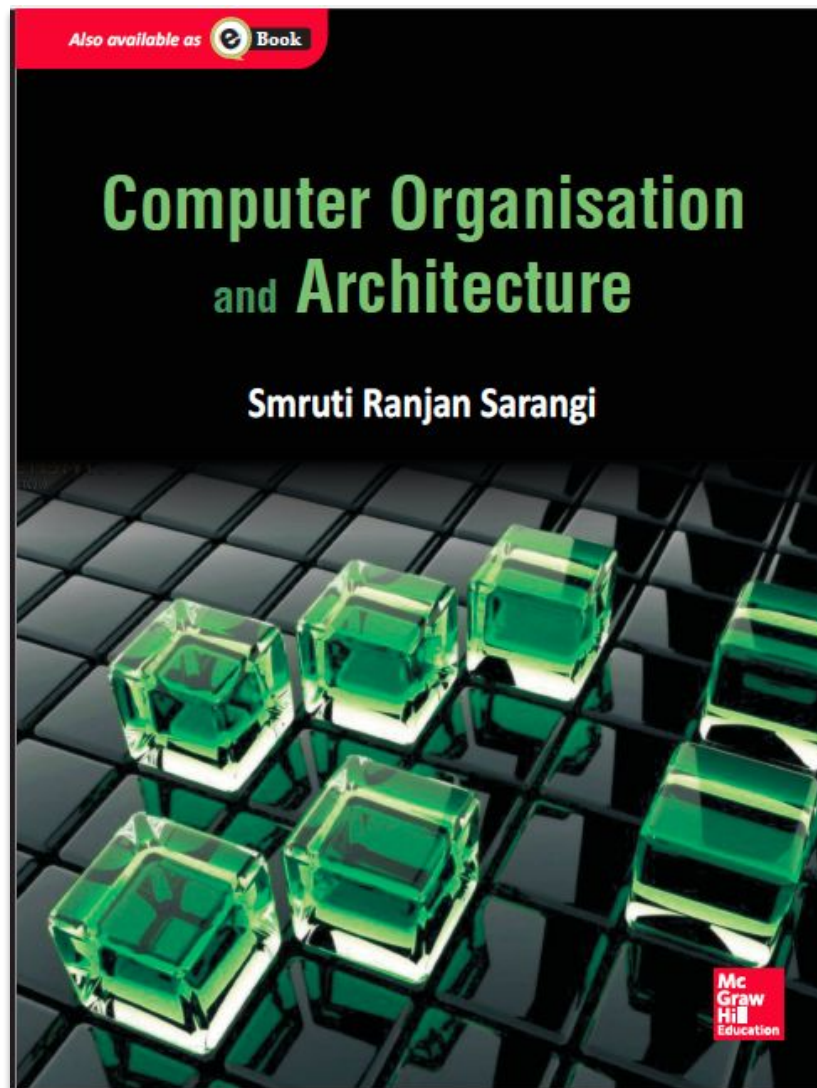

CS301: Computer Architecture

The slide features a minimalist design with two sets of horizontal lines at the top and bottom. Each set consists of a thin teal line followed by a thicker teal line. In the center, below the title, there are two short, horizontal olive-green bars, one on the left and one on the right.



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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	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

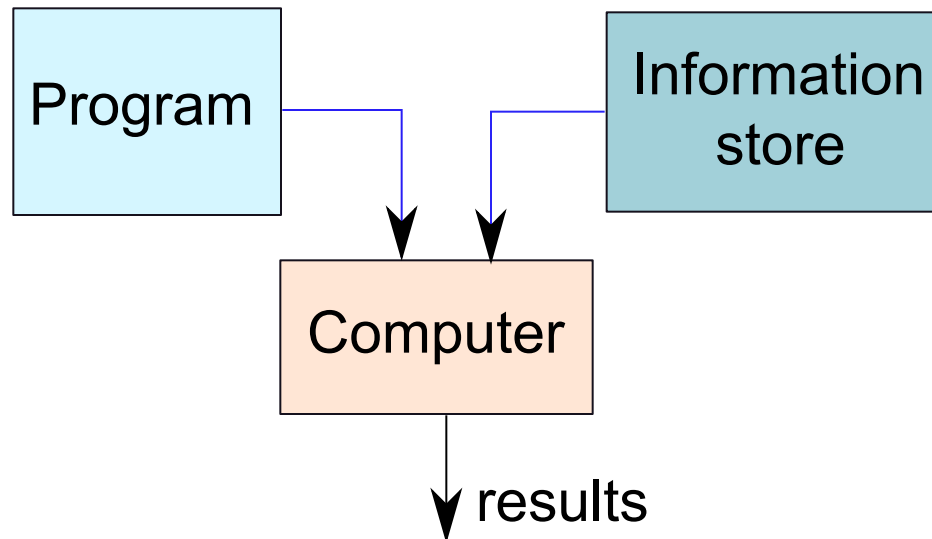
- Reducing feature size
 - Transistors are smaller, switch faster, consume less energy
- Improved Computer Architecture



Based on the
same
principles



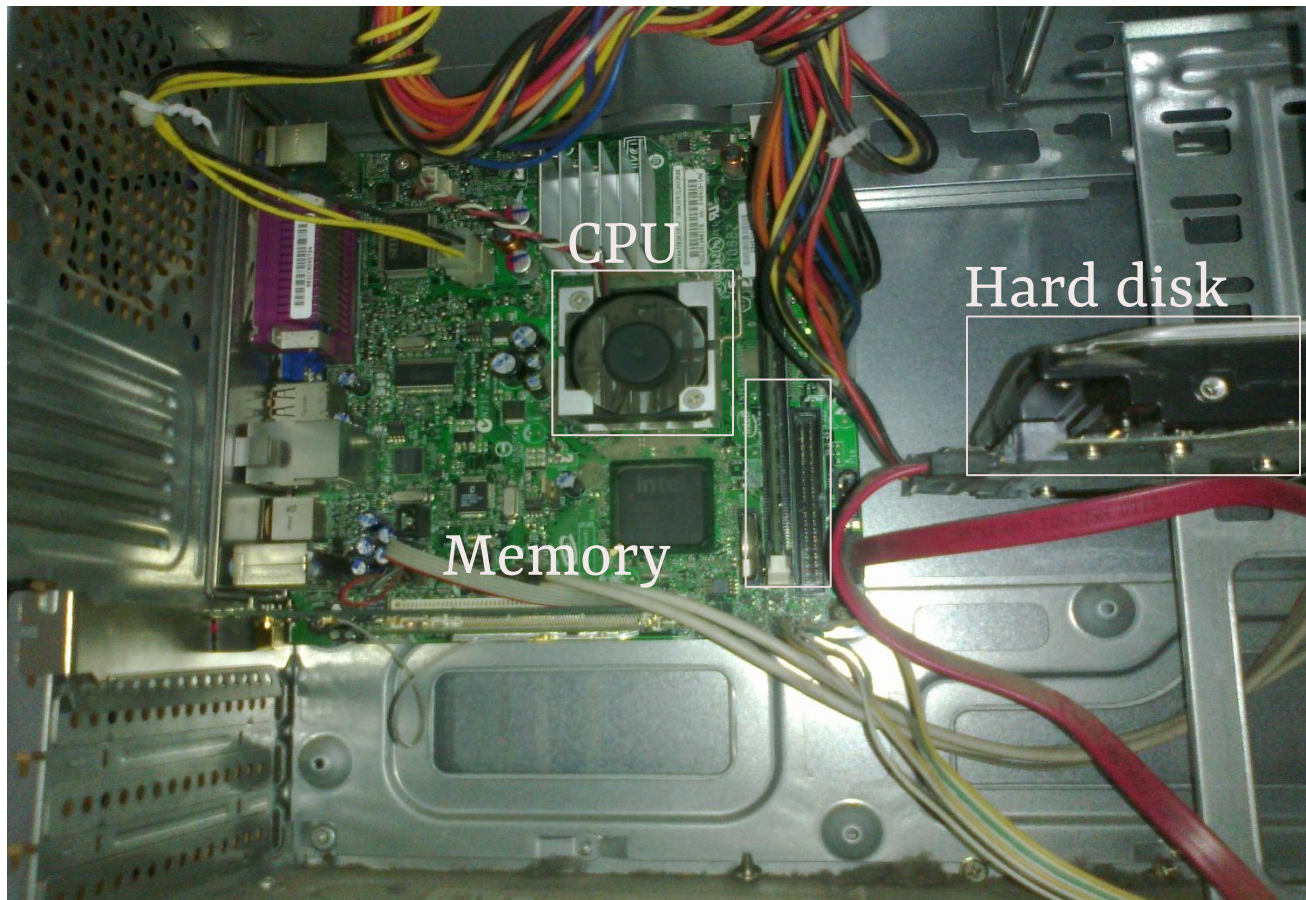
How does it work ?

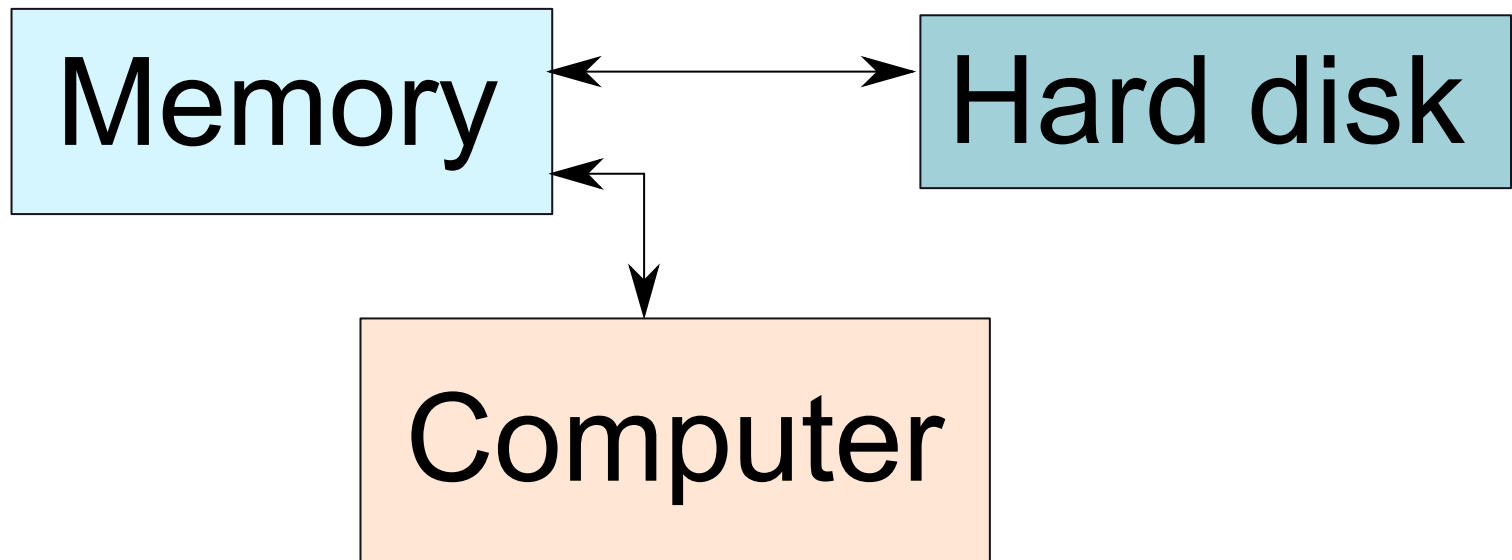


- * Program – List of instructions given to the computer
- * Information store – data, images, files, videos
- * Computer – Process the information store according to the instructions in the program

What does a computer look like ?

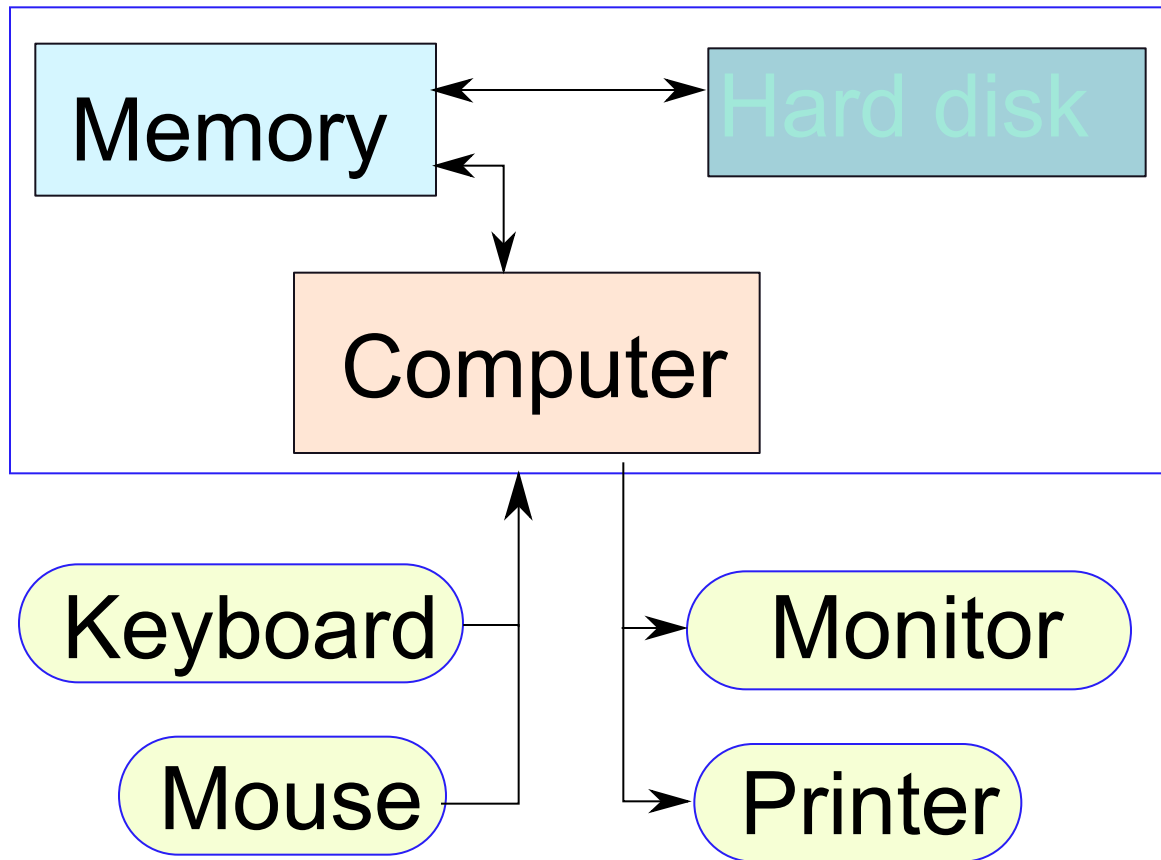
- * Let us take the lid off a desktop computer



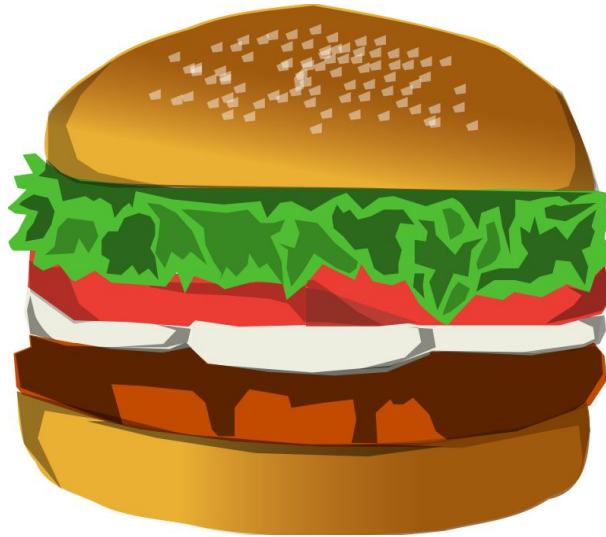


- * Memory – Stores programs and data. Gets destroyed when the computer is powered off
- * Hard disk – stores programs/data permanently

Let us make it a full system ...

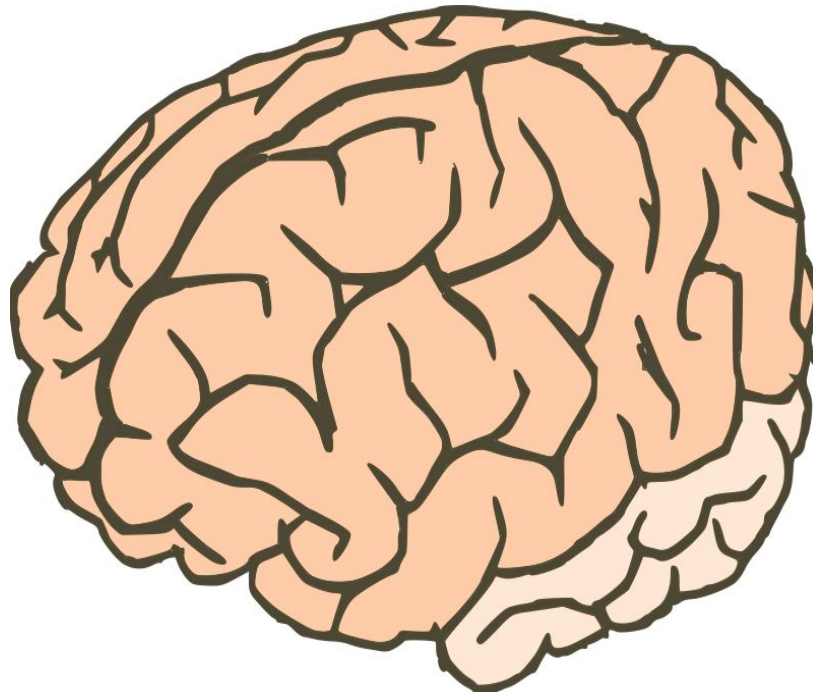


Food for Thought...



- * What is the most intelligent computer ?

Answer ...



* Our brilliant brains

How does an Electronic Computer Differ from our Brain ?

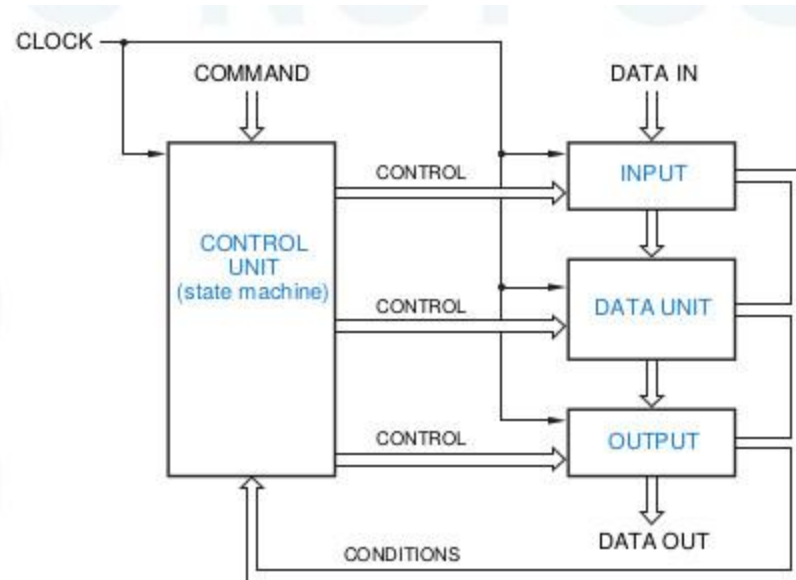
Feature	Computer	Our Brilliant Brain
Intelligence	Dumb	Intelligent
Speed of basic calculations	Ultra-fast	Slow
Can get tired	Never	After sometime
Can get bored	Never	Almost always

★ 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

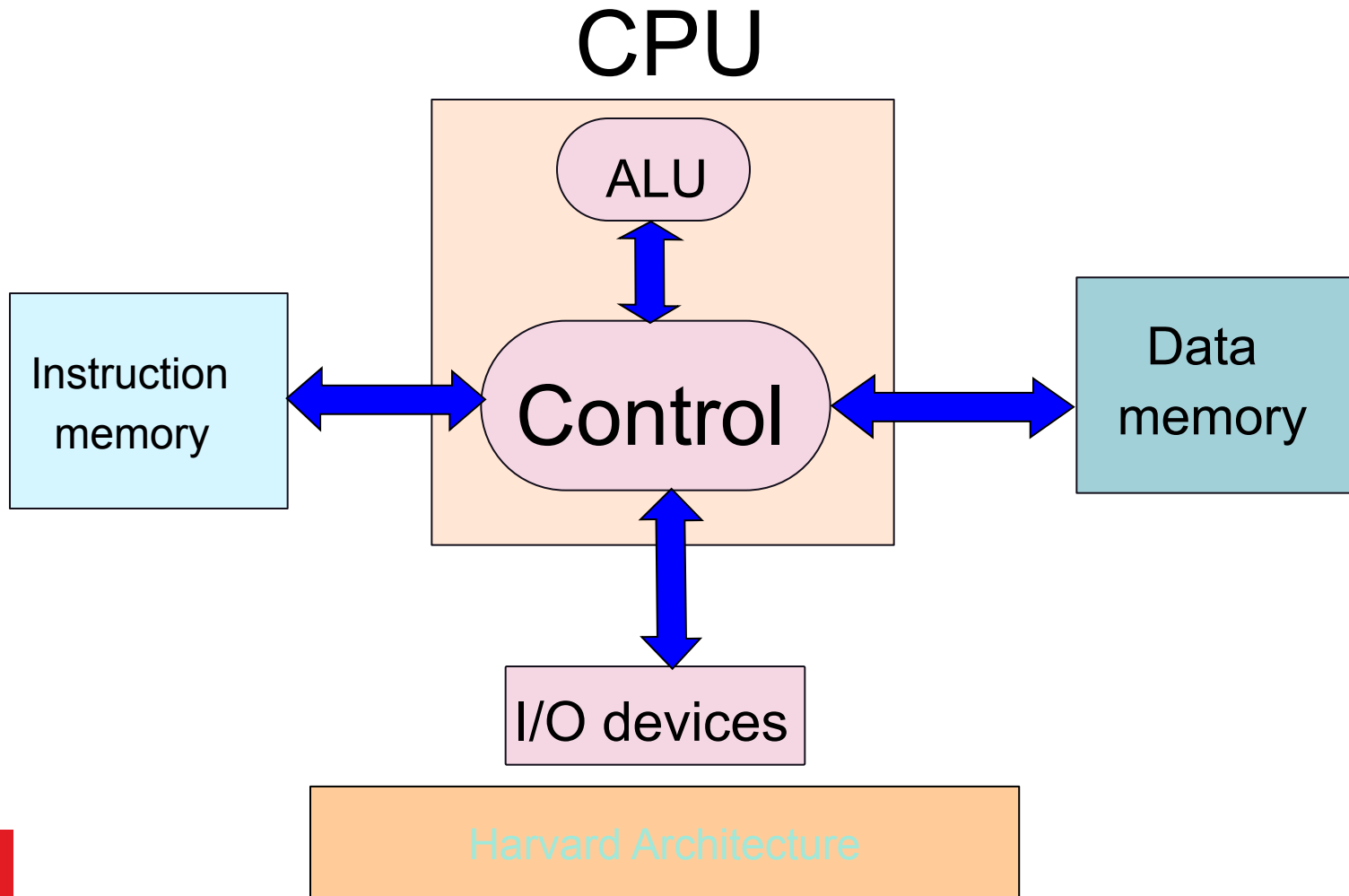
Foundations -- Synchronous Digital Systems

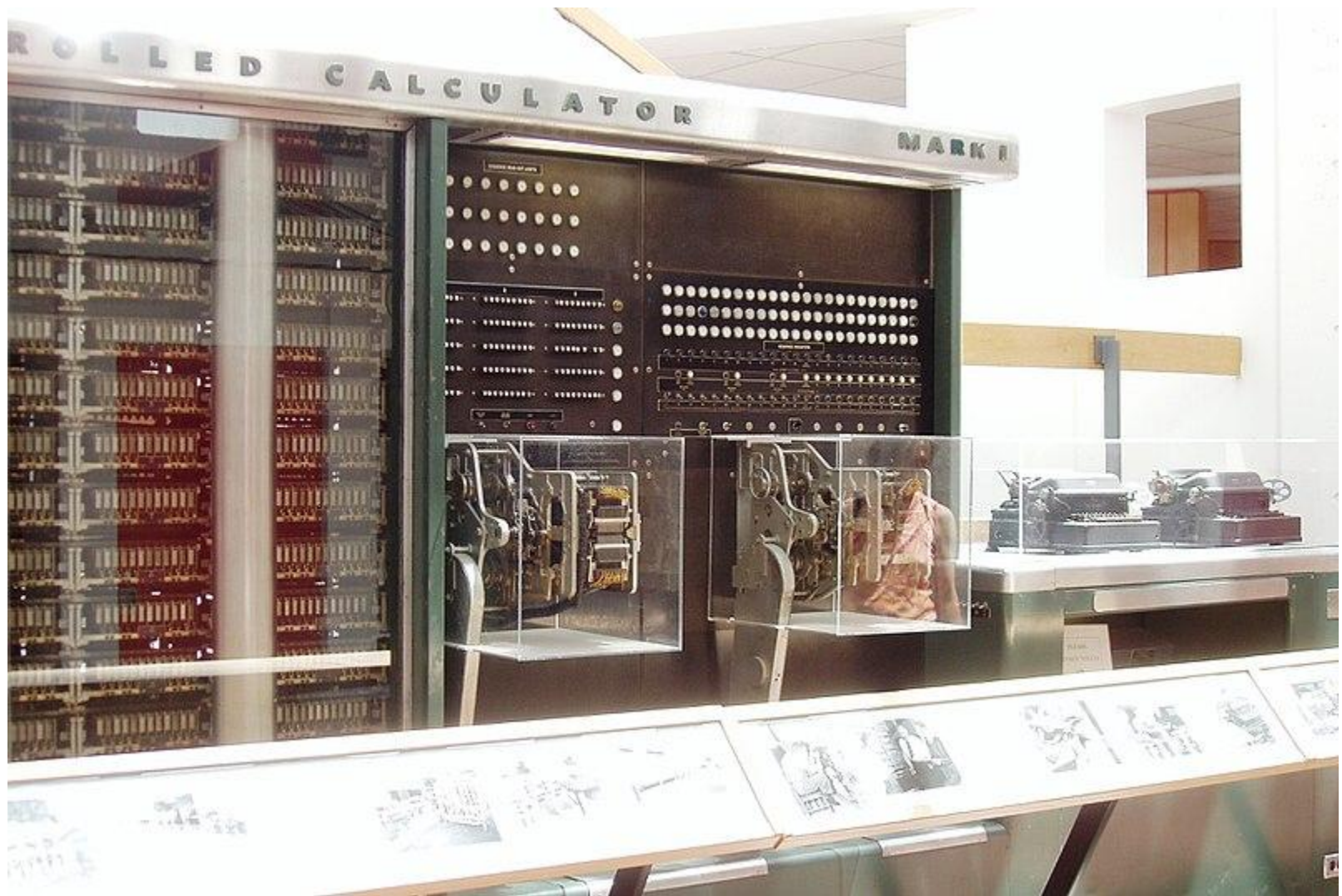


- “Control” can be a hardwired circuit. This makes it “application specific”.
- Alternatively, “control” can be “programmable”. This allows it to do a lot more.

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

Designing Practical Machines

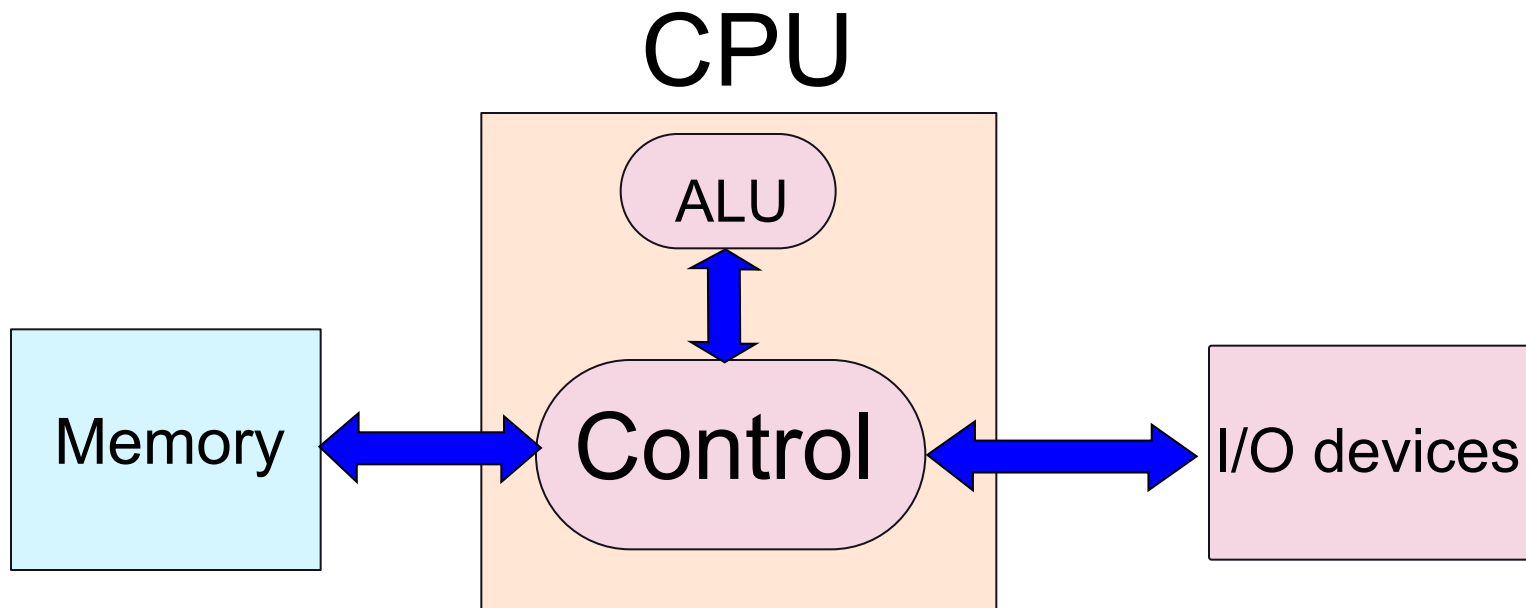


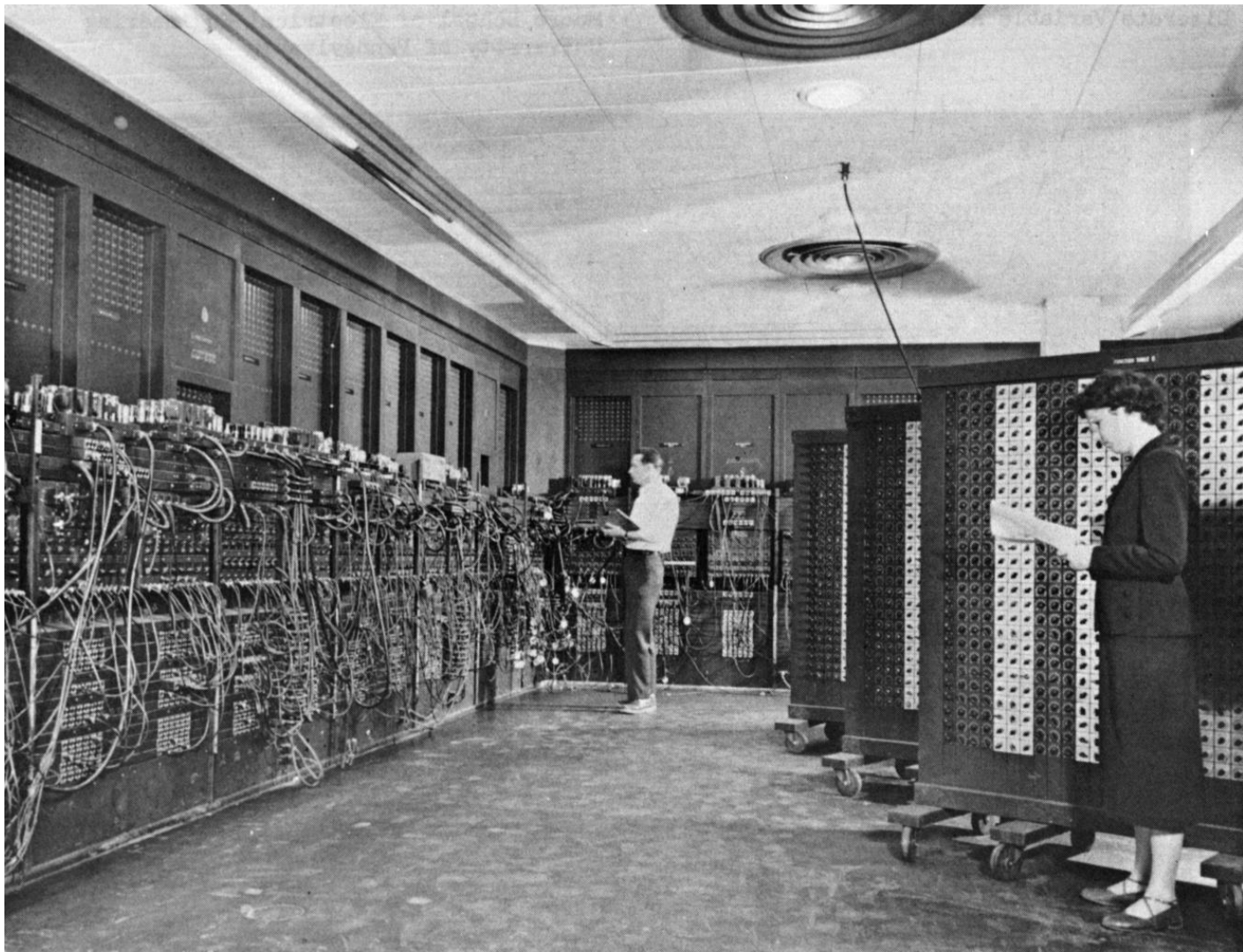


The Harvard Mark I

[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