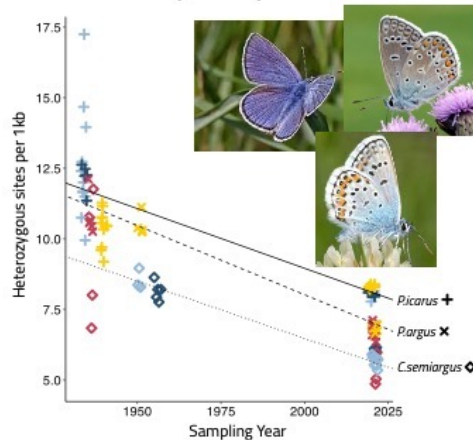


Introduction to the Bash Shell

Anna Runemark
`anna.runemark@biol.lu.se`

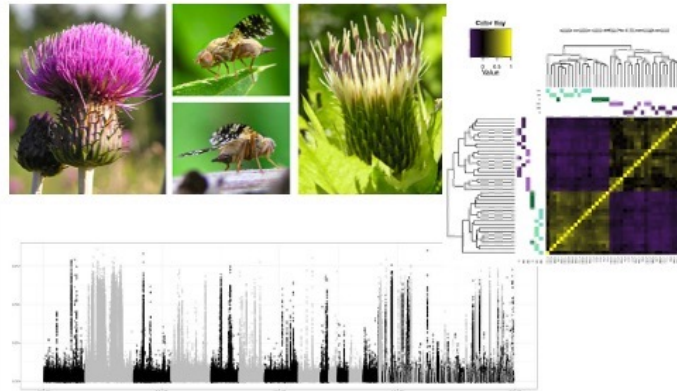
Runemark lab

Connectivity and genetic diversity in pollinators



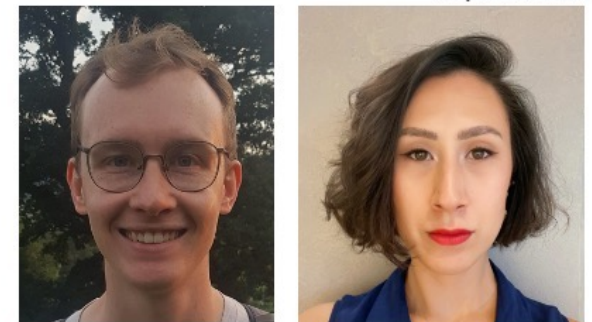
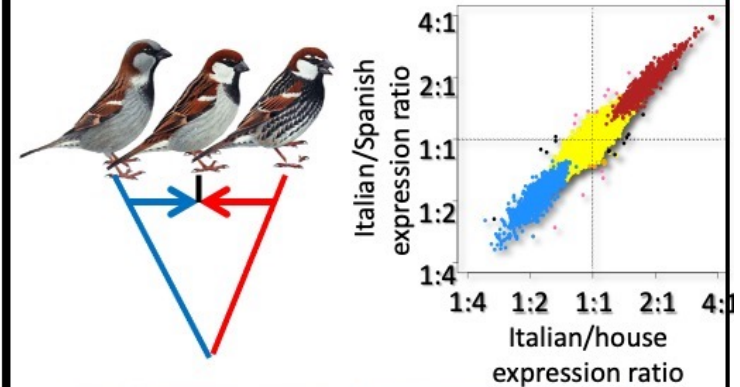
People:
Zachary Nolen (PhD-student)
Isolde van Riemsdijk (post doc)

The genomic changes enabling the use of a new host plant



People:
Rachel Steward (post doc)
Yajuan Huang (MSc-student)
Kalle Nilsson (PhD-student)

Can hybridization derived novel patterns of gene expression enable adaptation?

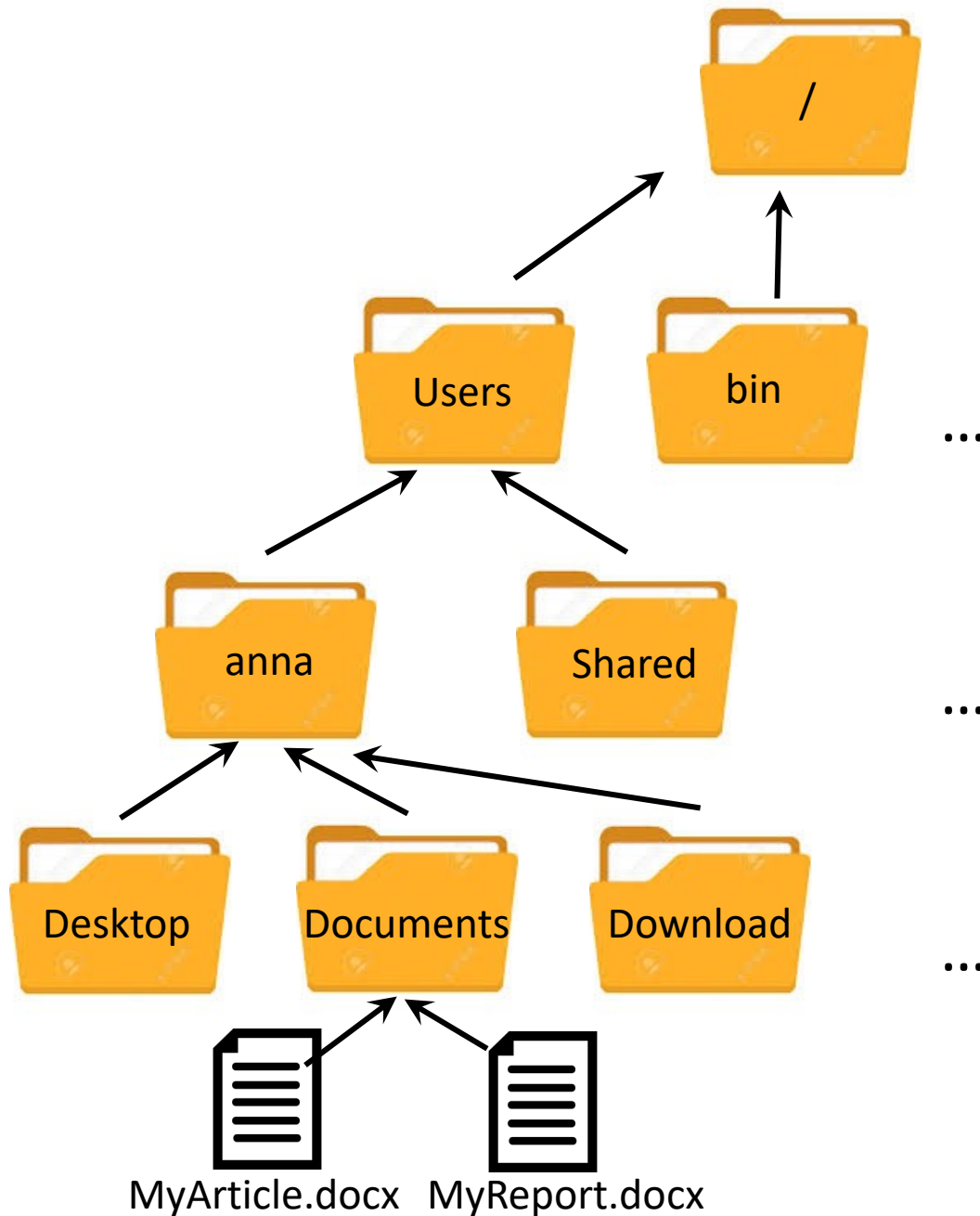


People:
Alex Lawrence (PhD-student)
Petronella Wessman (Lab manager)

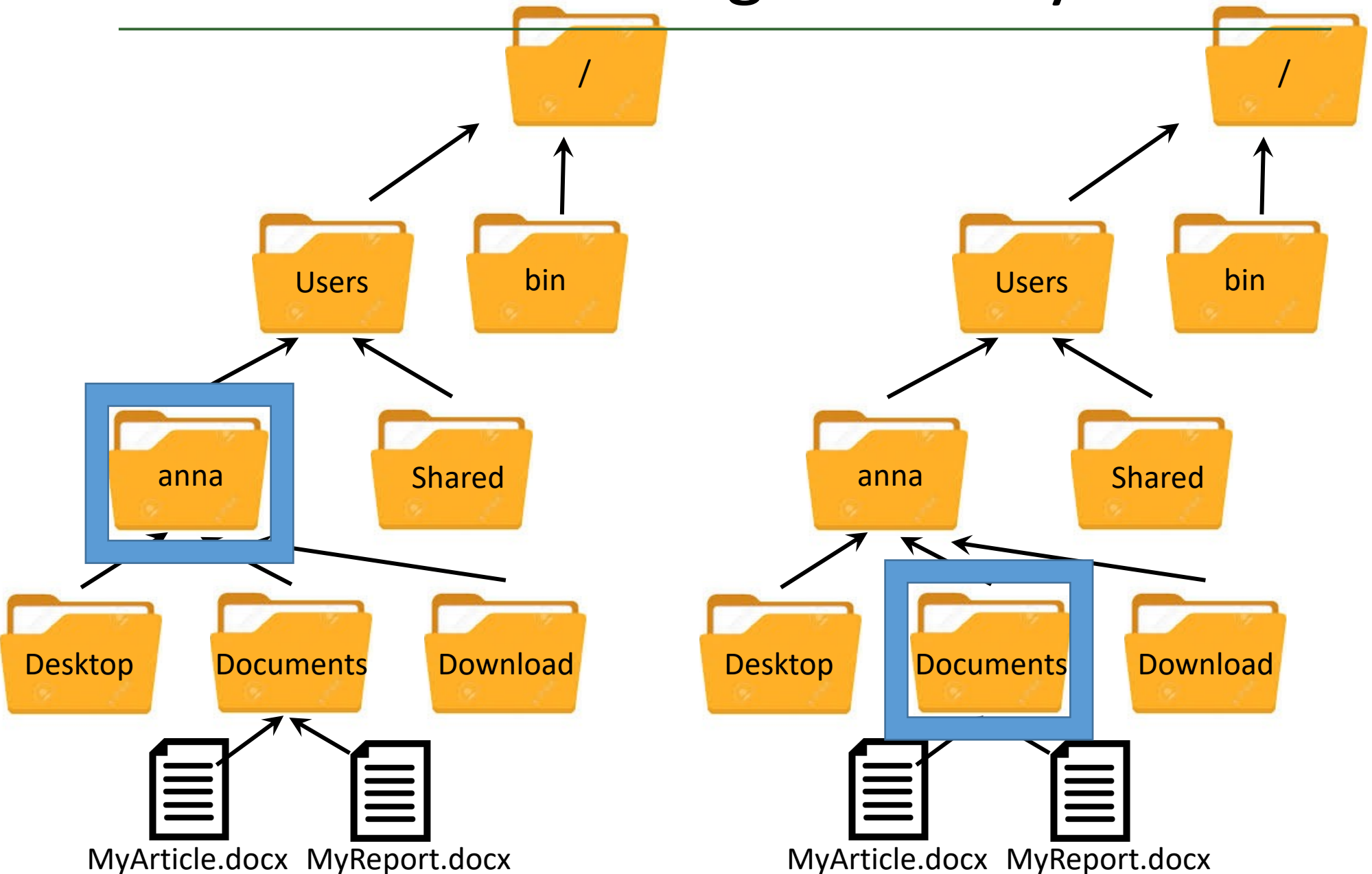
What is the Bash shell?

- Shell: Command line interpreter
- Bash: Our shell
- Terminal: Text based interface to computer

The file tree



The working directory



\$ cd Documents

The cd command

Do you want to change your Working Directory?

```
$ cd
```

```
$ cd Documents
```

The pwd command

Are you lost? Get your Present Working Directory

```
$ pwd
```

```
/User/anna/Documents
```

The ls command

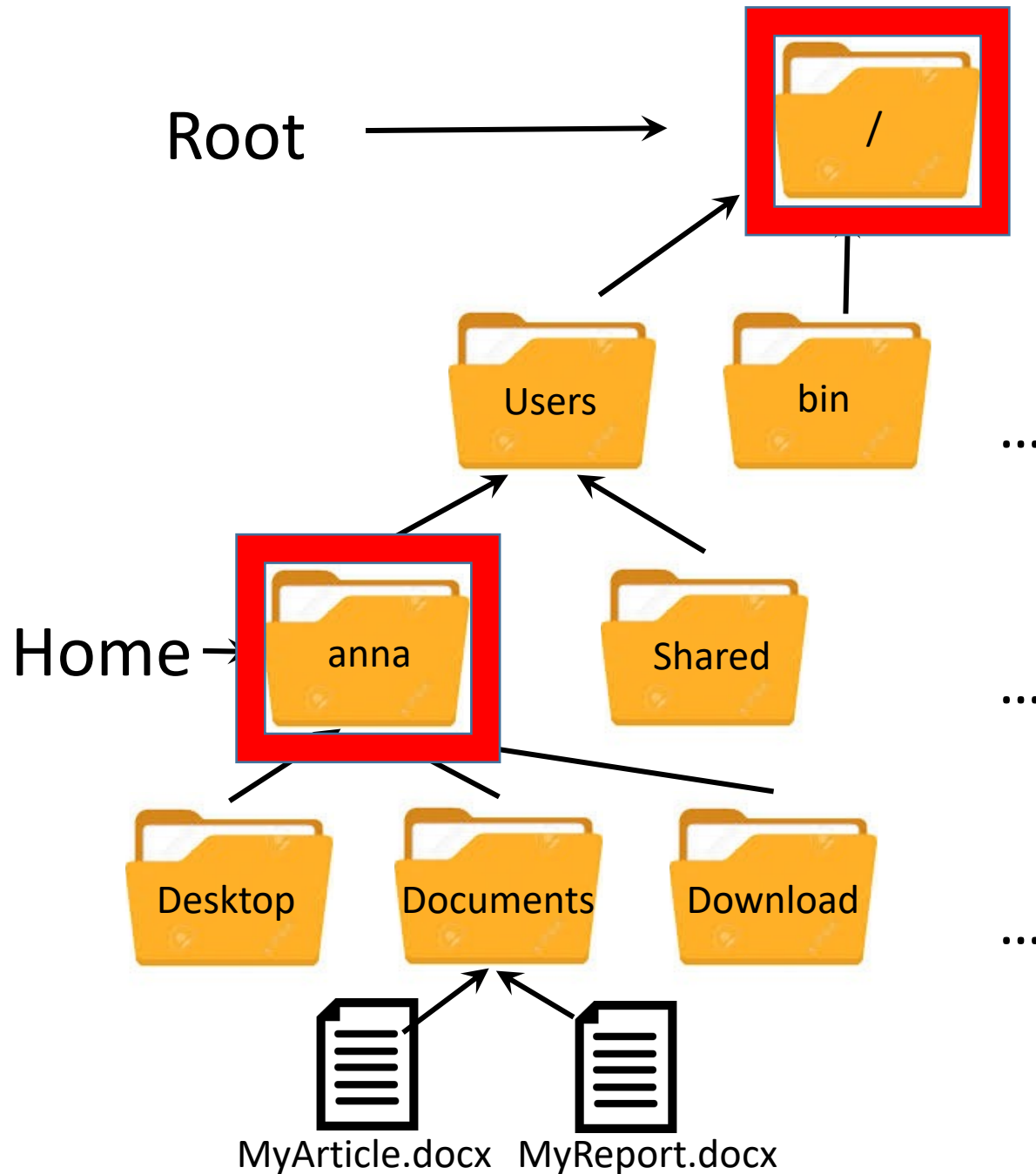
Forgotten what your file was called? List the files

```
$ ls
```

```
MyReport.pdf  
MyArticle.pdf
```


Demonstration1!

Special directories

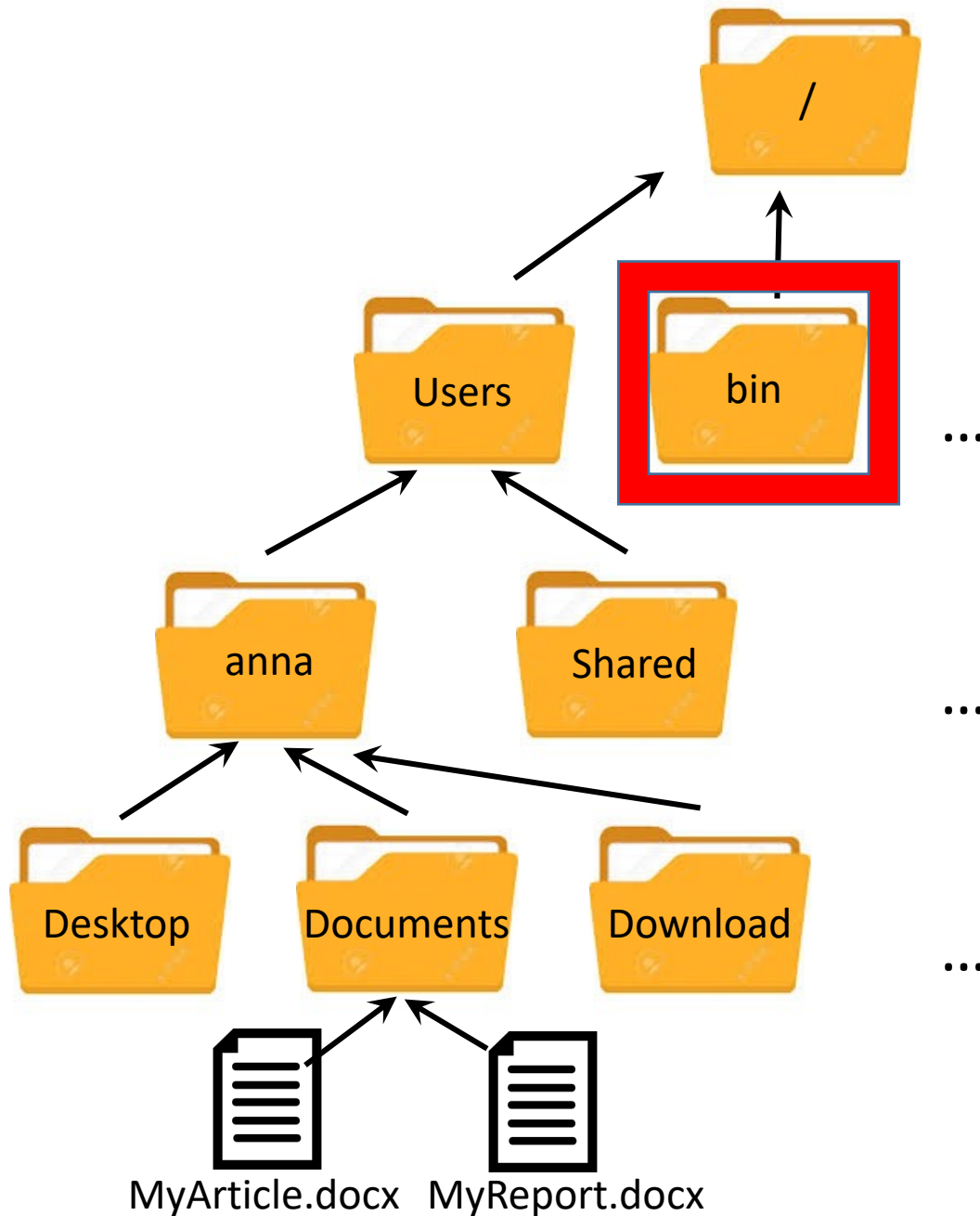


Special directories

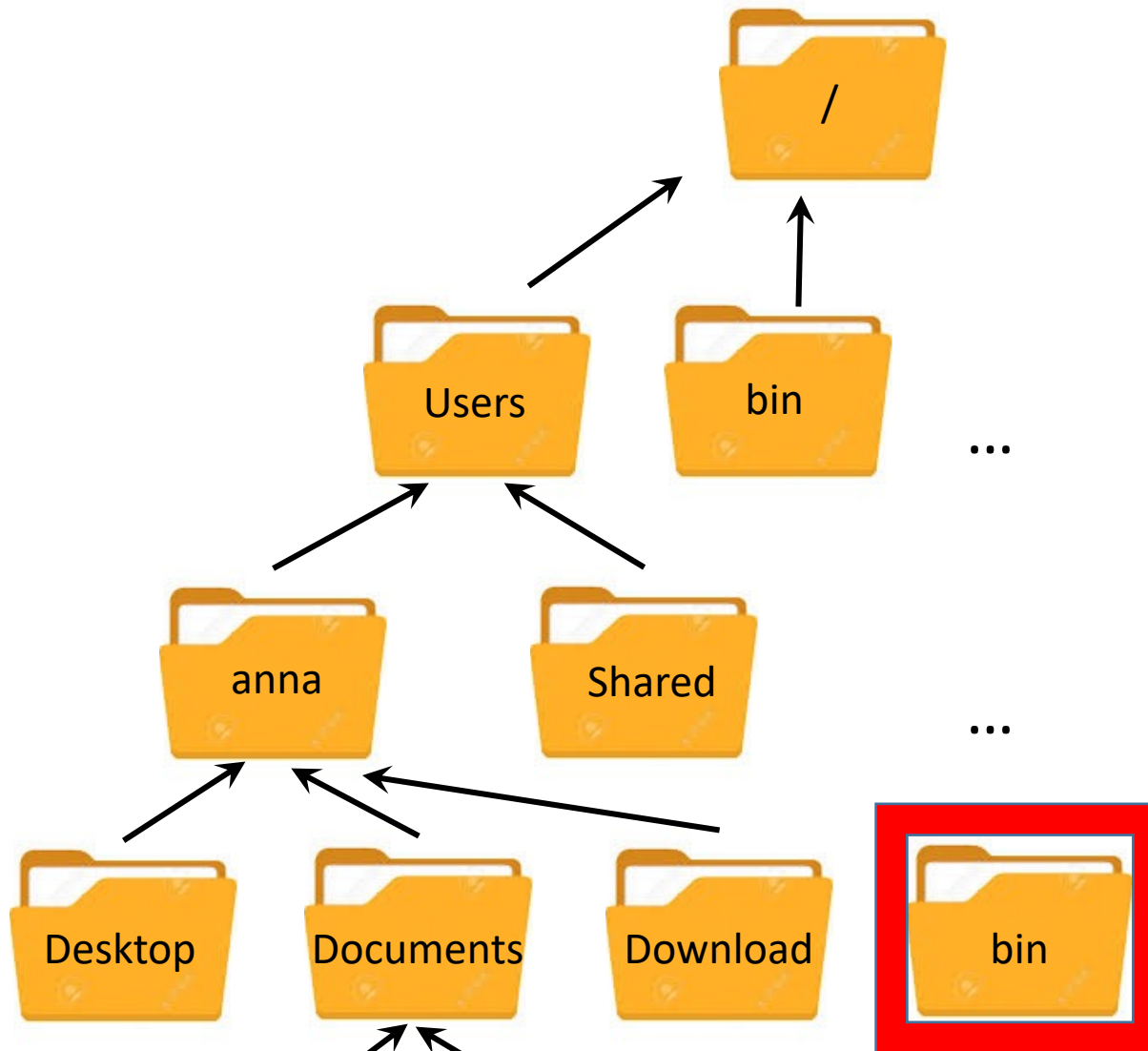
To get to the **Root** \$ cd /

To get to your **home folder** \$ cd or \$ cd ~

The bin directories

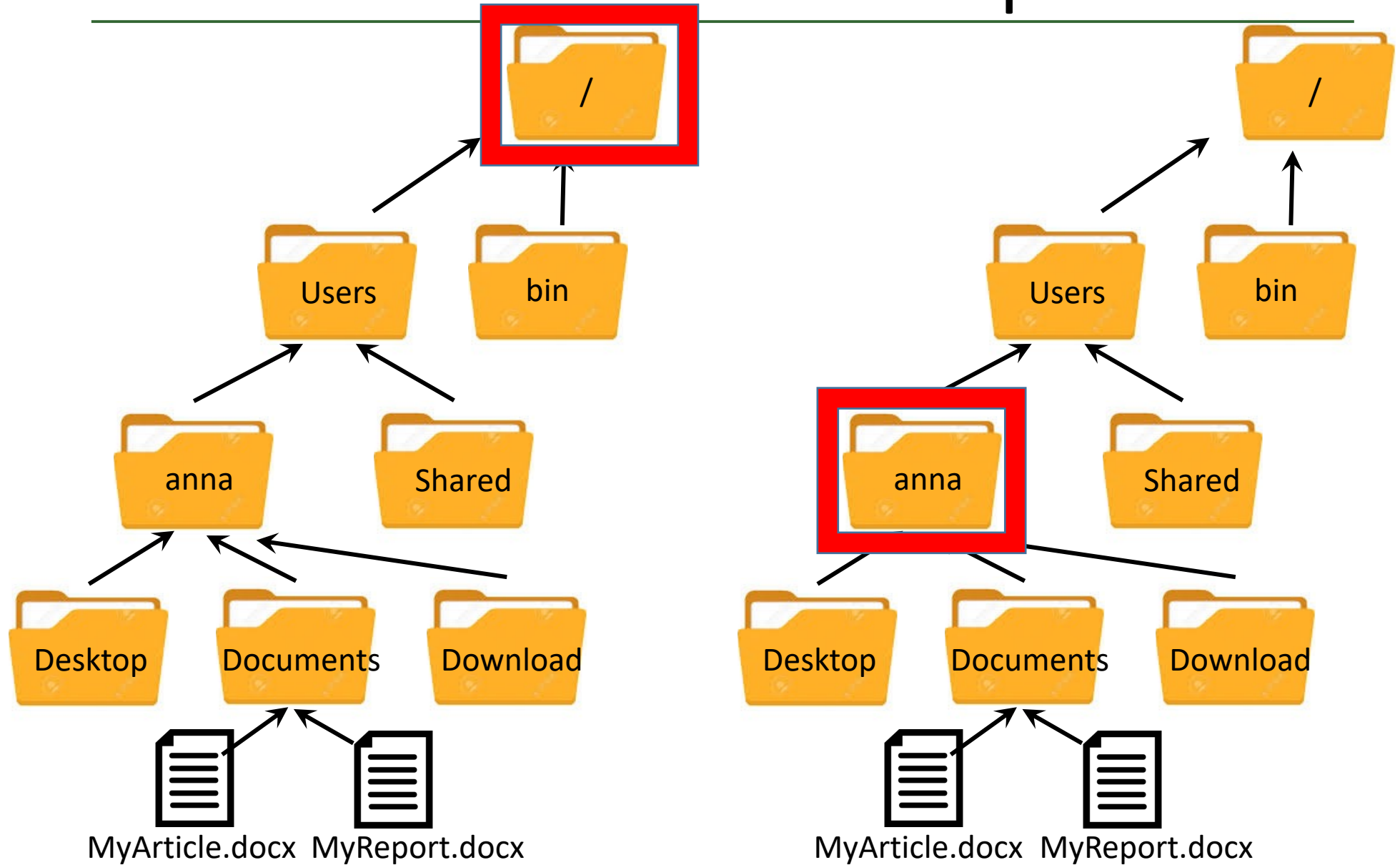


The bin directories



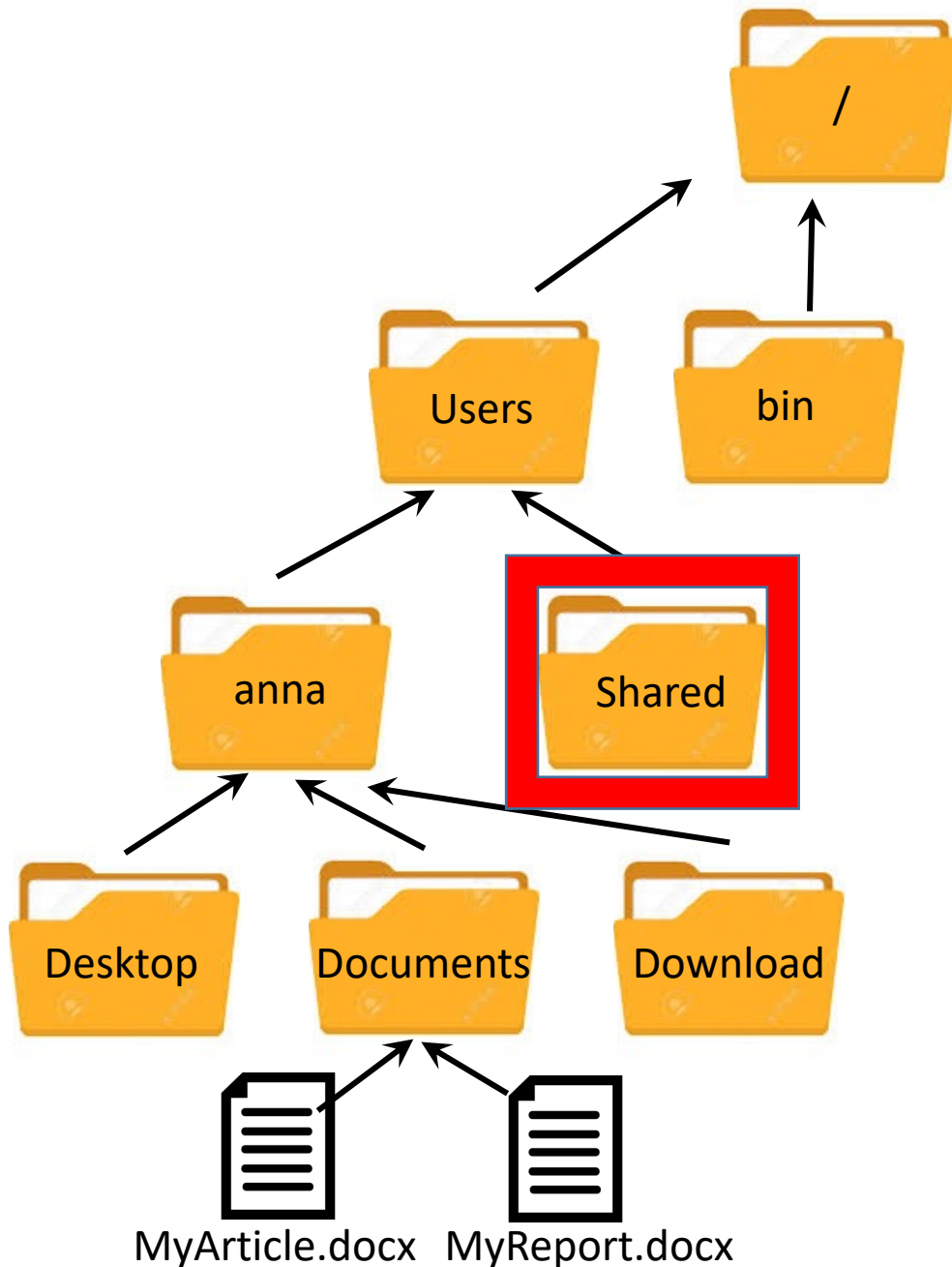
Store software you download in: /user/bin
here: /Users/anna/bin

Absolute and relative paths



Absolute: `/Users/anna/Documents/MyReport.pdf`
Relative: `Documents/MyReport.pdf`

Parent relative path



. Here
.. Up one step
../.. Up two steps
../anna/Documents/MyReport.pdf

Demonstration 2!

Standard input / output

```
$ cat <<< "hello"
```

```
STDIN:      hello
```

```
Program:    cat
```

```
STDOUT:     hello
```

Redirect output to file

Redirect STDOUT: >

```
$ echo "hello" > hi.txt
```

Redirect STDERR: 2>

```
$ get_error 2> error.txt
```

Pipes

```
$ echo "hello" | wc -c
```

STDIN:	hello	
Program:	echo	pipe
STDOUT:	hello	

STDIN:	hello
Program:	wc -c
STDOUT:	6

Demonstration 3!

Tweaking file formats: substituting

```
cat myFile.fna | tr acgtACGT tgcaTGCA > myNewFile.fna
```

changes to complementary base

```
cat myFile.csv | sed 's/,/ /' > myNewFile.txt
```

changes , to space once

```
cat myFile.csv | sed 's/,/ /g' > myNewFile2.txt
```

changes all , to spaces

Loops – for loops

Loops are used to perform actions on several lines/files

```
for i in 1 2 3 4 5  
do  
echo "Welcome $i times"  
done
```

Loops – for loops

For-loops can also be used on lists

```
for i in $(cat number.list)
do
echo "Welcome $i times"
done
```

Loops – while loops

```
while [ condition ]; do command1 command2 .. .... commandN;  
done
```

The while syntax will execute while a condition is true

Loops – while loops

```
cat myfile.fna | while read line; do echo -n $line | wc -c;  
done
```

Here we count the number of bases in the genome

the -n flag avoids printing newlines, creating a file with one line

Some special characters

Comments, code after this won't run

~ Shortcut to your home directory

\ Continue on next line

Making your life easier

Tab completion! Use it!

Iterate history with up and down arrow

Search history with Control + R

Get to beginning of line with control + a

Get to end of line with control + e

Stopping and exiting

Ctrl + c – kills a job

exit:

q (man, less, more)

Ctrl + x (nano)

cd – gets you home if you are lost

Finding help

man COMMAND (exit: q)

Google

StackOverflow

After doing research: Ask a friend or teacher!

Some advice

Your working folders should be under your home folder
`/users/annaru/BashExcercises`

Never use spaces in filenames or folder names

I usually start filenames with lowercase

```
echo "hello" > myFile.txt
```

and folders with uppercase

```
mkdir MyFolder
```

Some advice

Your working folders should be under your home folder
`/users/annaru/BashExcercises`

Be careful with the `/bin/` folder

The bin folder contains essential binary files (unlike `/usr/bin` directory) also for booting. It usually contains the shells like bash including all commands

Summary

Crucial concepts

- The file tree
- The working directory
- Absolute and relative paths
- Input and output channels
- Piping

Crucial concepts continued

- Substituting
- Loops

Extra topic: PATHs

\$PATH lists pre-defined locations that are searched every time you type a command

To make a program available anywhere

- 1) Add it to a folder in your \$PATH
- 2) Add the folder it resides in to your \$PATH

PATHs

What is in my path?

```
echo $PATH
```

(to make this easier to read, exchange : for newlines)

```
echo $PATH | tr ":" "\n"
```

PATHs

```
echo $PATH
```

```
/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin
```

```
echo $PATH | tr ":" "\n"
```

```
/usr/local/bin
```

```
/usr/bin
```

```
/bin
```

```
/usr/sbin
```

```
/sbin
```

PATHs

Exporting your \$PATH for current session only

```
export PATH="$PATH:/Users/anna/bin"
```

.bashrc profile

To permanently export a \$PATH, add it to your .bashrc profile

.bashrc is a file is run everytime we *open* a terminal session

It is a text file so you can access it with e.g. nano

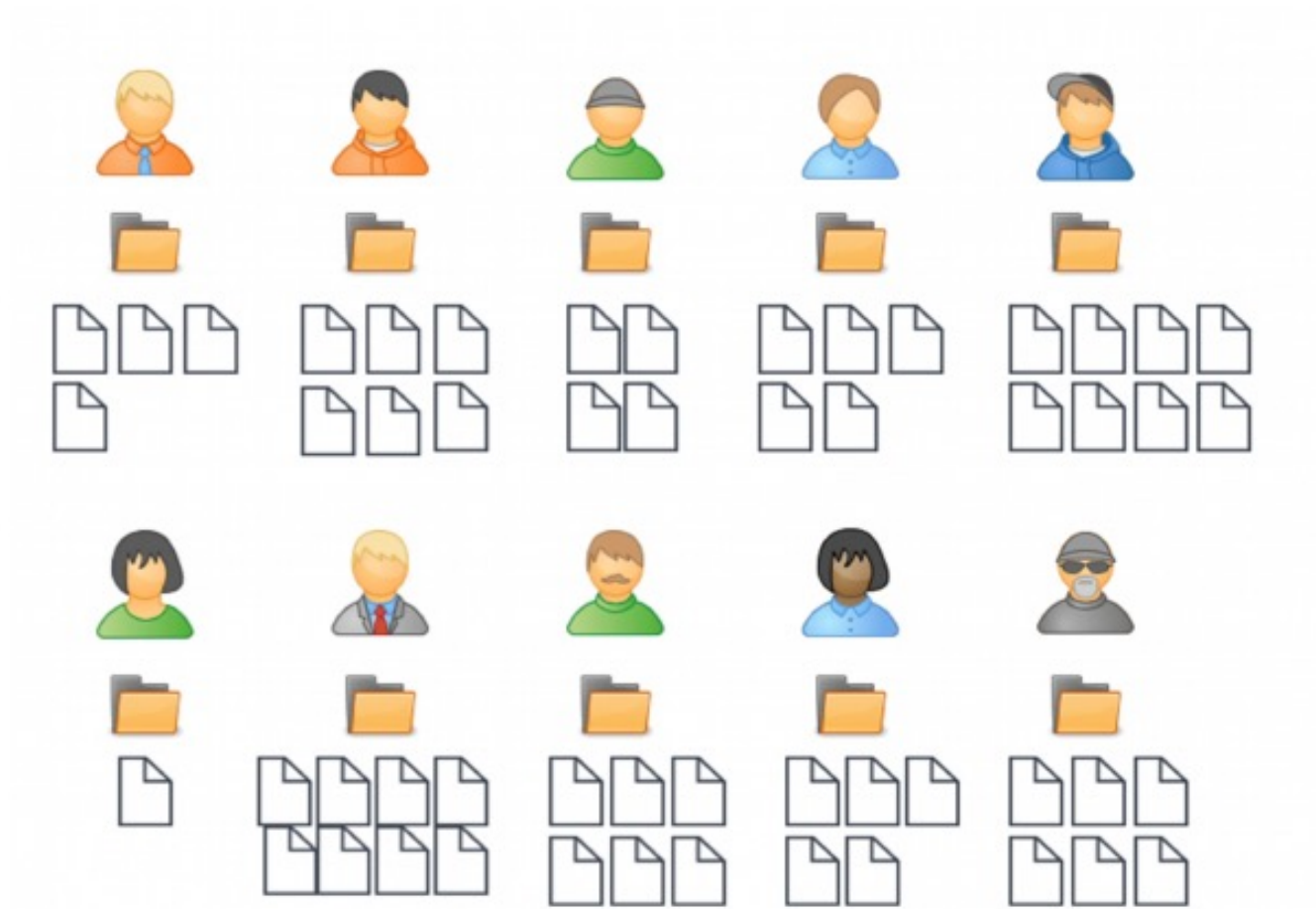
Export a \$PATH to your .bashrc

```
echo 'export PATH="$PATH:/Users/anna/bin"' >> ~/.bashrc
```


A quick note on project organization



A quick note on project organization



A quick note on project organization

Sparrows_20_09_11

doc
data
src
bin
results

Tephritis_20_09_29

doc
data
src
bin
results

Lithophragma_20_06_25

doc
data
src
bin
results

Arabis_20_09_28

doc
data
src
bin
results

Ischnura_20_09_27

doc
data
src
bin
results

Bark beetles_20_09_29

doc
data
src
bin
results

A quick note on project organization

Sparrows_20_09_11

doc
data
src
bin
results

Tephritis_20_09_29

doc
data
src
bin
results

Lithophragma_20_06_25

doc
data
src
bin
results

(General_scripts)

Arabis_20_09_28

doc
data
src
bin
results

Ischnura_20_09_27

doc
data
src
bin
results

Bark beetles_20_09_29

doc
data
src
bin
results

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