CSCI 121
Lab 1: Scavenger Hunt!

In this lab, we will gain experience with a **UNIX terminal**, which (among other things) provides us with a way to navigate and manipulate the files on a computer's hard drive.

Commands you'll learn:

- cat
- cd
- cp
- head
- less
- ls
- mkdir
- mv
- pwd
- rm
- tail
- unzip
- > (output redirection)

One

After cloning the repository from Github, we should have a directory containing `csci-121-lab0` (or something similar) in our working directory. We can check that using the `ls` command, which lists the files and subdirectories of our working directory.

```
(cs121) hopkinsm@C02X456YJHD3 csci121 % ls
csci-121-lab0   hw              main.py         materials
```

Two

To help us stay organized, let's create a directory called labs and put our current lab assignment into that directory. In UNIX, this can be accomplished by the following commands.

```
(cs121) hopkinsm@C02X456YJHD3 csci121 % mkdir labs
(cs121) hopkinsm@C02X456YJHD3 csci121 % mv csci-121-lab0 labs
```

The mkdir command makes a directory called labs in the working directory. The `mv` command moves the `csci-121-lab0` directory into the new labs directory. (Note: be careful using the `mv` command! It will not check whether you are overwriting an existing file or directory, so you could accidentally lose data.)

Three

Next let's confirm that we successfully moved the `csci-121-lab0` directory.

```
(cs121) hopkinsm@C02X456YJHD3 csci121 % cd labs
(cs121) hopkinsm@C02X456YJHD3 labs % pwd
/Users/hopkinsm/PycharmProjects/csci121/labs
(cs121) hopkinsm@C02X456YJHD3 labs % ls
csci-121-lab0
```

The `cd` command changes the working directory to become `labs`. The `pwd` command (short for "print working directory") tells us the working directory, which is currently `/Users/hopkinsm/PycharmProjects/csci121/labs`. Again, the `ls` command lists the files and subdirectories of our working directory.

Four

Now that our working directory is `/Users/hopkinsm/PycharmProjects/csci121/labs`, how do we get back to the parent directory? We can do so using the command "`cd ..`", which instructs the terminal to change the working directory to be **the parent** of the current working directory.

```
(cs121) hopkinsm@C02X456YJHD3 labs % pwd
/Users/hopkinsm/PycharmProjects/csci121/labs
(cs121) hopkinsm@C02X456YJHD3 labs % cd ..
(cs121) hopkinsm@C02X456YJHD3 csci121 % pwd
/Users/hopkinsm/PycharmProjects/csci121
```

Five

Another way to change the working directory is to fully specify the desired directory. Specifying the **absolute path** (as opposed to the **relative path**) requires more typing, but is often useful.

```
(cs121) hopkinsm@C02X456YJHD3 csci121 % pwd
/Users/hopkinsm/PycharmProjects/csci121
(cs121) hopkinsm@C02X456YJHD3 csci121 % cd /Users/hopkinsm/PycharmProjects/csci121/labs
(cs121) hopkinsm@C02X456YJHD3 labs % pwd
/Users/hopkinsm/PycharmProjects/csci121/labs
(cs121) hopkinsm@C02X456YJHD3 labs % cd /Users/hopkinsm/PycharmProjects/csci121
(cs121) hopkinsm@C02X456YJHD3 csci121 % pwd
/Users/hopkinsm/PycharmProjects/csci121
(cs121) hopkinsm@C02X456YJHD3 csci121 %
```

Six

At this point, let's go back to the `csci-121-lab0` directory and take a look inside.

```
(cs121) hopkinsm@C02X456YJHD3 csci121 % pwd
/Users/hopkinsm/PycharmProjects/csci121
(cs121) hopkinsm@C02X456YJHD3 csci121 % cd labs/csci-121-lab0
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % pwd
/Users/hopkinsm/PycharmProjects/csci121/labs/csci-121-lab0
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % ls
README.md       hunt            lizard.png      scavengers.txt
```

Seven

We're about to embark on a scavenger hunt, so it's probably a good idea to learn a bit more about scavengers. The file extension `.txt` indicates that the file just consists of so-called "plain text". We can look at this text by using the `cat` command.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % cat scavengers.txt
Scavengers are animals that consume dead organisms that have died
from causes other than predation. While scavenging generally
refers to carnivores feeding on carrion, it is also a herbivorous
feeding behavior. Scavengers play an important role in the ecosystem
by consuming dead animal and plant material. Decomposers and
detritivores complete this process, by consuming the remains left
by scavengers.

Scavengers aid in overcoming fluctuations of food resources in the
environment. The process and rate of scavenging is affected by
both biotic and abiotic factors, such as carcass size, habitat,
temperature, and seasons.
```

Eight

Sometimes files can get very long, and thus it is sometimes helpful to look only at the first and last lines of a file using the `head` or `tail` commands.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % head -7 scavengers.txt
Scavengers are animals that consume dead organisms that have died
from causes other than predation. While scavenging generally
refers to carnivores feeding on carrion, it is also a herbivorous
feeding behavior. Scavengers play an important role in the ecosystem
by consuming dead animal and plant material. Decomposers and
detritivores complete this process, by consuming the remains left
by scavengers.
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % tail -4 scavengers.txt
Scavengers aid in overcoming fluctuations of food resources in the
environment. The process and rate of scavenging is affected by
both biotic and abiotic factors, such as carcass size, habitat,
temperature, and seasons.
```

The command `head -7` instructs the terminal to show us the first 7 lines of a file, while the command `tail -4` instructs the terminal to show us the last 4 lines of a file. We can choose any number of lines to display (not just 7 and 4).

Nine

If we want to scroll through the file, we can use the `less` command. Try typing `less scavengers.longer.txt` and see what happens. Use the arrow keys and the space bar to navigate the file. When you're finished, type `q` to return to the main terminal.

Ten

There are several other helpful UNIX commands for finding out information about files. For instance, if we want to know the word count or the number of lines in a file, then we can use the `wc` command.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % wc -w scavengers.txt
      92 scavengers.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % wc -l scavengers.txt
      12 scavengers.txt
```

This tells us that `scavengers.txt` has 92 words and 12 lines.

Eleven

Observe that some files are not human readable using `cat`, `head`, `tail`, or `less`. For instance, using these commands on image files like `lizard.png` produces something that looks like gibberish.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % head -3 lizard.png
@PNG

IHDRo@U@m'iCCPiccxƃ@@J@P@@
š@@p'QPl@@@I[@ X@C@@IC@@$@ꟈG@.@>@@@@@@@@@@!Hp@o@@@@p@@b□@Q@A@U@@H@@@@3L@'@R@@:@@8@'>_çv@i@7@
PKr:@jY@,K@@$@@@(@@ @@q@@4Qu@@?@@vãkU@@[@q=_@@~@@@c@@Cu@ @@@\@/@@-LO@L@
```

Twelve

We can "redirect" the output of a UNIX command by using the symbol `>`. Here we put the result of `head -2 scavengers.txt` into a new file called `first2lines.txt`.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % head -2 scavengers.txt
Scavengers are animals that consume dead organisms that have died
from causes other than predation. While scavenging generally
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % head -2 scavengers.txt > first2lines.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % cat first2lines.txt
Scavengers are animals that consume dead organisms that have died
from causes other than predation. While scavenging generally
```

Thirteen

We can copy the file using `cp` and delete the original file using `rm`.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % ls
README.md               hunt.zip                scavengers.longer.txt
first2lines.txt         lizard.png              scavengers.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % cp first2lines.txt preface.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % ls
README.md               lizard.png              scavengers.txt
first2lines.txt         preface.txt
hunt.zip                scavengers.longer.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % rm first2lines.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % ls
README.md               lizard.png              scavengers.longer.txt
hunt.zip                preface.txt             scavengers.txt
```

Fourteen

We can run Python programs through the UNIX terminal by typing `python`, followed by the name of a Python program (these files end with the file extension `.py`). Here we run a Python program called `backwards.py`.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % python backwards.py
What is your name?
```

Fifteen

This particular program asks us to type our name, then it spells our name backwards.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % python backwards.py
What is your name? mark hopkins
Your name backwards is snikpoh kram.
```

Sixteen

Some Python programs require one (or more) "arguments," which provide the program with additional information that it might require. For example, the Python program capslock.py requires two arguments: the name of a file that you want to convert to capital letters, and the number of lines you want to display.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % python capslock.py
Usage: python capslock.py <inputfile> <numlines>
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % python capslock.py scavengers.txt 3
SCAVENGERS ARE ANIMALS THAT CONSUME DEAD ORGANISMS THAT HAVE DIED
FROM CAUSES OTHER THAN PREDATION. WHILE SCAVENGING GENERALLY
REFERS TO CARNIVORES FEEDING ON CARRION, IT IS ALSO A HERBIVOROUS
```

Seventeen

Now let's use our new UNIX skills on a scavenger hunt! I've compressed the files/directories for the scavenger hunt into a ZIP file called `hunt.zip`. To uncompress these files, use the `unzip` command.

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % ls
README.md               hunt.zip                scavengers.txt
backwards.py            lizard.png
capslock.py             scavengers.longer.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % unzip hunt.zip
Archive:  hunt.zip
   creating: hunt/
   creating: hunt/WIN/
  inflating: hunt/decode.py
  inflating: hunt/cast.zip
   creating: hunt/totem/
   creating: hunt/WIN/BIG/
  inflating: hunt/totem/hyena.txt
   creating: hunt/totem/totem2/
  inflating: hunt/WIN/BIG/injustice.txt
   creating: hunt/totem/totem2/totem3/
  inflating: hunt/totem/totem2/coyote.txt
  inflating: hunt/totem/totem2/totem3/vulture.txt
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % ls
README.md               hunt            scavengers.longer.txt
backwards.py            hunt.zip                scavengers.txt
capslock.py             lizard.png
```

The unzipped directory, called `hunt`, appears in our working directory.

Eighteen

Time to enter the `hunt` directory and start the scavenger hunt!

```
(cs121) hopkinsm@C02X456YJHD3 csci-121-lab0 % cd hunt
(cs121) hopkinsm@C02X456YJHD3 hunt % pwd
/Users/hopkinsm/PycharmProjects/csci121/labs/csci-121-lab0/hunt
(cs121) hopkinsm@C02X456YJHD3 hunt % ls
WIN             cast.zip        decode.py       totem
```

Nineteen

Find the following, using the UNIX knowledge you have acquired during this lab.

- the name of a group of vultures in flight
- the fifth-smallest biological family in the Carnivora
- the name of a Portland-based personal injury law firm that protects the injured from injustice
- the number of lines in the file hyena.txt
- the number of words in the file coyote.txt
- the name of the Avengers star who briefly attended Santa Monica High School, making him a genuine Southern California (SC) avenger.