr-x 5 mh719 staff 170 7 Apr 14:31 02_Alignment
wxr-xr-x 3 mh719 staff 102 7 Apr 14:31 03_VariantCalling
Subcommands are launched as `ipython cmd [args]`. For information on using
subcommand 'cmd', do: `ipython cmd -h`.
mpc204:00_Introduction mh719$ ll
mpc204:00_Introduction mh719$ pwd
kernel spec
kernel spec projects/git-checkouts/ngs-course/00_Introduction
kernel spec Manage IPython kernel specifications.
locate
locate # 1 mh719 staff 39434 7 Apr 14:34 bash_ipython_intro.pptx
mpc204:00_Introduction mh719$ echo "Hello, world!"
console
console 00_Introduction mh719$ echo "
console Launch the IPython terminal-based Console.
kernel
kernel 00_Introduction mh719$
kernel Start a kernel without an attached frontend.
install-nbextension
install-nbextension mh719$
install-nbextension Install IPython notebook extension files
notebook
notebook 00_Introduction mh719$
notebook Launch the IPython HTML Notebook Server.
profile
profile 00_Introduction mh719$ echo "Hello, world!"
profile Create and manage IPython profiles.
qtconsole
qtconsole Introduction mh719$
qtconsole Command not found
qtconsole Launch the IPython Qt Console.
nbconvert
nbconvert Introduction mh719$ echo 'hello'
nbconvert Convert notebooks to/from other formats.
trust
trust mpc204:00_Introduction mh719$
trust Sign notebooks to trust their potentially unsafe contents at load.
history
history 00_Introduction mh719$ man echo
history Manage the IPython history database.
```

IP[y]: Notebook

Ipython Notebook

- Start IPython notebook from command line!
 > **ipython notebook**

```
participant@black-sheep:~$ pwd
/home/participant
participant@black-sheep:~$ cd ngs-course
participant@black-sheep:~/ngs-course$ pwd
/home/participant/ngs-course
participant@black-sheep:~/ngs-course$ ipython notebook
[I 15:17:25.649 NotebookApp] Using existing profile dir: u'/home/participant/.ipython/profile_default'
[I 15:17:25.651 NotebookApp] Using MathJax from CDN: https://cdn.mathjax.org/mathjax/latest/MathJax.js
[I 15:17:25.657 NotebookApp] The port 8888 is already in use, trying another random port.
[I 15:17:25.658 NotebookApp] The port 8889 is already in use, trying another random port.
[I 15:17:25.659 NotebookApp] Serving notebooks from local directory: /home/participant/ngs-course
[I 15:17:25.659 NotebookApp] 0 active kernels
[I 15:17:25.659 NotebookApp] The IPython Notebook is running at: http://localhost:8890/
```

IP[y]: Notebook

- St

Notebooks

Running

Clusters

To import a notebook, drag the file onto the listing below or **click here**.

New Notebook

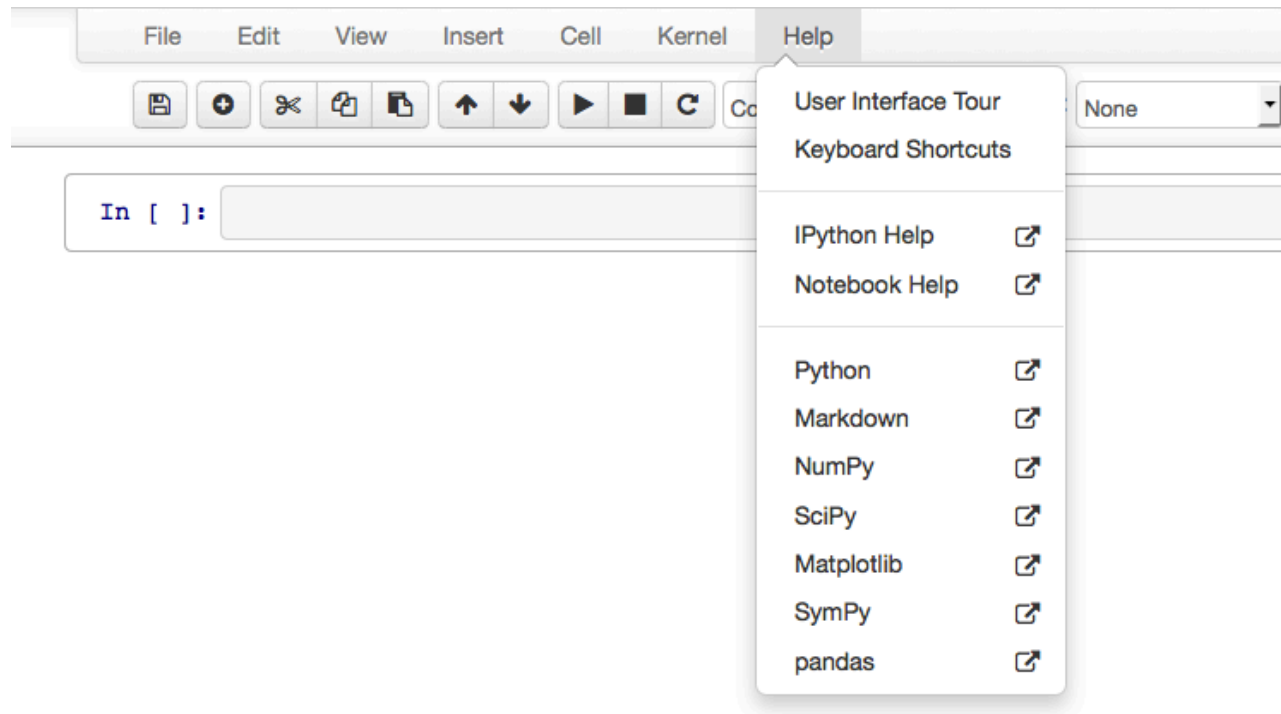


- /
- 00_Introduction
- 01_QualityControl
- 02_Alignment
- 03_VariantCalling
- 04_VariantAnnotation
- 05_VariantAssociation
- scripts


```
participant@b  
/home/partici  
participant@b  
participant@b  
/home/partici  
participant@b  
[I 15:17:25.6  
[I 15:17:25.6  
[I 15:17:25.6  
[I 15:17:25.6  
[I 15:17:25.6  
[I 15:17:25.6  
[I 15:17:25.6
```

```
file_default'  
st/MathJax.js  
s-course
```

IP[y]: Notebook




IP[y]: Notebook




The toolbar contains icons for save, add, undo, redo, insert, up, down, run, stop, and refresh. A dropdown menu is open, showing 'Code' as the selected option.

```
In [ ]: This is some text
```




The toolbar is the same as above, but the dropdown menu is open and 'Markdown' is selected. Other options include Code, Raw NBConvert, and Heading 1 through 6.

```
In [ ]: This is some text
```



The toolbar shows 'Markdown' as the selected option in the dropdown menu.

```
This is some text
```




A blue arrow points to the run button (a right-pointing triangle) in the toolbar. The dropdown menu is set to 'Code'.

This is some text


```
In [ ]: |
```

IP[y]: Notebook



This is some text

The toolbar includes icons for save, add, cut, copy, paste, up, down, run, stop, and refresh. The mode dropdown is set to 'Markdown'.



```
## Hello  
This is some important text
```

The toolbar is identical to the first image, with the mode dropdown set to 'Markdown'.



The toolbar is identical to the previous images, but the mode dropdown is now set to 'Code'. A blue arrow points to the run button (a right-pointing triangle).

Hello

This is some **important** text

IP[y]: Notebook

