Computer Architecture

Lecture 2b: Course Logistics

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ETH Zürich
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Increasingly Demanding Applications

- Dream, and they will come
Increasingly Diverging/Complex Tradeoffs

Communication Dominates Arithmetic

Dally, HiPEAC 2015
Increasingly Diverging/Complex Tradeoffs

A memory access consumes ~1000X the energy of a complex addition
Increasingly Complex Systems

Past systems

Microprocessor ← Main Memory → Storage (SSD/HDD)
Increasingly Complex Systems

- FPGAs
- Heterogeneous Processors and Accelerators
- Hybrid Main Memory
- (General Purpose) GPUs
- Persistent Memory/Storage

Modern systems
Recap: 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
Onur Mutlu

- Full Professor @ ETH Zurich CS, 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: Who Are We?

- Teaching Assistants
  - Dr. Mohammed Alser
  - Rahul Bera
  - Geraldo F. de Oliveira Jr.
  - Can Firtina
  - Dr. Juan Gomez Luna
  - Dr. Jawad Haj-Yahya
  - Hasan Hassan
  - Konstantinos Kanellopoulos
  - Jeremie Kim
  - Nika Mansouri Ghiasi
  - Dr. Lois Orosa Nogueira
  - Dr. Jisung Park
  - Minesh Patel
  - Giray Yaglikci

- Get to know them and their research
Review: Major High-Level Goals of This Course

- Understand the principles
- 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
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

This course covers the HW/SW interface and microarchitecture
- We will focus on tradeoffs and how they affect software
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

- **Come to class, participate**

- 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?

- Project assignments: 45%
- Midterm exam: 15%
- Final exam: 25%
- Homeworks: 15%

More on this later
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

- 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

- Due Sep 26

- Information about yourself

- All future grading is predicated on homework 0
Heads Up

- We will have a few required review assignments
  - Due likely end of next week

- HW1 will be out early next week
  - Due in ~2 weeks

- Lab 1 will be out today
  - Due in ~2 weeks

- Check the website. Will also be announced in lecture