

Syllabus

Computer evolution and performance; computer structure, function, and interconnection; memory hierarchy; cache memory; virtual memory; storage; input/output; operating system support; process; interrupt; system call; instruction set; processor structure and function; pipelining; super-scalar processors; multi-core computers.

Aim

Today digital technology permeates every corner of our society. There are three big trends that shape our future. The first one is the coming of Artificial Intelligence. The second one is the rise of Automation. The last one the revolution of technology to transfer money. These advancements rely on the power of computing. This class introduces an overview of modern computer system.

Topics

Computer Technology

Instructions

Arithmetic

Processor

Memory

Graphic Processing Unit

Quantum computing

Assessment

40% in-class work, simple question at break, homework

30% midterm (1:30 hours) around first week of March

30% final (2 hours)

Lecture

Computer Technology

Technology

Performance

Power

Basics

Instructions

Arithmetic

Floating-point arithmetic

Logic design

Processor

instruction execution

datapath

control unit

RISC-V simulation with detailed control sequence

<midterm exam>

pipeline-intro pipeline-implementation

memory technology

cache memory

direct-map cache

measuring cache performance

Graphic Processing Unit

Development of Graphics Processing Unit

General Purpose GPU applications

Concrete example: GPU simulator (NPU) with assembly programming

Quantum Computing