

INTRODUCTION

CHAPTER # 1

Introduction to IT

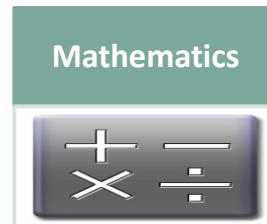
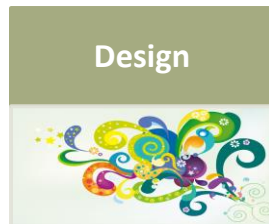
Muhammad Usman

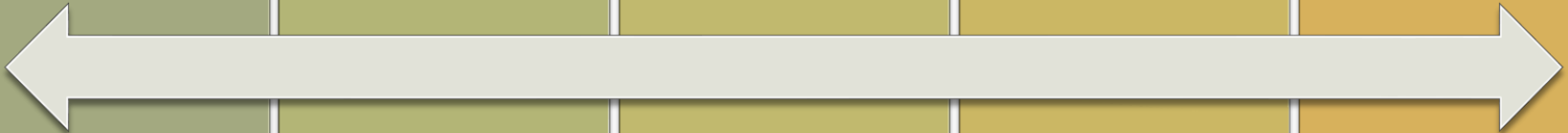
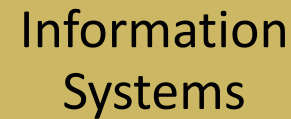
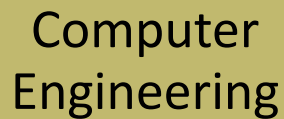
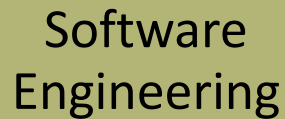
What is Computing

- Computing is any goal-oriented activity which benefits from computers
- Computing is the study of how computers and computer systems work and how they are constructed and programmed
- Computing includes
 - ▣ designing and building hardware and software systems
 - ▣ processing, structuring and managing various kinds of information
 - ▣ doing scientific research on and with computers
 - ▣ making computer systems behave intelligently
 - ▣ creating and using communications and entertainment media etc

What is Computing

- Its primary aspects of theory, systems and applications are drawn from the disciplines of
 - ▣ Technology
 - ▣ Design
 - ▣ Engineering
 - ▣ Mathematics
 - ▣ Physical Sciences and
 - ▣ Social Sciences





Subfields of Computing

- **Computer science (CS) or computing science**
 - ▣ It is the scientific and practical approach to computation and its applications
- **Software engineering (SE)**
 - ▣ It is the application of a systematic, disciplined, quantifiable approach to the design, development, operation, and maintenance of software, and the study of these approaches; that is, the application of engineering to software
- **Computer engineering (CE)**
 - ▣ It is a discipline that integrates several fields of electrical engineering and computer science required to develop computer systems
- **Information technology (IT)**
 - ▣ It is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise
- **Information systems (IS)**
 - ▣ It is the study of complementary networks of hardware and software that people and organizations use to collect, filter, process, create, and distribute data

History of Computing

- ❑ The history of computing is longer than the history of computing hardware and modern computing technology
- ❑ It includes the history of methods intended for pen and paper or for chalk and slate, with or without the aid of tables
- ❑ The earliest known tool for use in computation was the abacus (invented in Babylon circa 2400 BC)
- ❑ Calculators were also a popular computation tool used in recent centuries

Modern Day Computing

- ❑ Modern day computing is usually performed with the help of computers
- ❑ A computer is a machine that manipulates data according to a set of instructions called a computer program
- ❑ A computer program provides instructions to the computer hardware

What is a Computer

- ❑ Computer is a Latin word which means to compute
- ❑ It is a calculation machine to perform computations and to make logical decisions millions / billions times faster than human beings
- ❑ Computer is an electronic device used for information processing
- ❑ A computer is, at its most basic, a machine which can take instructions, and perform computations based on those instructions and give results
- ❑ Computer is an electronic machine made with many subunits that enables the user to access data easily
- ❑ A computation on a computer is performed on the basis of two main entities
 - ▣ i.e. hardware and software

Computer Hardware

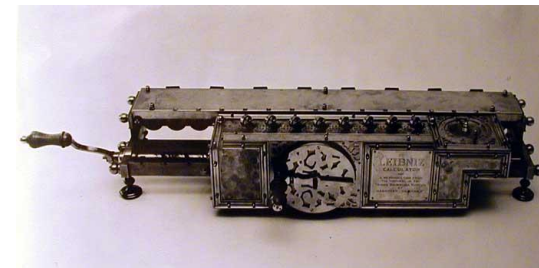
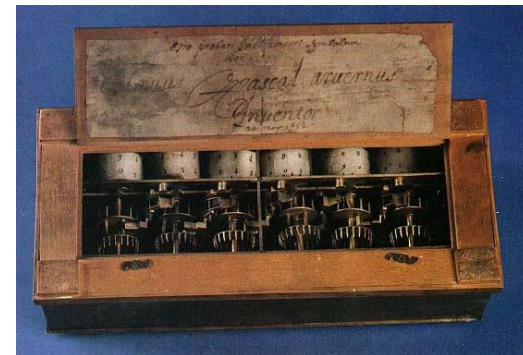
- ❑ Computer hardware is the collection of physical elements that comprise a computer system
- ❑ It encompasses the physical interconnections and devices required to store and execute (or run) the software
- ❑ It refers to the physical parts or components of a computer such as
 - ▣ monitor, keyboard, storage, hard drive disk, mouse, printers, CPU, memory, motherboard, graphic card, sound card, and other chips
- ❑ It contains physical objects that can be actually touched

Computer Software

- Software is a collection of computer programs and related data that provides the instructions for telling a computer what to do and how to do it
 - ▣ e.g. Microsoft Word, Internet Explorer, Windows
- Software is a set of programs, procedures, algorithms and its documentation concerned with the operation of a data processing system
- Software cannot be touched

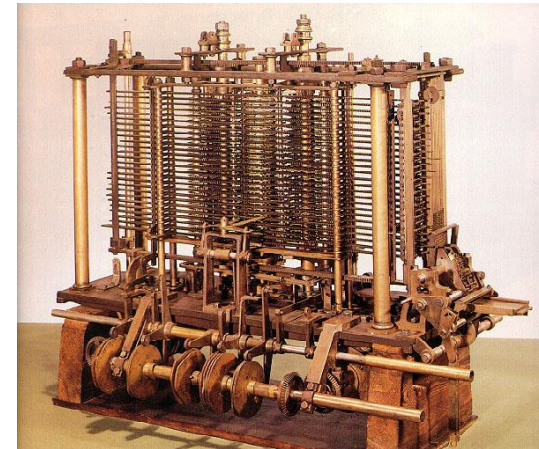
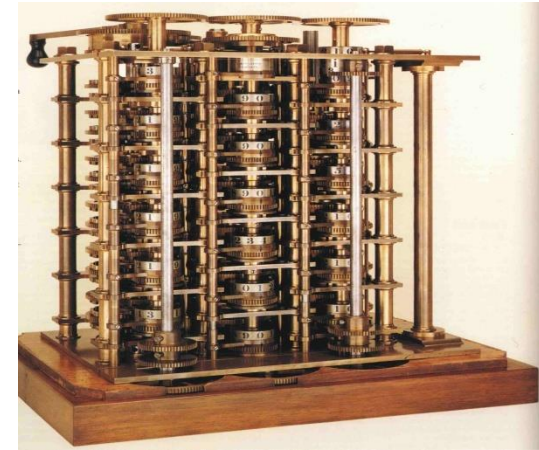
History of Computers

- Before the 1500s, in Europe, calculations were made with an abacus
 - ▣ Invented around 2500BC, available in many cultures (China, Mesopotamia, Japan, Greece, Rome, etc.)
- In 1642, Blaise Pascal (French mathematician, physicist, philosopher) invented a mechanical calculator called the Pascaline
- In 1671, Gottfried von Leibniz (German mathematician, philosopher) extended the Pascaline to do multiplications, divisions, square roots
- None of these machines had memory, and they required human intervention at each step



History of Computers

- In 1822 Charles Babbage (English mathematician, philosopher), sometimes called the “father of computing” built the Difference Engine
 - ▣ Machine designed to automate the computation (tabulation) of polynomial functions
 - which are known to be good approximations of many useful functions
 - ▣ based on the “method of finite difference”
 - ▣ implements some storage
- In 1833 Babbage designed the Analytical Engine, but he died before he could build it
 - ▣ It was built after his death, powered by steam



Early Computers

- Based on mechanical relays
 - ▣ 1940: Stibitz at Bell Laboratories
 - ▣ 1944: Mark I: Howard Aiken and IBM at Harvard
- Based on vacuum tubes
 - ▣ 1937-1941: Atanasoff-Berry at Iowa State
 - ▣ 1940s: Colossus: secret German code-breaker
 - ▣ 1940s: ENIAC: Mauchly & Eckert at U. of Penn.

Early Computers

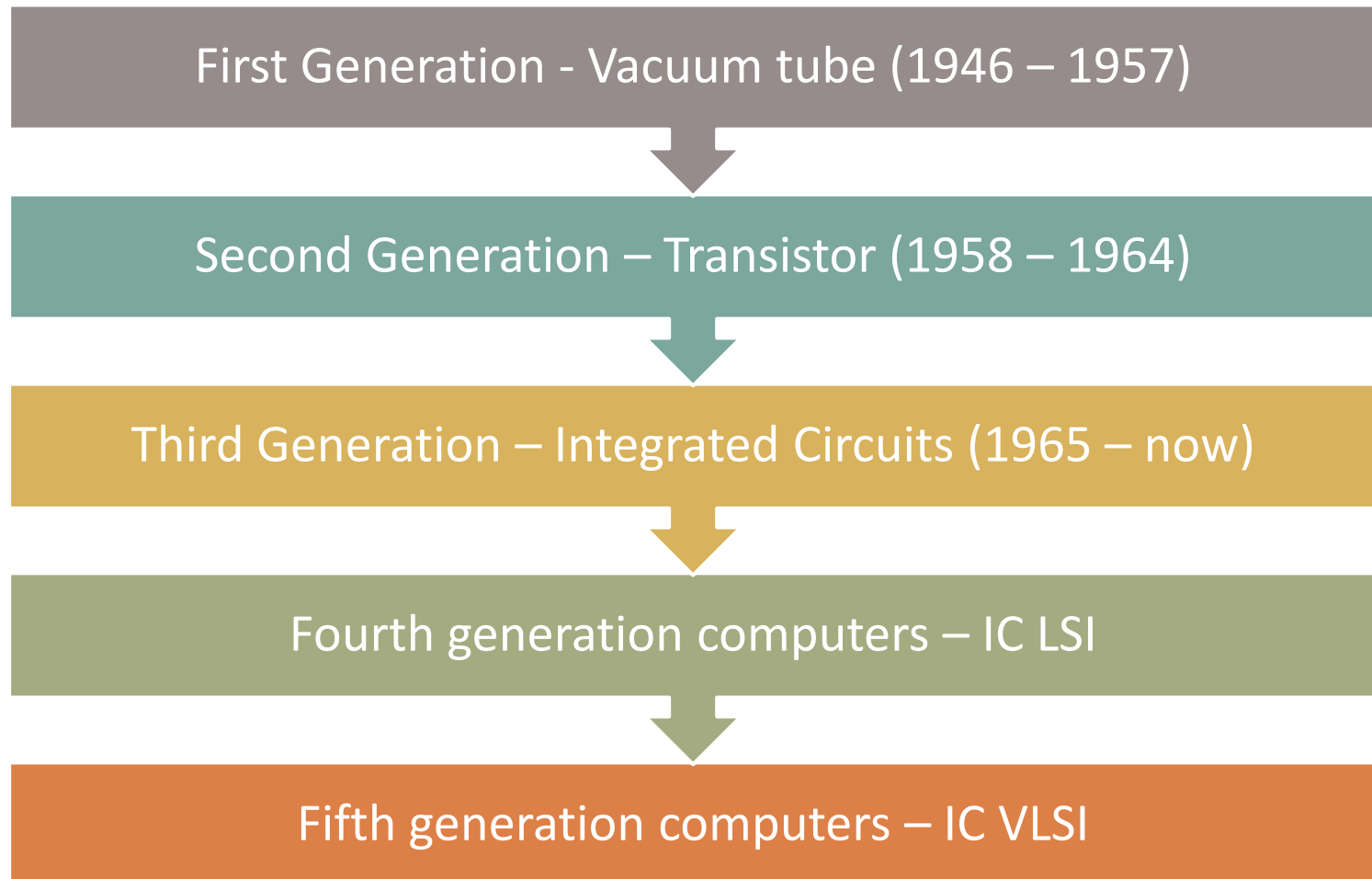


The Mark I computer

Generations of Computers

- First Generation - Vacuum tube (1946 – 1957)
- Second Generation - Transistor (1958 – 1964)
- Third Generation – Integrated Circuits (1965 – now)
 - ▣ Some people divide third generation into two more generations
- Fourth generation computers – IC LSI
- Fifth generation computers – IC VLSI

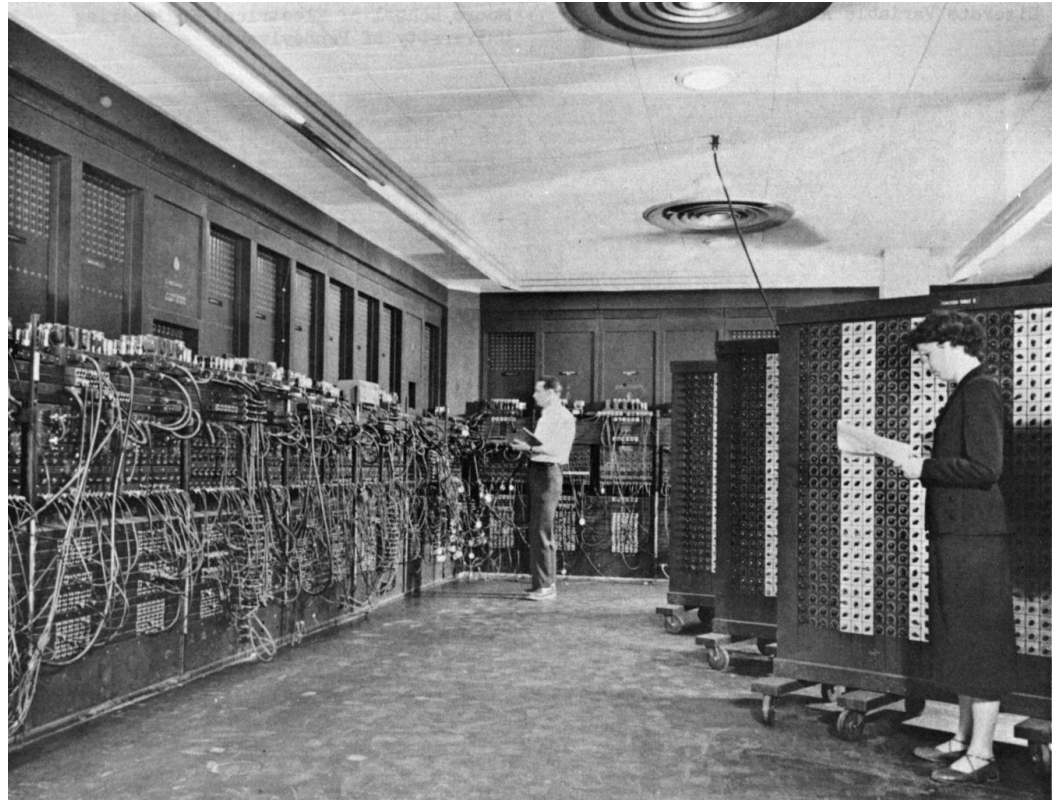
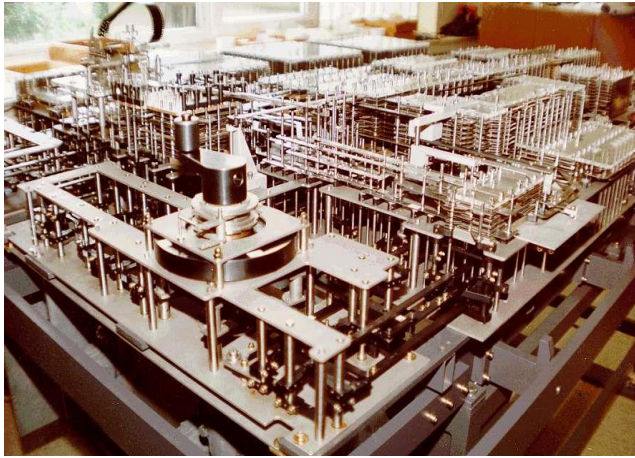
Generations of Computers



Generations of Computers

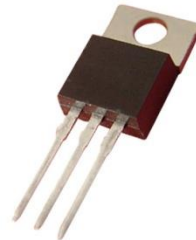
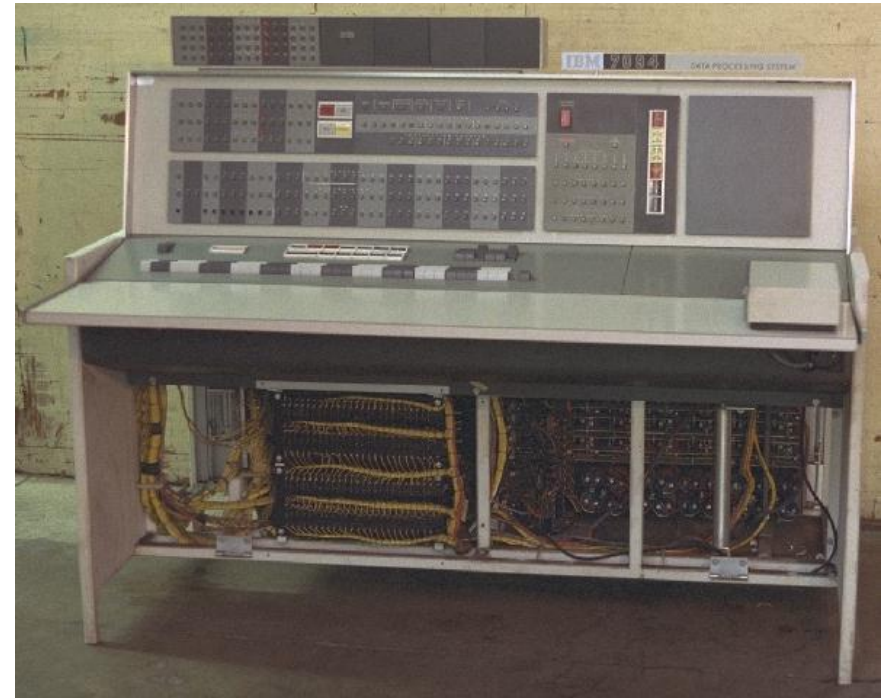
	First Gen.	Second Gen.	Third Gen.
Technology	Vacuum Tubes	Transistors	Integrated Circuits (multiple transistors)
Size	Filled Whole Buildings	Filled half a room	Smaller

First Generation – Vacuum Tubes

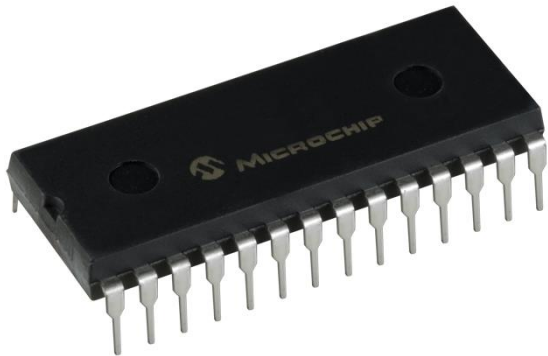


The ENIAC (Electronic Numerical Integrator and Computer) was unveiled in 1946: the first all-electronic, general-purpose digital computer

Second Generation – Transistors



Third Generation – Integrated Circuits



Third Generation – Integrated Circuits

- Small scale integration (1965 – 1968)
 - ▣ up to 100 devices on a chip
- Medium scale integration (1968 – 1971)
 - ▣ 100 - 3,000 devices on a chip
- Large scale integration (1971 – 1977)
 - ▣ 3,000 - 100,000 devices on a chip
 - ▣ sometimes referred as fourth generation
- Very large scale integration (1978 – 1991)
 - ▣ 100,000 - 100,000,000 devices on a chip
 - ▣ sometimes referred as fifth generation
- Ultra large scale integration (1991 – now)
 - ▣ over 100,000,000 devices on a chip

Modern Computers



Computer Science

- The science of algorithms
- Draws from other subjects, including
 - ▣ Mathematics
 - ▣ Engineering
 - ▣ Psychology
 - ▣ Business Administration
 - ▣ Psychology

Central Questions of Computer Science

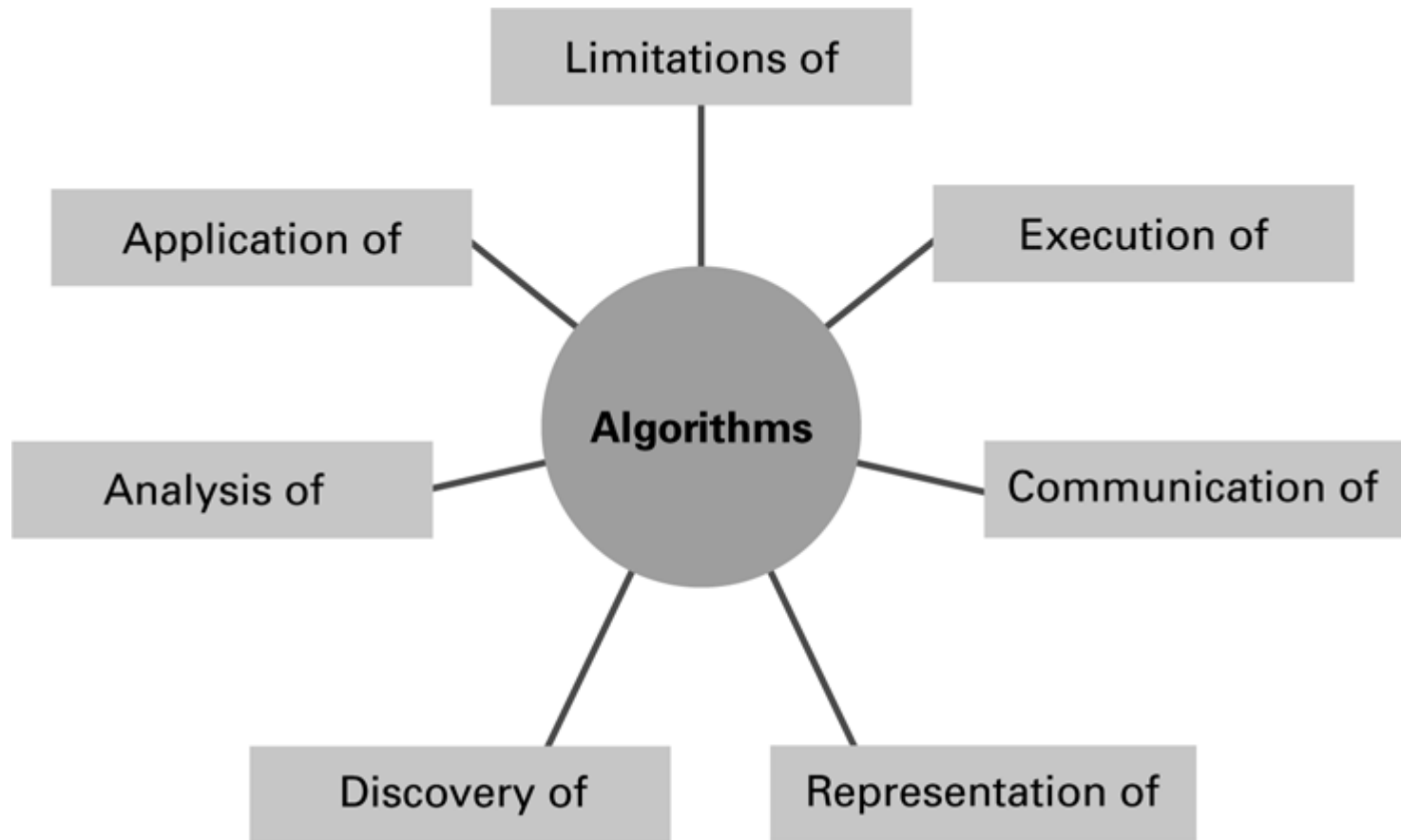
- ❑ Which problems can be solved by algorithmic processes?
- ❑ How can algorithm discovery be made easier?
- ❑ How can techniques of representing and communicating algorithms be improved?
- ❑ How can characteristics of different algorithms be analyzed and compared?

Central Questions of Computer Science



- How can algorithms be used to manipulate information?
- How can algorithms be applied to produce intelligent behavior?
- How does the application of algorithms affect society?

The central role of algorithms in computer science



Computer Science Terminologies

- **Algorithm**

- A set of steps that defines how a task is performed

- **Program**

- A representation of an algorithm

- **Programming**

- The process of developing a program

- **Software**

- Programs and algorithms

- **Hardware**

- Equipment