

Computer Systems

WEB: CS107.STANFORD.EDU

Cynthia Lee

Today's Topics

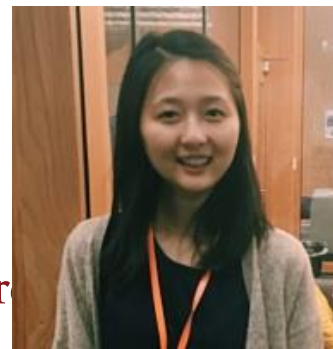
1. Introductions
2. What is this class?
3. Course components and policies overview
4. Diving right into the content:
 - › Your first C program, your first command-line compilation

Next lecture:

- › More whirlwind tour of C and UNIX

Meet our TAs

- Aojia Zhao
- Brendan Corcoran
- David Wang
- Devon Warshaw
- Jim Andress
- Joanne Jang
- John Clow
- John Louie
- Matt Volk
- Ran Gross
- Sabelle Smythe
- Sal Valdes
- Stephanie Palocz
- Travis Geis



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Introductions

CS107.STANFORD.EDU

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- Quick poll: how many of you have been in a class with me before?

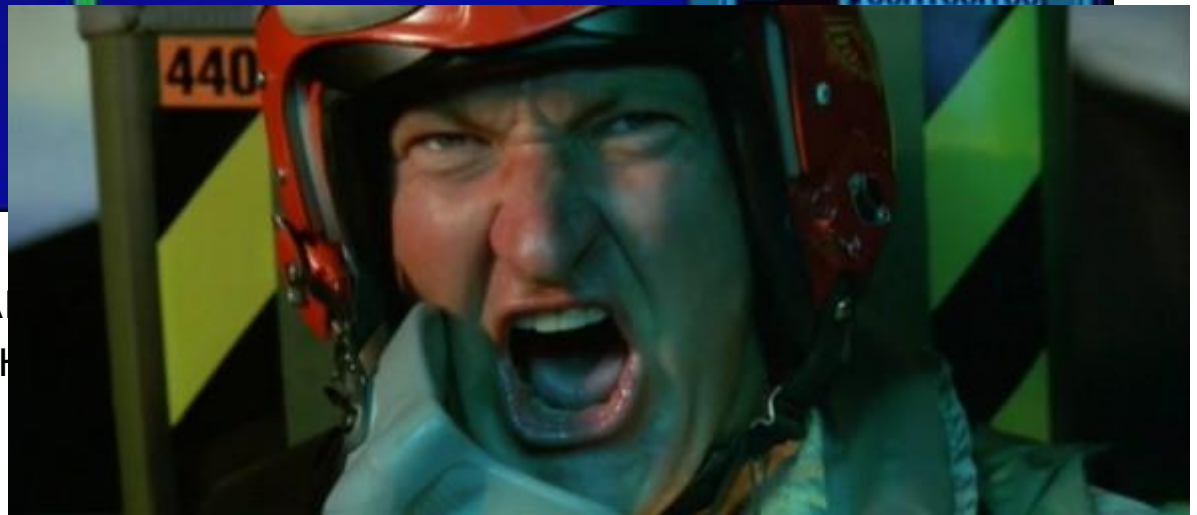
What is CS107 all about?

HAVE YOU EVER NOTICED HOW “HACKER” WORK LOOKS IN OLD MOVIES?...

Independence Day (1996)

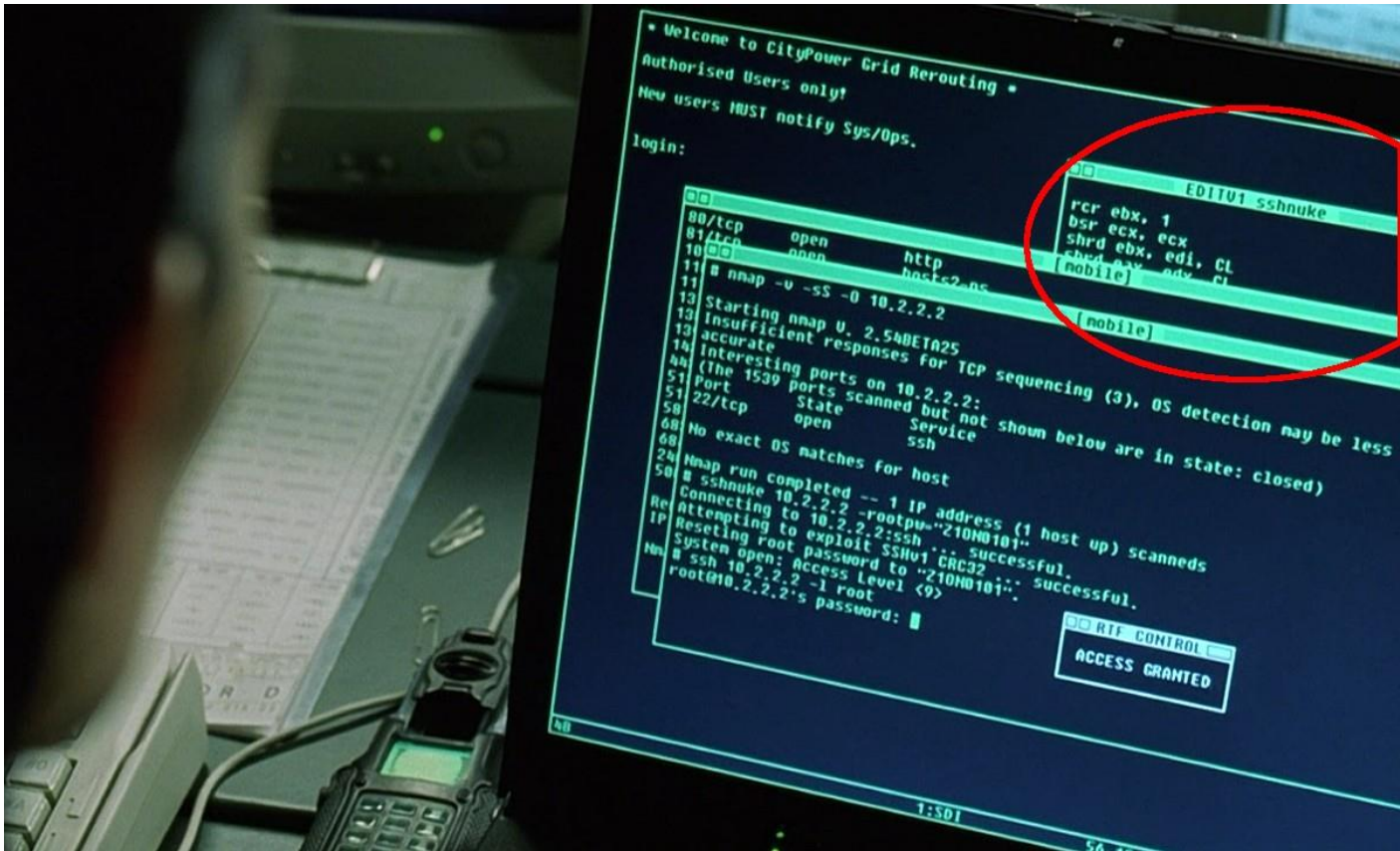


(JEFF GOLDBLUM'S CHARACTER
THE ALIEN MOTHERSHIP)



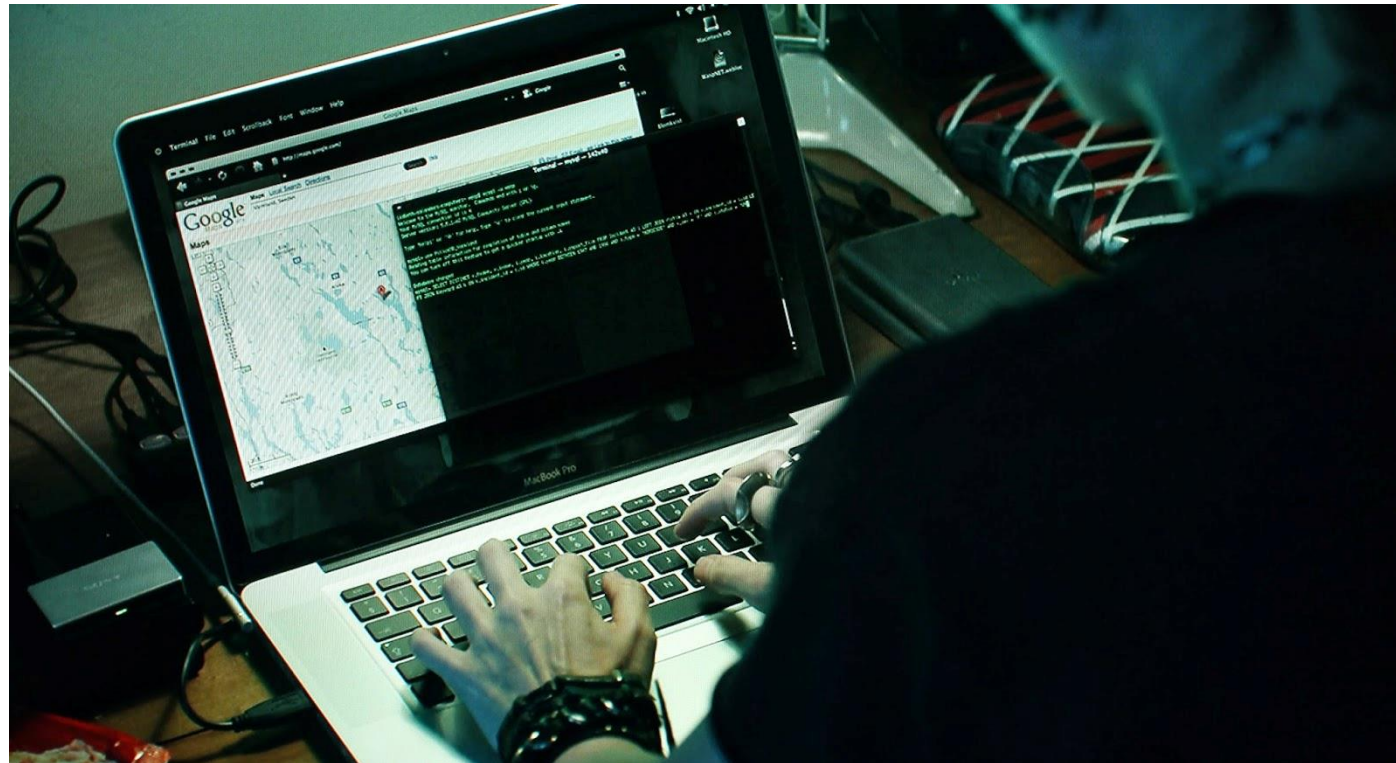
(SO THIS GUY CAN GO DIVEBOMB IT)

Matrix Reloaded (2003)



(TRINITY SAVING THE WORLD BY HACKING INTO THE POWER GRID)

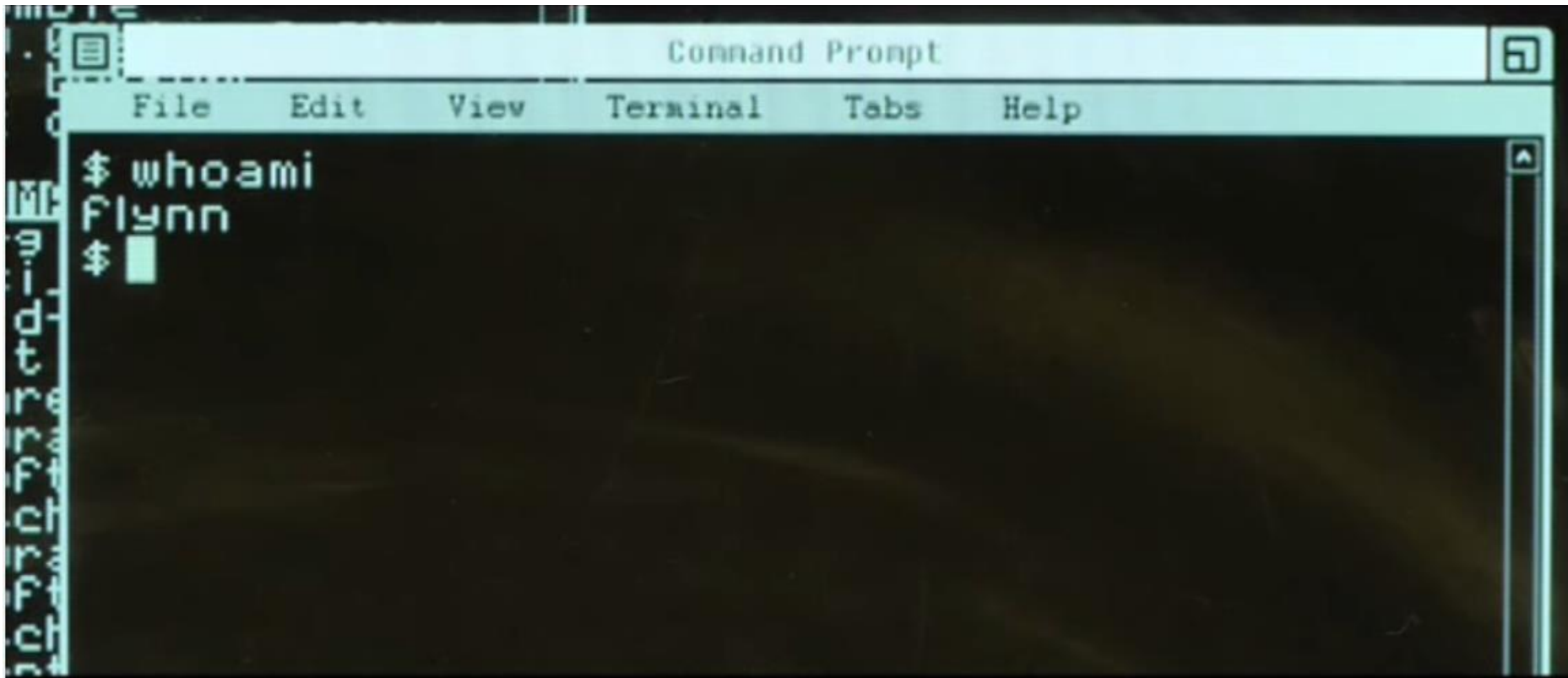
The Girl with the Dragon Tattoo (2011)



(LIBBETH SALANDER RESEARCHING MURDERS)

TRON Legacy (2011)

<https://www.youtube.com/watch?v=yQsaPVfze4s>



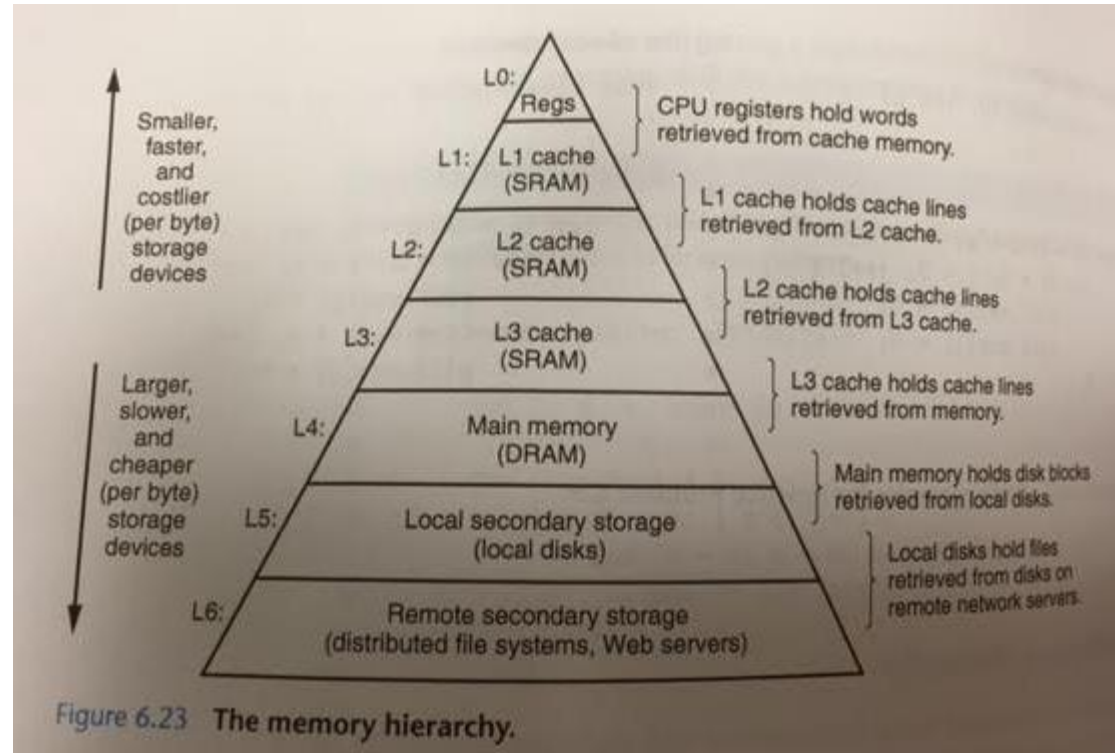
What is CS107 about?

- The CS106 series teaches you how to solve problems as a programmer
- Many times CS106 instructors had to say “just don’t worry about that” or “it probably doesn’t make sense why that happens, but ignore it for now” or “just type this to fix it”
- **CS107 finally takes you behind the scenes**
- **How do things really work in there?**
 - › It’s not quite down to hardware or physics/electromagnetism (those will have to stay even further behind the scenes for now!)
 - › It’s how things work **inside Java/C++ (we will explore from C)**, and how your programs map onto the components of computer systems
 - › *Who doesn’t love the idea of having an exclusive backstage pass?*
 - › *Who doesn’t love being in on a secret?*
 - › *It just feels good to know!*

Here's another reason why I think you should be excited:

This stuff MATTERS!

- Here's a figure that appears twice in your book (it's that important!)
- It takes **~one nanosecond** to access data closest to the hardware that actually does calculations (L0 at right)
- It takes **~ten million nanoseconds (10ms)** to access data on a hard disk (L5 at right)—ouch!!
- *A constant factor of 10 million can throw the “Big-Oh” algorithm comparisons you have studied so far (that ignore constant factors) way off!*



What are the learning goals for the course?

- The goals for CS107 are for students to gain **mastery** of
 - › writing C programs with complex use of memory and pointers
 - › an accurate model of the address space and compile/runtime behavior of C programs
- to achieve **competence** in
 - › translating C to/from assembly
 - › writing programs that respect the limitations of computer arithmetic
 - › identifying bottlenecks and improving runtime performance
 - › writing code that correctly ports to other architectures
 - › working effectively in UNIX development environment
- and have **exposure** to
 - › a working understanding of the basics of computer architecture

How does CS107 work?

Course Information Sheet walkthrough

Textbooks

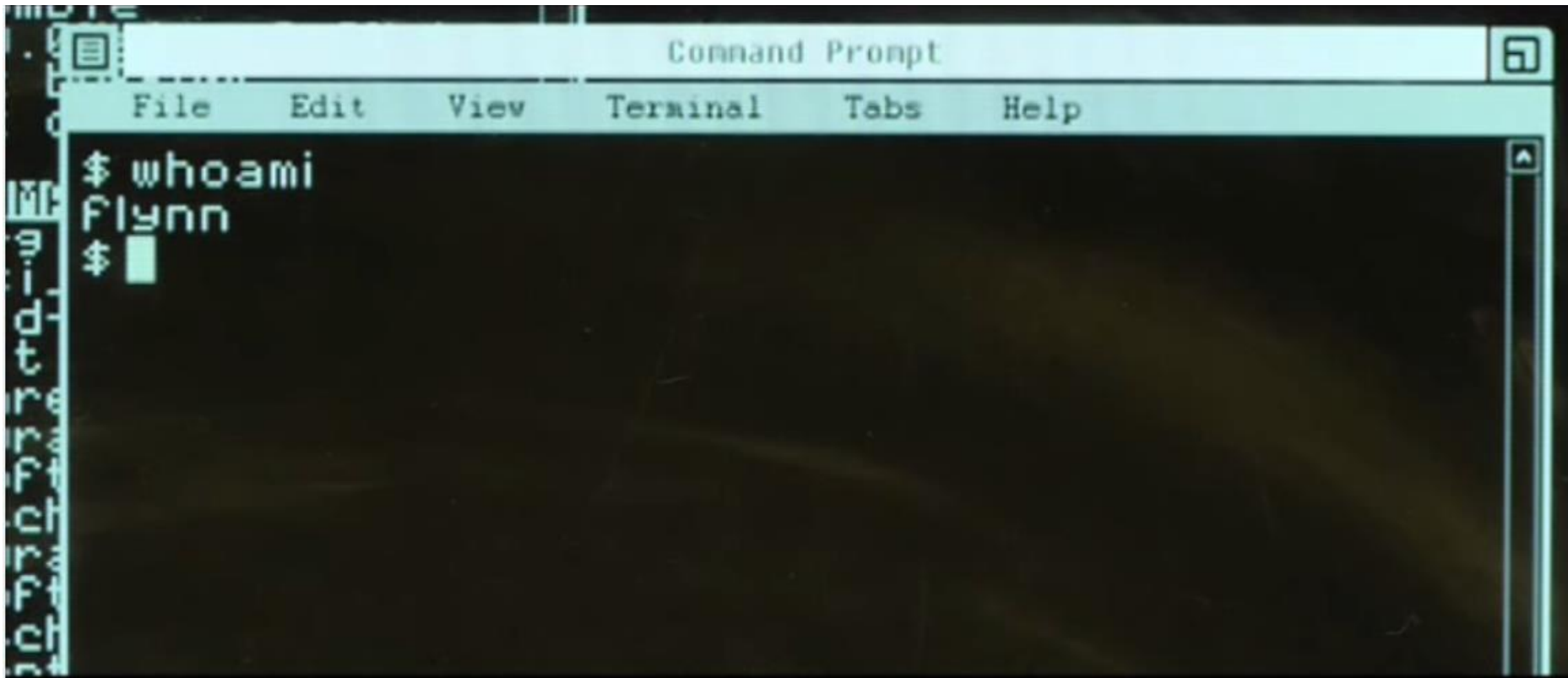
- You'll want to get the Bryant and O'Hallaron book
- 3rd edition (for once in a college class, this actually matters)
- The suggested C reference is just one suggestion
 - › You could do just as well with a different C book
 - › You could do just as well with Google or websites like <http://www.cplusplus.com/reference/clibrary/>
 - › *Just need somewhere to turn when you have a question about C*

Getting Started in UNIX

WELCOME TO THE WORLD OF GREEN AND BLACK!

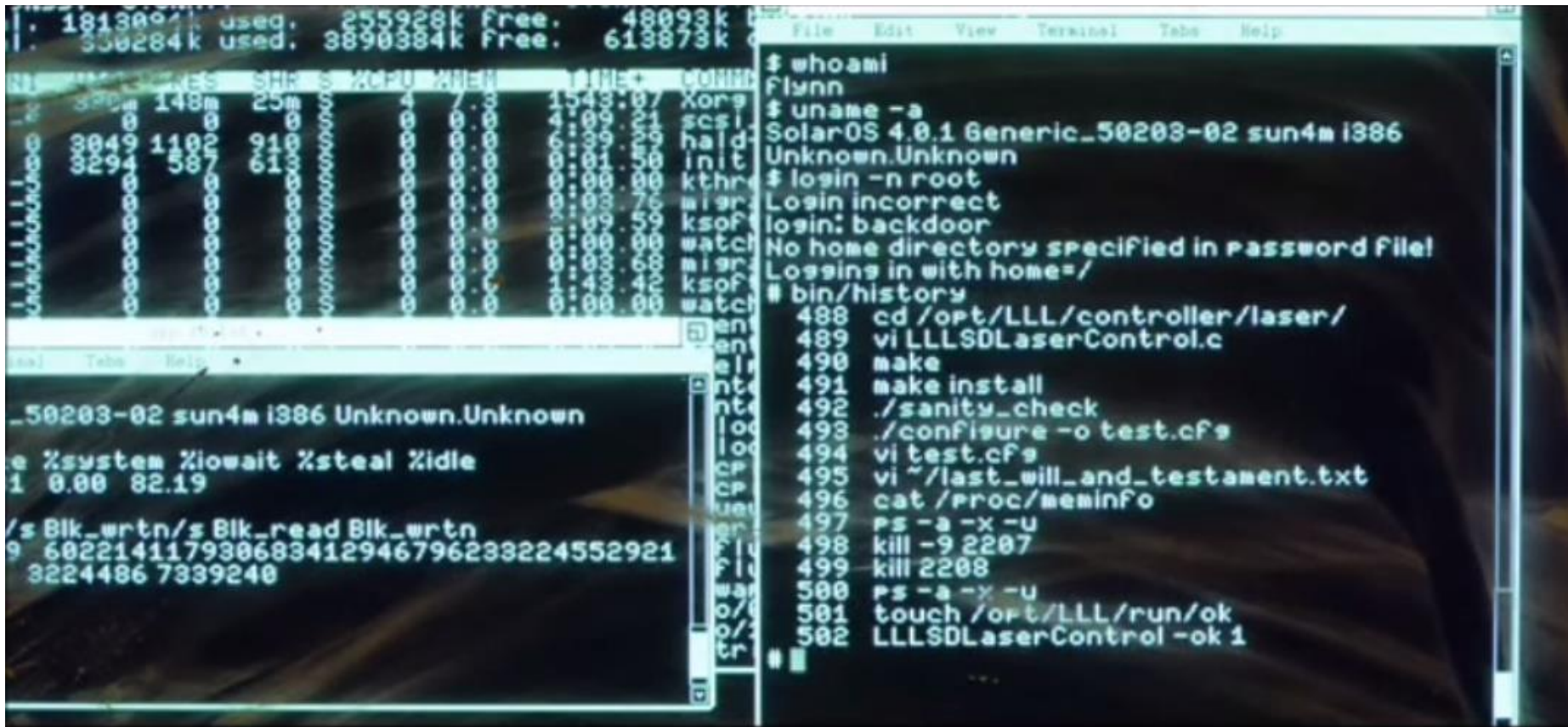
TRON Legacy (2011)

<https://www.youtube.com/watch?v=yQsaPVfze4s>



TRON Legacy (2011) (screenshot #2)

<https://www.youtube.com/watch?v=yQsaPVfze4s>



```
18138071 used, 255928k Free, 48893k
338284k used, 3898384k Free, 613873k

File Edit View Terminal Tabs Help

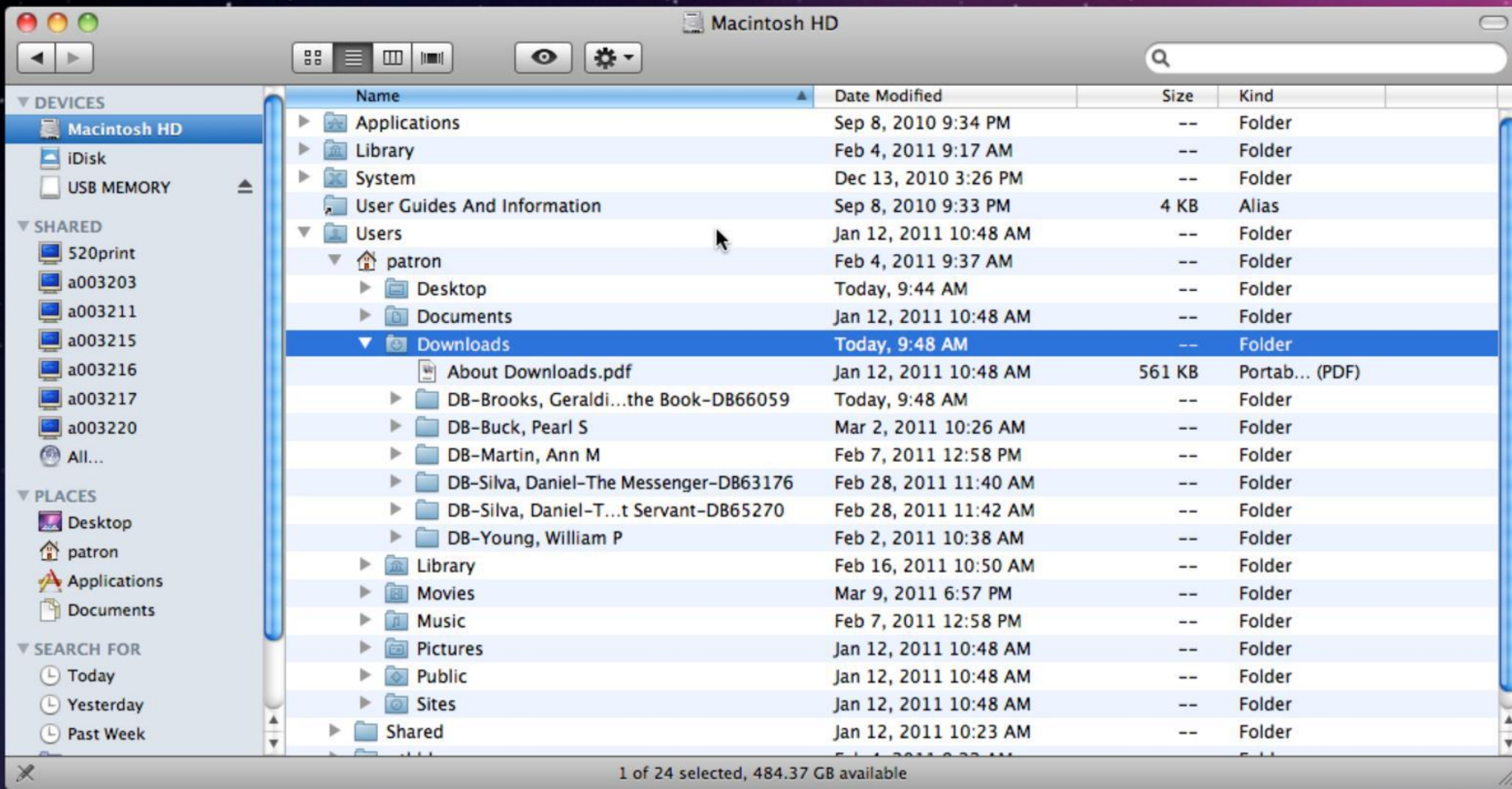
$ whoami
Flynn
$ uname -a
SolarOS 4.0.1 Generic_50203-02 sun4m i386
Unknown.Unknown
$ login -n root
Login incorrect
login: backdoor
No home directory specified in password file!
Logging in with home=/
# bin/history
488 cd /opt/LLL/controller/laser/
489 vi LLLSDLaserControl.c
490 make
491 make install
492 ./sanity_check
493 ./configure -o test.cfs
494 vi test.cfs
495 vi ~/last_will_and_testament.txt
496 cat /proc/meminfo
497 ps -a -x -u
498 kill -9 2207
499 kill 2208
500 ps -a -x -u
501 touch /opt/LLL/run/ok
502 LLLSDLaserControl -ok 1

_s0203-02 sun4m i386 Unknown.Unknown
e %system %iowait %steal %idle
1 0.00 82.19
/s Blk_wrtn/s Blk_read Blk_wrtn
9 602214117930683412946796233224552921
3224486 7339240
```

TRON Legacy (closeup)

```
File Edit View Terminal Tabs Help
$ whoami
Flynn
$ uname -a
SolarOS 4.0.1 Generic_50203-02 sun4m i386
Unknown.Unknown
$ login -n root
Login incorrect
login: backdoor
No home directory specified in password file!
Logging in with home=/
# bin/history
488 cd /opt/LLL/controller/laser/
489 vi LLLSDLaserControl.c
490 make
491 make install
492 ./sanity_check
493 ./configure -o test.cfs
494 vi test.cfs
495 vi ~/last_will_and_testament.txt
496 cat /proc/meminfo
497 ps -a -x -u
498 kill -9 2207
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500 ps -a -x -u
501 touch /opt/LLL/run/ok
502 LLLSDLaserControl -ok 1
# █
```


Navigating directories in UNIX (compared to Mac)



Navigating directories in UNIX (compared to Windows)

The screenshot shows a Windows File Explorer window titled '1516 Win CS107'. The address bar shows the path: This PC > Documents > Classes > 1516 Win CS107. The left sidebar shows a tree view of folders, with '1516 Win CS107' selected. The main pane displays a list of files with columns for Name, Date modified, Type, and Size.

Name	Date modified	Type	Size
01-lecture.pptx	1/4/2016 1:07 AM	Microsoft PowerP...	2,725 KB
02-lecture.pptx	1/7/2015 1:05 AM	Microsoft PowerP...	340 KB
courseinformation.docx	1/4/2016 12:04 PM	Microsoft Word D...	27 KB
courseinformation.pdf	1/4/2016 12:04 PM	Adobe Acrobat D...	406 KB
syllabus.docx	1/4/2016 12:09 PM	Microsoft Word D...	20 KB
syllabus.pdf	1/4/2016 12:09 PM	Adobe Acrobat D...	357 KB