

Welcome to CS4411

Operating Systems Practicum

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First, let's say Hi to each other!

**Type your questions in the Piazza
live Q&A anytime during the lecture.**

Why OS Practicum?

“What I cannot **create**, I do not **understand**.”

— Richard Feynman, theoretical physicist, Cornell alumni

Why understand OS?

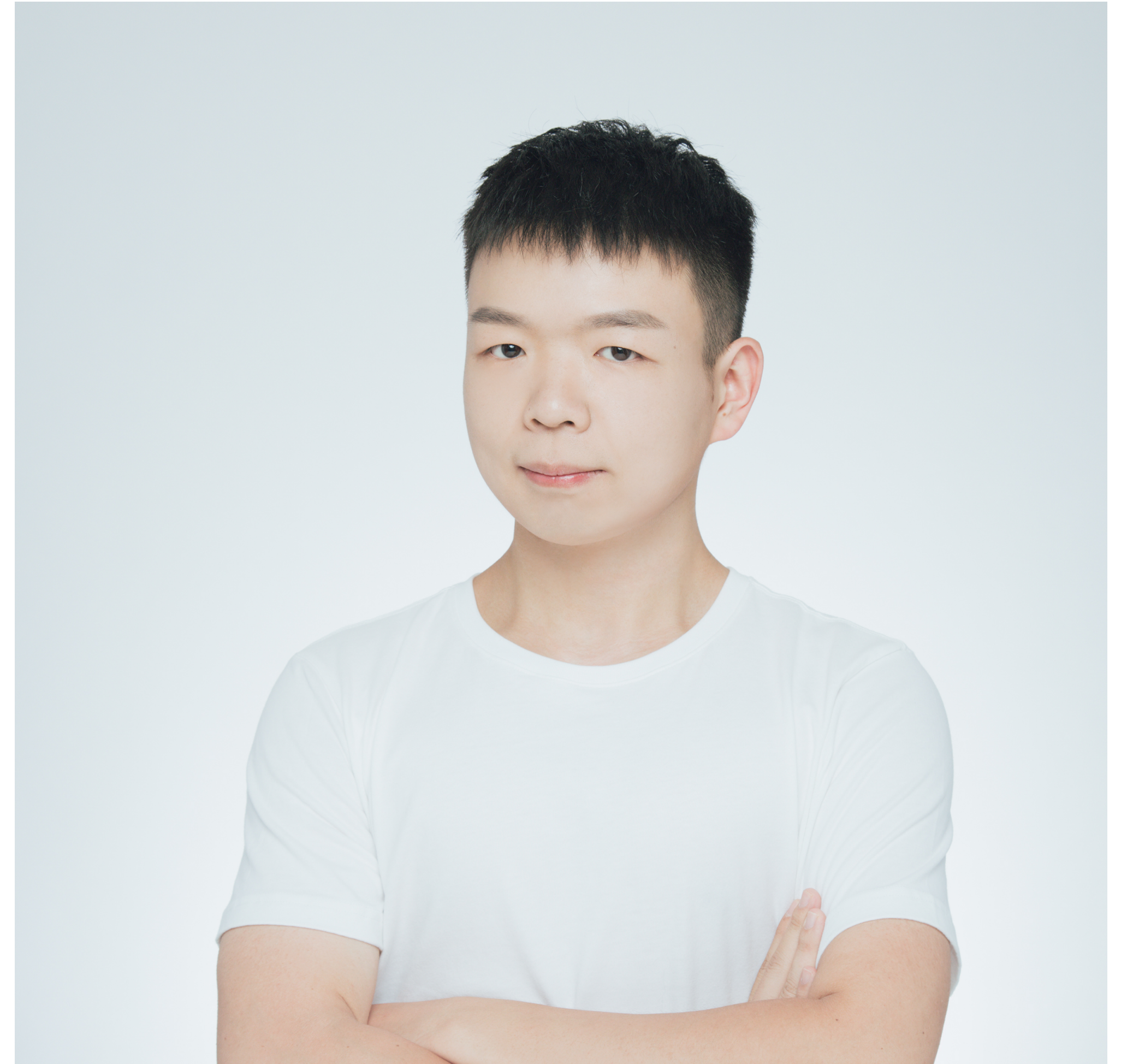
- Feynman understands theoretical physics just for fun.
- Many of us understand operating systems also just for fun.
- But there are more than that!

Why understand OS?

- Hands-on experience of how to make your piece of code **work gracefully** within a large-scale software project.
 - It's the everyday job of a software engineer.
 - 4411 projects simulate this job: you will implement operating systems functionalities within a large code base (~15K LoC) for five projects.
 - These projects help you understand how real-world operating systems (macOS, iOS, Windows, Linux, etc.) work.

About me

- I build systems. I built the OS for this course in 2018 with Robbert van Renesse.
- I lectured this course in 2019 spring and I really enjoyed sharing my engineering experiences with students.
- I do research in distributed systems and publish in the top systems conferences (SOSP&OSDI). My advisor is Lorenzo Alvisi.



Course overview

Topics	
P0	Memory, pointer and data structure in C language (today)
P1	Context-switch, threads, synchronization
P2	Scheduling
P3	Cache
P4	Testing and project management
P5	File system

Schedule on website

Week	Day	Date	Topic	Homework
1	Wed	Sep 2	Logistics & Intro; Memory & C Pointers	P0 Release
2	Wed	Sep 9	Thread, context and context switch	P1 Release
	Fri	Sep 11		P0 Due
3	Wed	Sep 16	Thread-based synchronization	
4	Wed	Sep 23	Classic synchronization algorithms	
5	Wed	Sep 30	I/O, interrupt and interrupt handling	P2 Release
	Fri	Oct 2		P1 Due
6	Wed	Oct 7	Interrupt-based scheduling	
7	Wed	Oct 14	University-wide break; no classes	
8	Wed	Oct 21	Cache and memory hierarchy	P3 Release
	Fri	Oct 23		P2 Due
9	Wed	Oct 28	Advanced topic: memory hardware architecture	
10	Wed	Nov 4	Makefile and project structure	P4 Release
	Fri	Nov 6		P3 Due
11	Wed	Nov 11	Storage device, file and file system	P5 Release
12	Wed	Nov 18	Semi-final period; no classes	
	Fri	Nov 20		P4 Due
13	Wed	Nov 25	Thanksgiving break; no classes	
14	Wed	Dec 2	Advanced topic: file system crash recovery	
15	Wed	Dec 9	Advanced topic: virtualization	
	Fri	Dec 11		P5 Due
16	Wed	Dec 16	Concluding remarks	

**Advanced topics are place holders.
Let us know what you want to learn
about!**

Logistics

- Lectures: Wednesday at 1:50 - 2:40, both in-person and online
- Communications
 - CMSx: project assignments and grades
 - Piazza: questions during and after lectures
 - Zoom: online lectures and office hours (please fill up the office hours poll on Piazza)
 - Canvas: lecture recordings for asynchronous access

Grading

- All grades come from projects.
- Project weight:
 - weight = 1 for P0, P3, P4; weight = 2 for P1, P2, P5
- Team policy:
 - You will work alone for P0 and then work in group of two.
 - Each student has **4** slip days in total and **2** for each project.
 - Write private post on Piazza if you need accommodations.

Academic Integrity

- All submitted work must be your own.
 - P0 must be entirely your own work.
 - Other projects must be solely the work of your group.
- We have all historical submissions and will check plagiarism.
- Do not put project code in a public GitHub repository.