INTRODUCTION AND LOGISTICS

Mahdi Nazm Bojnordi
Assistant Professor
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Instructor

- Mahdi Nazm Bojnordi
  - Assistant Professor of School of Computing
  - PhD degree in Electrical Engineering
- Research in Computer Architecture
  - Novel Memory Technologies
  - Energy-Efficient Computing
- Office Hours
  - Please email me for appointment
  - MEB 3418
- Class webpage: [http://cs.utah.edu/~bojnordi/teaching.html](http://cs.utah.edu/~bojnordi/teaching.html)
Teaching Assistants

- Anirban Nag
  - Email: anirban@cs.utah.edu
  - Office Hours: Monday 3:00-4:30 PM
  - MEB 2180

- Manikanth Miryala
  - Email: manikanth.miryala@utah.edu
  - Office Hours: Wednesday 10:00-11:30 AM
  - CADE Lab.
Resources and Requirements


- Pre-requisite: CS/ECE 3810 or equivalent
Course Expectation

- We use Canvas for homework submissions, grades, and homework announcements.

- Grading

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<tr>
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<th>Fraction</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>50%</td>
<td>Weekly homework assignments</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>20%</td>
<td>In-class, October 18th</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
<td>Wednesday, December 14th</td>
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<tr>
<td>Class Participation</td>
<td>0-10%</td>
<td>Questions and answers in class</td>
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- Good news: we will drop your lowest assignment score.
Academic Integrity

- Do NOT cheat!!
  - Please read the Policy Statement on Academic Misconduct, carefully.
  - We have no tolerance for cheating
  - Also, read to the College of Engineering Guidelines for disabilities, add, drop, appeals, etc.
  - For more information, please refer to the important policies on the class webpage.
Why CS/ECE 6810?

- Need another qualifier/graduation requirement?
- You plan to become a Computer Architect?
- Understand what is inside a modern processor?
- Want to use the knowledge from this course in your own field of study?
- Understand the technology trends and recent developments for future computing?
- …
Estimated Class Schedule

- Introduction and Performance Metrics
- Instruction Set Architecture and Pipelining
- Instruction-Level Parallelism
- Compiler Optimization
- Dynamic Instruction Scheduling
- Memory System Design
- Data Parallel Processors (VLIW and GPU)
- Interconnection Networks
- Embedded Systems
What is Computer Architecture?

- Computer systems are everywhere ...
What is Computer Architecture?

- What is inside modern processors ...

VLSI Circuits
Hardware Implementation

Software Applications
OS and Compiler
What is Computer Architecture?

- Computer architecture is the glue between software and VLSI implementation.

VLSI Circuits
Hardware Implementation

ISA, \( \mu \)architecture, system Architecture

Software Applications
OS and Compiler
Growth in Processor Performance

Source: Hennesy & Patterson Textbook
Growth in Processor Performance

- Main sources of the performance improvement
  - Enhanced underlying technology (semiconductor)
    - Faster and smaller transistors (Moore’s Law)
  - Improvements in computer architecture
    - How to better utilize the additional resources to gain more power savings, functionalities, and processing speed.
What are New Challenges?

- Resources (transistors) on a processor chip?
  - Not really, billions of transistors on a single chip.

- Can we use all of the transistors?
  - Due to energy-efficiency limitations, only a fraction of the transistor can be turned on at the same time!

- Who is affected?
  - Server computers by the peak power
  - Mobile and wearables due to energy-efficiency