

# Intro to the command line

Lecture 2

BIOS 6660, Spring 2019

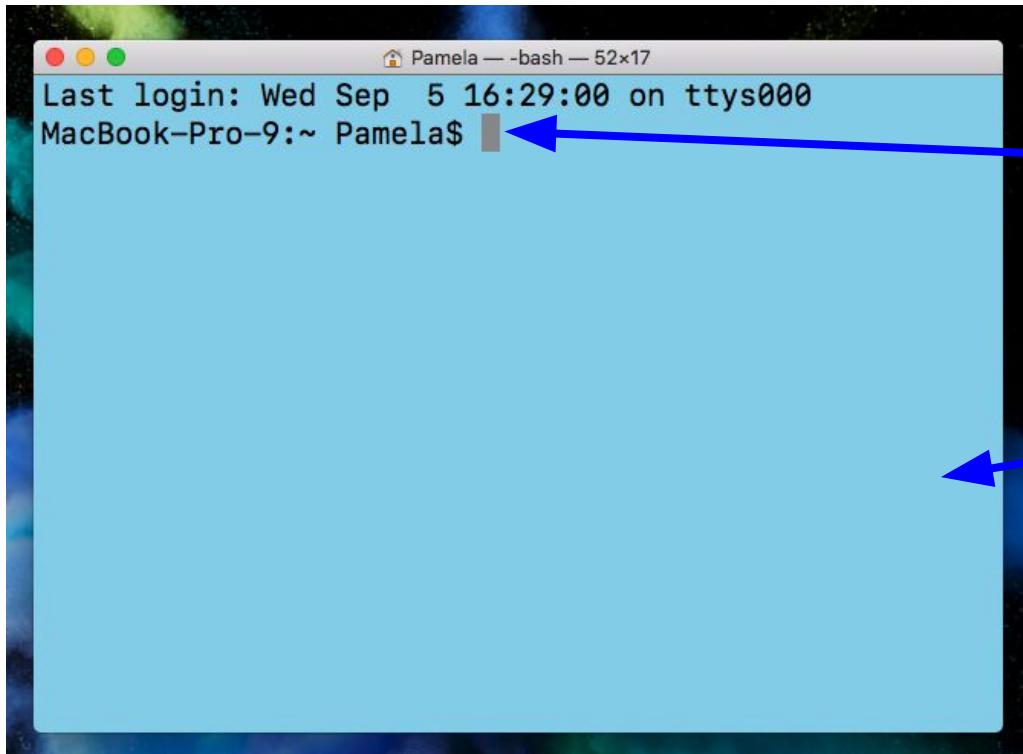
Instructor: Pam Russell



# Immediate and future plans

- ~~List every command~~
- Context
- How to think about command line
- Practical information
- Plenty of practice

# Shell vs. terminal



**Shell:** command line interface between user and operating system

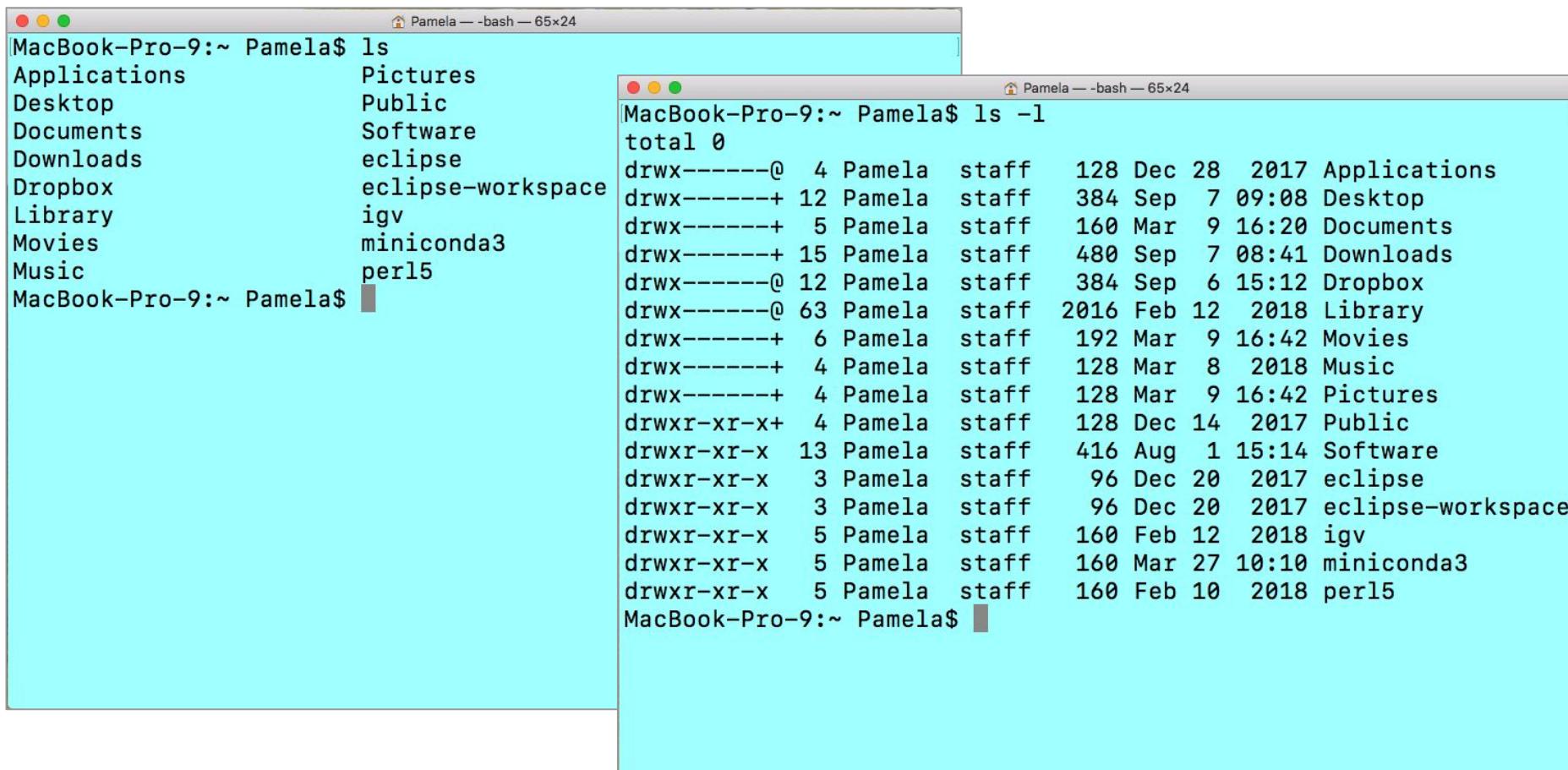
**Terminal:** a graphical interface for a shell

**Bash:** specific flavor of shell with specific commands

# What is a command?

Line of code that instructs computer to do something.

Single word followed by arguments;  
arguments usually start with a dash



The image shows two side-by-side terminal windows on a Mac OS X desktop. Both windows have a title bar 'Pamela — bash — 65x24' and a red, yellow, and green close button.

The left terminal window displays the output of the command 'ls'. It lists several directory names: Applications, Desktop, Documents, Downloads, Dropbox, Library, Movies, and Music. Each directory name is preceded by a space character.

```
MacBook-Pro-9:~ Pamela$ ls
Applications          Pictures
Desktop              Public
Documents             Software
Downloads            eclipse
Dropbox               eclipse-workspace
Library              igv
Movies               miniconda3
Music                perl5
MacBook-Pro-9:~ Pamela$
```

The right terminal window displays the output of the command 'ls -l'. This command provides a detailed listing of files and directories, including permissions, owner, group, file size, modification date, and name. The output is much longer than the standard 'ls' command.

```
MacBook-Pro-9:~ Pamela$ ls -l
total 0
drwx-----@ 4 Pamela  staff   128 Dec 28  2017 Applications
drwx-----+ 12 Pamela  staff  384 Sep  7 09:08 Desktop
drwx-----+ 5 Pamela  staff  160 Mar  9 16:20 Documents
drwx-----+ 15 Pamela  staff  480 Sep  7 08:41 Downloads
drwx-----@ 12 Pamela  staff  384 Sep  6 15:12 Dropbox
drwx-----@ 63 Pamela  staff  2016 Feb 12 2018 Library
drwx-----+ 6 Pamela  staff  192 Mar  9 16:42 Movies
drwx-----+ 4 Pamela  staff  128 Mar  8 2018 Music
drwx-----+ 4 Pamela  staff  128 Mar  9 16:42 Pictures
drwxr-xr-x+ 4 Pamela  staff  128 Dec 14  2017 Public
drwxr-xr-x  13 Pamela  staff  416 Aug  1 15:14 Software
drwxr-xr-x  3 Pamela  staff  96 Dec 20  2017 eclipse
drwxr-xr-x  3 Pamela  staff  96 Dec 20  2017 eclipse-workspace
drwxr-xr-x  5 Pamela  staff  160 Feb 12  2018 igv
drwxr-xr-x  5 Pamela  staff  160 Mar 27 10:10 miniconda3
drwxr-xr-x  5 Pamela  staff  160 Feb 10  2018 perl5
MacBook-Pro-9:~ Pamela$
```

# Google it

linux find file with name

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About 202,000,000 results (0.57 seconds)

[Find File Linux](#)

[Find Files in Linux](#)  
filtering objects in your system. You can use the command line tool **find** to search for files and folders that you want to be found and imported.

[Find Files in Linux](#)  
<https://www.linode.com/docs/guides/find-files-in-linux/>

Search for: Find File

linux change permissions

All Videos

About 68,900,000 results (0.57 seconds)

The **chmod** Command  
**change permissions** of files and directories. It is a command-line utility that changes the file mode bits of each specified file operand according to the mode掩码 and the optional user and group identifiers. If you are root or have appropriate permissions, you can change the permissions for other users.

[Linux Ownership and Permissions](#)  
[https://access.redhat.com/documentation/en-US/Red\\_Hat\\_Enterprise\\_Linux/6/html/Security\\_Guide/chap-File\\_Permissions.html](https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/6/html/Security_Guide/chap-File_Permissions.html)

linux view file

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## Linux And Unix Command To View File

1. cat command.
2. less command.
3. more command.
4. gnome-open command or xdg-open command (generic version) or kde-open command (kde version) – **Linux** gnome/kde desktop command to open any file.
5. open command – OS X specific command to open any file.

## Linux And Unix Command To View File - nixCraft

<https://www.cyberciti.biz/faq/unix-linux-command-to-view-file/>

# Stack Overflow

linux get all lines in file that match string

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**How to find lines containing a string in linux - Stack Overflow**  
<https://stackoverflow.com/questions/.../how-to-find-lines-containing-a-string-in-linux> ▾  
3 answers  
Aug 3, 2012 - I have a file in Linux, I would like to display lines which contain a specific string in that file, how to do this? ... grep 'pattern' file ... grep pattern filename ... It'll search subdirectories automatically and avoid files you'd ... first line text wanted text other text ... How do I find all files containing specific text on Linux?

How do I find all files containing specific text on ... 41 answers May 21, 2017  
shell - How to find lines containing any string from ... 5 answers Jan 20, 2015  
linux - How to grep for lines which contain particular ... 3 answers Oct 10, 2014  
bash - How to get the part of file after the line that ... 12 answers Aug 18, 2011

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## How to find lines containing a string in linux

I have a file in Linux, I would like to display lines which contain a specific string in that file, how to do this? **22**

linux string file search share edit flag 4

asked Aug 3 '12 at 14:30 by alwbtc 7,823 ● 37 ● 94 ● 146

5 man grep tells you what you want. – fdomig Aug 3 '12 at 14:31  
@fdomig : that should be an answer – leonbloy Aug 3 '12 at 14:32  
@leonbloy that is to easy :) – fdomig Aug 3 '12 at 14:33  
@fdomig - nonetheless it'll help others find the answer to this in the future – Brian Agnew Aug 3 '12 at 14:40

[add a comment](#)

**3 Answers** active oldest votes

The usual way to do this is with grep **39**

grep 'pattern' file share edit flag

answered Aug 3 '12 at 14:32 by knittl 145k ● 37 ● 218 ● 273

[add a comment](#)

# Manual pages

```
Pamela — bash — 83x31
MacBook-Pro-9:~ Pamela$ man pwd
```

```
Pamela — less - man pwd — 83x31
PWD(1)          BSD General Commands Manual          PWD(1)

NAME
    pwd -- return working directory name

SYNOPSIS
    pwd [-L | -P]

DESCRIPTION
    The pwd utility writes the absolute pathname of the current working
    directory to the standard output.

    Some shells may provide a builtin pwd command which is similar or
    identical to this utility. Consult the builtin(1) manual page.

    The options are as follows:

        -L      Display the logical current working directory.

        -P      Display the physical current working directory (all symbolic
               links resolved).

    If no options are specified, the -L option is assumed.

ENVIRONMENT
    Environment variables used by pwd:
        PWD  Logical current working directory.

:
```

Press **q** to exit

# Scrolling through previous commands

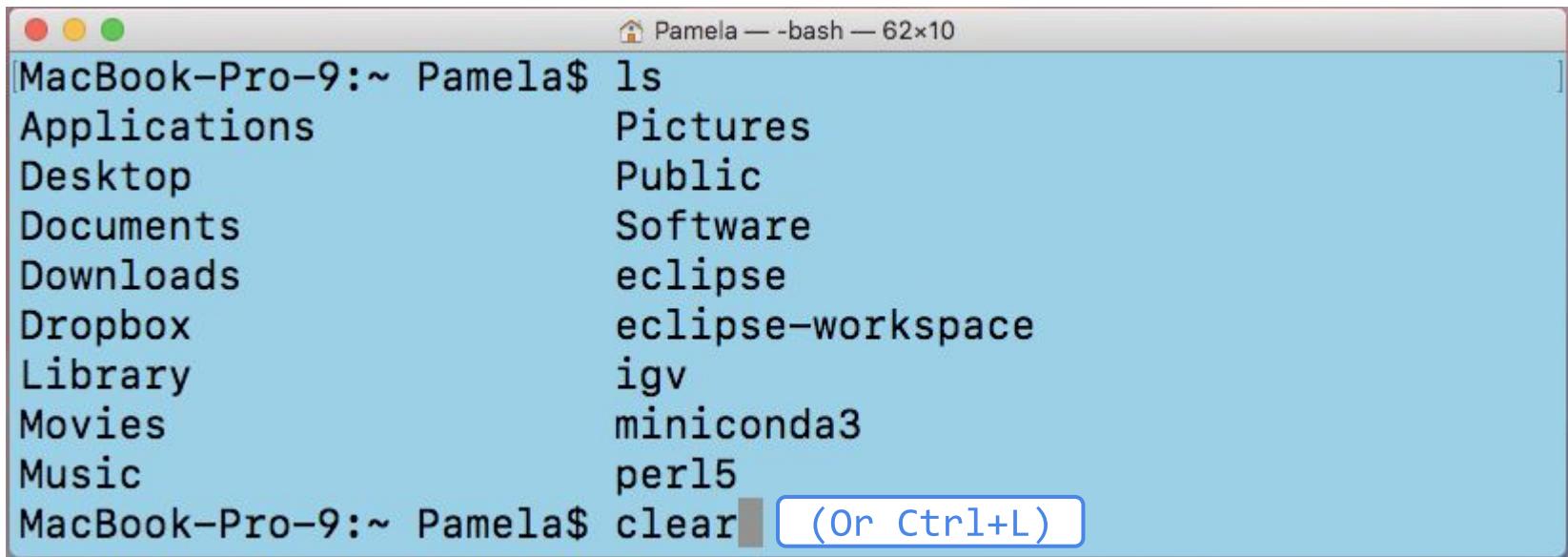
```
[MacBook-Pro-9:~ Pamela$ whoami  
Pamela  
MacBook-Pro-9:~ Pamela$]  
[MacBook-Pro-9:~ Pamela$ whoami  
Pamela  
MacBook-Pro-9:~ Pamela$ pwd  
/Users/Pamela  
MacBook-Pro-9:~ Pamela$]  
[MacBook-Pro-9:~ Pamela$ whoami  
Pamela  
MacBook-Pro-9:~ Pamela$ pwd  
/Users/Pamela  
MacBook-Pro-9:~ Pamela$ pwd ↑  
[MacBook-Pro-9:~ Pamela$ whoami  
Pamela  
MacBook-Pro-9:~ Pamela$ pwd  
/Users/Pamela  
MacBook-Pro-9:~ Pamela$ whoami ↑  
[MacBook-Pro-9:~ Pamela$ whoami  
Pamela  
MacBook-Pro-9:~ Pamela$ pwd  
/Users/Pamela  
MacBook-Pro-9:~ Pamela$ whoami  
Pamela  
MacBook-Pro-9:~ Pamela$
```

# Tab completion

The image shows a vertical sequence of five terminal windows, each with a title bar labeled "Pamela — -bash — 63x8". The windows are arranged from top to bottom, illustrating the process of completing a command line argument.

- Window 1:** The user types "MacBook-Pro-9:~ Pamela\$ du -h D". The letter "D" is highlighted with a red box.
- Window 2:** The user presses the TAB key. A blue box highlights the TAB key. The terminal shows the completion options: "Desktop/ Documents/ Downloads/ Dropbox/".
- Window 3:** The user types "MacBook-Pro-9:~ Pamela\$ du -h Doc". The letters "Doc" are highlighted with a red box. A blue box highlights the TAB key.
- Window 4:** The user presses the TAB key again. The terminal shows the completed path: "MacBook-Pro-9:~ Pamela\$ du -h Documents/". The letters "Documents/" are highlighted with a red box.
- Window 5:** The user presses the TAB key one more time. The terminal shows the final completed command: "MacBook-Pro-9:~ Pamela\$ du -h Documents/ 5.6M Documents/". The letters "5.6M" and "Documents/" are highlighted with a red box.

# Clearing the terminal window



A screenshot of a macOS terminal window titled "Pamela — -bash — 62x10". The window shows the output of the "ls" command, listing various directories and files. At the bottom, the user has typed "MacBook-Pro-9:~ Pamela\$ clear" and is awaiting the result. A blue box highlights the text "(Or Ctrl+L)".

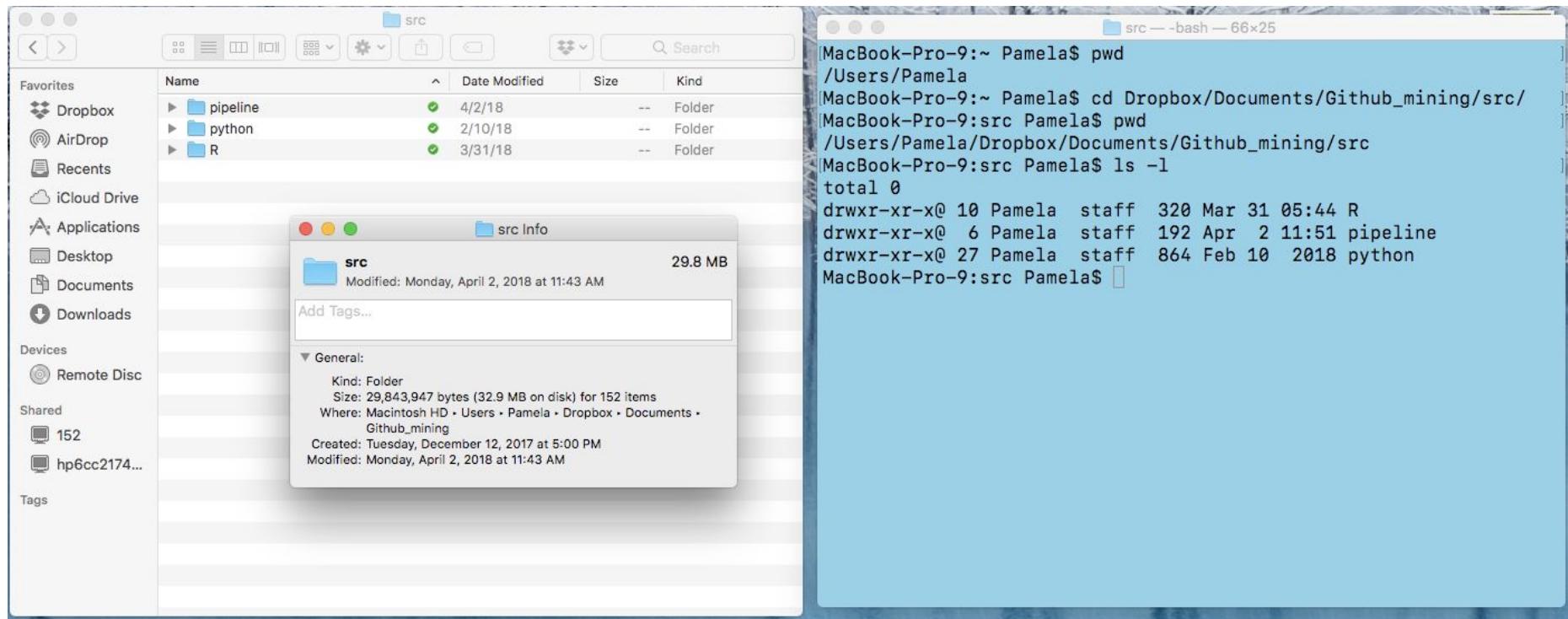
```
MacBook-Pro-9:~ Pamela$ ls
Applications          Pictures
Desktop              Public
Documents             Software
Downloads            eclipse
Dropbox               eclipse-workspace
Library              igv
Movies                miniconda3
Music                perl5
MacBook-Pro-9:~ Pamela$ clear (Or Ctrl+L)
```



A screenshot of a macOS terminal window titled "Pamela — -bash — 62x10". The window is completely blank, indicating that the "clear" command has been successfully executed.

```
MacBook-Pro-9:~ Pamela$
```

# Directory structure



# Directory structure

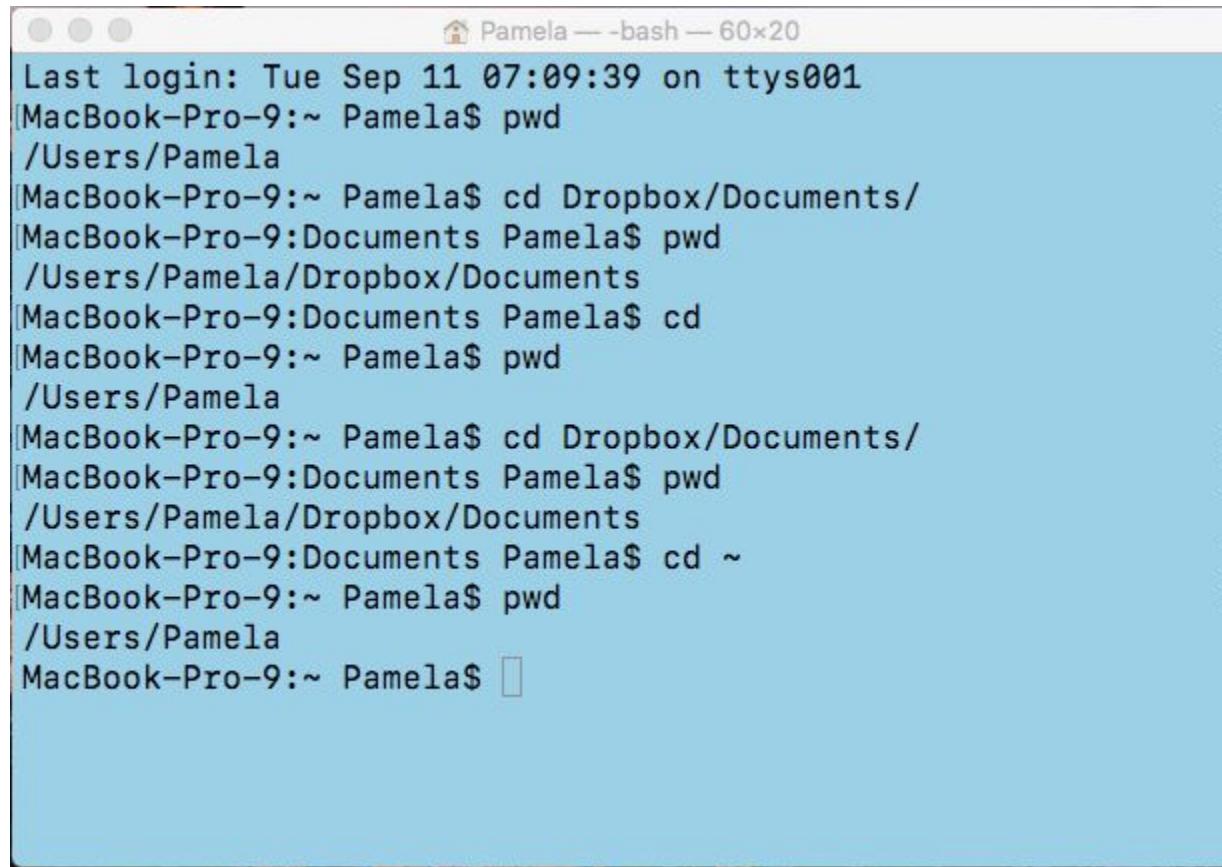
The image shows a Mac OS X desktop environment. On the left is a sidebar with sections for Favorites, Devices, Shared, and Tags. The main area is a Finder window titled 'src' containing a file list:

Name	Date Modified	Size	Kind
pipeline	4/2/18	--	Folder
python	2/10/18	--	Folder
R	3/31/18	--	Folder
archive	1/31/18	--	Folder
document_classification	1/31/18	--	Folder
exploratory_analysis	9/4/18	--	Folder
gender	2/4/18	--	Folder
ncbi	1/6/18	--	Folder
project_info.R	3/31/18	4 KB	R Source File

On the right is a terminal window titled 'src — bash — 74x25' showing the command-line history:

```
MacBook-Pro-9:~ Pamela$ pwd
/Users/Pamela
MacBook-Pro-9:~ Pamela$ cd Dropbox/Documents/Github_mining/src/
MacBook-Pro-9:src Pamela$ pwd
/Users/Pamela/Dropbox/Documents/Github_mining/src
MacBook-Pro-9:src Pamela$ ls -l
total 0
drwxr-xr-x@ 10 Pamela  staff  320 Mar 31 05:44 R
drwxr-xr-x@  6 Pamela  staff  192 Apr  2 11:51 pipeline
drwxr-xr-x@ 27 Pamela  staff  864 Feb 10 2018 python
MacBook-Pro-9:src Pamela$ ls -l R
total 8
drwxr-xr-x@  3 Pamela  staff   96 Jan 31 2018 archive
drwxr-xr-x@  7 Pamela  staff  224 Jan 31 2018 document_classification
drwxr-xr-x@ 14 Pamela  staff  448 Sep  4 16:27 exploratory_analysis
drwxr-xr-x@  5 Pamela  staff  160 Feb  4 2018 gender
drwxr-xr-x@  4 Pamela  staff  128 Jan  6 2018 ncbi
-rw-r--r--@  1 Pamela  staff 3800 Mar 31 05:44 project_info.R
MacBook-Pro-9:src Pamela$
```

# Home directory



Last login: Tue Sep 11 07:09:39 on ttys001  
[MacBook-Pro-9:~ Pamela\$ pwd  
/Users/Pamela  
[MacBook-Pro-9:~ Pamela\$ cd Dropbox/Documents/  
[MacBook-Pro-9:Documents Pamela\$ pwd  
/Users/Pamela/Dropbox/Documents  
[MacBook-Pro-9:Documents Pamela\$ cd  
[MacBook-Pro-9:~ Pamela\$ pwd  
/Users/Pamela  
[MacBook-Pro-9:~ Pamela\$ cd Dropbox/Documents/  
[MacBook-Pro-9:Documents Pamela\$ pwd  
/Users/Pamela/Dropbox/Documents  
[MacBook-Pro-9:Documents Pamela\$ cd ~  
[MacBook-Pro-9:~ Pamela\$ pwd  
/Users/Pamela  
MacBook-Pro-9:~ Pamela\$

`~` is shorthand for home directory

`cd` with no arguments or `cd ~` returns to home directory

# Root directory

```
MacBook-Pro-9:~ Pamela$ cd /
MacBook-Pro-9:/ Pamela$ pwd
/
MacBook-Pro-9:/ Pamela$ ls -l Users/Pamela/
total 0
drwx-----@ 4 Pamela  staff   128 Dec 28  2017 Applications
drwx-----+ 8 Pamela  staff   256 Sep 11 07:55 Desktop
drwx-----+ 5 Pamela  staff   160 Mar  9  2018 Documents
drwx-----+ 6 Pamela  staff   192 Sep 10 11:23 Downloads
drwx-----@ 12 Pamela staff   384 Sep  6 15:12 Dropbox
drwx-----@ 63 Pamela staff  2016 Feb 12  2018 Library
drwx-----+ 6 Pamela  staff   192 Mar  9  2018 Movies
drwx-----+ 4 Pamela  staff   128 Mar  8  2018 Music
drwx-----+ 4 Pamela  staff   128 Mar  9  2018 Pictures
drwxr-xr-x+ 4 Pamela  staff   128 Dec 14  2017 Public
drwxr-xr-x  13 Pamela staff   416 Aug  1 15:14 Software
drwxr-xr-x  3 Pamela  staff   96 Dec 20  2017 eclipse
drwxr-xr-x  3 Pamela  staff   96 Dec 20  2017 eclipse-workspace
drwxr-xr-x  5 Pamela  staff   160 Feb 12  2018 igv
drwxr-xr-x  5 Pamela  staff   160 Mar 27 10:10 miniconda3
drwxr-xr-x  5 Pamela  staff   160 Feb 10  2018 perl5
MacBook-Pro-9:/ Pamela$ █
```

Root directory is the top of the directory tree (entire computer)

/ is shorthand for root directory

cd / navigates to root directory

# Current working directory

```
MacBook-Pro-9:/ Pamela$ cd
MacBook-Pro-9:~ Pamela$ cd Dropbox/Documents/Github_mining/src/
MacBook-Pro-9:src Pamela$ ls -l
total 0
drwxr-xr-x@ 10 Pamela  staff  320 Mar 31 05:44 R
drwxr-xr-x@  6 Pamela  staff  192 Apr  2 11:51 pipeline
drwxr-xr-x@ 27 Pamela  staff  864 Feb 10  2018 python
MacBook-Pro-9:src Pamela$ ls -l .
total 0
drwxr-xr-x@ 10 Pamela  staff  320 Mar 31 05:44 R
drwxr-xr-x@  6 Pamela  staff  192 Apr  2 11:51 pipeline
drwxr-xr-x@ 27 Pamela  staff  864 Feb 10  2018 python
MacBook-Pro-9:src Pamela$ ls -l R
total 8
drwxr-xr-x@  3 Pamela  staff    96 Jan 31  2018 archive
drwxr-xr-x@  7 Pamela  staff   224 Jan 31  2018 document_classification
drwxr-xr-x@ 14 Pamela  staff   448 Sep  4 16:27 exploratory_analysis
drwxr-xr-x@  5 Pamela  staff   160 Feb  4  2018 gender
drwxr-xr-x@  4 Pamela  staff   128 Jan  6  2018 ncbi
-rw-r--r--@  1 Pamela  staff  3800 Mar 31 05:44 project_info.R
MacBook-Pro-9:src Pamela$ ls -l ./R
total 8
drwxr-xr-x@  3 Pamela  staff    96 Jan 31  2018 archive
drwxr-xr-x@  7 Pamela  staff   224 Jan 31  2018 document_classification
drwxr-xr-x@ 14 Pamela  staff   448 Sep  4 16:27 exploratory_analysis
drwxr-xr-x@  5 Pamela  staff   160 Feb  4  2018 gender
drwxr-xr-x@  4 Pamela  staff   128 Jan  6  2018 ncbi
-rw-r--r--@  1 Pamela  staff  3800 Mar 31 05:44 project_info.R
MacBook-Pro-9:src Pamela$
```

Working directory is the directory you are in right now

- is shorthand for current working directory

[pwd](#) prints current working directory

# Parent directory

```
[MacBook-Pro-9:src Pamela$ pwd  
/Users/Pamela/Dropbox/Documents/Github_mining/src  
[MacBook-Pro-9:src Pamela$ ls -l ..  
total 16  
-rw-r--r--@ 1 Pamela staff 1071 Jul 26 2017 LICENSE  
-rw-r--r--@ 1 Pamela staff 2253 Sep 4 11:24 README.md  
drwxr-xr-x@ 10 Pamela staff 320 Sep 4 15:14 key  
drwxr-xr-x@ 6 Pamela staff 192 Feb 26 2018 paper  
drwxr-xr-x@ 4 Pamela staff 128 May 4 16:51 paper_backups  
drwxr-xr-x@ 5 Pamela staff 160 Jun 11 11:55 presentations  
drwxr-xr-x@ 7 Pamela staff 224 Feb 16 2018 results  
drwxr-xr-x@ 10 Pamela staff 320 Apr 2 11:43 src  
drwxr-xr-x@ 4 Pamela staff 128 Feb 26 2018 structure  
[MacBook-Pro-9:src Pamela$ cd ..  
[MacBook-Pro-9:Github_mining Pamela$ pwd  
/Users/Pamela/Dropbox/Documents/Github_mining  
[MacBook-Pro-9:Github_mining Pamela$ ls -l  
total 16  
-rw-r--r--@ 1 Pamela staff 1071 Jul 26 2017 LICENSE  
-rw-r--r--@ 1 Pamela staff 2253 Sep 4 11:24 README.md  
drwxr-xr-x@ 10 Pamela staff 320 Sep 4 15:14 key  
drwxr-xr-x@ 6 Pamela staff 192 Feb 26 2018 paper  
drwxr-xr-x@ 4 Pamela staff 128 May 4 16:51 paper_backups  
drwxr-xr-x@ 5 Pamela staff 160 Jun 11 11:55 presentations  
drwxr-xr-x@ 7 Pamela staff 224 Feb 16 2018 results  
drwxr-xr-x@ 10 Pamela staff 320 Apr 2 11:43 src  
drwxr-xr-x@ 4 Pamela staff 128 Feb 26 2018 structure  
MacBook-Pro-9:Github_mining Pamela$ ]
```

Parent directory is one level “up” from working directory

.. is shorthand for parent directory

cd .. navigates “up” one level to parent directory

# Absolute and relative paths

```
[MacBook-Pro-9:Github_mining Pamela$ pwd  
/Users/Pamela/Dropbox/Documents/Github_mining  
[MacBook-Pro-9:Github_mining Pamela$ ls -l  
total 16  
-rw-r--r--@ 1 Pamela staff 1071 Jul 26 2017 LICENSE  
-rw-r--r--@ 1 Pamela staff 2253 Sep 4 11:24 README.md  
drwxr-xr-x@ 10 Pamela staff 320 Sep 4 15:14 key  
drwxr-xr-x@ 6 Pamela staff 192 Feb 26 2018 paper  
drwxr-xr-x@ 4 Pamela staff 128 May 4 16:51 paper_backups  
drwxr-xr-x@ 5 Pamela staff 160 Jun 11 11:55 presentations  
drwxr-xr-x@ 7 Pamela staff 224 Feb 16 2018 results  
drwxr-xr-x@ 10 Pamela staff 320 Apr 2 11:43 src  
drwxr-xr-x@ 4 Pamela staff 128 Feb 26 2018 structure  
[MacBook-Pro-9:Github_mining Pamela$ ls -l src/  
total 0  
drwxr-xr-x@ 10 Pamela staff 320 Mar 31 05:44 R  
drwxr-xr-x@ 6 Pamela staff 192 Apr 2 11:51 pipeline  
drwxr-xr-x@ 27 Pamela staff 864 Feb 10 2018 python  
[MacBook-Pro-9:Github_mining Pamela$ ls -l /Users/Pamela/Dropbox/Documents/Gith  
ub_mining/src/  
total 0  
drwxr-xr-x@ 10 Pamela staff 320 Mar 31 05:44 R  
drwxr-xr-x@ 6 Pamela staff 192 Apr 2 11:51 pipeline  
drwxr-xr-x@ 27 Pamela staff 864 Feb 10 2018 python  
MacBook-Pro-9:Github_mining Pamela$ ]
```

Current working directory

`src/` is a relative path with respect to current working directory

The same directory as an absolute path, starting all the way from the root directory (`/`)

# Viewing file contents with less

The screenshot shows a macOS terminal window with two panes. The top pane displays the command `MacBook-Pro-9:data Pamela$ less repo_features_main.txt`. The bottom pane shows the output of the `less` command, which is a list of feature names from the file `repo_features_main.txt`. The features listed include: repo\_name, license, first\_commit, last\_commit, commit\_span\_days, commit\_authors\_female, commit\_authors\_male, commit\_authors\_no\_gender, team\_type\_gender, shannon\_commit\_author\_gender, commit\_authors, commits\_female, commits\_male, commits\_no\_gender, shannon\_commits\_gender, commits\_title, paper\_authors\_female, paper\_authors\_male, paper\_authors\_no\_gender, team\_type\_paper\_authors, first\_author\_gender, last\_author\_gender, shannon\_paper\_authors, paper\_authors, is\_fork, stargazers\_count, watchers\_count, forks\_count, subscribers\_count, journal\_date\_pubmed, num\_citations\_pmc, num\_citations\_per\_week\_pmc\_minus\_2\_years, num\_langs, total\_file\_size, largest\_file\_size, mean\_file\_size, num\_langs\_no\_data, total\_file\_size\_no\_data, largest\_file\_size\_no\_data, mean\_file\_size\_no\_data, num\_days\_new\_files\_added, mean\_new\_files\_per\_day\_with\_new\_files, mean\_day\_new\_files\_added, mean\_files\_added\_per\_month, pct\_months\_new\_files\_added, consecutive\_months\_with\_new\_files\_added, consecutive\_months\_no\_new\_files\_added, median\_commit\_message\_len, mean\_commit\_message\_len, mean\_commits\_per\_month, pct\_months\_with\_commits, consecutive\_months\_with\_commits, consecutive\_months\_no\_commits, commits\_after\_article\_in\_pubmed, includes\_Python, bytes\_Python, pct\_bytes\_no\_data\_Python, includes\_Bourne\_Shell, bytes\_Bourne\_Shell, pct\_bytes\_no\_data\_Bourne\_Shell, includes\_R, bytes\_R, pct\_bytes\_no\_data\_R, includes\_C\_Cpp\_Header, bytes\_C\_Cpp\_Header, pct\_bytes\_no\_data\_C\_Cpp\_Header, includes\_Perl, bytes\_Perl, pct\_bytes\_no\_data\_Perl, includes\_Cpp, bytes\_Cpp, pct\_bytes\_no\_data\_Cpp, includes\_JavaScript, bytes\_JavaScript, pct\_bytes\_no\_data\_JavaScript, includes\_C, bytes\_C, pct\_bytes\_no\_data\_C, includes\_Java, bytes\_Java, pct\_bytes\_no\_data\_Java, includes\_Bourne\_Again\_Shell, bytes\_Bourne\_Again\_Shell, pct\_bytes\_no\_data\_Bourne\_Again\_Shell, includes\_MATLAB, bytes\_MATLAB, pct\_bytes\_no\_data\_MATLAB, includes\_m4, bytes\_m4, pct\_bytes\_no\_data\_m4, includes\_SQL, bytes\_SQL, pct\_bytes\_no\_data\_SQL, repo\_features\_main.txt.

```
repo_name      license first_commit      last_commit      commit_span_days
                commit_authors_female   commit_authors_male   commit_authors_no_gender
                team_type_gender       shannon_commit_author_gender   commit_authors
                commits_female         commits_male        commits_no_gender       shannon_commits_gender
                commits_title          paper_authors_female   paper_authors_male        paper_authors_no_gender
                team_type_paper_authors first_author_gender   last_author_gender
                shannon_paper_authors  paper_authors        is_fork stargazers_count
                watchers_count         forks_count        subscribers_count      journal date_pubmed
                num_citations_pmc     num_citations_per_week_pmc_minus_2_years
                num_langs              total_file_size    largest_file_size      mean_file_size
                num_langs_no_data      total_file_size_no_data  largest_file_size_no_data
                mean_file_size_no_data num_days_new_files_added  mean_new_files_per_day_with_new_files
                mean_day_new_files_added  mean_files_added_per_month
                pct_months_new_files_added consecutive_months_with_new_files_added
                consecutive_months_no_new_files_added median_commit_message_len
                mean_commit_message_len mean_commits_per_month  pct_months_with_commits
                consecutive_months_with_commits consecutive_months_no_commits  commits_after_article_in_pubmed
                includes_Python        bytes_Python        pct_bytes_no_data_Python
                includes_Bourne_Shell   bytes_Bourne_Shell  pct_bytes_no_data_Bourne_Shell
                includes_R              bytes_R            pct_bytes_no_data_R
                includes_C_Cpp_Header  bytes_C_Cpp_Header  includes_Perl
                bytes_C_Cpp_Header    pct_bytes_no_data_C_Cpp_Header  includes_Perl
                bytes_Perl             pct_bytes_no_data_Perl
                includes_Cpp            bytes_Cpp          pct_bytes_no_data_Cpp
                includes_JavaScript    bytes_JavaScript    pct_bytes_no_data_JavaScript
                includes_C              bytes_C            pct_bytes_no_data_C
                includes_Java           bytes_Java          pct_bytes_no_data_Java
                bytes_Java             pct_bytes_no_data_Java
                includes_Bourne_Again_Shell  bytes_Bourne_Again_Shell
                pct_bytes_no_data_Bourne_Again_Shell  includes_MATLAB
                bytes_MATLAB           pct_bytes_no_data_MATLAB
                includes_m4             bytes_m4          pct_bytes_no_data_m4
                includes_SQL            bytes_SQL          pct_bytes_no_data_SQL
                repo_features_main.txt
```

# Chop lines with -S on the command line or within the less window

```
[MacBook-Pro-9:data Pamela$ less -S repo_features_main.txt]
```

```
repo_name      license first_commit    last_commit    commit_span_days
smirarab/binning   NA     2014-12-16T20:43:01Z  2016-07-20T21:06:21Z
oliverhampton/SVachra  NA     2014-03-11T18:11:03Z  2014-07-21T14:44:03Z
CzirjakGabor/PrinCCes  NA     2015-07-20T13:54:08Z  2015-09-28T16:03:21Z
rothlab/chromozoom   agpl-3.0  2012-05-01T06:14:28Z  2017-09-26T18:
sanger-pathogens/mlst_check other   2012-07-23T15:22:08Z  2017-05-15T16:
chvlyl/ZIBR        NA     2016-01-29T01:05:06Z  2017-06-22T00:04:36Z  511
ORCABioinfo/ORCAcode  NA     2014-06-10T09:46:18Z  2014-08-18T12:27:34Z
radamsRHA/GppFst     NA     2016-09-20T02:18:32Z  2017-06-18T00:33:38Z
Ensembl/ensembl-rest apache-2.0   2011-03-08T16:20:00Z  2017-09-21T08:
kandlinf/agennt     NA     2017-03-24T12:32:21Z   2017-08-10T13:56:35Z  140
aherbert/GDSC        gpl-3.0  2014-06-19T13:39:20Z  2017-09-08T14:10:10Z  1178
zhouxiaofan1983/iWGS gpl-2.0   2014-11-11T20:37:46Z  2016-08-05T04:38:03Z
TheJacksonLaboratory/CloudNeo apache-2.0   2016-11-14T02:15:17Z  2017-0
ktrappe/daisy        gpl-3.0  2015-09-15T08:27:12Z  2017-08-31T16:24:16Z  717
anwala/NicheSimulation other   2016-02-25T16:51:57Z  2016-02-28T17:56:30Z
cbib/MICADo          other   2015-07-03T11:55:54Z  2016-11-10T11:49:10Z  497
jfpresley2/lipid-droplet-segmentation gpl-2.0   2014-08-12T19:18:51Z  2014-0
uomsystemsbiology/LMMEI-miR-miner   mit     2016-01-11T23:12:50Z  2016-1
biocore/deblur        bsd-3-clause 2015-01-20T19:34:02Z  2017-09-12T20:40:13Z
becklab/SexLinked     NA     2015-07-14T16:33:44Z  2015-07-22T14:51:04Z
hcorrada/methylFlow   other   2014-03-10T16:48:40Z  2016-10-10T10:23:05Z
dschlauch/stego       NA     2016-07-05T21:48:20Z  2016-07-21T21:36:24Z  17
deweylab/metasra-pipeline  NA     2016-11-24T05:09:42Z  2017-09-21T20:
raivokolde/seqlm      NA     2013-10-08T09:33:06Z  2017-04-02T15:33:17Z
mojones/afterParty2    NA     2011-10-05T16:09:28Z  2014-05-30T11:01:37Z
ts404/CysBar          NA     2015-03-04T06:48:38Z  2016-01-28T04:48:16Z  331
tamjidul/DisPredict_v1.0  NA     2015-09-02T15:22:49Z  2015-09-02T15:
```

repo\_features\_main.txt

# Helpful commands within less window

Chop long lines: `-S + enter`

Return to beginning of file: `g`

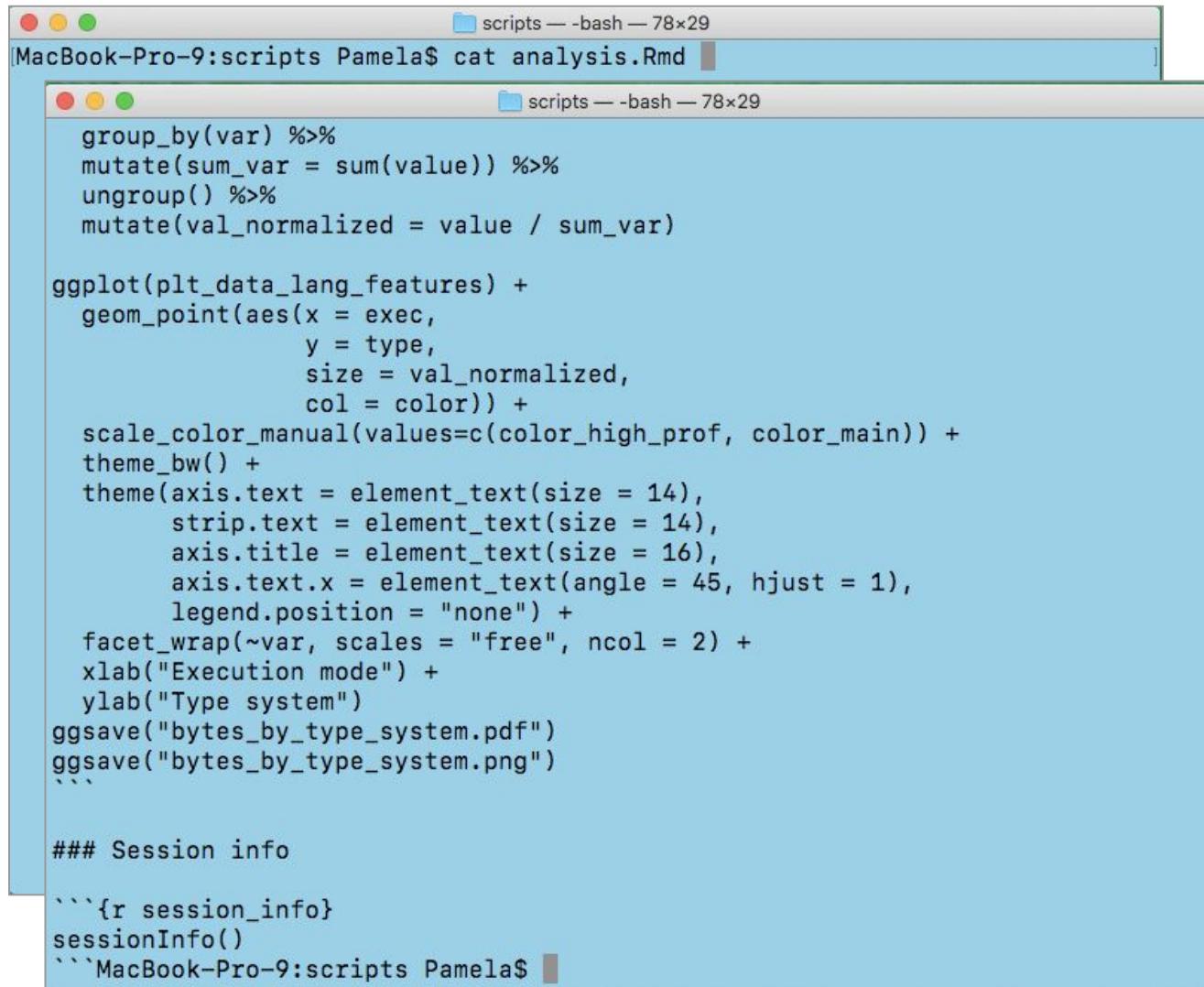
Scroll down one screen: `spacebar`

Scroll up one screen: `b`

Skip to end of file: `shift+F` (`ctrl+C` to return to normal less window)

Quit and return to command line: `q`

# Printing file contents to the terminal: **cat**



The screenshot shows a macOS terminal window with two tabs. The top tab is titled "scripts — -bash — 78x29" and contains the command "MacBook-Pro-9:scripts Pamela\$ cat analysis.Rmd". The bottom tab is also titled "scripts — -bash — 78x29" and displays the contents of the R Markdown file "analysis.Rmd". The R code includes ggplot2 syntax for creating a scatter plot, setting axis text sizes, and facet wrapping, followed by ggsave commands to save the plot as PDF and PNG files, and session info at the end.

```
group_by(var) %>%
  mutate(sum_var = sum(value)) %>%
  ungroup() %>%
  mutate(val_normalized = value / sum_var)

ggplot(plt_data_lang_features) +
  geom_point(aes(x = exec,
                 y = type,
                 size = val_normalized,
                 col = color)) +
  scale_color_manual(values=c(color_high_prof, color_main)) +
  theme_bw() +
  theme(axis.text = element_text(size = 14),
        strip.text = element_text(size = 14),
        axis.title = element_text(size = 16),
        axis.text.x = element_text(angle = 45, hjust = 1),
        legend.position = "none") +
  facet_wrap(~var, scales = "free", ncol = 2) +
  xlab("Execution mode") +
  ylab("Type system")
ggsave("bytes_by_type_system.pdf")
ggsave("bytes_by_type_system.png")
```

### Session info

```{r session_info}
sessionInfo()
```
MacBook-Pro-9:scripts Pamela$
```

**cat** prints the entire contents of the file to the screen and returns to the command prompt

You can scroll up to see the beginning of the file

# Printing file contents to the terminal: head and tail

The image displays three separate terminal windows, each showing a different command being run and its output.

- Top Terminal:** Shows the command `head analysis.Rmd`. The output includes the YAML header of the R Markdown file, followed by the first few lines of the R code block, which starts with ````{r setup, include=FALSE}`.
- Middle Terminal:** Shows the command `tail analysis.Rmd`. The output shows the final lines of the R code block, specifically the `ggsave` calls to generate PDF and PNG files, and the session info at the bottom.
- Bottom Terminal:** Shows the command `head -3 analysis.Rmd`. The output is identical to the top terminal's output, showing the first three lines of the R Markdown file.

# Other basic commands to practice

Create new directory: `mkdir`

Create a new empty file: `touch`

Move or rename a file: `mv`

Copy a file into same or other directory: `cp`

Delete a file<sup>\*</sup>: `rm`

\* There is no “undo” or “trash bin” in Linux, so you should probably avoid deleting things from the command line.

# Commands call programs

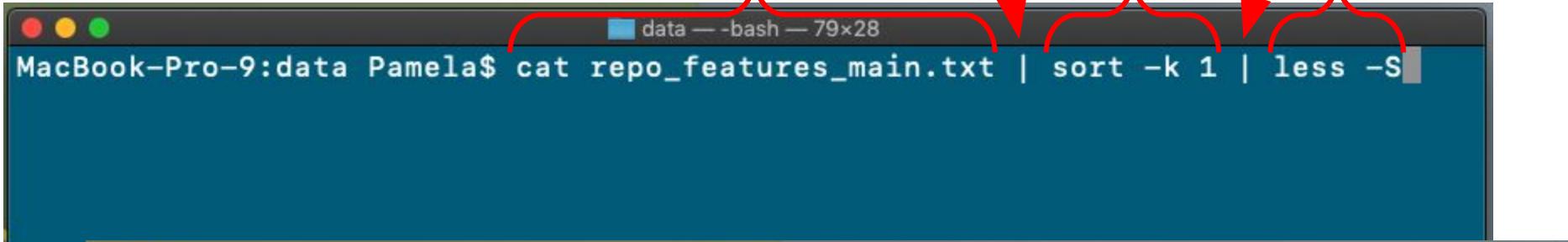
`cd`, `cat`, `head`, `mkdir`, etc., are programs that come installed with every Linux distribution.

# Killer feature: pipes

Many programs can run with input from a file or an input stream

“Pipe” the output of one program into the input of another program

# Pipe example



Print file contents

Pipe

Sort input data by first column and print results

Pipe

View input data

```
MacBook-Pro-9:data Pamela$ cat repo_features_main.txt | sort -k 1 | less -S
```

| Column 1                  | Column 2     | Column 3             | Column 4             | Column 5 |
|---------------------------|--------------|----------------------|----------------------|----------|
| 0asa/TTree-source         | bsd-2-clause | 2014-01-20T08:33:12Z | 2014-10-20T15:0      |          |
| 347033139/isomiR2Function | NA           | 2016-06-14T08:44:01Z | 2017-10-09T02:2      |          |
| 3d-e-chem/3D-e-Chem-VM    | apache-2.0   | 2016-01-11T21:10:32Z | 2017-04-18T08:4      |          |
| 4ment/seqotron            | gpl-3.0      | 2015-05-18T07:11:09Z | 2017-07-29T09:58:09Z | 804      |
| 4ndr01d3/biosual          | other        | 2012-11-23T10:27:15Z | 2014-11-20T17:23:18Z |          |
| A1kmm/sbasetram           | agpl-3.0     | 2009-07-09T21:54:04Z | 2010-01-25T21:26:14Z |          |
| ABCgrp/DORAEMON           | gpl-2.0      | 2016-10-27T12:17:46Z | 2016-10-27T12:37:15Z | 1        |
| ABI-Software/ICMA         | NA           | 2014-09-25T03:50:08Z | 2015-03-06T03:27:55Z |          |
| ADAC-UoN/PIMMS            | gpl-2.0      | 2014-12-03T13:33:24Z | 2015-03-31T11:45:33Z | 119      |
| ALLBio/allbiotc2          | NA           | 2013-03-19T17:44:31Z | 2014-08-01T12:36:44Z |          |
| AdmiralenOla/Scoary       | gpl-3.0      | 2016-02-03T13:05:20Z | 2017-10-04T12:24:28Z |          |
| AltschulerWu-Lab/PHOCOS   | NA           | 2016-05-11T00:09:02Z | 2016-05-11T00:12:35Z |          |
| AndersenLab/VCF-kit       | mit          | 2014-07-16T16:27:41Z | 2017-09-26T16:36:37Z |          |
| Anderson-Lab/SNV-DA       | mit          | 2015-02-23T17:30:06Z | 2016-11-07T00:34:18Z |          |
| ArlenCHOP/affyLumCNA      | NA           | 2014-05-12T15:25:24Z | 2015-05-08T14:59:26Z |          |
| ArtPoon/kamphir           | bsd-3-clause | 2014-12-03T00:37:40Z | 2017-02-19T14:58:26Z |          |

# Killer feature: awk

A small text processing language

Embed awk statements into commands

- Print matching lines
- Print selected fields
- Lots of other text processing...

# Simple awk example

The screenshot shows a macOS terminal window titled "data — bash — 85x29". The command entered is:

```
MacBook-Pro-9:data Pamela$ cat repo_features_main.txt | awk '{print $2}' | sort -u
```

The output of the command is a list of unique file features:

- Print file contents (red bracket above the command)
- Print column 2 of input data (red bracket above the awk command)
- Sort input data and print unique rows (red bracket above the sort command)

Output:

```
NA
afl-3.0
agpl-3.0
apache-2.0
artistic-2.0
bsd-2-clause
bsd-3-clause
cc-by-sa-4.0
cc0-1.0
epl-1.0
gpl-2.0
gpl-3.0
isc
lgpl-2.1
lgpl-3.0
license
mit
osl-3.0
other
```

MacBook-Pro-9:data Pamela\$

# Awk resources

One liners:

<http://tuxgraphics.org/~guido/scripts/awk-one-liner.html>

Awk tutorial:

<http://www.grymoire.com/Unix/Awk.html>

# Mixing genomic programs and Linux programs

```
MacBook-Pro-9:SamBam Pamela$ samtools view ex1_refresh.bam | less -S
```

```
SamBam — less -S — 123x29

EAS56_57:6:190:289:82 69 chr1 100 0 * = 100 0 CTCAAGGTTGTTGCAAGGGGGTCTATGTGAACAAA
EAS56_57:6:190:289:82 137 chr1 100 73 35M = 100 0 AGGGGTGCAGAGCCGAGTCACGGGTTGCCAGCAC
EAS51_64:3:190:727:308 99 chr1 103 99 35M = 263 195 GGTGCAGAGCCGAGTCACGGGTTGCCAGCACAGG
EAS112_34:7:141:80:875 99 chr1 110 99 35M = 265 190 AGCCGAGTCACGGGTTGCCAGCACAGGGCTAA
EAS219_FC30151:3:40:1128:1940 163 chr1 112 99 35M = 291 214 CCGAGTCACGGGTTGCCAGCACAGGG
EAS51_62:5:290:319:736 69 chr1 113 0 * = 113 0 GTTCTCAAGGTTGTTGCAAGGGGGTCTATGTGAAC
EAS51_62:5:290:319:736 137 chr1 113 73 35M = 113 0 CGAGTCACGGGTTGCCAGCACAGGGCTTAACCT
B7_597:2:132:493:921 69 chr1 119 0 * = 119 0 GTTCTCAAGGTTGTTGCAAGGGGGTCTATGTGAAC
B7_597:2:132:493:921 137 chr1 119 75 35M = 119 0 ACGGGGTTGCCAGCACAGGGCTTAACCTCTGGT
EAS114_30:7:283:799:560 163 chr1 121 66 35M = 283 197 GGGGTTGCCAGCACAGGGGCTTAACCTCTGGTAC
EAS192_3:1:225:195:543 99 chr1 123 99 35M = 299 211 GTTGGCCAGCACAGGGGCTTAACCTCTGGTACTG
B7_589:6:114:714:317 99 chr1 126 99 35M = 311 220 TGCCAGCACAGGGCTTAACCTCTGGTACTGCCA
EAS114_39:1:70:147:84 163 chr1 128 73 35M = 285 192 CCAGCACAGGGGCTTAACCTCTGGTACTGCCAGA
EAS188_7:2:187:227:818 163 chr1 129 99 35M = 290 196 CAGCACAGGGGCTTAACCTCTGGTACTGCCAGAG
EAS1_97:4:77:29:126 99 chr1 131 99 35M = 315 219 GCACAGGGGCTTAACCTCTGGTACTGCCAGAGCT
EAS114_30:4:327:795:103 99 chr1 133 99 35M = 302 204 ACAGGGGCTTAACCTCTGGTACTGCCAGAGCTC
EAS114_30:3:139:117:262 69 chr1 135 0 * = 135 0 GTTCTCAAGGTTGTTGCAAGGGGGTCTATGTGAAC
EAS114_30:3:139:117:262 137 chr1 135 76 35M = 135 0 AGGGGCTTAACCTCTGGTACTGCCAGAGCTGCTG
EAS219_FC30151:5:29:817:854 73 chr1 135 77 35M = 135 0 AGGGGCTTAACCTCTGGTACTGCCAGAGCTGGCAG
EAS219_FC30151:5:29:817:854 133 chr1 135 0 * = 135 0 GTTCTCAAGGTTGTTGCAAGGGGGTTT
EAS192_3:6:170:169:57 163 chr1 138 99 35M = 296 193 GGCTTGACCTCTGGTACTGCCAGAGCTGCTGGCC
B7_595:4:84:802:737 99 chr1 140 68 35M = 284 179 CTTAACCTCTGGTACTGCCAGAGCTGCTGGCAAG
```

# What are Linux and Unix?

Unix started in the 1960s and grew rapidly

Unix philosophy: combine small programs to do complex tasks  
(commands are programs)

Mac OS is similar to Unix

Linux = free alternative to Unix developed in the 1990s

User experience with Unix and Linux is largely the same



# Your computer vs. Yampa

Yampa is a remote Linux server that you log into. It has more compute power than a laptop for genomic analyses later in the course.

If you have a Mac: it runs a Unix-like operating system under the hood, with the terminal giving a similar experience to Yampa

If you use Windows: modern Windows distributions include a Linux "Subsystem"; you have to go through some steps to use it

# Version control with Git and GitHub

Lecture 2  
BIOS 6660, Spring 2019  
Instructor: Pam Russell



# Version control

Maintaining an archive of snapshots throughout project life cycle

# Version control for record keeping

Karen Cranston  
@kcranstn

**@mtholder** motivating git: You mostly collaborate with yourself, and me-from-two-months-ago never responds to email.  
**@swcarpentry**

7:23 AM - 23 Aug 2013

29 Retweets 20 Likes

Reply 29 Like 20

<https://twitter.com/kcranstn/status/370914072511791104>

# Version control for protection



# Version control for collaboration



# What is Git?

Command line program that lets you track versions of files, e.g. code

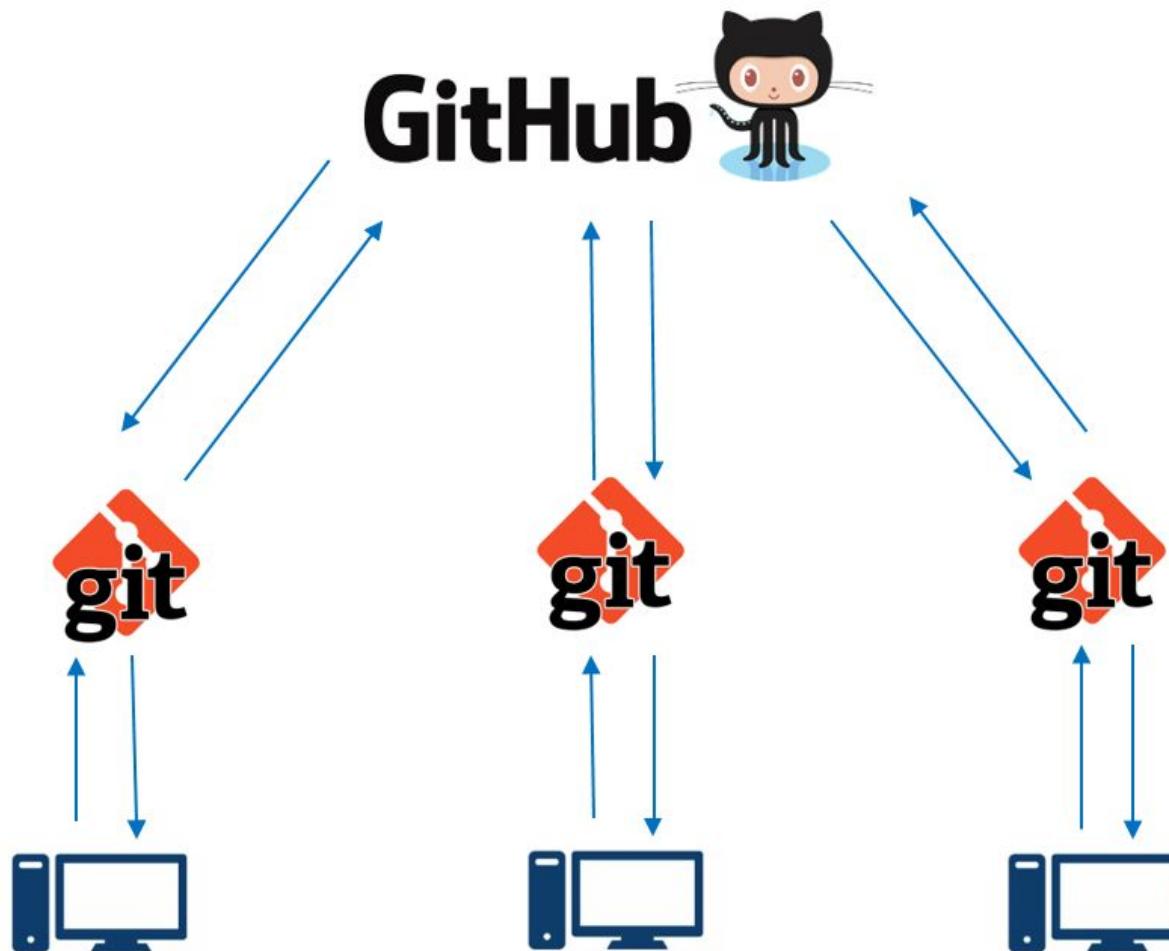
Organized around “repositories”: directories under version control containing groups of files

# What is GitHub?

A website that hosts Git repositories

Publish repositories for others to see, collaborate with others on repositories, or keep private repositories

**“Git is a tool. GitHub is a website.”**



# Summary: repositories

Git repository = directory under version control

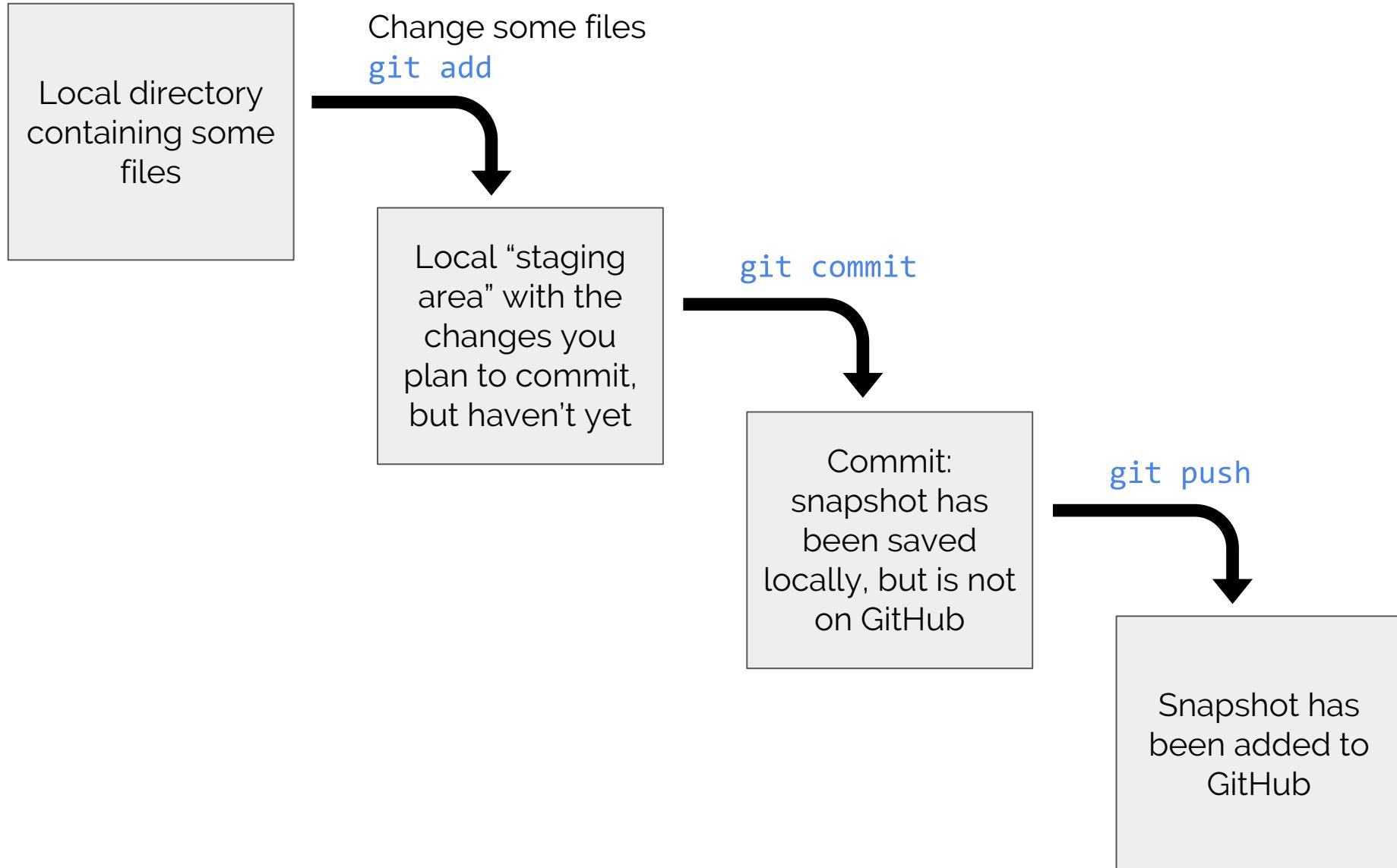
- You decide when to take snapshots (make commits)

May or may not be hosted on GitHub

- You decide when to “push” local copy to GitHub
- You can keep working copies on multiple computers
- Your working copy(ies) can be out of sync with each other and the copy on GitHub

“Repo” = repository

# Git + GitHub workflow



Let's create a Git repo locally and make some commits

Then put the repo on GitHub

# Create Git repo, add file, first commit

```
MacBook-Pro-9:Desktop Pamela$ mkdir pams_repo  
MacBook-Pro-9:Desktop Pamela$ cd pams_repo/  
MacBook-Pro-9:pams_repo Pamela$ git init  
Initialized empty Git repository in /Users/Pamela/Desktop/pams_repo/.git/  
MacBook-Pro-9:pams_repo Pamela$ echo "Hello world" > hello.txt  
MacBook-Pro-9:pams_repo Pamela$ git status  
On branch master  
  
No commits yet  
  
Untracked files:  
(use "git add <file>..." to include in what will be committed)  
  
    hello.txt  
  
nothing added to commit but untracked files present (use "git add" to track)  
MacBook-Pro-9:pams_repo Pamela$ git add hello.txt  
MacBook-Pro-9:pams_repo Pamela$ git status  
On branch master  
  
No commits yet  
  
Changes to be committed:  
(use "git rm --cached <file>..." to unstage)  
  
    new file:   hello.txt  
  
MacBook-Pro-9:pams_repo Pamela$ git commit -m "Initial commit"  
[master (root-commit) 895428e] Initial commit  
 1 file changed, 1 insertion(+)  
 create mode 100644 hello.txt  
MacBook-Pro-9:pams_repo Pamela$ git status  
On branch master  
nothing to commit, working tree clean  
MacBook-Pro-9:pams_repo Pamela$
```

Create new directory

Initialize directory as a Git repo

Create a new file

Check repo status

Add the file to version control

Check repo status

Commit the changes

Check repo status

# Add a new file and modify the first file; commit the latest changes

```
MacBook-Pro-9:pams_repo Pamela$ echo "This is a new file" > newfile.txt
MacBook-Pro-9:pams_repo Pamela$ echo "Adding a line to the first file" >> hello.txt
MacBook-Pro-9:pams_repo Pamela$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

    modified:   hello.txt

Untracked files:
  (use "git add <file>..." to include in what will be committed)

    newfile.txt

no changes added to commit (use "git add" and/or "git commit -a")
MacBook-Pro-9:pams_repo Pamela$ git add hello.txt newfile.txt
MacBook-Pro-9:pams_repo Pamela$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    modified:   hello.txt
    new file:   newfile.txt

MacBook-Pro-9:pams_repo Pamela$ git commit -m "Created newfile.txt; added a line to hello.txt"
[master 8ca5aa7] Created newfile.txt; added a line to hello.txt
 2 files changed, 2 insertions(+)
 create mode 100644 newfile.txt
MacBook-Pro-9:pams_repo Pamela$ git status
On branch master
nothing to commit, working tree clean
MacBook-Pro-9:pams_repo Pamela$
```

Create new file  
Modify first file  
Check repo status

Add both files to staging  
area of changes to  
commit  
Check repo status

Commit with a commit  
message

Check repo status

GitHub has not entered the picture yet.  
Let's add our repo to GitHub.

# Adding our repo to GitHub (1/3)

**Create a new repository**

A repository contains all the files for your project, including the revision history.

---

**Owner**      **Repository name**

 pamelarussell  / pams\_repo 

---

Great repository names are short and memorable. Need inspiration? How about [ubiquitous-journey](#).

**Description (optional)**

---

 **Public**  
Anyone can see this repository. You choose who can commit.

 **Private**  
You choose who can see and commit to this repository.

---

**Initialize this repository with a README**  
This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

---

Add .gitignore: **None** ▾    Add a license: **None** ▾ 

---

**Create repository**

# Adding our repo to GitHub (2/3)

The screenshot shows a GitHub repository page for 'pamelarussell / pams\_repo'. The page includes navigation links for Code, Issues (0), Pull requests (0), Projects (0), Wiki, Insights, and Settings. A 'Quick setup' section provides links for 'Set up in Desktop' (with options for HTTPS and SSH) and a copy link. It also recommends including README, LICENSE, and .gitignore files. Below this, instructions for creating a new repository on the command line are provided, along with a copy link for the command:

```
echo "# pams_repo" >> README.md  
git init  
git add README.md  
git commit -m "first commit"  
git remote add origin https://github.com/pamelarussell/pams_repo.git  
git push -u origin master
```

A section for pushing an existing repository from the command line is highlighted with an orange border and contains the following commands:

```
git remote add origin https://github.com/pamelarussell/pams_repo.git  
git push -u origin master
```

At the bottom, there's an option to import code from another repository, with a 'Import code' button.

# Adding our repo to GitHub (3/3)

```
MacBook-Pro-9:pams_repo Pamela$ echo "# pams_repo" >> README.md
MacBook-Pro-9:pams_repo Pamela$ git init
Reinitialized existing Git repository in /Users/Pamela/Desktop/pams_repo/.git/
MacBook-Pro-9:pams_repo Pamela$ git add README.md
MacBook-Pro-9:pams_repo Pamela$ git commit -m "first commit"
[master 1f78ce6] first commit
 1 file changed, 1 insertion(+)
 create mode 100644 README.md
MacBook-Pro-9:pams_repo Pamela$ git remote add origin https://github.com/pamelarussell/pams_repo.git
MacBook-Pro-9:pams_repo Pamela$ git push -u origin master
Counting objects: 10, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (5/5), done.
Writing objects: 100% (10/10), 862 bytes | 862.00 KiB/s, done.
Total 10 (delta 0), reused 0 (delta 0)
To https://github.com/pamelarussell/pams_repo.git
 * [new branch]      master -> master
Branch 'master' set up to track remote branch 'master' from 'origin'.
MacBook-Pro-9:pams_repo Pamela$
```

# Viewing the repo on GitHub

The screenshot shows a GitHub repository page for 'pamelarussell / pams\_repo'. The repository is private, has 3 commits, 1 branch, 0 releases, and 1 contributor. It contains files README.md, hello.txt, and newfile.txt. The README.md file content is 'pams\_repo'.

GitHub, Inc. [US] | https://github.com/pamelarussell/pams\_repo

Search or jump to... Pull requests Issues Marketplace Explore

pamelarussell / pams\_repo Private Unwatch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Wiki Insights Settings

No description, website, or topics provided. Edit

Manage topics

3 commits 1 branch 0 releases 1 contributor

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

| File        | Description                                    | Time                                |
|-------------|------------------------------------------------|-------------------------------------|
| README.md   | first commit                                   | Latest commit 1f78ce6 2 minutes ago |
| hello.txt   | Created newfile.txt; added a line to hello.txt | 2 minutes ago                       |
| newfile.txt | Created newfile.txt; added a line to hello.txt | 5 minutes ago                       |

README.md

pams\_repo

# Work on the repo from different computers

pamelarussell / pams\_repo Private

Unwatch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Wiki Insights Settings

No description, website, or topics provided. Edit

Manage topics

3 commits 1 branch 0 releases 1 contributor

Branch: master New pull request

Create new file Upload files Find file Clone or download

Clone with HTTPS Use SSH

Use Git or checkout with SVN using the web URL.

<https://github.com/pamelarussell/pams>

Open in Desktop Download ZIP

pamelarussell first commit

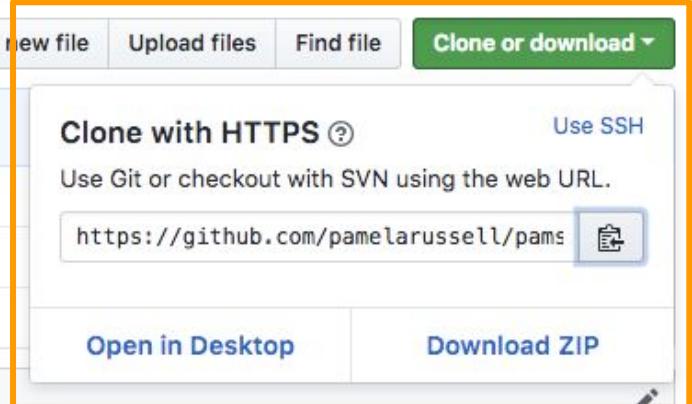
README.md first commit

hello.txt Created newfile.txt; added a line to hello.txt

newfile.txt Created newfile.txt; added a line to hello.txt

README.md

**pams\_repo**



# Work on the repo from different computers

```
pams_repo — bash — 64x21
MacBook-Pro-9:~ Pamela$ git clone https://github.com/pamelarousse
11/pams_repo.git
Cloning into 'pams_repo'...
remote: Counting objects: 10, done.
remote: Compressing objects: 100% (5/5), done.
remote: Total 10 (delta 0), reused 10 (delta 0), pack-reused 0
Unpacking objects: 100% (10/10), done.
MacBook-Pro-9:~ Pamela$ cd pams_repo/
MacBook-Pro-9:pams_repo Pamela$ git status
On branch master
Your branch is up to date with 'origin/master'.

nothing to commit, working tree clean
MacBook-Pro-9:pams_repo Pamela$
```

Create a “clone”: a copy of the GitHub repo in this directory

Navigate into the repo

See that it is up to date with the master copy on GitHub because we haven't modified anything yet

# Make a change to the repo from this computer and push the change to GitHub

```
pams_repo — bash — 78x25
[MacBook-Pro-9:pams_repo Pamela$ echo "this is some text" > anotherfile.txt
[MacBook-Pro-9:pams_repo Pamela$ git status
On branch master
Your branch is up to date with 'origin/master'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)

    anotherfile.txt

nothing added to commit but untracked files present (use "git add" to track)
[MacBook-Pro-9:pams_repo Pamela$ git add anotherfile.txt
[MacBook-Pro-9:pams_repo Pamela$ git commit -m "created anotherfile.txt"
[master b283820] created anotherfile.txt
 1 file changed, 1 insertion(+)
 create mode 100644 anotherfile.txt
[MacBook-Pro-9:pams_repo Pamela$ git push
Counting objects: 3, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 369 bytes | 369.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/pamelarussell/pams_repo.git
 1f78ce6..b283820  master -> master
MacBook-Pro-9:pams_repo Pamela$
```

Create a new text file

Check repo status; Git recognizes that we have added a new file

"Stage" the file: adds it to the next commit

Create a commit in the local copy of the repo on this computer; the changes are not reflected on GitHub yet

Push the changes to the master copy of the repo on GitHub

# Pull the changes we just made into a different copy of the repo

```
pams_repo — bash — 71x27
MacBook-Pro-9:~ Pamela$ cd ~/Desktop/pams_repo/
MacBook-Pro-9:pams_repo Pamela$ ls -l
total 32
-rw-r--r-- 1 Pamela staff 12 Sep 13 15:50 README.md
-rw-r--r-- 1 Pamela staff 44 Sep 13 15:46 hello.txt
-rw-r--r-- 1 Pamela staff 19 Sep 13 15:46 newfile.txt
-rw-r--r-- 1 Pamela staff 21 Sep 13 16:08 thirdfile.txt
MacBook-Pro-9:pams_repo Pamela$ git pull
remote: Counting objects: 3, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 3 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), done.
From https://github.com/pamelarussell/pams_repo
  1f78ce6..b283820 master      -> origin/master
Updating 1f78ce6..b283820
Fast-forward
 anotherfile.txt | 1 +
 1 file changed, 1 insertion(+)
 create mode 100644 anotherfile.txt
MacBook-Pro-9:pams_repo Pamela$ ls -l
total 40
-rw-r--r-- 1 Pamela staff 12 Sep 13 15:50 README.md
-rw-r--r-- 1 Pamela staff 18 Sep 20 08:05 anotherfile.txt
-rw-r--r-- 1 Pamela staff 44 Sep 13 15:46 hello.txt
-rw-r--r-- 1 Pamela staff 19 Sep 13 15:46 newfile.txt
-rw-r--r-- 1 Pamela staff 21 Sep 13 16:08 thirdfile.txt
MacBook-Pro-9:pams_repo Pamela$
```

Navigate to a different copy of the repo

See that anotherfile.txt is not in this local copy

Pull the master copy from GitHub

Now we have anotherfile.txt

# Ignoring files with Git

The screenshot shows a macOS terminal window titled "pams\_repo — bash — 79x28". The terminal output is as follows:

```
|MacBook-Pro-9:pams_repo Pamela$ echo "This is a third file" > thirdfile.txt
|MacBook-Pro-9:pams_repo Pamela$ echo "thirdfile.txt" >> .gitignore
|MacBook-Pro-9:pams_repo Pamela$ git status
On branch master
Your branch is up to date with 'origin/master'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)

    .gitignore

nothing added to commit but untracked files present (use "git add" to track)
|MacBook-Pro-9:pams_repo Pamela$ echo ".gitignore" >> .gitignore
|MacBook-Pro-9:pams_repo Pamela$ git status
On branch master
Your branch is up to date with 'origin/master'.

nothing to commit, working tree clean
MacBook-Pro-9:pams_repo Pamela$
```

Annotations with arrows point to specific commands and outputs:

- An arrow points to the command `echo "thirdfile.txt" >> .gitignore` with the label "Add to .gitignore".
- An arrow points to the output "Untracked files:" with the label "Check repo status".
- An arrow points to the command `echo ".gitignore" >> .gitignore` with the label "Add .gitignore itself to .gitignore".
- An arrow points to the output "nothing to commit, working tree clean" with the label "Check repo status".

# Additional resources provided by GitHub

[Cheat sheet](#) of Git commands

Excellent [introduction to Git and GitHub](#)

THIS IS GIT. IT TRACKS COLLABORATIVE WORK  
ON PROJECTS THROUGH A BEAUTIFUL  
DISTRIBUTED GRAPH THEORY TREE MODEL.

COOL. HOW DO WE USE IT?

NO IDEA. JUST MEMORIZIZE THESE SHELL  
COMMANDS AND TYPE THEM TO SYNC UP.  
IF YOU GET ERRORS, SAVE YOUR WORK  
ELSEWHERE, DELETE THE PROJECT,  
AND DOWNLOAD A FRESH COPY.

