

Unix command line; editors

Tools for Reproducible Research

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Course web: kbroman.org/Tools4RR

Windows vs. Mac OSX vs. Linux

Remote vs. Not

If you use Windows...

Consider **Git Bash** (or **Cygwin**)
(and perhaps **Mintty**)

If you use a Mac...

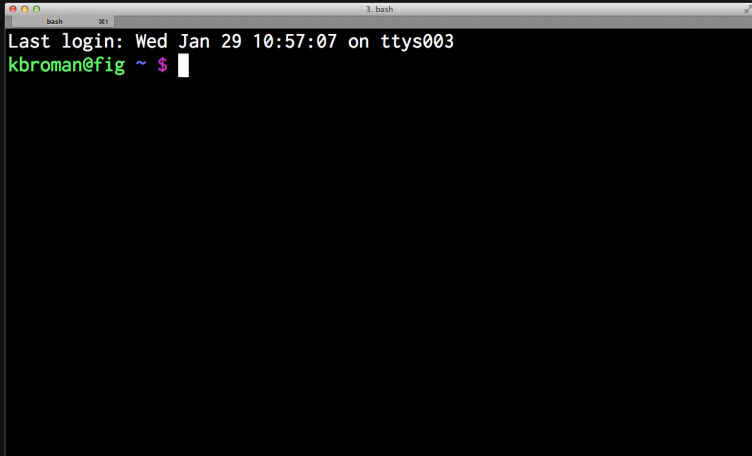
Consider Homebrew and iTerm2

Also the XCode command line tools

The command line is your friend

- ▶ Don't touch that mouse!
- ▶ Scriptable
- ▶ Flexible

The shell

A screenshot of a terminal window. The title bar at the top shows standard macOS window controls (red, yellow, green buttons) and the text '3. bash'. The terminal content shows the message 'Last login: Wed Jan 29 10:57:07 on ttys003' in white text. Below this, the prompt 'kbroman@fig ~ \$' is displayed, with 'kbroman@fig' in green, '~' in white, and '\$' in pink. A white cursor is positioned after the dollar sign.

```
bash 0x1 3. bash
Last login: Wed Jan 29 10:57:07 on ttys003
kbroman@fig ~ $
```

Options: tcsh, bash, zsh

Basics

- ▶ Directory structure

Absolute vs. relative paths

```
ls -l ~/Figs ../Rawdata/
```

- ▶ Creating, removing, changing directories

```
mkdir
```

```
rmdir
```

```
cd
```

```
cd -
```

- ▶ Moving, copying, removing files

```
mv
```

```
cp
```

```
rm -i
```

~/.bash_profile

```
export PATH=./usr/local/bin:$PATH
export LD_LIBRARY_PATH=/usr/local/lib

noclobber=1      # prevent overwriting of files
IGNOREEOF=1      # disable Ctrl-D as a way to exit
HISTCONTROL=ignoredups

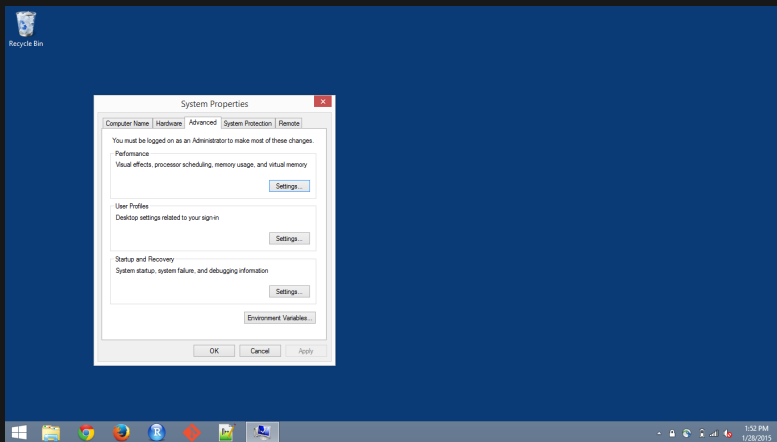
alias cl='clear;cd'
alias rm='rm -i'
alias mv='mv -i'
alias cp='cp -i'
alias ls='ls -GF'
alias 'l.='='ls -d .[a-zA-Z]*'
alias ll='ls -lh'
alias md='mkdir'
alias rd='rmdir'
alias rmb='rm .*~ *~ *.bak *.bk!'

alias Rb='R CMD build --force --resave-data'
alias Ri='R CMD INSTALL --library=/Users/kbroman/Rlibs'
alias Rc='R CMD check --library=/Users/kbroman/Rlibs'
alias Rcc='R CMD check --as-cran --library=/Users/kbroman/Rlibs'
```


PATH in Windows



PATH in Windows



The screenshot shows a Windows 7 desktop with a blue background. In the foreground, the 'System Properties' dialog box is open, with the 'Environment Variables' tab selected. The dialog box has a title bar with 'System Properties' and standard window controls. Below the title bar, there are tabs for 'Computer Name', 'Hardware', 'Advanced', 'System Protection', and 'Remote'. The 'Advanced' tab is active, showing the 'Environment Variables' section. This section is divided into two parts: 'User variables for Karl' and 'System variables'. Each part contains a table with 'Variable' and 'Value' columns. The 'User variables' table lists 'Path' (c:\Program Files\R\R-3.1.2\bin), 'TEMP' (%USERPROFILE%\AppData\Local\Temp), and 'TMP' (%USERPROFILE%\AppData\Local\Temp). The 'System variables' table lists 'Path' (c:\Rtools\bin;c:\Rtools\gcc-4.6.3\bin;C:...), 'PATHEXT' (.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;...), 'PROCESSOR_ARCHITECTURE' (AMD64), and 'PROCESSOR_IDENTIFIER' (Intel64 Family 6 Model 55 Stepping 8, G...). Below the tables are buttons for 'New...', 'Edit...', and 'Delete'. At the bottom of the dialog box are 'OK' and 'Cancel' buttons. The desktop taskbar at the bottom shows icons for the Start button, Recycle Bin, Internet Explorer, Google Chrome, Firefox, RStudio, and several other applications. The system clock in the bottom right corner shows '1:53 PM' and '1/28/2015'.

Redirection and pipes

```
$ curl -L http://bit.ly/hamlet_txt > hamlet.txt

$ wc -l hamlet.txt

$ grep Ham hamlet.txt > tmp.txt
$ wc -l tmp.txt

$ grep Ham hamlet.txt | wc -l

$ grep Ham hamlet.txt | less

$ cat file1.txt file2.txt > combined.txt
$ cat file3.txt >> combined.txt
```

Wild cards

```
$ grep blah *.txt  
$ ls blah.???  
$ ls [a-z]*  
$ ls /usr/bin/[auz]*  
$ ls /usr/bin/[auz]*.*  
$ ls -l *.txt | wc -l  
$ wc -l *.txt | grep total
```

Suspend/foreground/background

```
$ R CMD BATCH input.R output.txt &  
  
$ R CMD BATCH input.R output.txt  
[ctrl-Z]  
$ bg  
  
$ emacs afile.txt  
[ctrl-Z]  
$ fg
```

Moving around the command line

<code>ctrl-f, ctrl-b</code>	move forward and back
<code>ctrl-a, ctrl-e</code>	move to beginning and end of line
<code>ctrl-k, ctrl-u</code>	delete rest of line, or to the start
<code>ctrl-l</code>	clear the screen
<code>ctrl-c</code>	cancel what you've typed
<code>tab</code>	autocomplete command or file
<code>ctrl-p, ctrl-n</code>	forward and backward in history
<code>ctrl-r</code>	search for a previous command

How to solve computing problems

- ▶ Try stuff!
- ▶ man pages and help files
- ▶ `blah -h` or `blah --help`
- ▶ Google
- ▶ Stackoverflow and other StackExchange sites
- ▶ Google with `site:stackoverflow.com`
- ▶ email lists and google groups
- ▶ friends or colleagues
- ▶ Twitter
- ▶ Buy a book. Buy **all** of the books.

Examples

- ▶ How do you suppress warnings in knitr?
- ▶ What symbol corresponds to the unicode `\u00B1`?
- ▶ What's the difference between `curl` and `wget`?
- ▶ What does "502 Bad Gateway" mean?
- ▶ "To open `gs` you need to install X11"
- ▶ `mclapply` isn't working in Windows
- ▶ How to ping a server in Python?
- ▶ Font shape ``EU1/pplx/m/n'` undefined
- ▶ `except KeyError, k: raise AttributeError, k`

Important principle

Learn to code by looking at good code.

Choose a good editor

- ▶ Emacs
- ▶ VIM
- ▶ RStudio
- ▶ Textwrangler
- ▶ Notepad++
- ▶ Sublime Text
- ▶ Atom

A good editor

- ▶ Doesn't require pointing-and-clicking
- ▶ Easy to get code between R and a script
- ▶ Syntax highlighting of code
- ▶ Automatic indentation
- ▶ Close parentheses/brackets/braces
- ▶ Browse code across files
- ▶ Integrated with other tools (e.g., version control)

Other useful tools

```
$ find . -name *.py
$ locate article.cls

$ ps ux

$ top

$ df -hk

$ du -h
$ du -hd2

$ ln -s ~/Projects/SomeFriend/Data
$ ln -s ~/Projects/SomeFriend/Data SomeFriend_Data

$ tar xzvf qtl_1.29-2.tar.gz
$ tar czvf blah.tgz Blah/
$ tar tzvf blah.tgz
```

Further useful tools

```
$ whereis bash
$ type rm
$ type emacs

$ pwd

$ head afile.txt
$ tail afile.txt
$ head -n20 afile.txt

$ man head

$ kill 8453
$ kill -9 8453

$ history
$ !!
$ !-2
$ !503

$ ping www.google.com

$ ispell afile.txt
```

Opening a file from the command line

Windows:

```
$ start mypaper.pdf  
$ start http://google.com
```

Mac:

```
$ open mypaper.pdf  
$ open http://google.com
```

File modes

```
kbroman@fig ~/Teaching/Tools4RR/Lectures (master) $ ll
total 8
drwxr-xr-x 27 kbroman staff 918B Jan 27 11:35 01_Intro/
drwxr-xr-x 30 kbroman staff 1.0K Jan 29 11:38 02_Unix/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 03_KnitrMarkdown/
drwxr-xr-x 37 kbroman staff 1.2K Jan 20 23:05 04_Git/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 05_Organization/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 06_EDA/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 07_ClearCode/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 08_Rpack/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 09_TestingDebugging/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 10_BigJobs/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 11_KnitrPapers/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 12_KnitrTalks/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 13_KnitrPosters/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 14_Python/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 15_Licenses/
-rwxr-xr-x 1 kbroman staff 488B Oct 23 16:18 createVersionWithNotes.rb*
kbroman@fig ~/Teaching/Tools4RR/Lectures (master) $
```


File modes/owner/group

```
sudo chown kbroman .  
chgrp -R staff .  
chmod +x createVersionWithNotes.rb  
chmod 755 02_Unix  
chmod 644 02_Unix/02_unix.tex  
chmod 700 Private_stuff
```

Don't forget to look at the resources page

kbroman.org/Tools4RR/pages/resources.html