

# Computer Architecture

## Lecture 2b: Course Info & Logistics

Prof. Onur Mutlu

ETH Zürich

Fall 2023

29 September 2023

# Course Info: Who Are We?



## ■ Onur Mutlu

- Full Professor @ ETH Zurich ITET (INFK), since Sept 2015
- Strecker Professor @ Carnegie Mellon University ECE (CS), 2009-2016, 2016-...
- Started the Comp Arch Research Group @ Microsoft Research, 2006-2009
- Worked @ Google, VMware, Microsoft Research, Intel, AMD
- PhD in Computer Engineering from University of Texas at Austin in 2006
- BS in Computer Engineering & Psychology from University of Michigan in 2000
- <https://people.inf.ethz.ch/omutlu/>    [omutlu@gmail.com](mailto:omutlu@gmail.com)

## ■ Research and Teaching in:

- **Computer architecture, systems, hardware security, bioinformatics**
- Memory and storage systems
- Robust & dependable hardware systems: security, safety, predictability, reliability
- Hardware/software cooperation
- New computing paradigms; architectures with emerging technologies/devices
- Architectures for bioinformatics, genomics, health, medicine, AI/ML
- ...

# Course Info: The Teaching Team

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## ■ **Instructors**

- Prof. Onur Mutlu
- Dr. Juan Gomez Luna
- Dr. Mohammad Sadrosadati

## ■ **Teaching Assistants**

- **Dr. Yu Liang**
- **Ataberk Olgun**
- Rahul Bera
- Geraldo F. de Oliveira Jr.
- Can Firtina
- Konstantinos Kanellopoulos
- Nika Mansouri Ghiasi
- Giray Yaglikci
- Rakesh Nadig
- Haocong Luo
- Banu Cavlak
- Nisa Bostanci
- Joel Lindegger
- Ismail Emir Yuksel
- Melina Soysal
- Zulal Bingol

## ■ Get to know them and their research

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# Some Goals of This Course

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- 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

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- 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?

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- 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

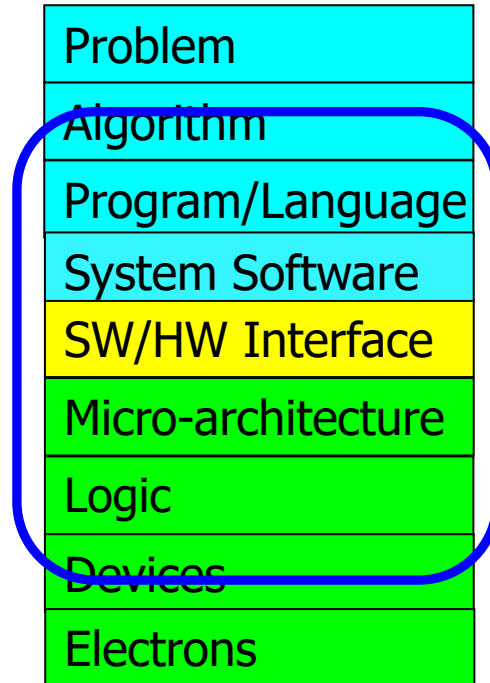
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- This course might seem like it is only “Computer Hardware”
- However, you will be much more capable if you master both hardware and software (and the interface between them)
  - Can develop better software if you understand the hardware
  - Can design better hardware if you understand the software
  - Can design a better computing system if you understand both

# The Transformation Hierarchy

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**Computer Architecture  
(expanded view)**





# What Do I Expect From You?

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- **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?

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- 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?

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- Lab assignments: 50%
  - Final exam (180 minutes): 30%
  - Homeworks: 20%
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- Many extra credit possibilities in HWs, Labs, Exam

# Course Goals

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- 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

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- <https://safari.ethz.ch/architecture/fall2023/>
- 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

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- Is due Oct 13
  - <https://safari.ethz.ch/architecture/fall2023/lib/exe/fetch.php?media=hw0.pdf>
- Information about yourself
- All future grading is predicated on homework 0

# Heads Up

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- Lab 1 is already out
  - Due on Oct. 13
- HW1 will be out soon
  - Due in ~2 weeks after release
- Check the website and your email frequently for assignments and announcements
  - <https://safari.ethz.ch/architecture/fall2023/>
- My goal is to enable your learning and growth, so labs can be done any time until the end of the semester
  - But, please know yourself and plan accordingly

## **Richard Hamming**

### **“You and Your Research”**

Transcription of the  
Bell Communications Research Colloquium Seminar  
7 March 1986

<https://safari.ethz.ch/architecture/fall2021/lib/exe/fetch.php?media=youandyourresearch.pdf>

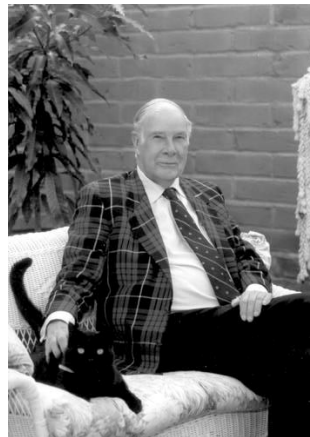


# Required Reading on Mindset & More

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If you really want to be a first-class scientist you need to know yourself, your weaknesses, your strengths, and your bad faults, like my egotism. How can you convert a fault to an asset? How can you convert a situation where you haven't got enough manpower to move into a direction when that's exactly what you need to do? I say again that I have seen, as I studied the history, the successful scientist changed the viewpoint and what was a defect became an asset.

In summary, I claim that some of the reasons why so many people who have greatness within their grasp don't succeed are: they don't work on important problems, they don't become emotionally involved, they don't try and change what is difficult to some other situation which is easily done but is still important, and they keep giving themselves alibis why they don't. They keep saying that it is a matter of luck. I've told you how easy it is; furthermore I've told you how to reform. Therefore, go forth and become great scientists!



# Suggested Talk on Mindset & Research



The image shows a YouTube video player with a presentation slide. The slide has a white background with a thin gold border. The text on the slide is as follows:

Applying to Grad School  
& Doing Impactful Research

Onur Mutlu  
[omutlu@gmail.com](mailto:omutlu@gmail.com)  
<https://people.inf.ethz.ch/omutlu>  
13 June 2020  
Undergraduate Architecture Mentoring Workshop @ ISCA 2021

At the bottom of the slide, there are three logos: SAFARI, ETH zürich, and Carnegie Mellon.

The video player interface includes a progress bar at the bottom showing 0:27 / 50:31. Below the video, the video title is "Arch. Mentoring Workshop @ISCA'21 - Applying to Grad School & Doing Impactful Research - Onur Mutlu". It has 1,563 views and was premiered on Jun 16, 2021. The video is from the channel "Onur Mutlu Lectures" which has 17.2K subscribers. There are 74 likes and 1 comment. The video is available for sharing, saving, and analytics.

# SAFARI Research Group: Introduction and Research

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- Onur Mutlu,  
**"SAFARI Research Group: Introduction & Research"**  
*Talk at ETH Future Computing Laboratory Welcome Workshop (**EFCL**), Virtual, 6 July 2021.*  
[Slides (pptx) (pdf)]

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