

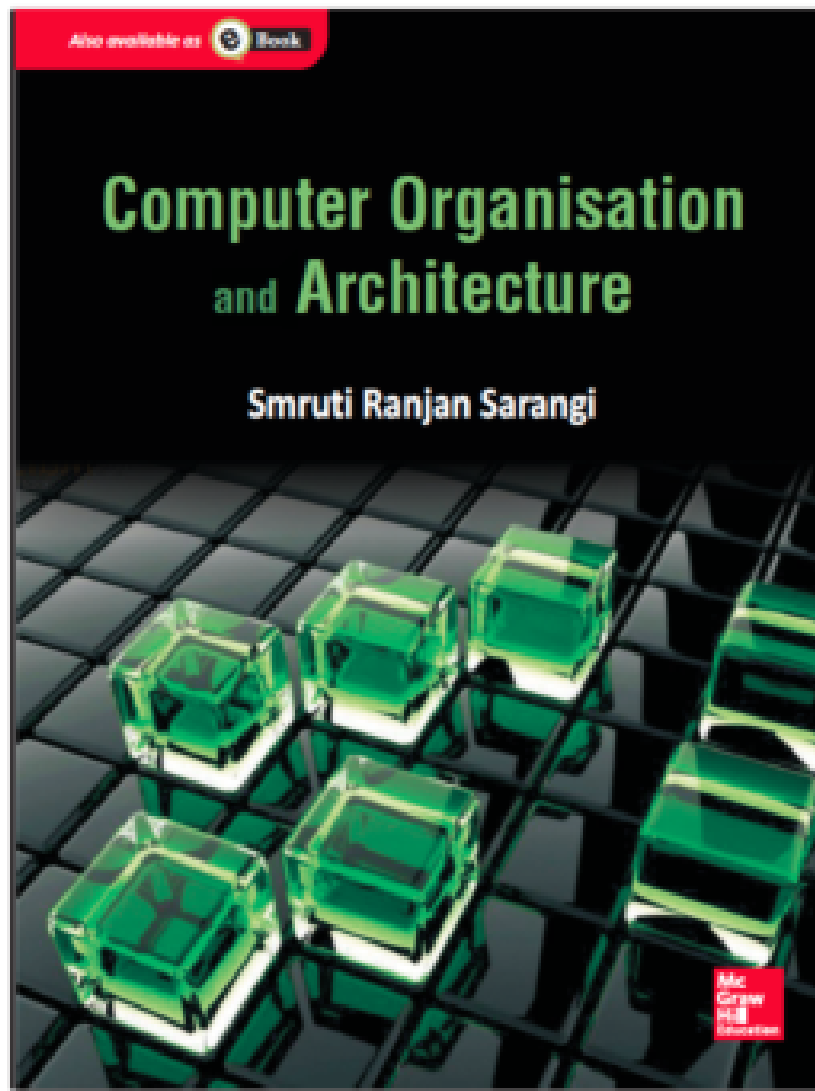
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# CS301: Computer Architecture

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These slides are meant to be used along with the book:  
Computer Organisation and Architecture, Smruti Ranjan  
Sarangi, McGrawHill 2015

Visit:

<http://www.cse.iitd.ernet.in/~srsarangi/archbooksoft.html>

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## Compare

2 items

☐ Show only differences

	Lenovo Core i5 7th Gen - (8 GB/1 TB HDD/DOS/2 GB Graphics) IP 320E Laptop	Dell Vostro 15 3000 Core i5 8th Gen - (8 GB/1 TB HDD/Windows 10 Home/2 GB Graphics) 3578 Laptop	Choose Brand	Choose Brand
	₹41,990	₹47,990	Choose a Product	Choose a Product
Ratings & Reviews	 10,153 Ratings & 2,216 Reviews All 2216 reviews	 3,615 Ratings & 801 Reviews All 801 reviews		
Highlights	NVIDIA GeForce 940MX for High Graphics Performance Intel Core i5 Processor (7th Gen) 8 GB DDR4 RAM DOS Operating System 1 TB HDD 15.6 inch Display Warranty: 1 Year Onsite Warranty Returns: 10 Days Replacement Policy	Intel Core i5 Processor (8th Gen) 8 GB DDR4 RAM 64 bit Windows 10 Operating System 1 TB HDD 15.6 inch Display Warranty: 1 Year Onsite Warranty Returns: 10 Days Replacement Policy		

What do all these mean?

# i3 v/s i5 v/s i7

- Classification of manufactured chips based on maximum safe operating frequency

## Generations

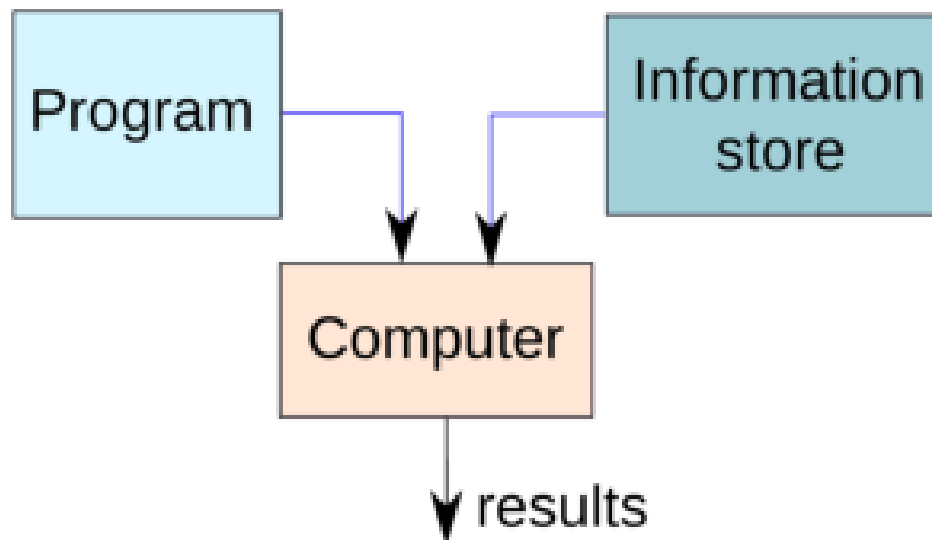
- Reducing feature size
  - Transistors are smaller, switch faster, consume less energy
- Improved Computer Architecture



Based on the  
same  
principles



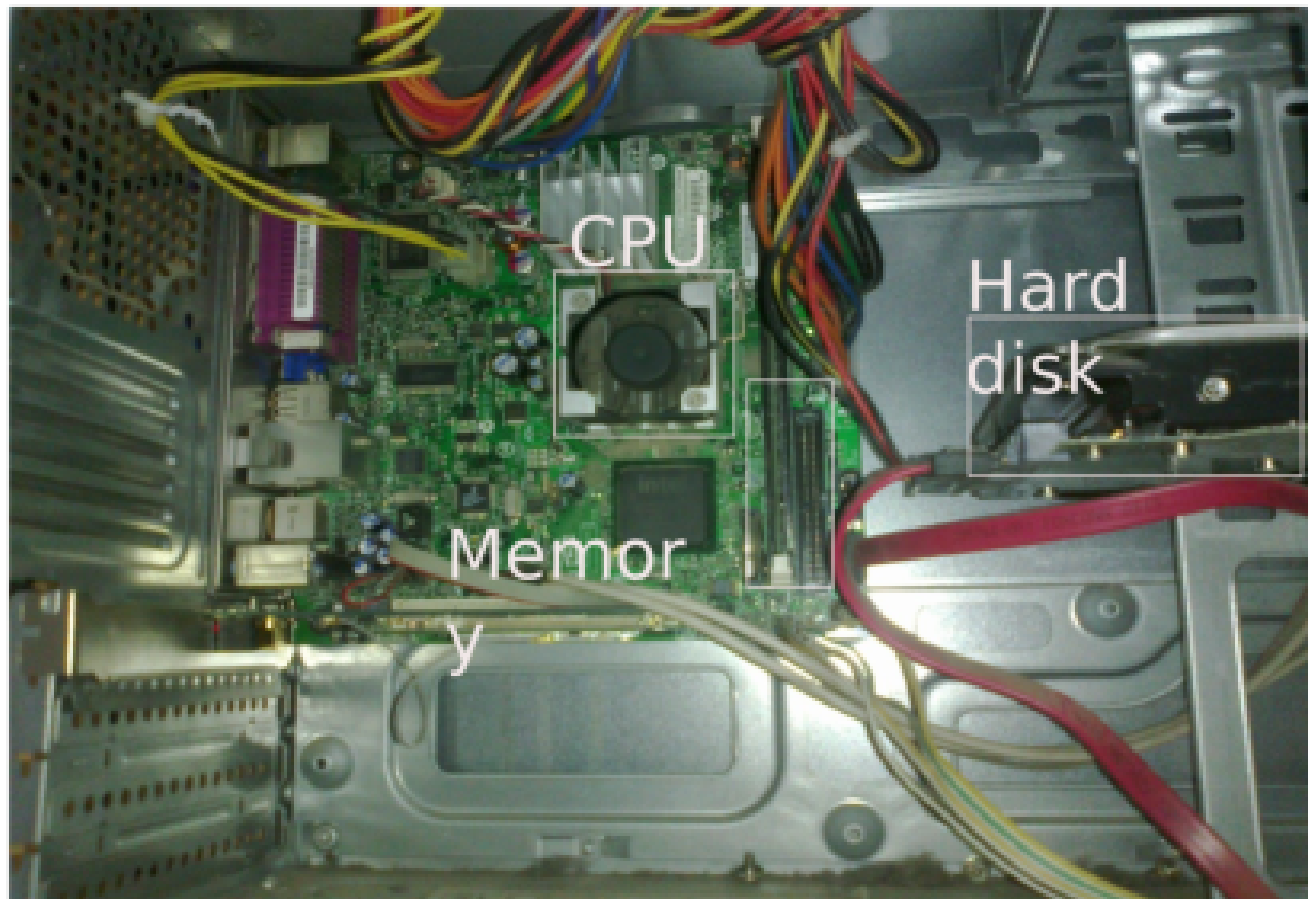
# How does it work ?

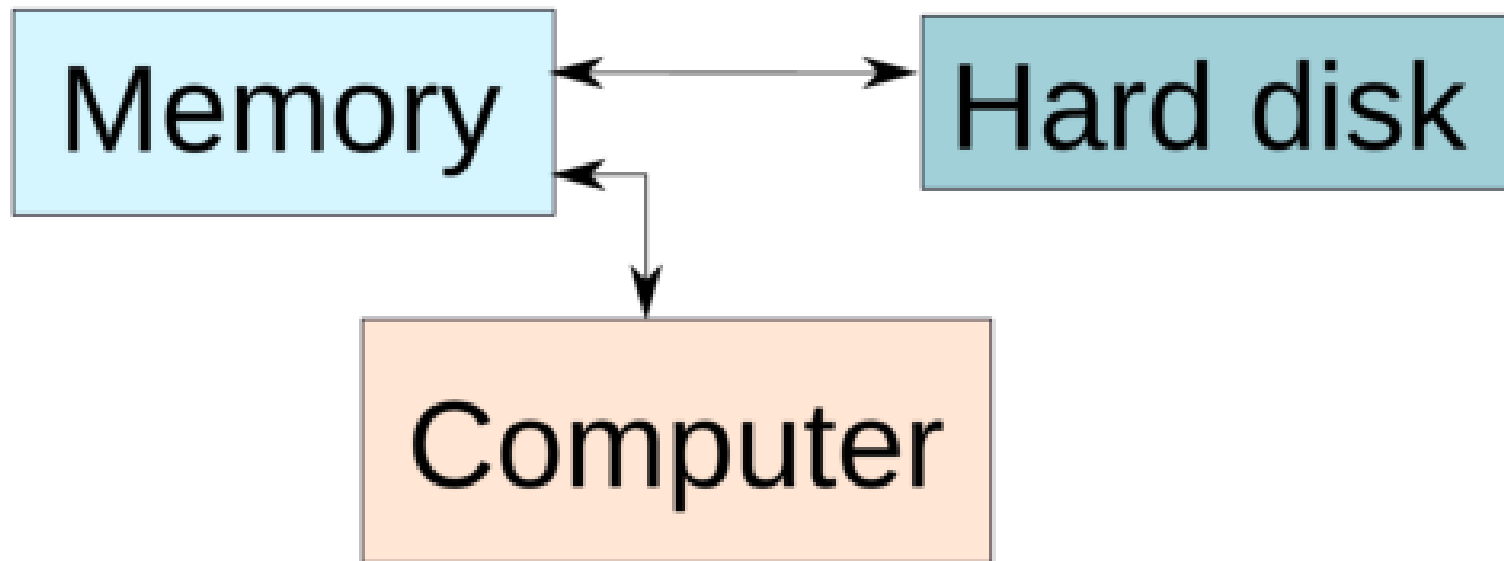


- \* Program – List of instructions given to the computer
- \* Information store – data, images, files, videos
- \* Computer – Process the information store according to the instructions in the program

# What does a computer look like ?

- \* Let us take the lid off a desktop computer

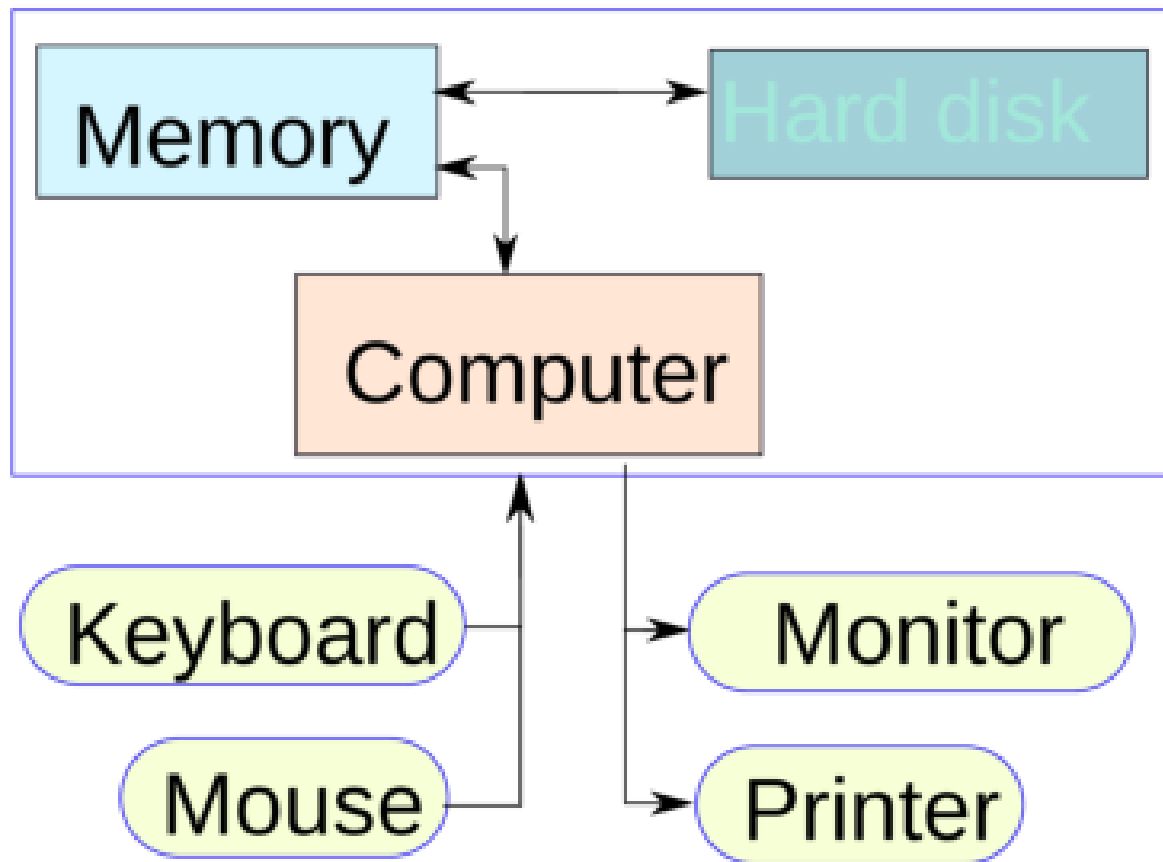




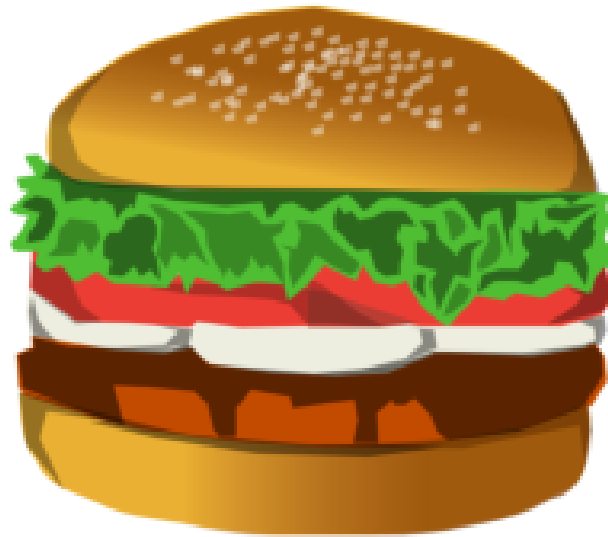
- \* Memory – Stores programs and data. Gets destroyed when the computer is powered off
- \* Hard disk – stores programs/data permanently



# Let us make it a full system ...



# Food for Thought...



\* What is the most intelligent computer ?

# Answer ...



\*Our brilliant brains

# How does an Electronic Computer Differ from our Brain ?

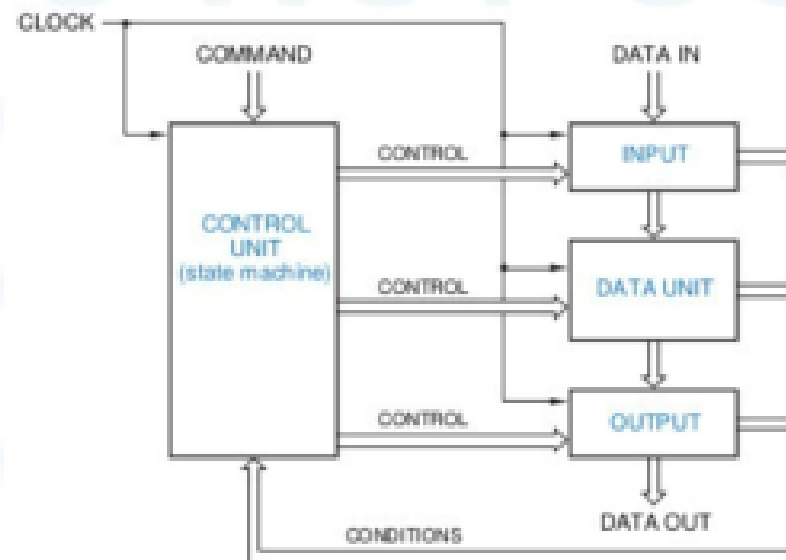
Feature	Computer	Our Brilliant Brain
Intelligence	Dumb	Intelligent
Speed of basic calculations	Ultra-fast	Slow
Can get tired	Never	After sometime
Can get bored	Never	Almost always

\*Computers are ultra-fast and ultra-dumb

# Foundations -- Theory of Computation

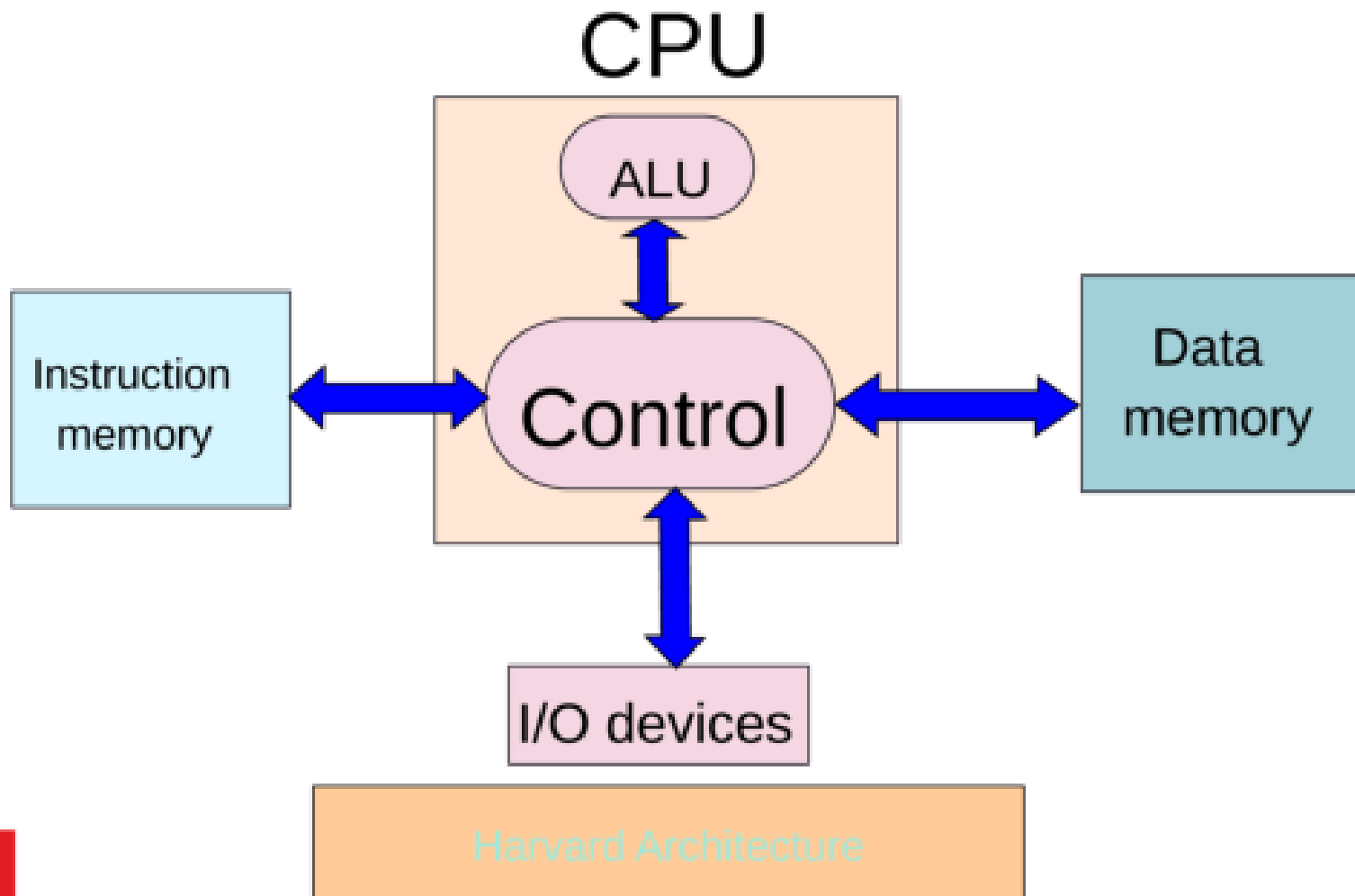
- A modern computer is a practical Turing Machine
  - The memory refers to the tape
    - Both program instructions and data reside in memory
  - Program counter refers to the state
    - Program counter indicates which instruction is to be executed next
  - The processor itself refers to the transition table
    - Based on the instruction, it performs some modifications on data

# Foundations -- Synchronous Digital Systems



- “Control” can be a hardwired circuit. This makes it “application specific”.
- Alternatively, “control” can be “programmable”. This allows it to do a lot more.

# Designing Practical Machines

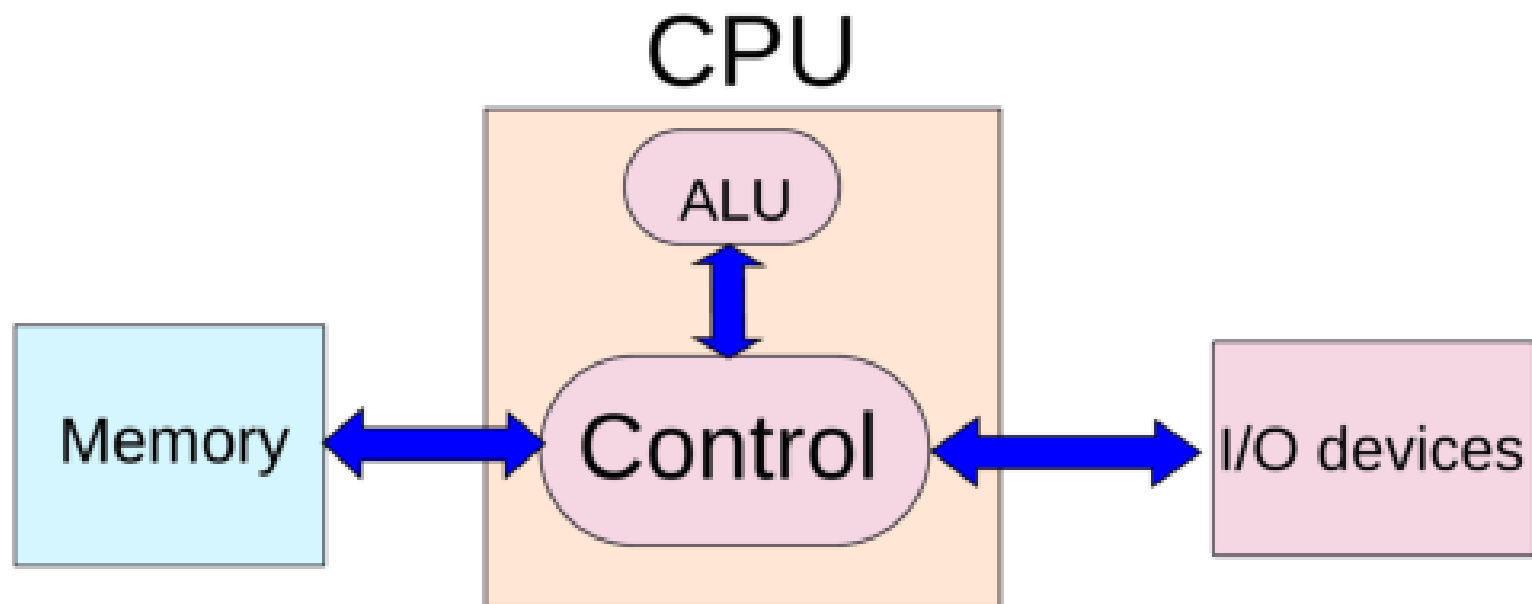


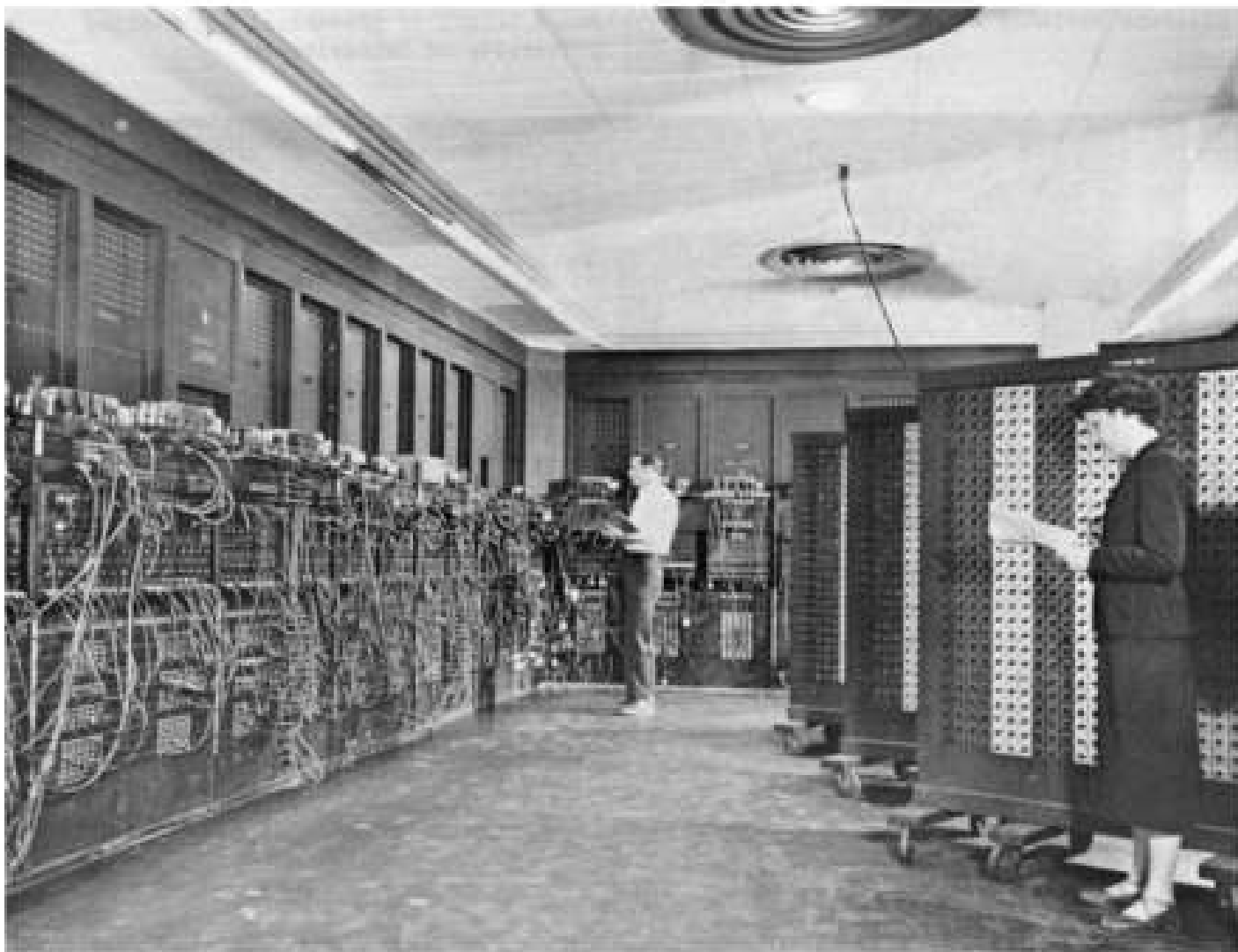


The Harvard Mark I



# Von-Neumann Architecture





The ENIAC

# Evaluation: Theory

Quizzes	35 %
Mid-semester	25 %
End-semester	40 %

# Books

1. Computer Organization and Architecture, by Smruti Ranjan Sarangi, McGraw Higher Ed, 2017.
2. Computer Architecture A Quantitative Approach, Fifth edition, by David Patterson and John L. Hennessy, Morgan Kaufmann, 2017.

# Laboratory

- You will build a software model of a processor
- Programming will be in Java
- Recommended
  - Eclipse
  - Mercurial / bitbucket.org OR Git / github.com
  - Latex
  - Google!
- Evaluation
  - In-semester
    - auto-evaluation
    - viva
  - End-semester
    - programming examination where you will add a feature to your processor

In-semester	75 %
End-semester	25 %

# Today's Assignment