Welcome!

COMS 4118

Operating Systems I

Spring 2022

`http://www.cs.columbia.edu/~jae/4118/?asof=20220119`

Teaching staff

- 7 Teaching Assistants (TAs)
  - Hans Jr Montero hjm2133@columbia.edu – Head TA
  - Kent John Hall kjh2166@columbia.edu – Head TA
  - Tal Zussman tz2294@columbia.edu
  - Xijiao Li xl2950@columbia.edu
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  - Eilam S Lehrman esl2160@columbia.edu
- TA email & office hours
  - Emails to `cucs4118-tas@googlegroups.com` go to all teaching staff
  - TA office hour calendar: `http://bit.ly/4118-cal`
- Instructor: Jae Woo Lee
  - Email: `jae@cs.columbia.edu`
  - Office: 715 CEPSR
  - Jae's office hour calendar: `http://bit.ly/jae-cal`
  - Home page: `http://www.cs.columbia.edu/~jae/`

Who am I?

- Jae Woo Lee
  - Senior Lecturer in Computer Science
    - Teaching first, research second
  - Just call me Jae (pronounced 'Jay')
    - Note that this is NOT a general rule – address instructors as Professors unless told otherwise
- My background
  - Undergrad in Columbia College
  - Many years of professional experience
    - Designing and coding large-scale software systems
    - Running a start-up company
  - Came back to Columbia for Ph.D.
  - More info at
    http://www.cs.columbia.edu/~jae/

Prerequisites

1. PLEASE PLEASE DO NOT TAKE THIS COURSE IF YOU DON'T KNOW C COLD

2. UNIX
   - Must be comfortable at command line
   - Don't take the course if you never worked on UNIX

3. Computer architecture
   - Basic knowledge of computer hardware: register, cache, bus, etc.
   - Should be able to read simple assembly code: load, store, add, jmp, etc.

4. Data structures
   - Nothing fancy, but must be solid on the basics: list, tree, stack & queue

Columbia courses:

For 1 & 2:
   W3157 Advanced Programming

For 3:
   W3827 Fundamentals of Computer Systems

For 4:
   W3134, W3136, or W3137 Data Structures

Lectures

- In-person lectures
  - May switch to online as needed (like these first two weeks)
  - Auditors are welcome to lectures & listserv, but no GitHub repos, no lab/exam submissions, no TA access
- Zoom lectures are recorded
- Recording in-person lectures are being worked out – no promises

Exam dates

- **Synchronous** and **in-person** exams for all sections
  - Exam 1: **Wednesday Mar 9, 4:20pm**
  - Exam 2: **Wednesday Apr 27, 4:20pm**
- May switch to online format if necessary
- All students must take the exams at those times; there are **no make-up and no alternate exams**
  - Please take OS next semester if you can't make these times
  - If you receive extended time accommodation, you cannot have a class after this class
- Your overall grade
  - HW 40%, Midterm 30%, Final 30%
  - Grading policy may change later

Topics

- **General OS theory**
  - Throughout the whole semester
- **Advanced UNIX programming**
  - First 1/3 of the semester
  - UNIX from outside
    - Processes, threads, networking, concurrency, signals, non-blocking & async I/O
- **Linux kernel implementation**
  - Later 2/3 of the semester
  - UNIX from inside
    - Syscalls, wait queues, scheduler, file systems, virtual memory

28.8 million lines of code

- Linux 5.12: 28.8 million lines of code across more than 60k files in 2021
  - Learn to navigate a large code base
  - Learn to read code rather than documentations that are often vague, out-of-date, or flat-out wrong
- You are likely to encounter a large existing code base at work

Homework

- 7 assignments (not including hw0)
  - Some are individual, some are group assignments
  - Some are short & light, some are long & heavy
  - Assignments carry different weights
- Some assignments may not be graded
  - But you won't know until after the deadline
  - HWs picked for grading will be 40% of your grade
- Late policy
  - 20% penalty after deadline up to 24 hours; zero afterwards

Zero tolerance on cheating

- **REQUIRED READING:**
  http://www.cs.columbia.edu/~jae/honesty.html
- You are cheating if you:
  - Take code from friends, or search for code on the Internet
  - Look at solutions that your friend has from previous semester
  - Upload any class materials (including your own code) to public repository (ex. GitHub) during or after this semester
- We can tell
  - We compare you submissions to CURRENT AND PREVIOUS submissions
  - You submit work history – minimum 5 commits required

Class ListServ

- Communication between all of us, including official announcements
    - Do:
        - Ask & answer questions – 1st place to go for non-personal questions
        - Provide helpful tips & links for your classmates
        - Be considerate & friendly
    - Don't:
        - Ask questions without first trying to solve it on your own
        - Post code or critical info that leads directly to solution
        - Be impatient & rude
    - Learn to manage high volume
        - [ANN] in email subject for announcements – set up Gmail filter
- Please use class listserv rather than TA mailing list
    - General questions to the TAs may be redirected to class listserv with your ID removed
    - Never send a same question individually to multiple TAs
- There will be an ongoing anonymous feedback form

Textbooks

1. **Operating Systems: Three Easy Pieces**
   - Version 1.00, 2018 – by Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau
   - Free in PDF form: http://pages.cs.wisc.edu/~remzi/OSTEP/

2. **Linux Kernel Development**
   - 3rd Edition, 2010, Addison-Wesley – by Robert Love

3. **Advanced Programming in the UNIX Environment**
   - 3rd Edition, 2013, Addison-Wesley – by W. Richard Stevens, Stephen A. Rago

4. **And a few other online materials that will be assigned**

Get them wherever you usually get your textbooks from…

Equipment

- You need a computer that has:
  - 64-bit CPU with multiple cores
    - All computers manufactured within the last five years should have this
  - At least 8GB RAM
- You must run one of the following platforms:
  - Windows on x86 CPU (i.e. Intel or AMD)
  - MacOS on x86 CPU
  - MacOS on Apple M1 chip
  - Linux on x86 CPU
- You will receive VMware for your platform
  - VMware for Apple M1 is in beta

Let's get to work

1. **Subscribe to 4118 ListServ TODAY**
   - https://lists.cs.columbia.edu/mailman/listinfo/cs4118
   - In the textbox "Your name (optional)" put Your Full Name (UNI)
     - For example: Jae Woo Lee (jwl3)
   - **You must reply to the confirm email (which might be in your spam folder)**
   - Then receive "Welcome to the "Cs4118" mailing list"
     - This email contains your password for accessing archives of past postings
2. Read the following two documents:
   - http://www.cs.columbia.edu/education/honesty
   - http://www.cs.columbia.edu/~jae/honesty.html
3. **HW0 (50 points) – due Fri, 1/21, 11:59pm**
4. **HW1 (100 points) – due Sun, 1/30, 11:59pm**
5. Reading assignments
   - See course home page for HW0, HW1, and reading assignments:
     http://www.cs.columbia.edu/~jae/4118/?asof=20220119
6. Start forming groups of 3 – feel free to advertise on listserv