Intro to Unix

Sarah Medland

The 2021 Virtual Workshop on Statistical Genetic Methods for Human Complex Traits

This year's OS

Debian (linux)

- Free

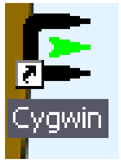
Based on Unix

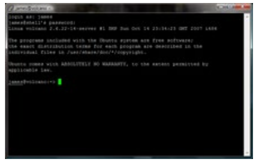
- long and venerable history
- http://en.wikipedia.org/wiki/Unix

Close but not the same…

/\ BIG PROBLEM is \ vs /

You will have used some version of unix previously





```
login as: james
james@shell's password:
Linux volcano 2.6.22-14-server #1 SMP Sun Oct 14 23:34:23 GMT 2007 i686

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

james@volcano:~$
```

File hygiene is very important

Files are stored in Unix format not DOS or Mac

- Changes the line ending characters
- Use dos2unix, unix2dos, mac2unix, unix2mac to change formats
- Can use the file command to check format

Unix systems are case sensitive!

NO SPACES in your file/directory names!!

Wildcards ie dos2unix *.dat

Working in the terminal
Input …. Output

- Input
    - Most commands don’t need input signifiers
    - < can be used to specify
- Output
    - Without specifying most output will print to the screen
    - > can be used to direct
        - type: echo ‘this is a dummy file’
        - echo ‘this is a dummy file’ > dummy.txt

| (pipe) | more pauses the output after a screen worth of text has appeared hit the space bar to get the next screens worth

The manual

- The man command can be used in conjunction with other commands to put up some basic instructions

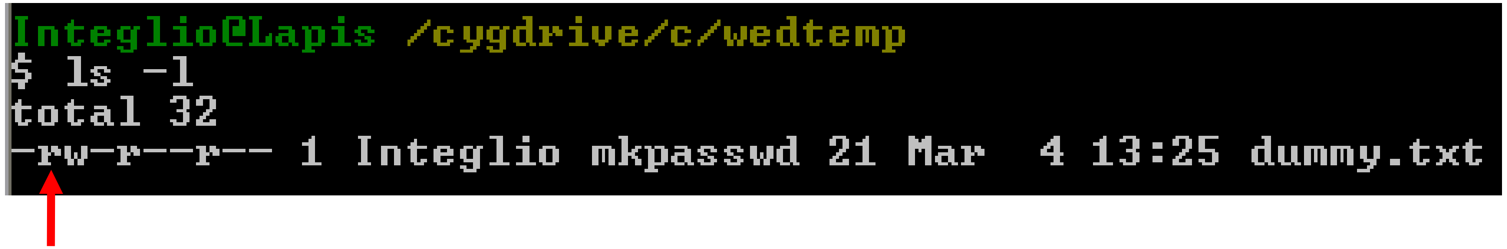
- type: man ls
  - ls is the list command it pulls up a list of the files in the directory

Also many many helpful webpages w examples

Permissions

the ability to read, write and execute files

- type: ls –l



```
Integlio@Lapis /cygdrive/c/wedtemp
$ ls -l
total 32
-rw-r--r-- 1 Integlio mkpasswd 21 Mar  4 13:25 dummy.txt
```

- These are the permissions
- 1st a directory flag (d or -)
- then 3 letters to define the owners permissions
- 3 letters to define the groups permissions
- 3 letters to define the everyone else's permissions

Permissions

the ability to read, write and execute files

- **r**ead access
- **w**rite access
- e**x**ecute
  - to ‘run’ script or a program the file must be made executable

Permissions

the ability to **r**ead, **w**rite and e**x**ecute files

- To change the mode/permissions use chmod
  - a number of ways to do this
  - type: echo “this is a test” > dummy.txt
  - ls –l
  - chmod +x dummy.txt
  - ls –l
  - chmod -x dummy.txt
  - ls –l
  - what happened?

Useful ‘one liners’

- cp copy
- mv move = rename
- rm remove
- ls list
- echo
- head looks at the top 10 lines
- tail looks at the last 10 lines
- wc counts number of lines, words, characters
- sed find and replace
- grep find and report
- awk restructure files

- pwd find where you are
- ~/ get to your home directory
- file reports type of file

Grep

- search **g**lobally for lines matching the **r**egular **e**xpression, and **p**rint them
  - For association output for chromosome 2
  - To extract the result for snp rs59831
  - Type: grep ‘rs59831’ output.txt > summary.txt

Grep

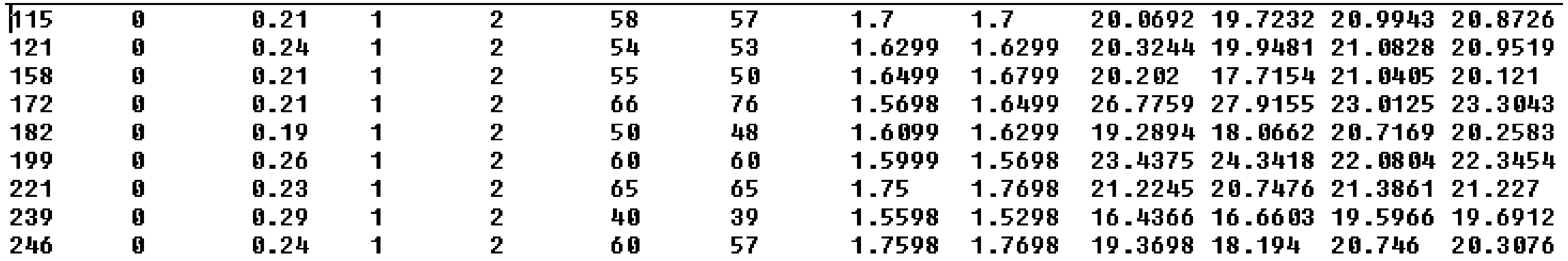
- Useful flags
  - -v
    - reverse grep select line that does not have the pattern
  - -C x
    - To x rows before and after the target
  - -n
    - Print the line number before the line
  - Many more…

Awk

- derived from the surnames of its authors — Alfred **A**ho, Peter **W**einberger, and Brian **K**ernighan
- Many functions
- Very useful for restructuring data

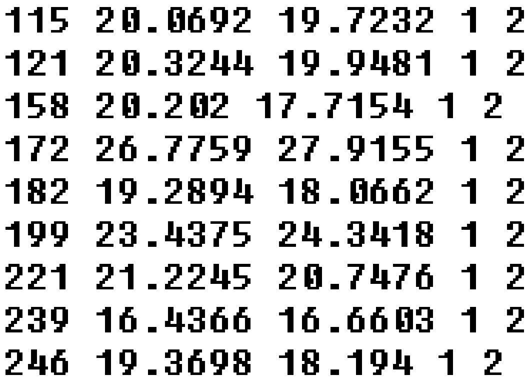
Awk

- Ozbmi2.rec



```
115     0      0.21    1      2      58     57     1.7     1.7     20.0692 19.7232 20.9943 20.8726
121     0      0.24    1      2      54     53     1.6299  1.6299  20.3244 19.9481 21.0828 20.9519
158     0      0.21    1      2      55     50     1.6499  1.6799  20.202  17.7154 21.0405 20.121
172     0      0.21    1      2      66     76     1.5698  1.6499  26.7759 27.9155 23.0125 23.3043
182     0      0.19    1      2      50     48     1.6099  1.6299  19.2894 18.0662 20.7169 20.2583
199     0      0.26    1      2      60     60     1.5999  1.5698  23.4375 24.3418 22.0804 22.3454
221     0      0.23    1      2      65     65     1.75    1.7698  21.2245 20.7476 21.3861 21.227
239     0      0.29    1      2      40     39     1.5598  1.5298  16.4366 16.6603 19.5966 19.6912
246     0      0.24    1      2      60     57     1.7598  1.7698  19.3698 18.194  20.746  20.3076
```

- awk ‘{ print $1, $10, $11, $4, $5 }’ ozbmi2.rec > new.rec



```
115 20.0692 19.7232 1 2
121 20.3244 19.9481 1 2
158 20.202 17.7154 1 2
172 26.7759 27.9155 1 2
182 19.2894 18.0662 1 2
199 23.4375 24.3418 1 2
221 21.2245 20.7476 1 2
239 16.4366 16.6603 1 2
246 19.3698 18.194 1 2
```

Awk

- $1 = column 1
- Print $0 = print whole line
- add subtract multiply etc
- change number of decimals
- Many functions

Sort

- Useful flags
  - -f ignore case
  - -n numeric sort
  - -r reverse
  - -c check if a file is sorted
  - -u prints only unique lines
  - -k2 sort starting at column 2

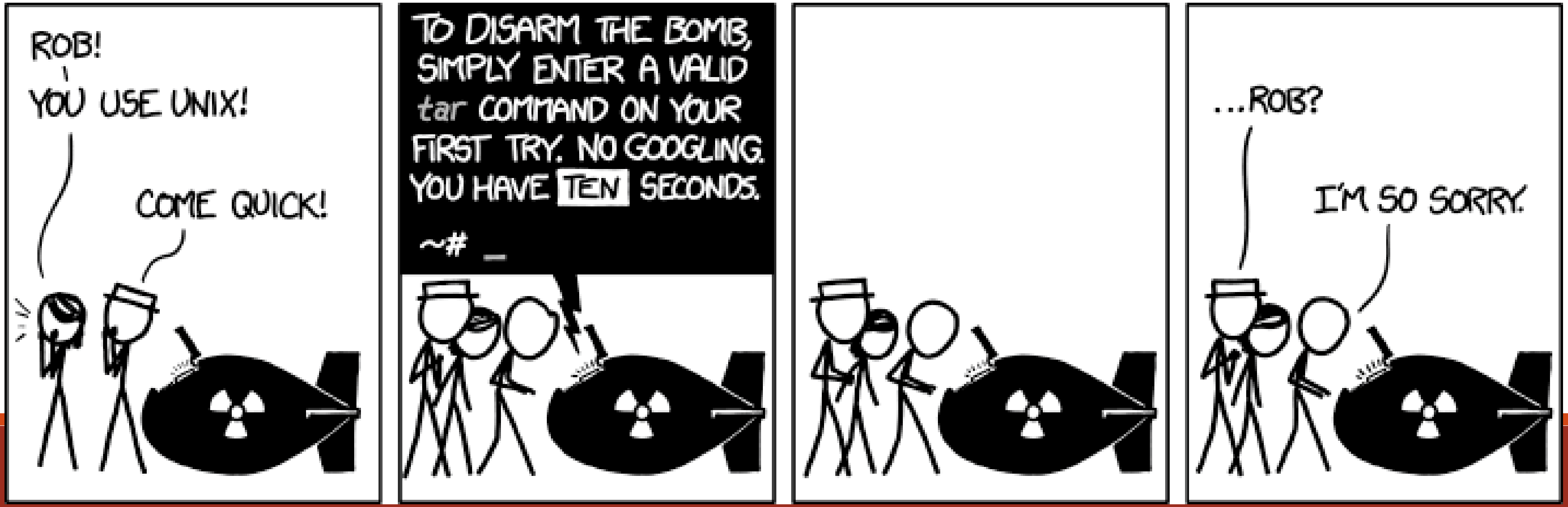
  - sort –fg –k 3   (sort in numeric order on column 3)

Zipping and unzipping

- zip
  - zip my1st.zip *txt
  - zip –mTr my1st.zip *txt
- unzip
  - unzip my1st.zip
- gzip
  - gzip example.txt
- Un-gzip
  - gzip –d example.txt.gz

tar

- Unzipping tar.gz files
  - tar -xzvf example.tar.gz
- Make Tar files
  - tar cvf MyProject.tar MyProject
- List contents
  - tar tvf my-archive.tar
  - tar tzvf my-archive.tar.gz


ROB!
YOU USE UNIX!
COME QUICK!
TO DISARM THE BOMB, SIMPLY ENTER A VALID tar COMMAND ON YOUR FIRST TRY. NO GOOGLING. YOU HAVE TEN SECONDS.
~# _
...ROB?
I'M SO SORRY.

Looking at your data

- less *filename*
  - Allows you to scroll through your data
- less –S *filename*
  - Shows a screen width of data (stops text wrapping)
- zless –S *filename*
  - Allows you to look at a gz file without unzipping

Nano (text editor)

- nano *filename*
  - Commands at bottom of screen
  - Save = crtl+O
  - Exit = crtl +X

Putting it together

- Making a ‘shell’ script to automate analyses

<contents of imaginary file inefficient.sh>

```
pedstats –p 1.ped –d 1.dat –pdf --prefix:1
merlin –p 1.ped –d 1.dat –m 1.map --vc --pdf --prefix:1
pedstats –p 2.ped –d 2.dat –pdf --prefix:2
merlin –p 2.ped –d 2.dat –m 2.map --vc --pdf --prefix:2
pedstats –p 3.ped –d 3.dat –pdf --prefix:3
merlin –p 3.ped –d 3.dat –m 3.map --vc --pdf --prefix:3
```

To run this make inefficient.sh executable then type ./inefficient.sh

Loops 1

<contents of imaginary file loop_a.sh>

```
for $i in 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
do
   pedstats –p $i.ped –d $i.dat --pdf --prefix:$i
   merlin –p $i.ped –d $i.dat –m $i.map --vc --pdf --prefix:$i
done
```

Loops 2

<contents of imaginary file loop_b.sh>

```
for ((  i = 1 ;  i <= 22 ;  i++  ))
do
   pedstats –p $i.ped –d $i.dat --pdf --prefix:$i
   merlin –p $i.ped –d $i.dat –m $i.map --vc --pdf --prefix:$i
done
```

Other bits

- When working on servers
  - bg &
  - fg
  - nohup
  - crtl+c
  - crtl+z
  - which

Shutting down you unix session

- exit
- logout
- quit
- q

Questions?
Post to slack