

# Command Line

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We will walk you through some basic usage of command line. We follow the book *Learn Enough Command Line to Be Dangerous*.

## What is and why Command Line?

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Command line is a text interface (contrasting to **graphical user interface**) that allows the user to interact with computer programs by typing lines of text (known as command lines).

Typing commands instead of clicking and dragging may seem clumsy at first, but as you will see, once you are comfortable with writing commands in the shell, you can do some tasks in a few keystrokes (so more convenient) and develop your **technical sophistication**.

## Getting Started

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Click the Terminal and open it!

### Elements of command line

A typical command line looks like

```
[~]$ rm -f foo.txt
```

- [~]\$ is called prompt, symbols designed to “prompt” you to action.
- rm command
- -f option
- foo.txt argument

### Exercise

What is the prompt, command, option and argument of the following command line:

```
[ruby]$ ls -d dropbox
```

## Hello World!

We start with the simple command in printing the word “Hello World”:

```
$ echo "Hello World"
```

What do you observe? How about

```
$ echo Hello World
```

What if you type

```
$ echo 'Hello World
```

Try get rid of trouble through

```
ctrl + C.
```

You might also see `^C` in the future. `^` stands for the button `ctrl`.

## Exercise

Try to print “Hello World”. Note the you need to print the quotation mark. How can you get rid of trouble if you type

```
echo "echo ?
```

## Line editing and Clean Up

Suppose you type

```
echo Operations Research and Infomation Engeneering
```

You notice there are two spelling mistakes in `Infomation Engeneering`. Suppose your cursor is at the beginning of `echo`. Is there a convenient way to jump to the end?

Of course you can type the direction key `↑ ↓ ← →`. But it is a bit cumbersome in doing so. Try `^E`. How about `^A`? What happens if you type `^U`?

You can clear past command by

```
clear
```

and you can type

```
exit
```

if you are done with your Terminal and want to exit.

## Exercise

First type

```
echo from fairest creatures we desire Increase,
```

(which is the first line of Shakespeare's first sonnet). Then make the first `f` capitalized, and the letter `I` in `Increase` to lowercase.

Next type `^L` (then hit `enter`), and `^D` (then hit `enter`). What do you observe?

## Manipulating Files

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We now start manipulating (text) files.

### Redirecting and Appending

Suppose we want to make a text file called `poem_1` with one line text

"Once upon a time an immortal flew away on the back of a yellow crane,". How can you do this in one line of code?

This is where *redirect operator* `>` kicks in. Try

```
echo "Once upon a time an immortal flew away on the back of a yellow  
crane," > poem_1.txt
```

What if you want to append one more line "What remains of the tale here is a tower bearing its name." to the poem file? Try

```
echo "What remains of the tale here is a tower bearing its name." >>  
poem_1.txt
```

Note the use of `>>` . One can append additional line by `>>` as well.  
To inspect the content, we can use the `cat` (concatenate) command.

## Listing, Renaming, Copying, Deleting

We list the following command for Listing, Renaming, Copying, Deleting.

- The command `ls` will list all the files and directories (folders) in your current directory.
- To rename a file called `file_1` to `file_2`, try `mv file_1 file_2`
- To make copy of `file_1` with `file_2` as the name of the copy, try `cp file_1 file_2`
- To delete a file called `file_1`, try `rm file_1`.

There are a few additional feature you might be interested.

- What if you also want to the hidden file in the current directory (folder)? Create a hidden file called `.gitignore` by `touch .gitignore`, then use `ls` and `ls -a`.
- To review files in *long format time reversed* order, use `ls -rtf`.

## How to type a bit less and being more accurate?

It is easy to miss spell the file name if you have get in touch with it for a while. If you only have a rough memory of the file name, say the first few letters, what should you do? Try the `Tab` key!

### Exercise

1. Create two text file `Line_1.txt` and `Line_2.txt` where  
`Line_1.txt` contains the line `From fairest creatures we desire increase,`  
and `Line_2.txt` contains the line `That thereby beauty's Rose might never die, .`
2. Create a file called `sonnet_1.txt` via appending `>` and `>>` . Can you achieve the same goal using `cat` and files `Line_1.txt` and `Line_2.txt` ? (Recall `cat` stands for “concatenate”).
3. What are the files in your current directory (folder)? Try `ls` .
4. Create a third file `poem_1.txt` contains `Once upon a time an immortal flew away on the back of a yellow crane,` and fourth file `poem_2.txt` with content `What remains of the tale here is a tower bearing its name.`

5. Now type `ls 1*` what do you observe? What if you only want to list the files with names starting with `poem` ?
6. Try `ls -r -t -l` and compare with `ls -t -r -l` and `ls -t -l`.
7. Rename `Line_1.txt` as `Line_second.txt` . Make a copy of the file `Line_2.txt` with name `Line_first.txt` . Can you do the copying task with `cat` command as well?

## Inspecting files

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### Download files (or even before that installing `curl`)

How do you download a file via command line? One command allows you to do that is called `curl` . However, it looks like it is not installed in our `VirtualBox` !

To install `curl`, try

```
apt install curl
```

Now let's download the file

```
curl -OL cdn.learnenough.com/sonnets.txt
```

We can check the existence via `ls -tl` .

### 'head', 'tail', 'wc' and pipelines

To inspect the content of file `sonnets.txt` . Instead of using `cat` and seeing too many lines pop out at the same time, we may use `head` to see the first few lines and `tail` to see the last few lines.

The command `wc` will count the lines, word and bytes. How do you count the number of words in the first 10 lines of the file `sonnets.txt` with just one line command? We can use the pipeline

```
head -10 sonnets.txt | wc .
```

The above command runs `head -10 sonnets.txt` and then *pipes* the result through `wc` using the pipe symbol `|` .

### Grepping!!

The command `grep` perhaps is the most important function in searching text in a text file. Let's try

```
grep rose sonnets.txt
```

It outputs the lines of with the word `rose`. To count the number of words appearing, try

```
grep rose sonnets.txt > wc
```

## Less is more!

To read the `sonnets.txt` file in a reading more, it is recommended to use the command `less`.

```
less sonnets.txt
```

You can search the word `rose` via `/rose` and quit the reading mode, try `q`. We list the use of a few keys in the following table:

Command	Description
space bar	Move forward one page
^F	Move forward one page
^B	Move back one page
G	Move to end of file
1G	Move to beginning of file
/<string>	Search file for string
n	Move to next search result
N	Move to previous search result
q	Quit <code>less</code>

## Help!

It is not possible to remember the usage of all the commands and their options. Thus it is important to get help when you meet a new command. This can be done through the

`man` (manual) command. Let us see

```
man ls
```

Since the reading mode of manual is the same as the reading mode of `less`, we can use the keys in previous table! try `/time`.

## Exercise

1. Download the files with `url`  
`https://people.orie.cornell.edu/bdg79/Seeing_Off_a_Friend.txt` and  
`https://people.orie.cornell.edu/bdg79/The_Tower_of_Yellow_Crane` with  
names `Seeing_Off_a_Friend.txt` and `The_Tower_of_Yellow_Crane`
2. The name of the author of the poem in `Seeing_Off_a_Friend.txt` is in the first  
line of the file. Try to print the name only using `head -1`.
3. How many words are there in the first 3 lines of the file  
`The_Tower_of_Yellow_Crane`? Use one command line to do this task.
4. How many times does `rose` or `Rose` appear in the file `sonnets.txt`? You might  
want to search `case` in the `man` page of `grep`.

## Directories

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The term **directory** refers to the way a structured list of document *files* and *folders* is stored on the computer.

In computing, a directory and a folder are the same thing. If one is referring to a container of documents, the term folder is more appropriate.

### Your current/home directory

To check your current directory, type `pwd`.

The symbol `~` stands for home directory. Try `echo ~` to see what your home directory is.

The directory `/Users/bdg79` might be read as “slash users slash bdg79” or “slash users bdg79”.

### making a directory

We can make a directory via `mkdir` . Let's try

```
mkdir Chinese_poems , and  
mkdir English_poems .
```

We can move files into directory by `mv filename directory` , e.g.

```
mv Seeing_Off_a_Friend.txt Chinese_poems .
```

If we want to list the directory only in the current directory, we can do

```
ls -d .
```

## Navigating directories

Perhaps the most useful command for directory is `cd` . If you want to switch to the home directory type

```
cd ~ .
```

The command `~` stands for home directory and `/` only stands for root directory. So you can switch to root directory by

```
cd / .
```

The command `..` stands for one level upper directory and `.` stands for current directory. So `ls ..` and `ls .` will do the same thing and `cd ..` will directs you one level up.

## Renaming, copying, and deleting directories

We shall use the command `mv` , `cp` and `rm` here. Though similar, there is some difference.

To move or copy a file into a directory, we can do

```
mv filename directory and  
cp filename directory respectively.
```

Let's try to move the files from `Chinese_poems` to one directory up. Also copy one poems to a new directory called `Poems` .

To move a directory into another we can do



```
mv directory1 directory2
```

However, for `cp`, there is a difference between

```
cp -r directory1/ directory2 and  
cp -r directory1 directory2.
```

Note you need to include the `-r` option (for “recursive”) because there are some files in a directory.

Try `cp -r Chinese_poems Poems` and `cp -r Chinese_poems/ Poems`.

To remove a directory, try `rmdir directory`. If not succeed, try `rm -rf directory`.

Finally, if you want to search certain string in a directory ( so some files in the folder might contain the string you want), try

```
grep -r stringname directory.
```

## Exercise

1. Starting in your home directory, make a directory `foo`, change into it, create a file `bar` with content “baz”, print out `bar` 's contents, and then `cd` back to the directory you came from.
2. Why the commands `'rm -rf /'` and ``rm -rf ~'` are very dangerous?
3. `-` stands for previous directory. What is the command if you want to switch to previous directory?