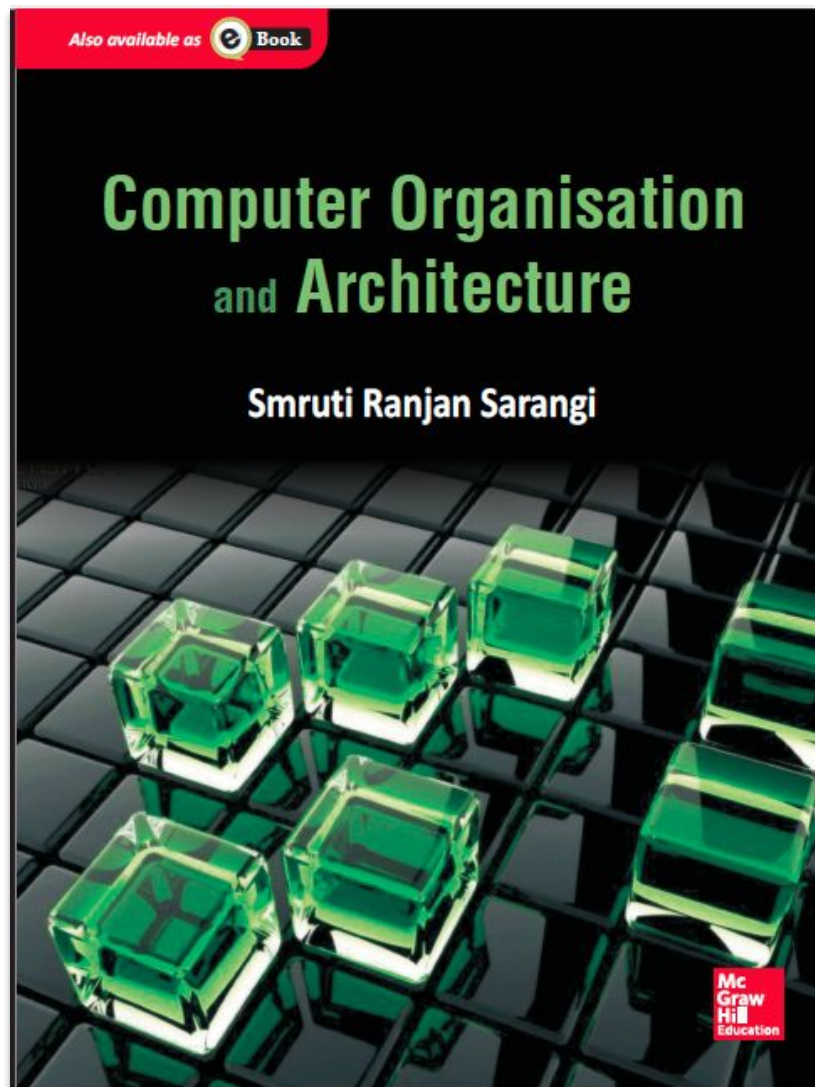

CS301: Computer Architecture

The slide features a minimalist design with two sets of horizontal lines, one at the top and one at the bottom. Each set consists of a thin teal line above a thicker teal line. Additionally, there are two small, solid olive-green horizontal bars, one positioned to the left and one to the right of the center, below the main title.



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>

Online Shopping India | x +

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☐ 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	4.3 ★ 10,153 Ratings & 2,216 Reviews All 2216 reviews	4.2 ★ 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

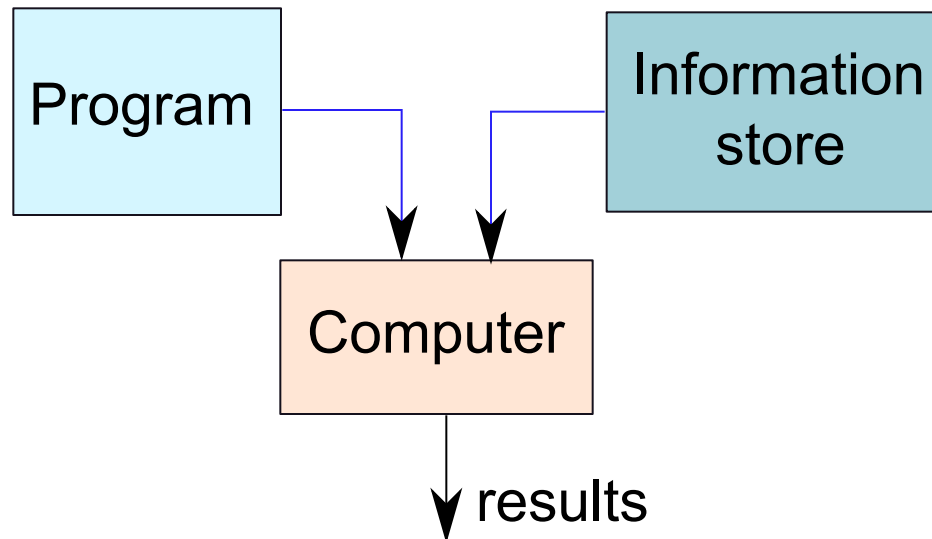
- Reducing feature size
 - Transistors are smaller, switch faster, consume less energy
- Improved Computer Architecture



Based on the
same
principles



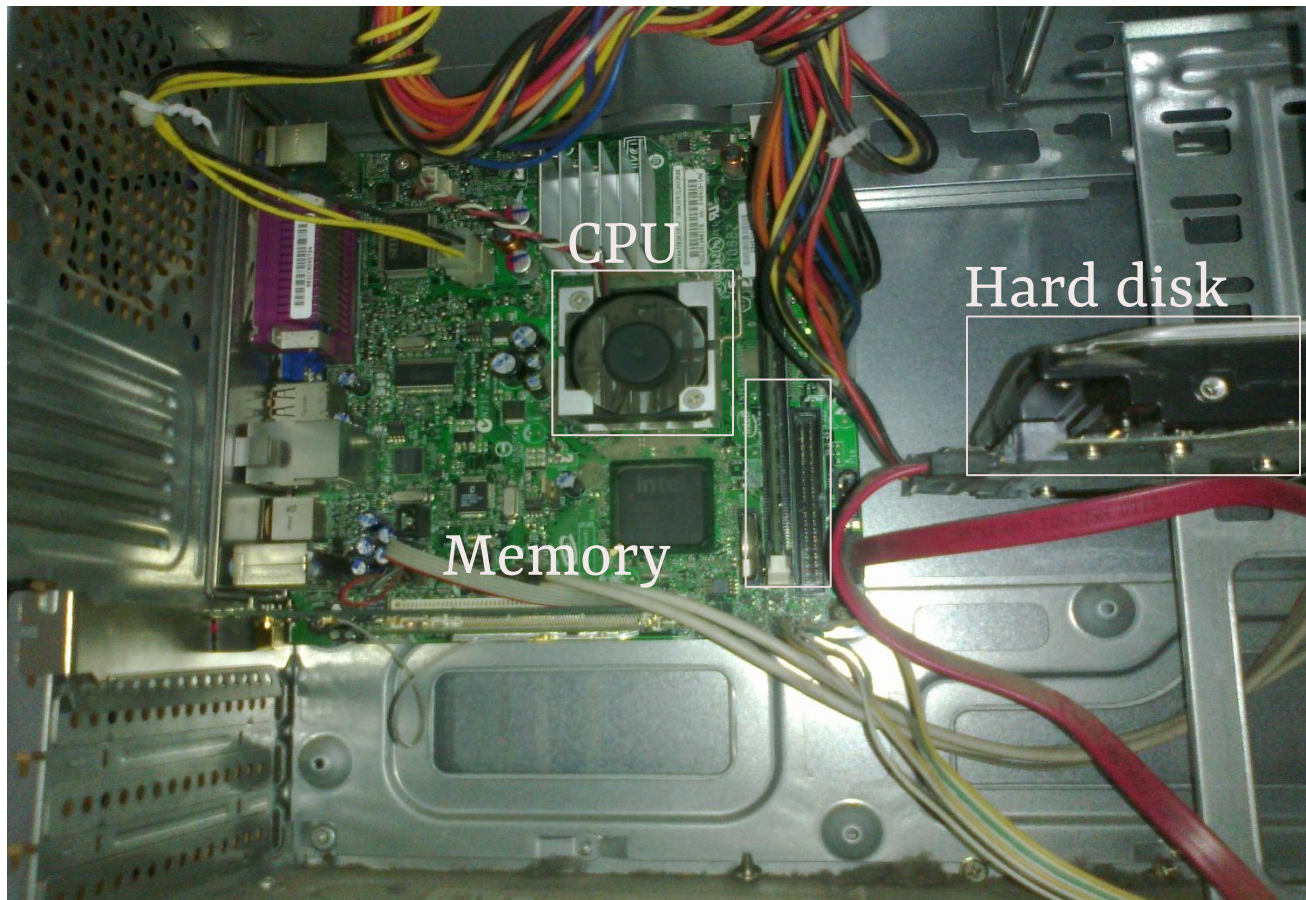
How does it work ?

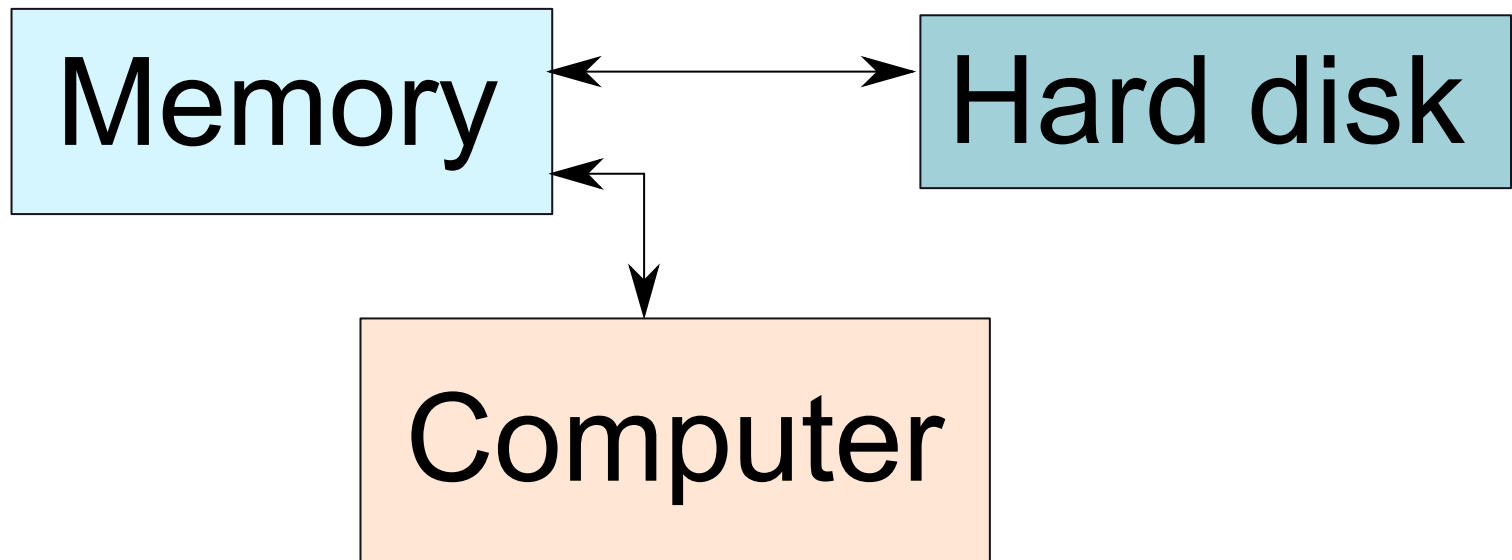


- * Program – List of instructions given to the computer
- * Information store – data, images, files, videos
- * Computer – Process the information store according to the instructions in the program

What does a computer look like ?

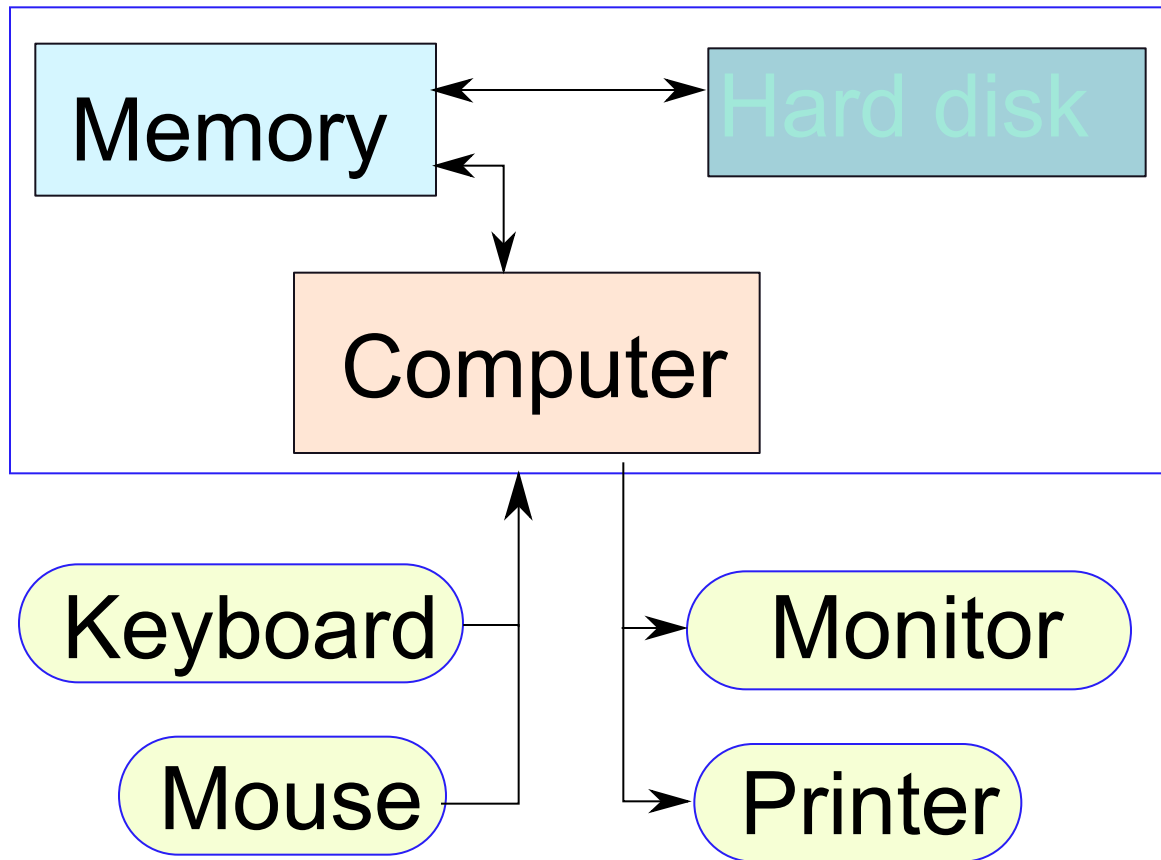
- * Let us take the lid off a desktop computer



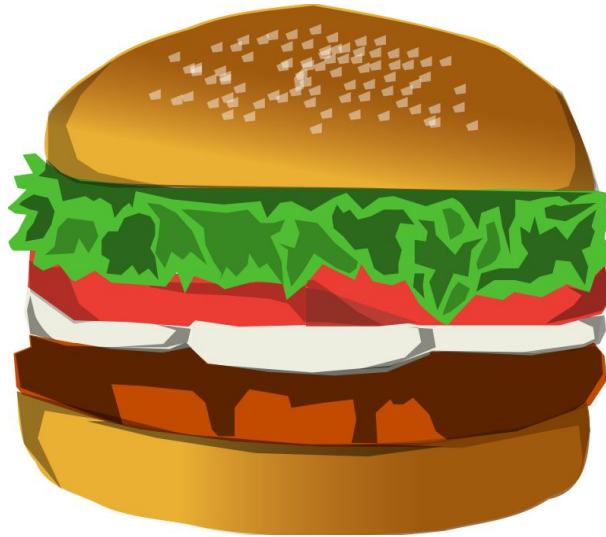


- * Memory – Stores programs and data. Gets destroyed when the computer is powered off
- * Hard disk – stores programs/data permanently

Let us make it a full system ...

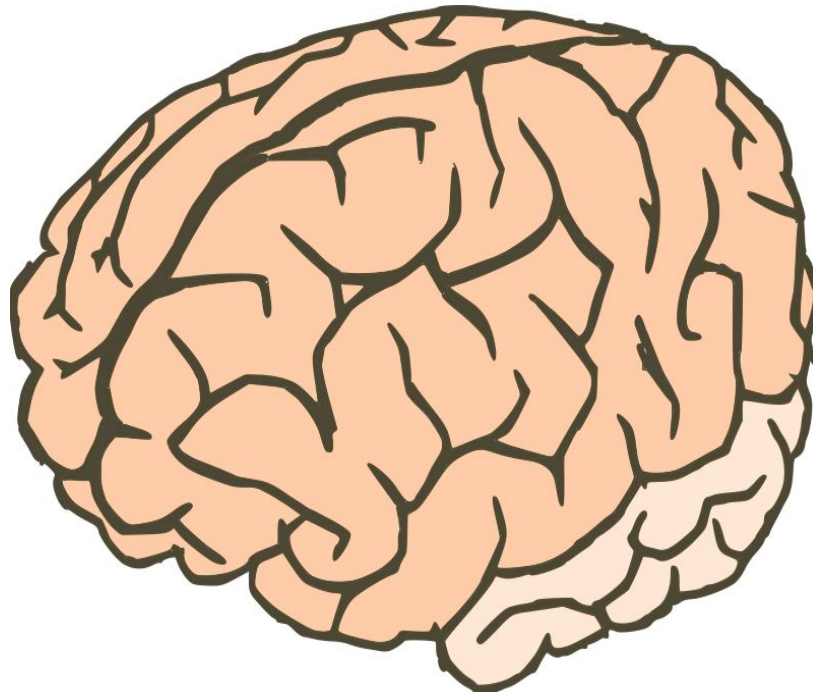


Food for Thought...



- * What is the most intelligent computer ?

Answer ...



* Our brilliant brains

How does an Electronic Computer Differ from our Brain ?

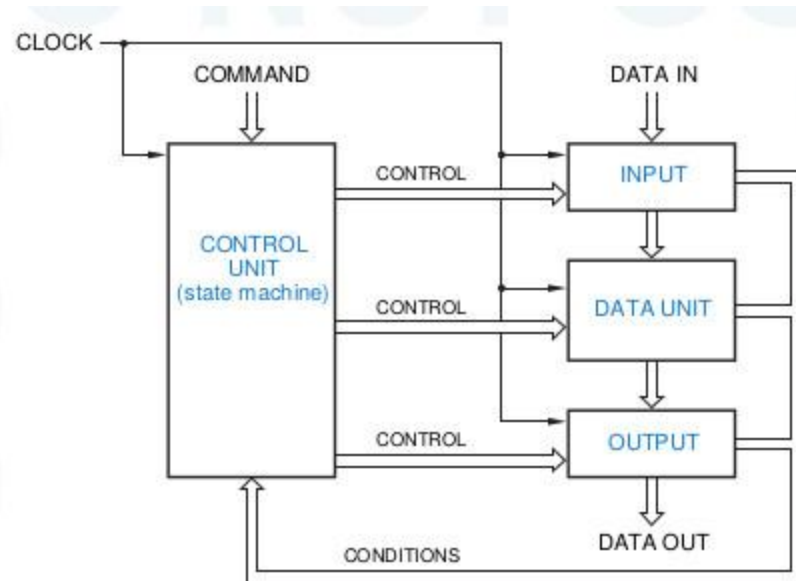
Feature	Computer	Our Brilliant Brain
Intelligence	Dumb	Intelligent
Speed of basic calculations	Ultra-fast	Slow
Can get tired	Never	After sometime
Can get bored	Never	Almost always

★ 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

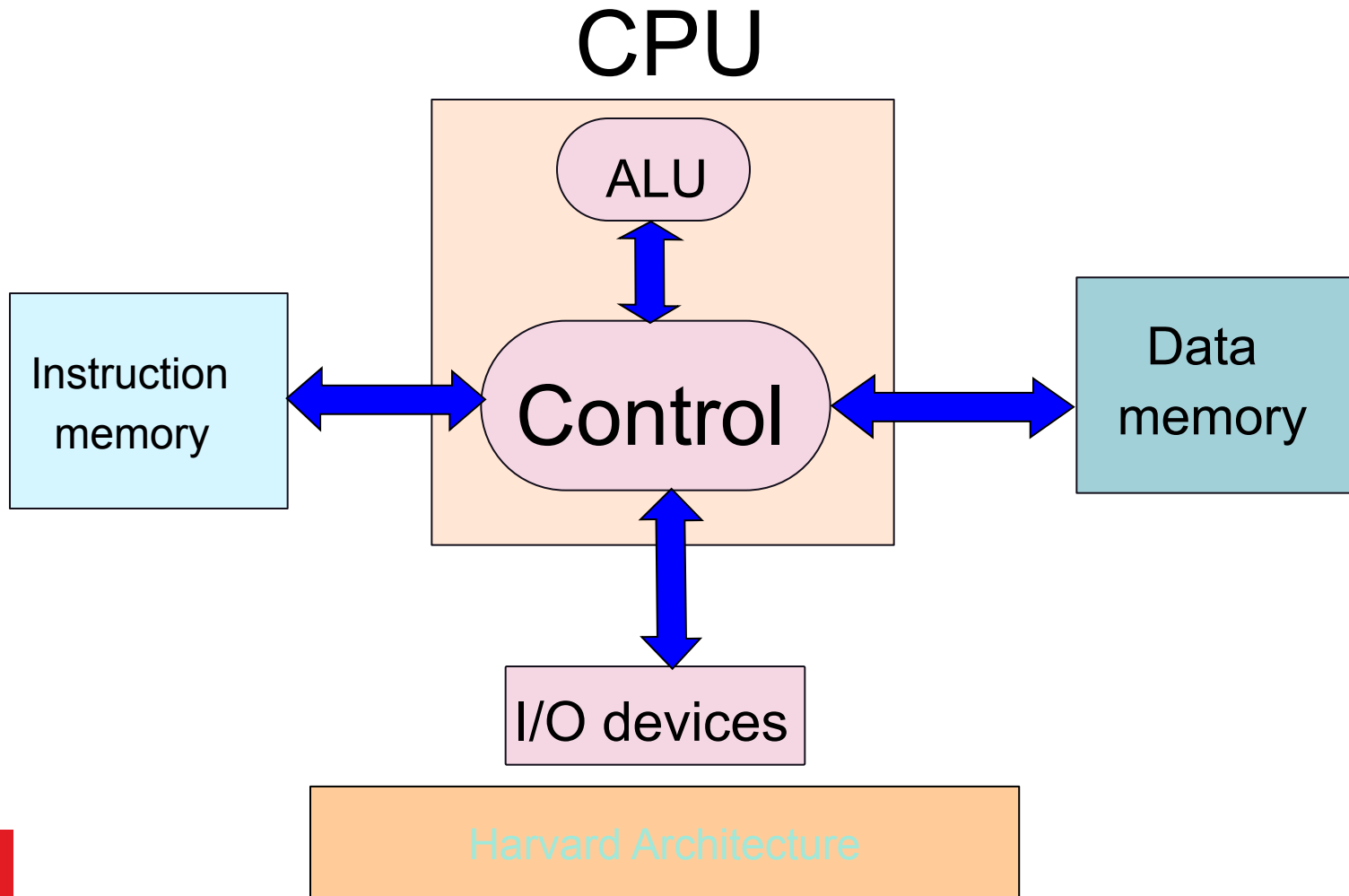
Foundations -- Synchronous Digital Systems

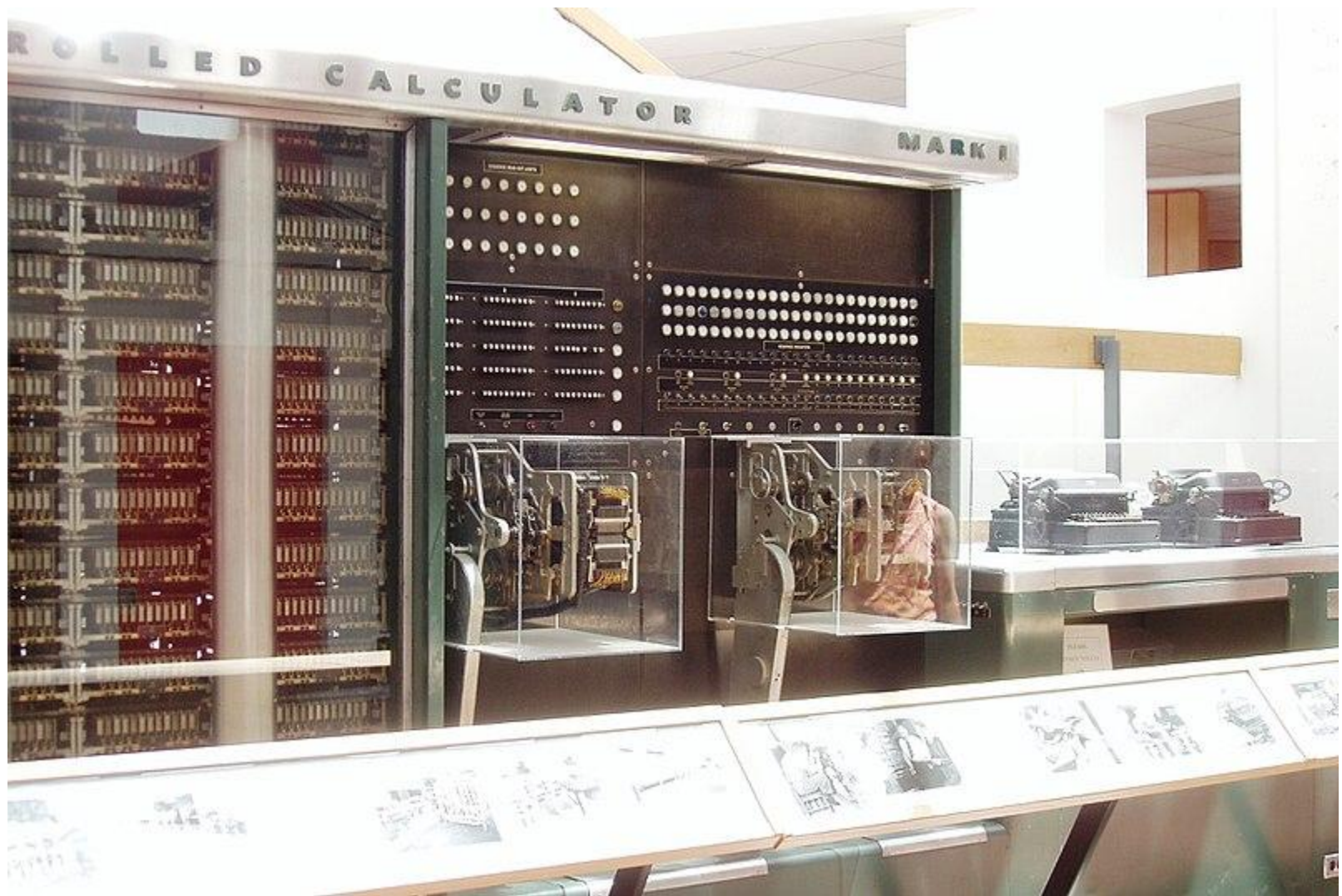


- “Control” can be a hardwired circuit. This makes it “application specific”.
- Alternatively, “control” can be “programmable”. This allows it to do a lot more.

[image from “Digital Design Principles and Practices”, John F. Wakerly, 3rd edition, Prentice Hall 1999]

Designing Practical Machines

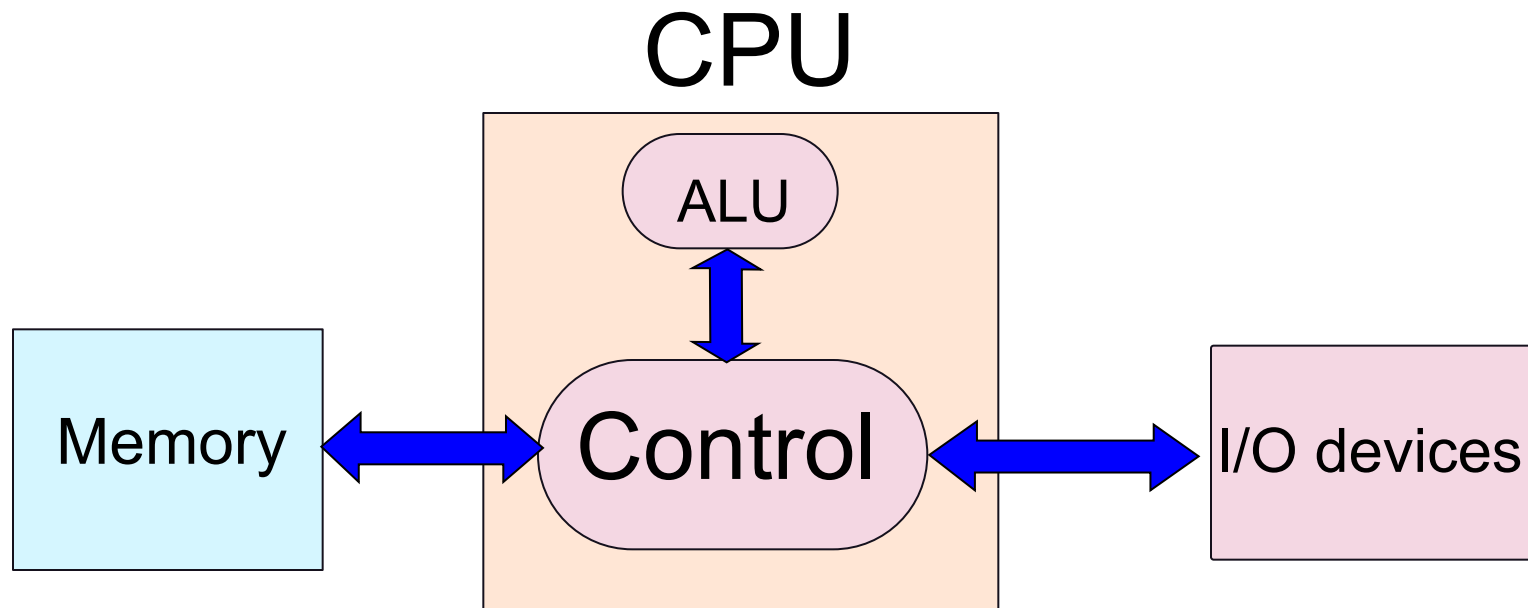


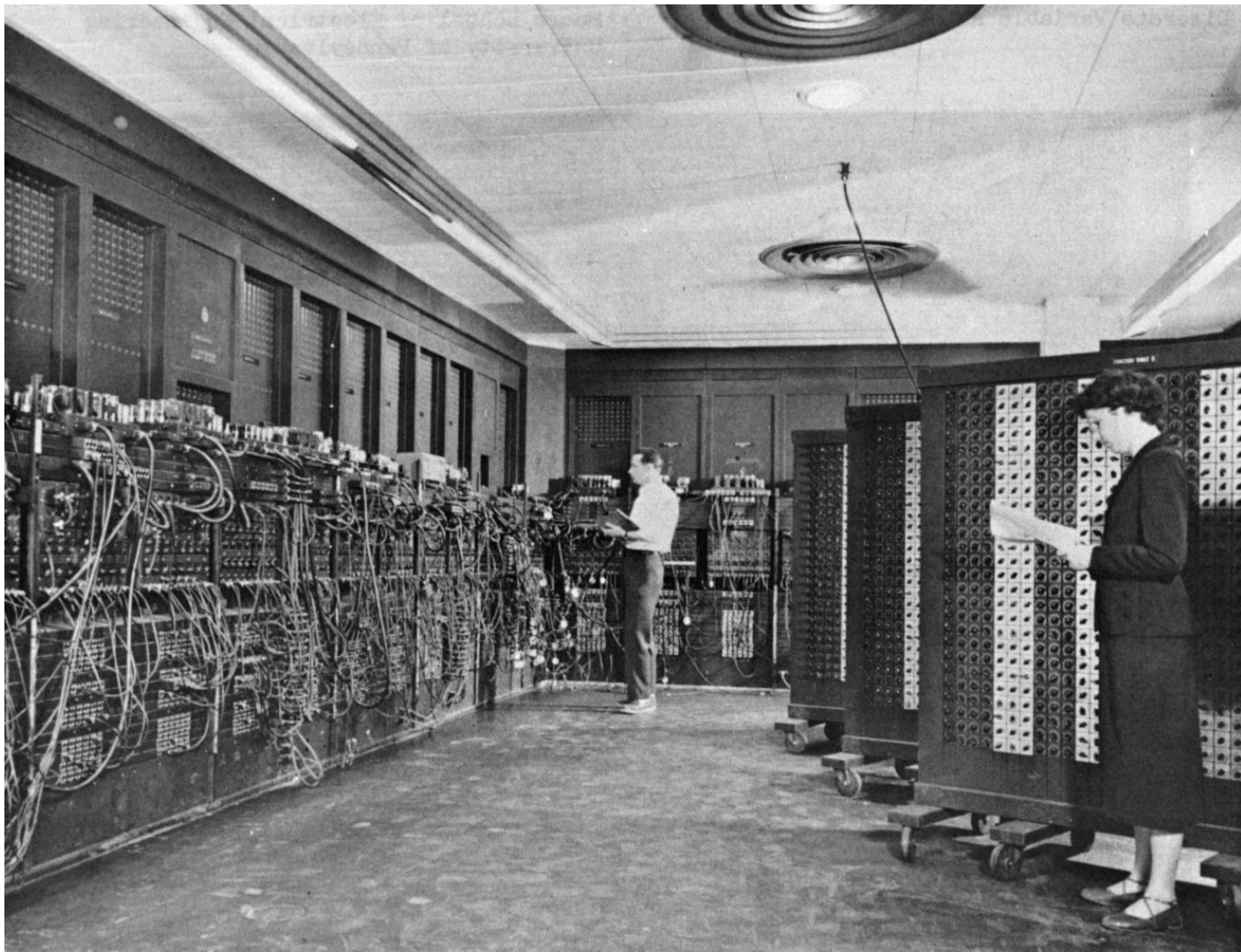


The Harvard Mark I

[image from wikipedia]

Von-Neumann Architecture





The ENIAC

[image from wikipedia]

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. Hennesy, 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