Computer Architecture

Lecture 3b: Course Info & Logistics

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ETH Zürich
Fall 2021
7 October 2021
Onur Mutlu

- Full Professor @ ETH Zurich ITET (INFK), since September 2015
- Strecker Professor @ Carnegie Mellon University ECE/CS, 2009-2016, 2016-...
- PhD from UT-Austin, worked at Google, VMware, Microsoft Research, Intel, AMD
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Research and Teaching in:

- Computer architecture, computer systems, hardware security, bioinformatics
- Memory and storage systems
- Hardware security, safety, predictability
- Fault tolerance
- Hardware/software cooperation
- Architectures for bioinformatics, health, medicine
- ...
Course Info: The Teaching Team

- Teaching Assistants
  - Dr. Mohammed Alser
  - João Dinis Ferreira
  - Rahul Bera
  - Geraldo F. de Oliveira Jr.
  - Can Firtina
  - **Dr. Juan Gomez Luna**
  - Hasan Hassan
  - Konstantinos Kanellopoulos
  - Nika Mansouri Ghiasi
  - Dr. Haiyu Mao
  - Dr. Lois Orosa
  - Dr. Jisung Park
  - Gagandeep Singh
  - Giray Yaglikci
  - **Dr. Mohammad Sadrosadati**
  - Dr. Behzad Salami
  - Dr. Nour Almadhoun Alserr
  - Rakesh Nadig
  - Haocong Luo
  - Roknoddin Azizi

- Get to know them and their research
Some Goals of This Course

- **Teach/enable/empower you to:**
  - Understand how a computing platform works
  - Understand how decisions made in hardware affect the software/programmer as well as the hardware designer
  - Think critically (in solving problems)
  - Think broadly across the levels of transformation
  - Understand how to analyze and make tradeoffs in design
  - Apply the above in several lab projects and HWs
Review: Major High-Level Goals of This Course

- Understand the principles (of design)
- Understand the precedents

Based on such understanding:
- Enable you to evaluate tradeoffs of different designs and ideas
- Enable you to develop principled designs
- Enable you to develop novel, out-of-the-box designs

The focus is on:
- Principles, precedents, and how to use them for new designs

In Computer Architecture
Why These Goals?

- Regardless of your future direction, learning the principles and methodical analysis techniques we cover will be useful to
  - design better hardware
  - design better software
  - design better systems
  - make better tradeoffs in design
  - understand why computers behave the way they do
  - solve problems better
  - think “in parallel”
  - think critically
  - ...

A Note on Hardware vs. Software

- This course might seem like it is only “Computer Hardware”

- However, you will be much more capable if you master both hardware and software (and the interface between them)
  - Can develop better software if you understand the hardware
  - Can design better hardware if you understand the software
  - Can design a better computing system if you understand both
The Transformation Hierarchy

<table>
<thead>
<tr>
<th>Computer Architecture (expanded view)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem</td>
</tr>
<tr>
<td>Algorithm</td>
</tr>
<tr>
<td>Program/Language</td>
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<tr>
<td>System Software</td>
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<tr>
<td><strong>SW/HW Interface</strong></td>
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<tr>
<td>Micro-architecture</td>
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<tr>
<td>Logic</td>
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<tr>
<td>Devices</td>
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<tr>
<td>Electrons</td>
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</tbody>
</table>
What Do I Expect From You?

- **Required background:** Digital circuits course, programming, an open mind willing to take in many exciting concepts.

- Learn the material thoroughly
  - attend lectures, do the readings, do the exercises, do the labs

- **Work hard:** this will be a hard, but fun & informative course

- Ask questions, take notes, participate

- Perform the assigned readings

- **Participate online (lecture, Moodle)**

- Start early

- If you want feedback, come to office hours

- Remember “**Chance favors the prepared mind.**” (Pasteur)
What Do I Expect From You?

- How you prepare and manage your time is very important.

- There will be many lab and homework assignments:
  - They will take time
  - Start early, work hard

- This will be a heavy course:
  - However, you will learn a lot of fascinating topics and understand how a computing platform works
  - And, it will hopefully change how you look at and think about designs around you
How Will You Be Evaluated?

- Lab assignments: 50%
- Final exam (180 minutes): 30%
- Homeworks: 20%

- Many extra credit possibilities in HWs, Labs, Exam
Course Goals

Goal 1: To familiarize those interested in computer system design with both fundamental operation principles and design tradeoffs of processor, memory, and platform architectures in today’s systems.
- Strong emphasis on fundamentals, design tradeoffs, key current/future issues
- Strong emphasis on looking backward, forward, up and down

Goal 2: To provide the necessary background and experience to design, implement, and evaluate a modern processor by performing hands-on simulator implementation.
- Strong emphasis on functionality, hands-on design & implementation, and efficiency.
- Strong emphasis on making things work, realizing ideas
Course Website

- [https://safari.ethz.ch/architecture/fall2021/](https://safari.ethz.ch/architecture/fall2021/)

- All slides, lecture videos, readings, assignments to be posted

- Plus, other useful information for the course

- Check frequently for announcements and due dates
Homework 0

- Was due Sep 30

- Information about yourself

- All future grading is predicated on homework 0
Heads Up

- HW1 is already out
  - Due in ~2 weeks after release

- Lab 1 is already out
  - Due in ~2 weeks after release

- Check the website and your email frequently for assignments and announcements
  - https://safari.ethz.ch/architecture/fall2021/