Welcome!

CS-173 Fundamentals of Digital Systems

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Meet the Teacher

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Why Studying Digital Systems?
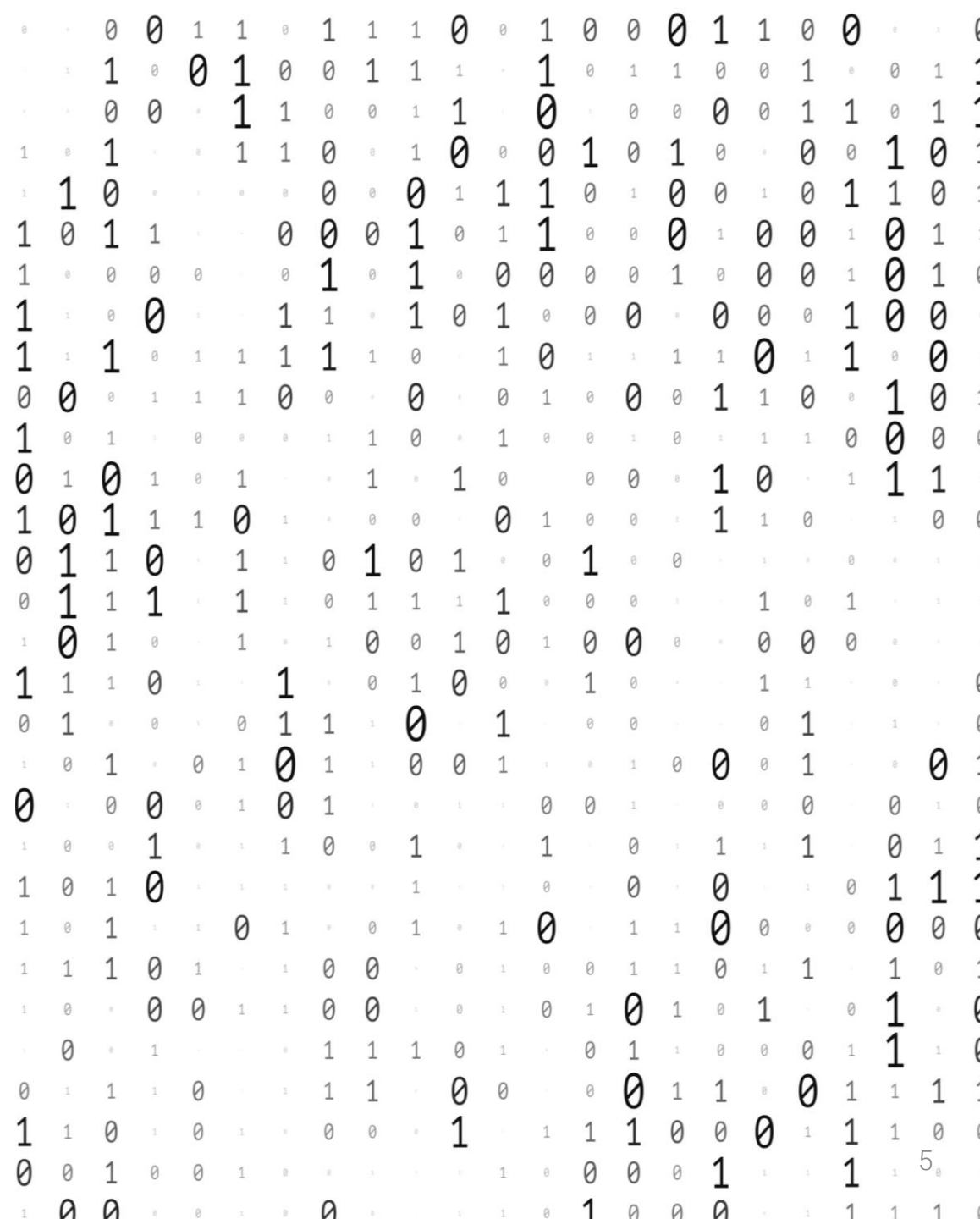
Why Studying Digital Systems?

- CPUs are impressive,
  but modern applications require specialized HW/SW

- We are no longer able to continue "squeezing" more and more computing units and functionality into devices

- Machine learning is very compute-intensive and needs custom computing HW

Contents: Part I

Number Systems

- Digital systems are built from circuits that process binary digits

- Discover how familiar numeric quantities can be represented and manipulated in a digital system

- Describe binary number systems

- Learn how basic arithmetic operations are performed

Contents: Part II

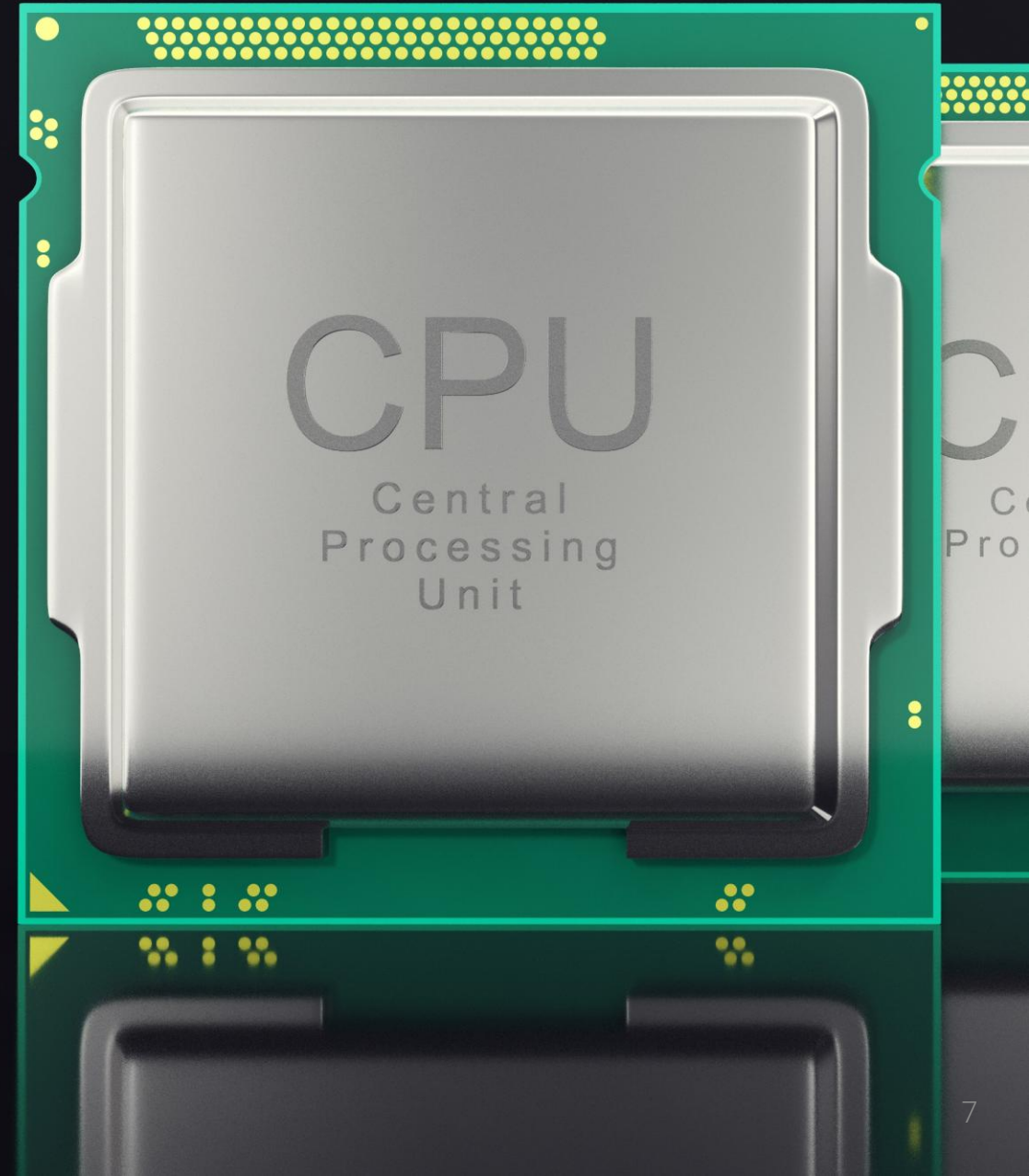**Digital Logic and Design with Verilog**

- Binary logic circuits have the dominant role in digital technology

- Discover logic gates and expressions, combinational and sequential logic elements, and build state machines

- Design and simulate logic circuits in Logisim-Evolution and Verilog hardware description language

Contents: Part III

Intro to Computer Architecture

- Discover fundamental building blocks of computers

- Study processor architecture and the RISC-V open-standard ISA

- Learn about domain-specific architectures and their role in the future of computing

- Discover FPGAs

Connection with Other Courses

- CS-173 prepares for several courses, for example:
  - CS-200 Computer Architecture
    - Complex digital systems and processors
    - Memory hierarchy
    - IOs and exceptions
    - Instruction-level parallelism
    - Multiprocessors and cache coherence
  - CS-470 Advanced Computer Architecture
  - CS-476 Embedded System Design
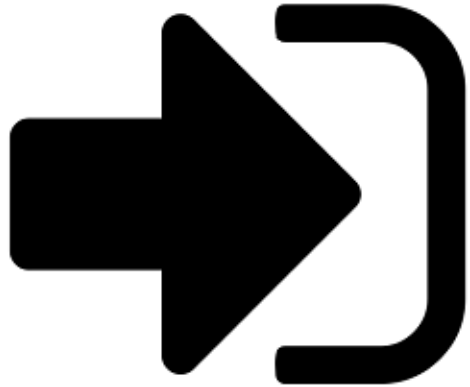 - CS-473 System Programming for Systems-on-Chip

Teaching Methods

- Ex cathedra lectures
  - On-site, sometimes flipped classroom
  - Streamed live and available for rewatching on mediaspace.epfl.ch
- Exercise sessions
  - Solving problems, on-site Q&A
- Self-learning
  - Books, online resources
- Office hours, upon request
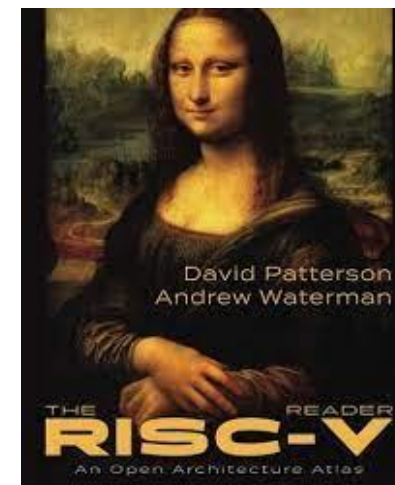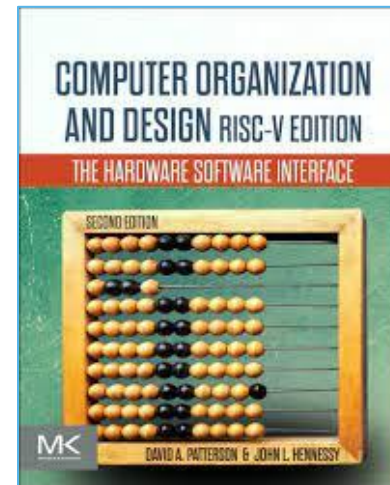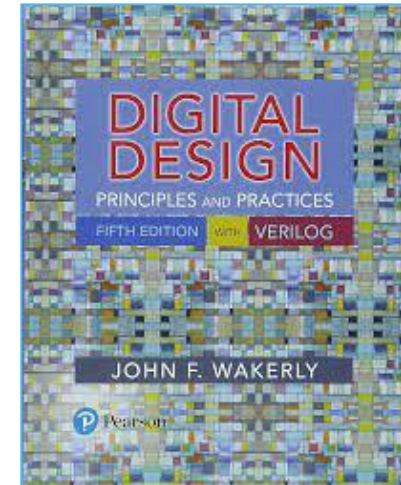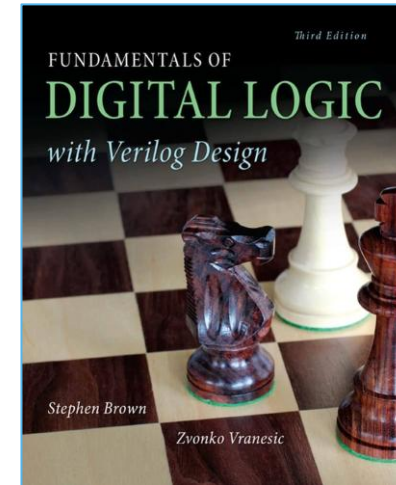
Communication

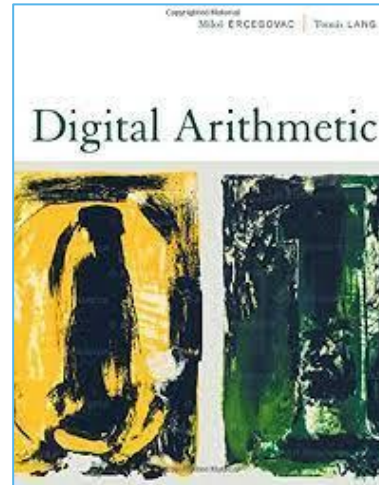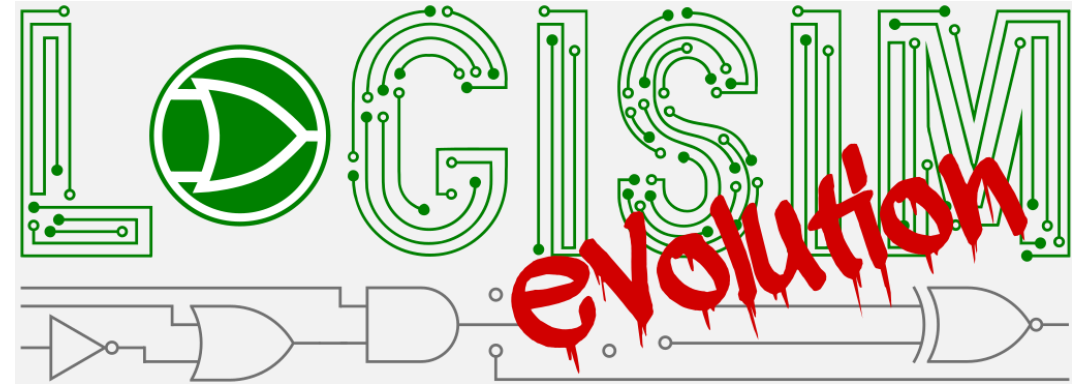- [Moodle](#)

- Ed Discussion

- E-mail announcements

Literature

- Course material
- Online resources
- Books

Style of the Exercises

- Pen and paper
- With open-source tools
  - Ubuntu VM on vdi.epfl.ch
  - Logisim-Evolution
  - Icarus Verilog
  - GTKWave
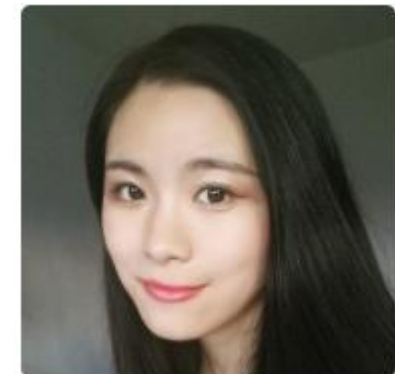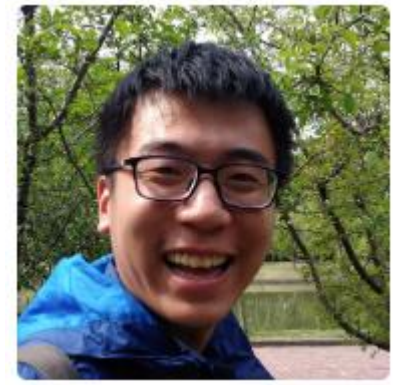 - Visual Studio Code

Assessment

- Two written exams
  - **M**, midterm, during the semester
  - **F**, final, in the exam session

- **TOTAL = M $\times$ 0.3 + F $\times$ 0.7**

- **TOTAL $\rightarrow$ Grade**
  rounded to the closest
  multiple of 0.25

Graduate TA Team

- Ali Ansari
- Bugra Erylmaz
- Shanqing Lin
- Rouzbeh Pirayadi
- Alexandros Poupakis
- Shashwat Shrivastava
- Mohammadarman Soleimani
- Rui Yang

Ready...Steady...