Welcome

Session 2022

Department of Computer Science

Introduction to Computing

Introduction Of Teacher:

- **Dr. Syed Khaldoon Khurshid**
  (Assistant Professor)
  Department of Computer Science

- **I will be teaching theory class and Lab (Section A and B)**

Contact details

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  University of Engineering and Technology, Lahore

- **Course Contents and CLOs**

Lecture Format

- Lectures will be preferably delivered in English.
- Lecture through multimedia and white board.
- Most important part of learning in university is ***individual test.***
- Class participation is encouraged throughout the course.
- Attendance marks will effect your final grades.

Marks distribution of the course

- **Theory** **Total= 100 Marks**
  - Final paper contains 40% Marks
  - Mid-terms contain 30% Marks
  - Quizzes contain 30% Marks

- **Lab Project** **Total= 100 Marks**
  - Lab projects contain 100% Marks

Theory Quizzes

- They may be written (or) verbal.
- Two main Quizzes.
- There can be number of surprise quizzes throughout the semester.

Book and Application:

Recommended Book:

- **Computer Science an Overview**

  Author: J. Glenn Brook Shear
- **Brilliant Application**
- **Lab: MS Office and Web Development**

A piece of advice before start of formal Lectures

- In semester System there is very little time for students to waste.
- Don’t indulge yourself in other activities except your studies.

Home Assignment

Question:

What is Computer Science?

Google it

Descriptive Example to make you understand “Computers”

- Description by Richard Feynman about computers
  - Example of Librarian

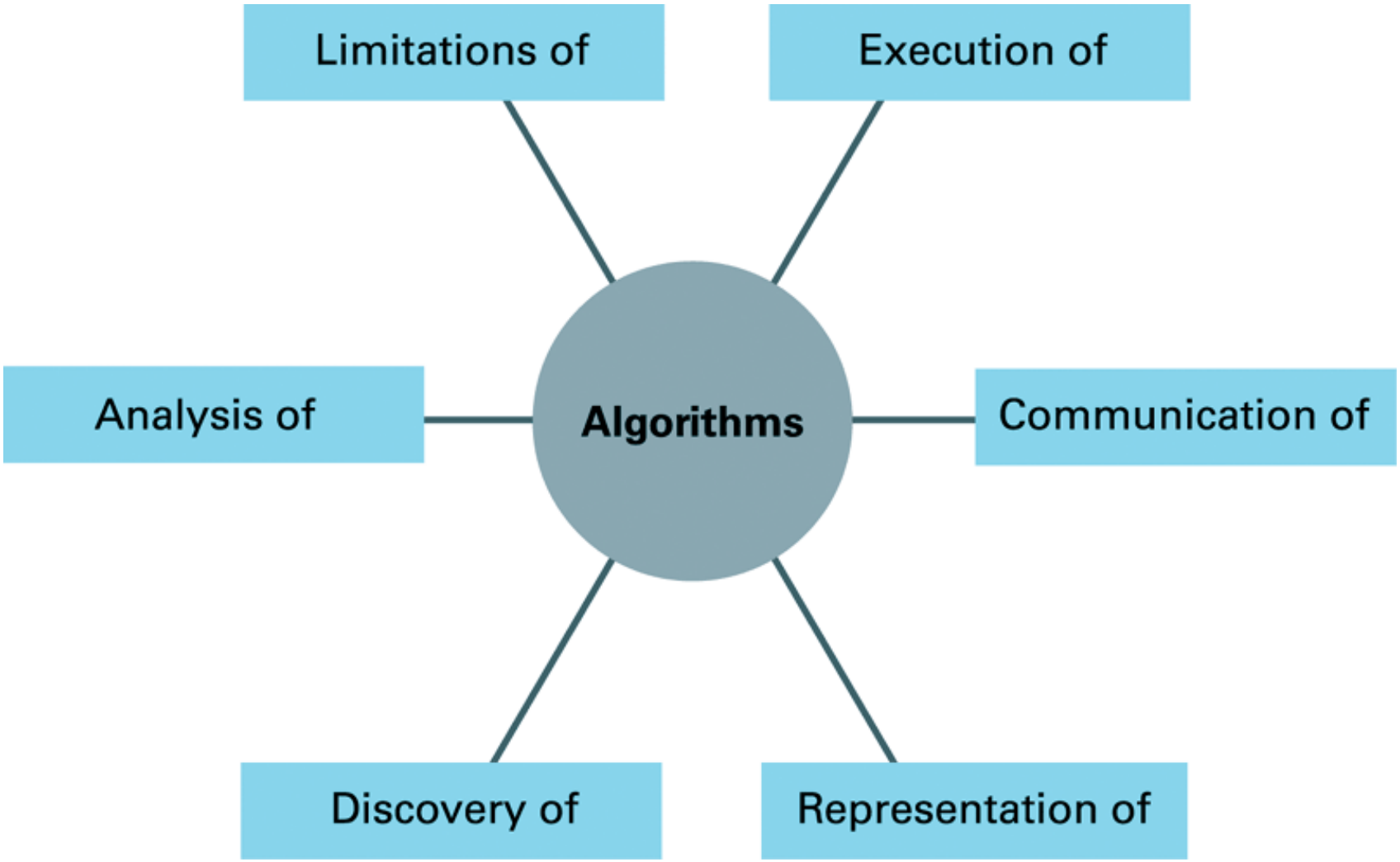
Introduction:
Computer Science - What is it? (1)

- **A combination of many things...**
  - includes a.o.:
    - (1) hardware design, (2) programming, (3) human computer interaction, (4) artificial intelligence, etc...
  - in other words:
    - mathematics, engineering, psychology, linguistics, biology, business administration, ethics, sociology, …
- **Certainly not:**
  - ‘science’ of computer applications
  - ‘science’ of programming in language ‘X’

Introduction:
Computer Science - What is it? (2)

- **Science of algorithms:**
  - algorithm (informally):
    - set of steps that defines how a task is performed
    - Our Knowledge of algorithms would be the main driving force behind modern technology and this book
  - machine-compatible representation = ‘program’
  - central issues:
    - (1) algorithm discovery
    - (2) algorithm representation
    - (3) handling complex collections of algorithms
    - (4) hardware implications, ...

The central role of algorithms in computer science



Orientation of Book

- **Discovery**
  - Discover solution of a problem **- Chapter 4**
- **Representation**
  - Communication to Machine-Programming Languages
  - Programming Languages are based on programming paradigms or processes**- Chapter 5**
- **Communication**
  - Communication among the algorithms **- Chapter 10**
  - Interaction among the components **- Chapter 6**
  - Computer Architecture – Data storage, presentation, manipulation and Retrieval **- Chapters 1, 2, 7, 8 & 9**

Orientation of Book (2)

- **Execution**
  - The design of large software system involve more development of individual algorithms for performing the required activities.
  - Software Engineering - Project management, Personal management and programming language design.
  - Software Engineering also deals with the development of the tools **- Chapter 6**
  - How algorithms will be stored in machine? How algorithms will be executed by machine **- Chapter 3**
  - Human intelligence is and will be simulated to machines so that machine can perform more activities like humans. **Chapter 10**

Orientation of Book (3)

- **Limitations**

  In Early 1900 Kurt Godel proposed "incompleteness theory":

  "Any Complete study of our arithmetic system lies beyond the capabilities of algorithmic activities"

  – Limitation of algorithms study limits the mathematical studies to design hypothetical machines- **Chapter 11**

- **Analysis**

  – Analysis of algorithms is important to know which algorithm is more efficient and correct **- Chapter 4**

Figure 0.7: Viewing this text, itself, as a hierarchy of abstract tools (continued)

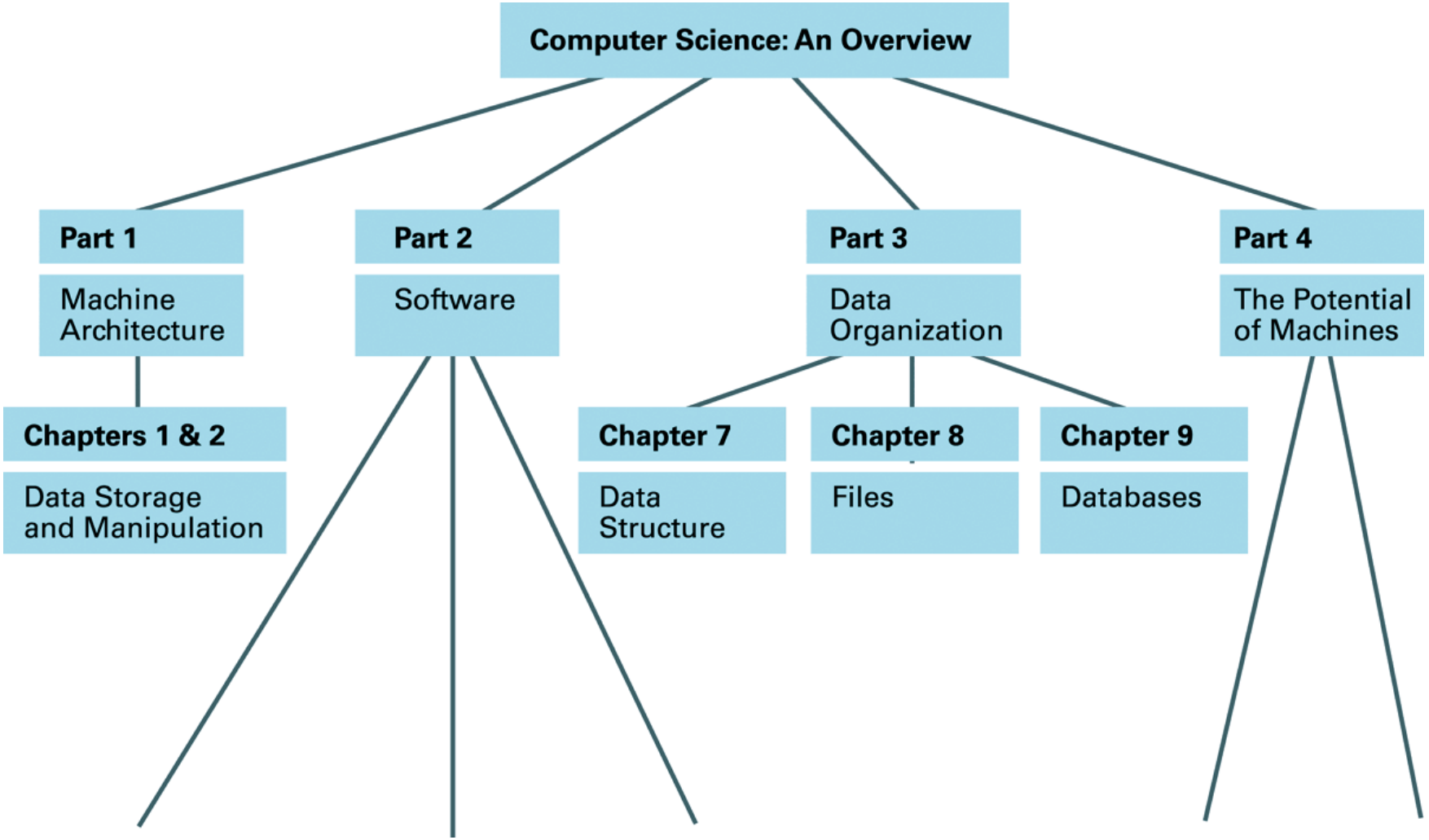


Figure 0.7: Viewing this text, itself, as a hierarchy of abstract tools

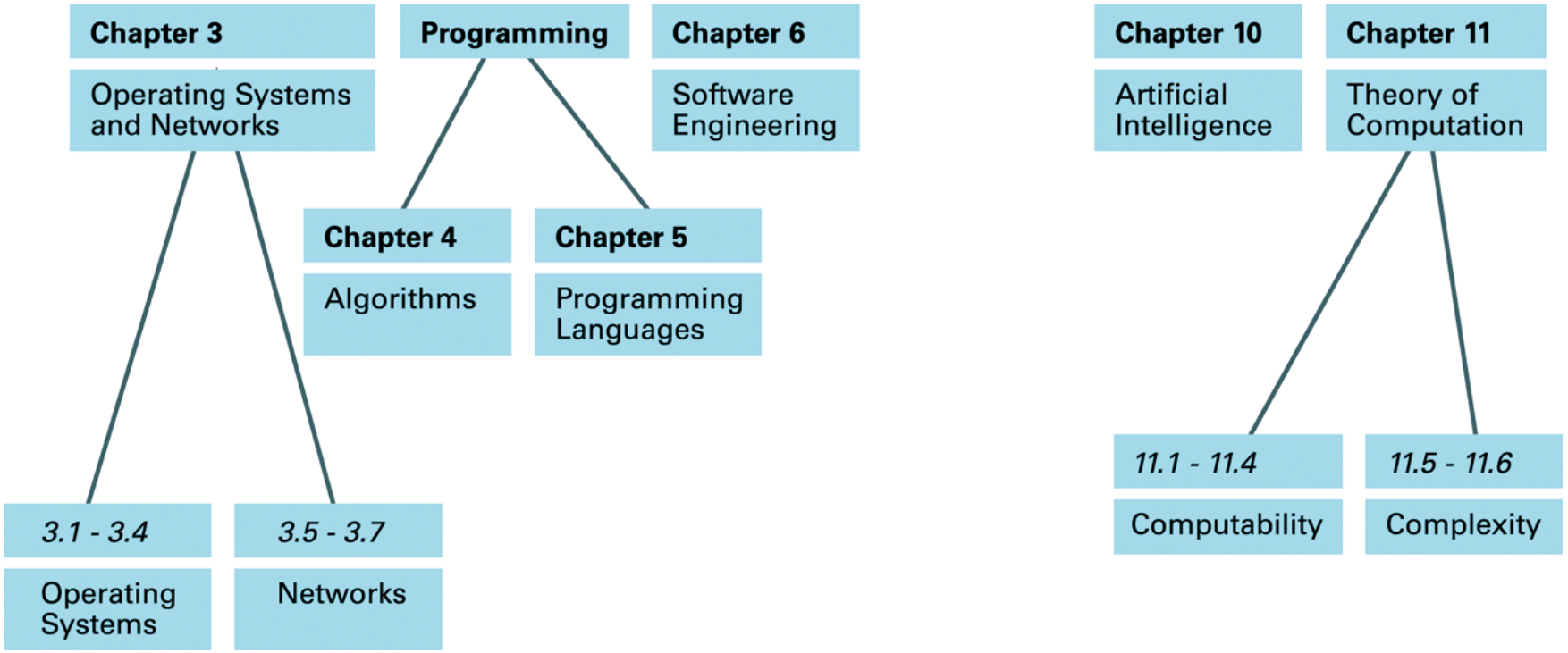
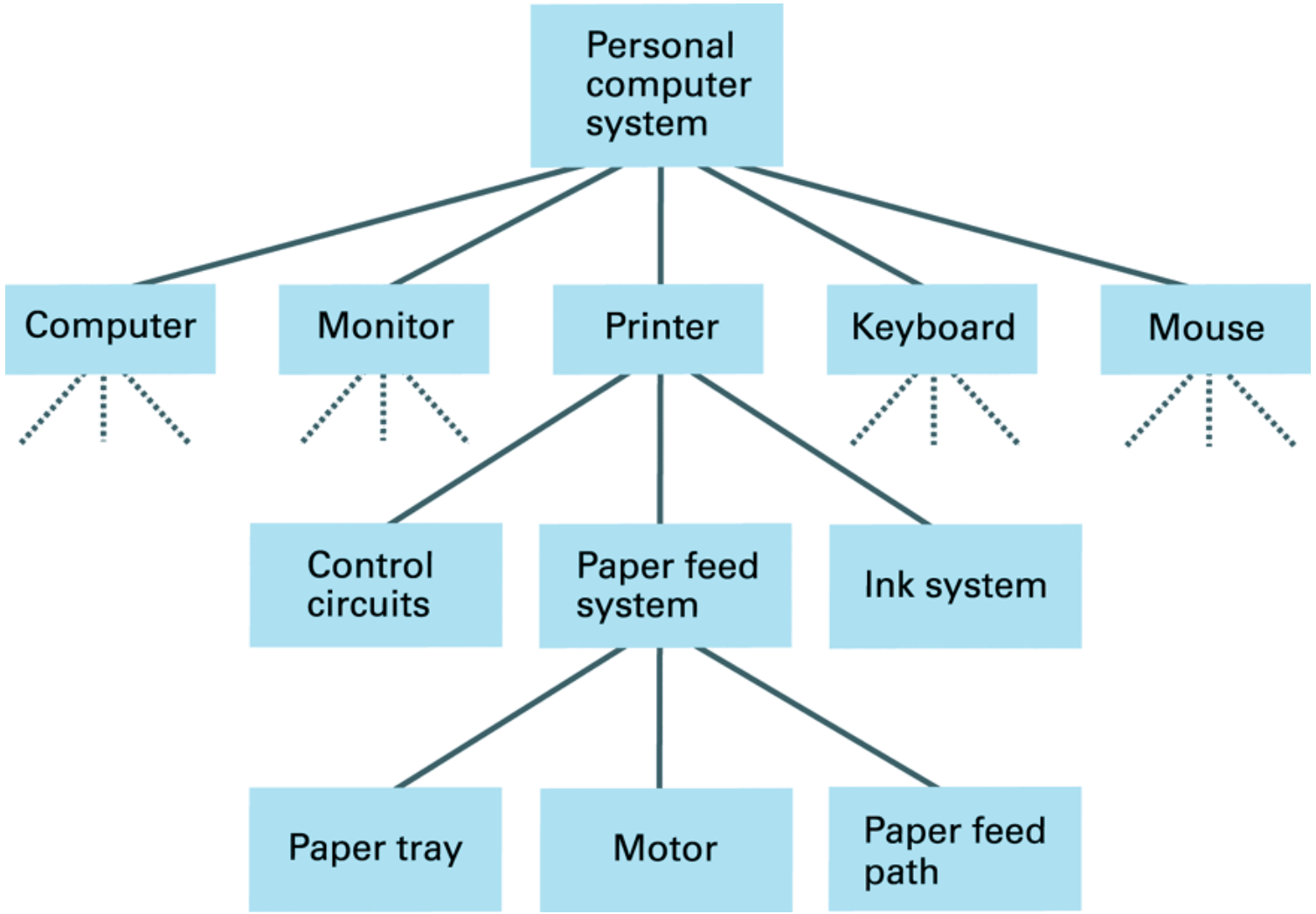


Figure 0.6: The hierarchy of abstraction in the hardware of a typical personal computer

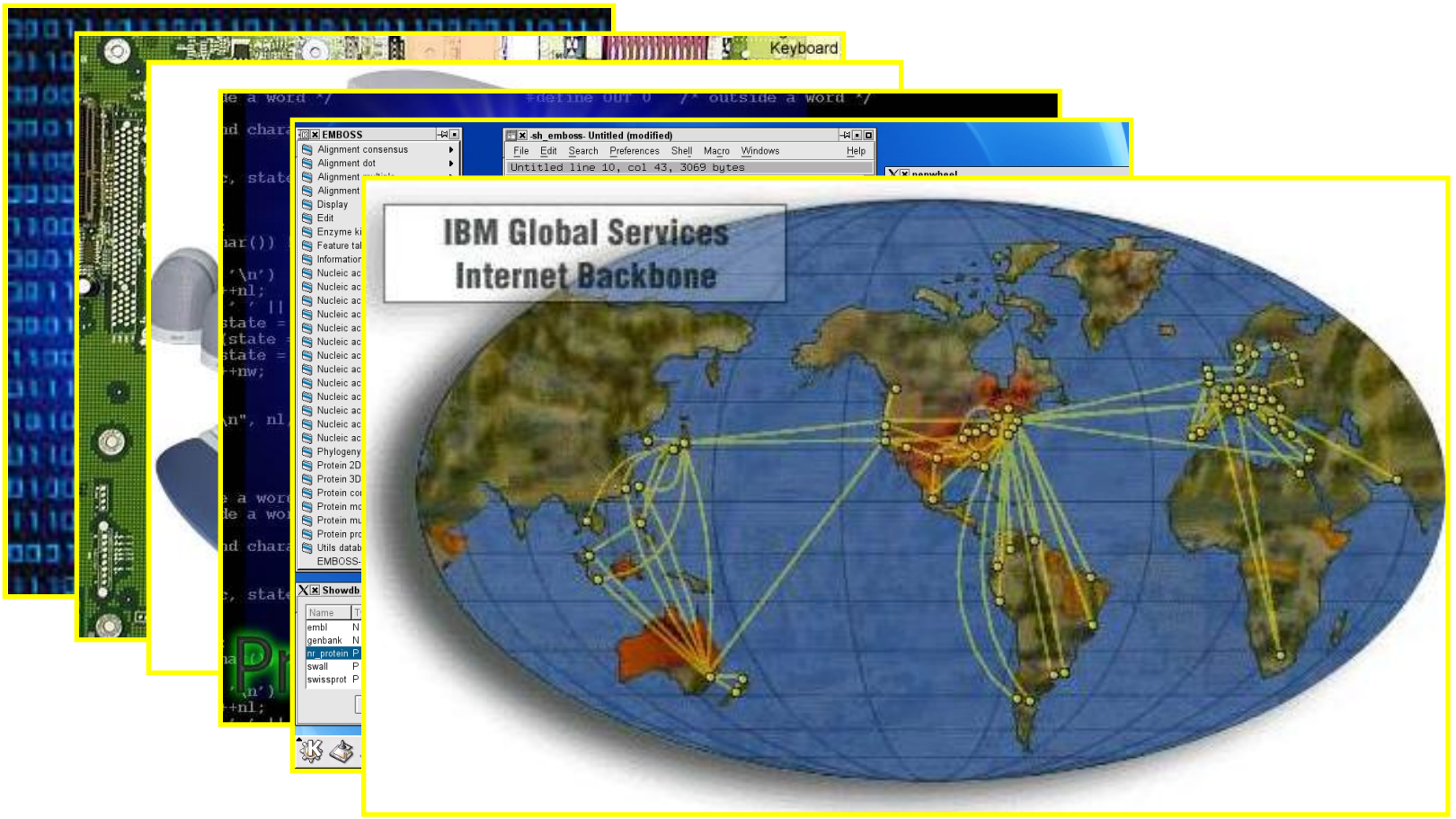


Introduction:
Computer Science - What is it?

- **Science of 'abstraction':**
  - obtaining *external* properties of an entity, by hiding its *internal* details.

Introduction:
Computer Science - What is it?

- **Abstraction... on abstraction... on...**



Computer Science in relation to desktop PC...

2. Software
(Operating Systems, Programming, ...)

4. Potential of Computers
(A.I., Theory of Computation, …)

3. Data Organization
(Data Structures, File Structures, Databases, …)

1. Machine Architecture
(Data Storage, Data Manipulation, ...)

The origin of computing machines

- First Computing device: Abacus
- Mechanical Devices before the invent of Electricity
  - Efforts by Pascal, Leibuiz and Charles babbage
  - Babbage's machine was programmable
    - Augusta Ada is considered first programmer

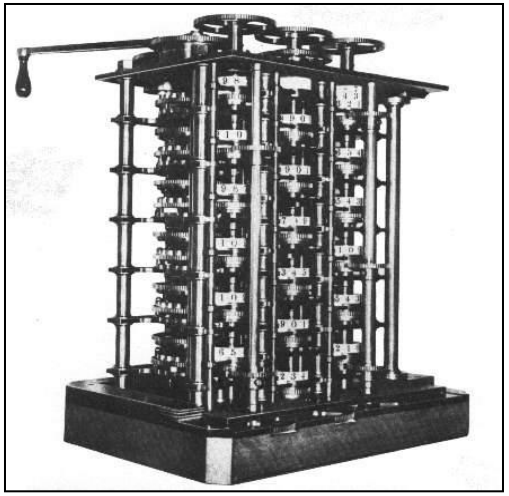
After the invention of electricity

- 1944- **Mark I** at Harvard university
- Obsoleted soon, because work on vacuum tube technology has been done to construct Electronic Digital Computers

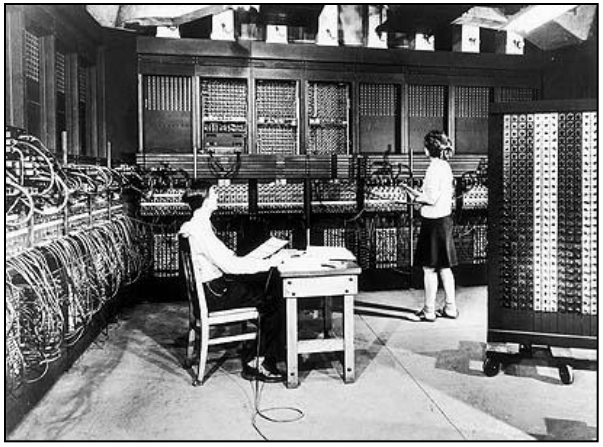
  1945- **ENIAC**- Electronic Numerical Integrator Calculator
- 1981- **PC**- IBM first personal Computer, software by Microsoft

Central issues identical in the past...

- Abacus (ca. 50 BC)



- Difference Engine (Babbage, ca. 1822)



- ENIAC (Univ. of Pennsylvania, 1945)

The Evolution of Computers: Then & Now

Questions:

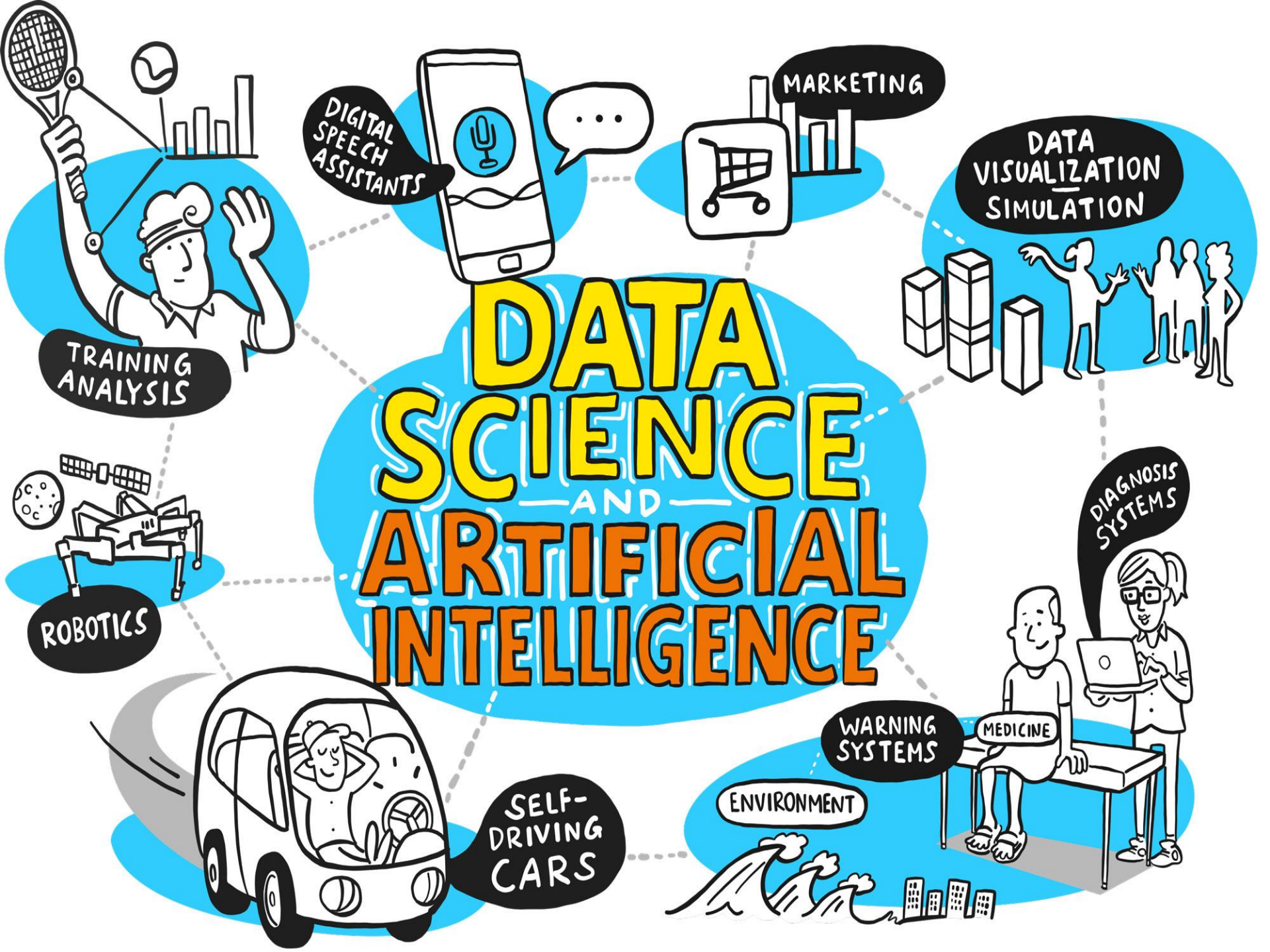
- Can you think of any other common computing device other than computers?

Mobiles
Correct Answer
But Why?

Today Mobiles and Devices

Dream Smartphone Devices| Intelligent Personnel Assistant Mobile

- No need to take tension about its charging time. it can be charge from body heat or electromagnetic waves.
- it check my mood and set the wallpaper of mobile phone according to my mood.
- Make a record of my decision and give me opinion is my every day problem.
- Detecting your Geo location and hence providing you help like mulch-language translation support and best traffic routing via GPS.
- Direct satellite connection for 24/7 uninterrupted service/internet connection.
- Looking at your schedule and replying to an incoming invitation for a party/get together.
- Fully voice functional.
- Ability to provide you suggestion about your schedule/adjusting your schedule as it best fits.
- Behavior based detection of messages hence informing you about the important ones only.
- Practically 100% unbreakable and stealth proof/secure

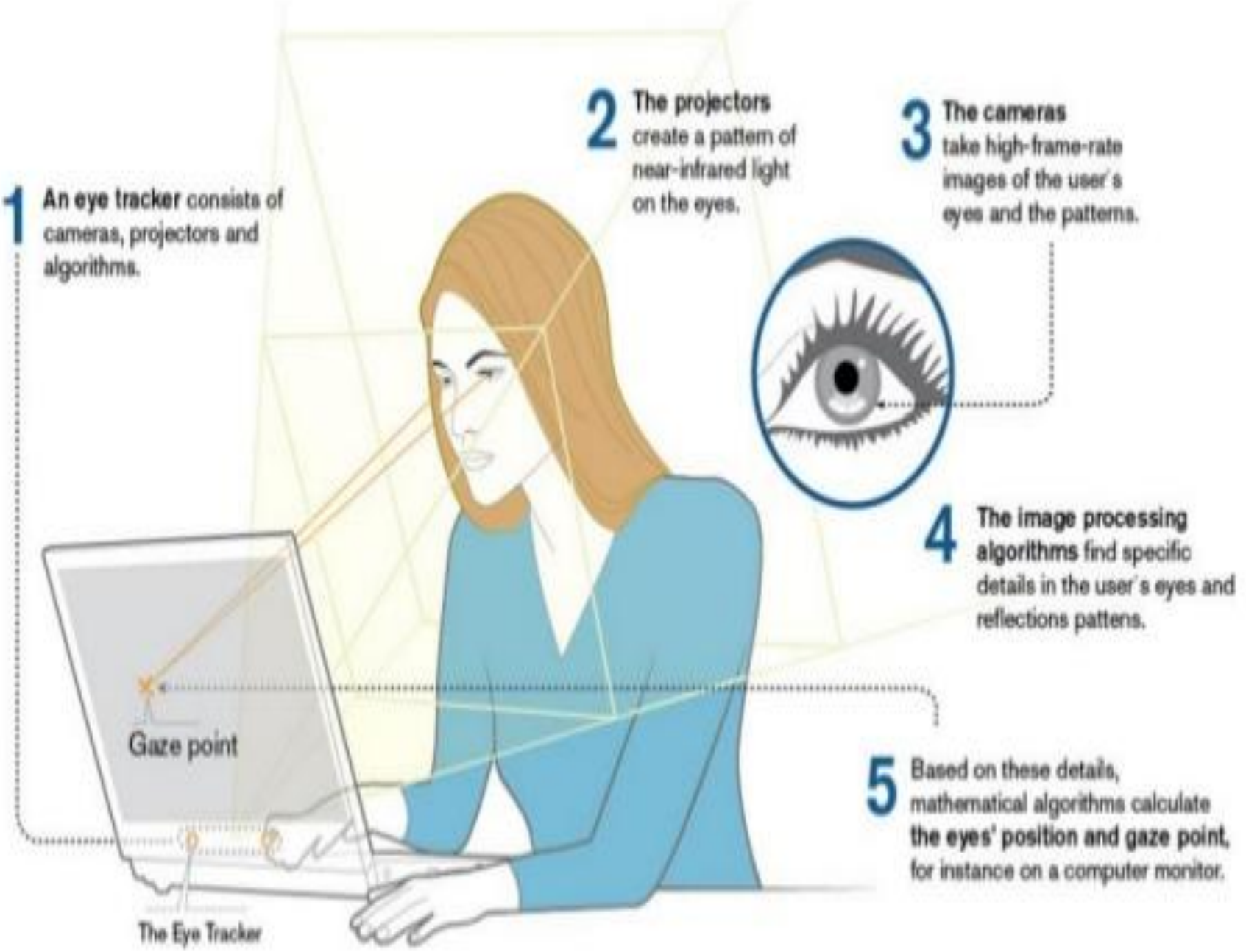

DATA SCIENCE AND ARTIFICIAL INTELLIGENCE
TRAINING ANALYSIS
DIGITAL SPEECH ASSISTANTS
MARKETING
DATA VISUALIZATION — SIMULATION
ROBOTICS
SELF-DRIVING CARS
ENVIRONMENT
WARNING SYSTEMS
MEDICINE
DIAGNOSIS SYSTEMS


Breakthrough Future
Technologies
2019 - 2055

Eye Tracking for Everyone

2019

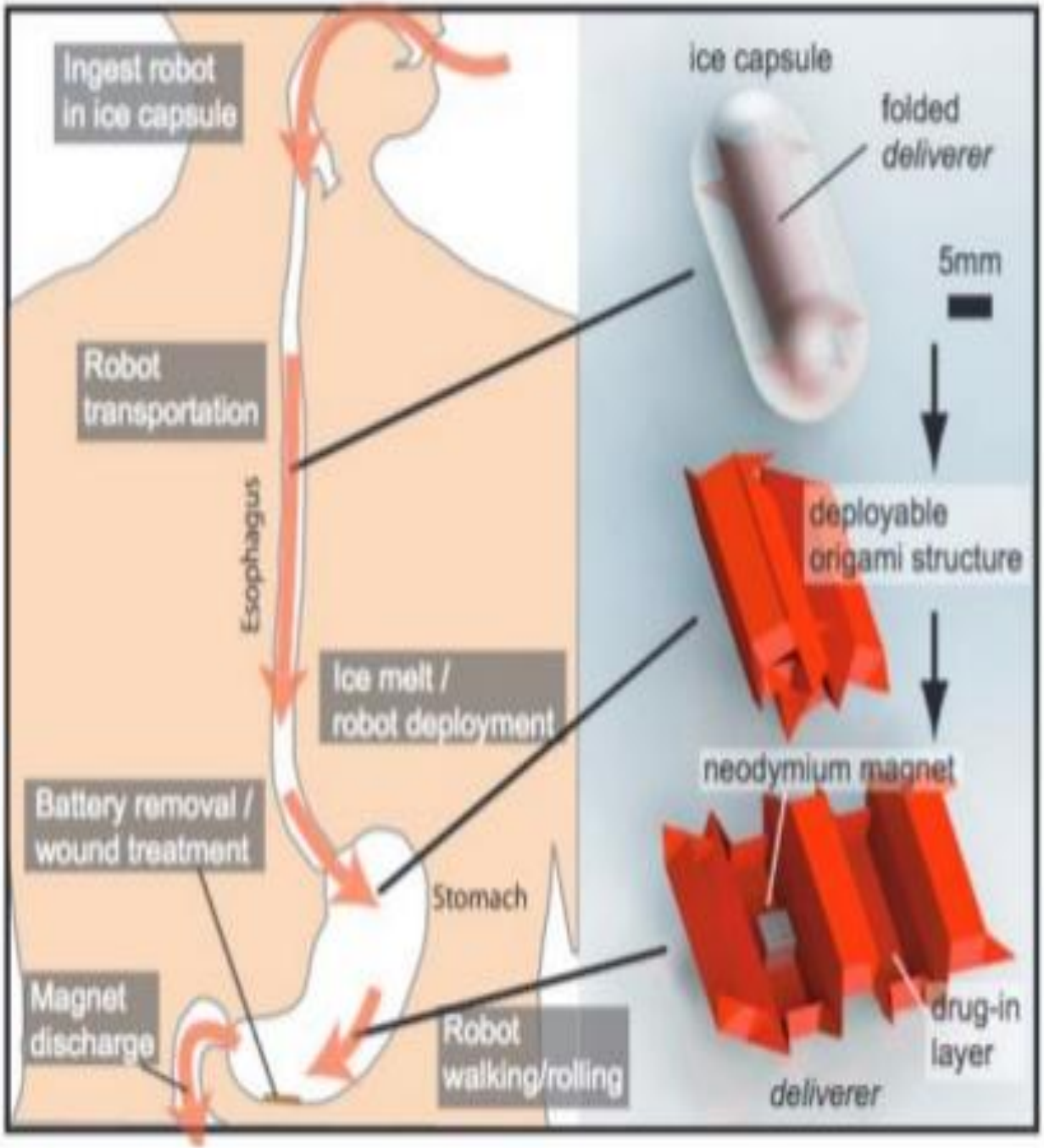
x: 1044
y: 0928


1 An eye tracker consists of cameras, projectors and algorithms.
2 The projectors create a pattern of near-infrared light on the eyes.
3 The cameras take high-frame-rate images of the user's eyes and the patterns.
4 The image processing algorithms find specific details in the user's eyes and reflections patterns.
5 Based on these details, mathematical algorithms calculate the eyes' position and gaze point, for instance on a computer monitor.
Gaze point
The Eye Tracker

Ingestible Robots

2024

Ingestible Robots




Smart Clothing
2026

Smart Clothing

- Smart clothing is still to go mainstream after first popping to the surface in 2015.
- Electronic textiles, also known as smart garments, smart clothing, smart textiles, or smart fabrics, are fabrics that enable digital components such as a battery and a light (including small computers), and electronics to be embedded in them.
- Smart textiles can be broken into two different categories: aesthetic and performance enhancing.
- Aesthetic examples include fabrics that light up and fabrics that can change color.
- Performance enhancing smart textiles are intended for use in athletic, extreme sports and military applications.


Uncheckable Quantum Internet
2034

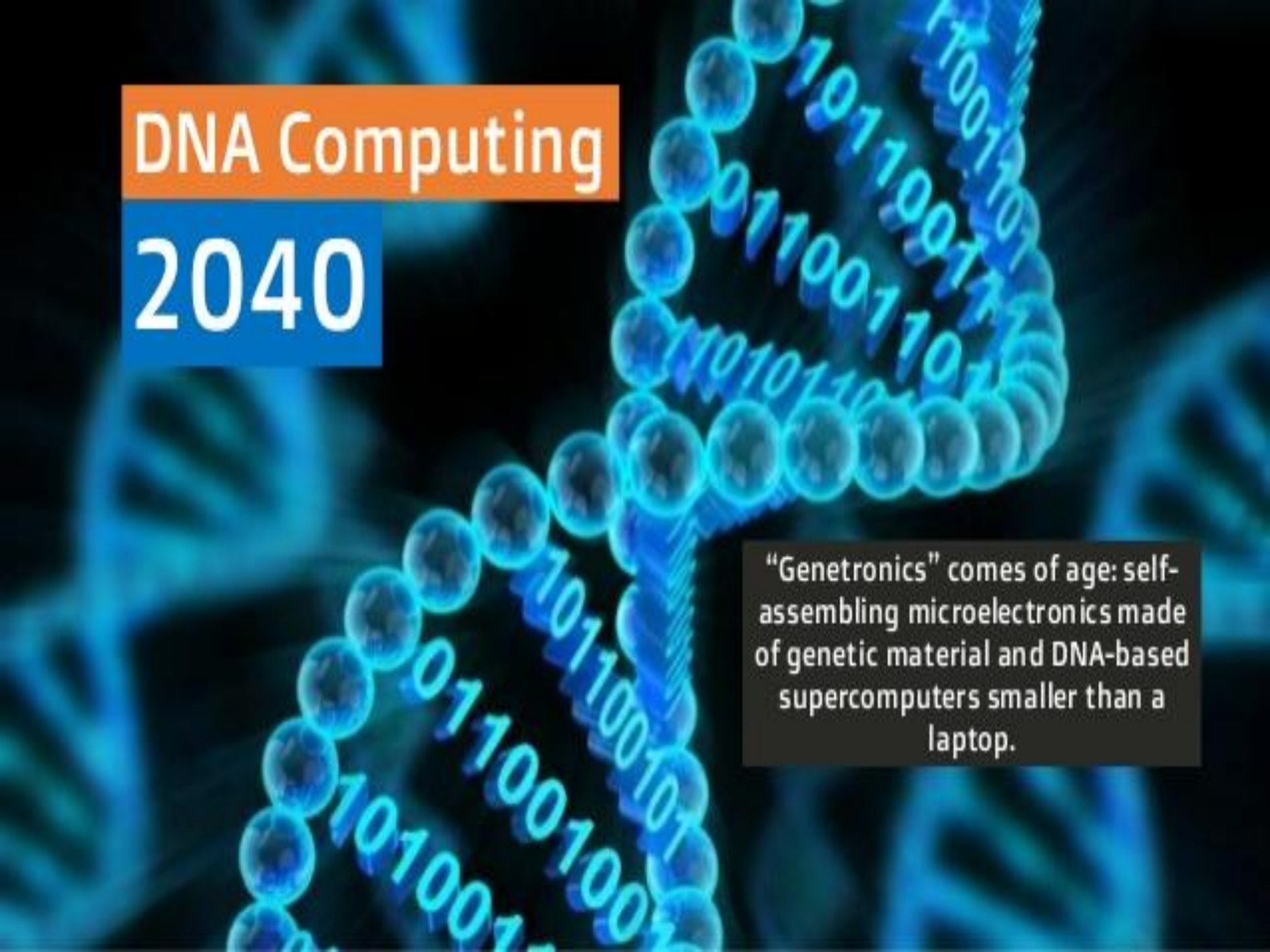
Uncheckable Quantum Internet

- The internet is vulnerable to the kind of hacking revealed by Snowden because data still travels over cables in the form of classical bits—a stream of electrical or optical pulses representing 1s and 0s.
- A hacker who manages to tap into the cables can read and copy those bits in transit.
- The laws of quantum physics, on the other hand, allow a particle—for example, an atom, an electron, or (for transmitting along optical cables) a photon of light—to occupy a quantum state that represents a combination of 1 and 0 simultaneously.
- Such a particle is called a quantum bit, or qubit. When you try to observe a qubit, its state "collapses" to either 1 or 0.
- If a hacker taps into a stream of qubits, the intruder both destroys the quantum information in that stream and leaves a clear signal that it's been tampered with.
- Because of this property, qubits have been used for quite some time to generate encryption keys in a process known as quantum key distribution (QKD).
- This involves sending data in classical form over a network, while the keys needed to decrypt the data are transmitted separately in a quantum state.


The Next Evolution of A.I.
2036
Big data analytics and predictive AI come of age-from weather, to elections, to geopolitics, evolution, and much else, the future has become almost disappointingly predictable.


3D Printing in Every Home
2037
The ultimate in home shopping: cheap 3D printers in every home can print out almost anything – Electronics, Furniture, Food, and medicines – from files purchased and downloaded from the internet.


Fully Immersive Computer Interface
2038
Intuitive interaction with entertainment, infotainment, web-surfing and what have you through advances in VR/AR, projection mapping, haptics, and brain-computer interface.


DNA Computing
2040
"Genetronics" comes of age: self-assembling microelectronics made of genetic material and DNA-based supercomputers smaller than a laptop.


Holographic Pets
2041
Holographic Pets become the next "thing" – interactive AI holograms that express and response to emotions. Holographic dating sites also take off.

Algorithmic Advances

2045

Sophisticated algorithms- the product of advanced quantum computing-achieve wonders in medicine, astronomy, the search for extraterrestrial life, economics, architecture, and reconstructing the history of evolution on Earth.

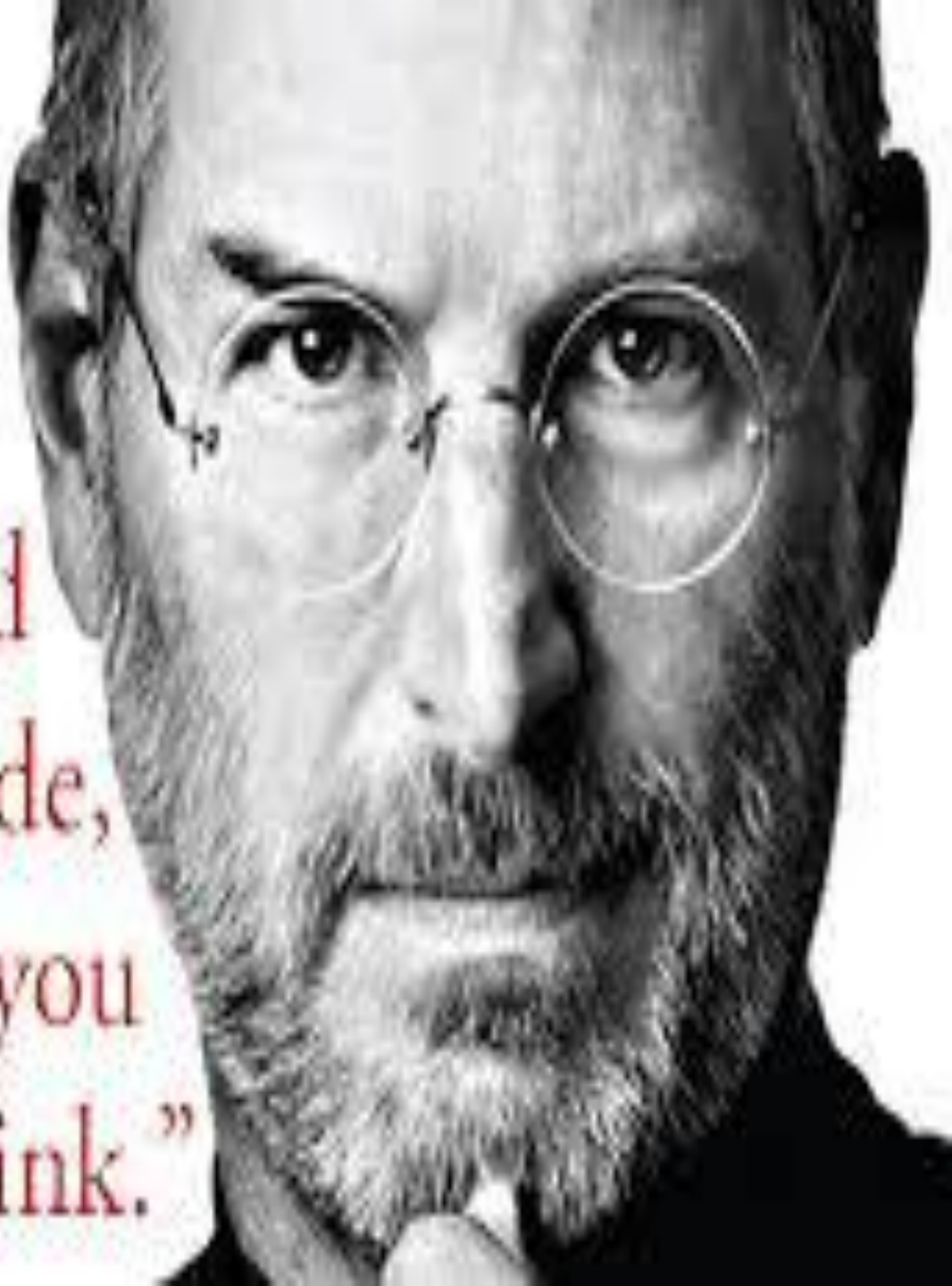
Motivation

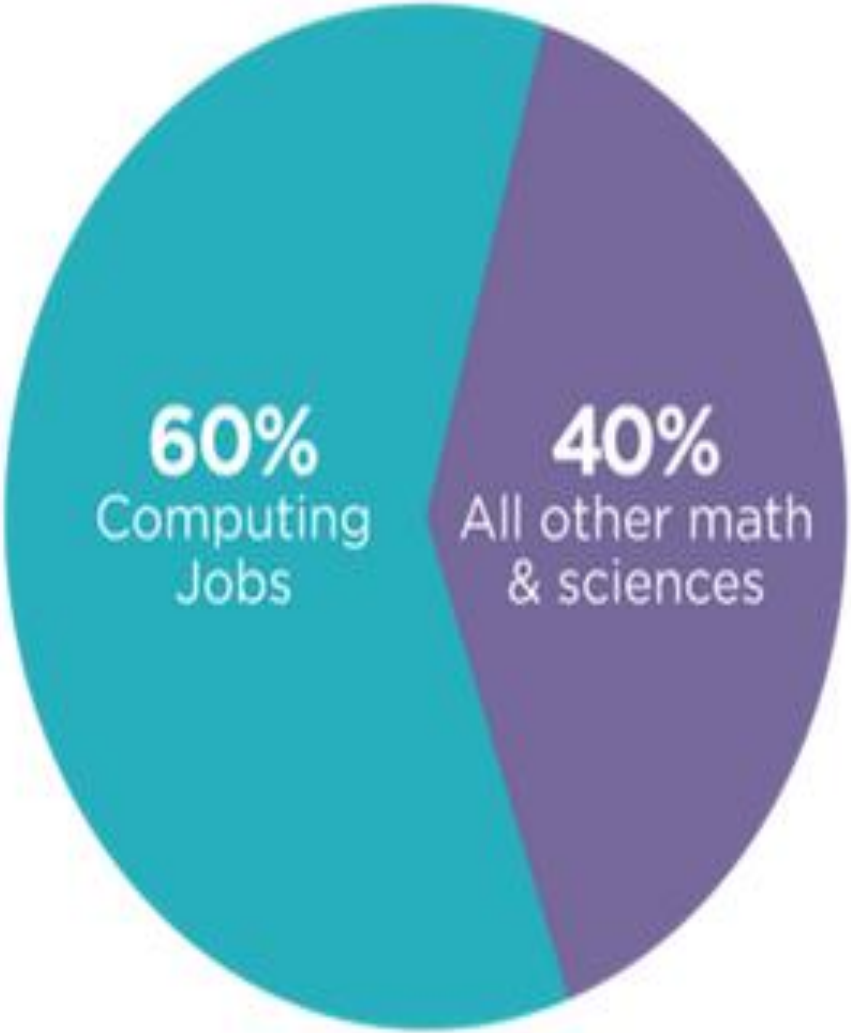
- Learning how to program is hard
- High dropout rate, poor grades, bad habits emerging in next courses (like Data structures, or Programming Projects)
- Teaching how to program in introductory programming courses is mainly based on lectures + some exercises (home assignments, complex exercises)
- The problem is not in mastering syntax and semantics of a language, it is in mastering the process of combining constructs into programs

Steve Jobs

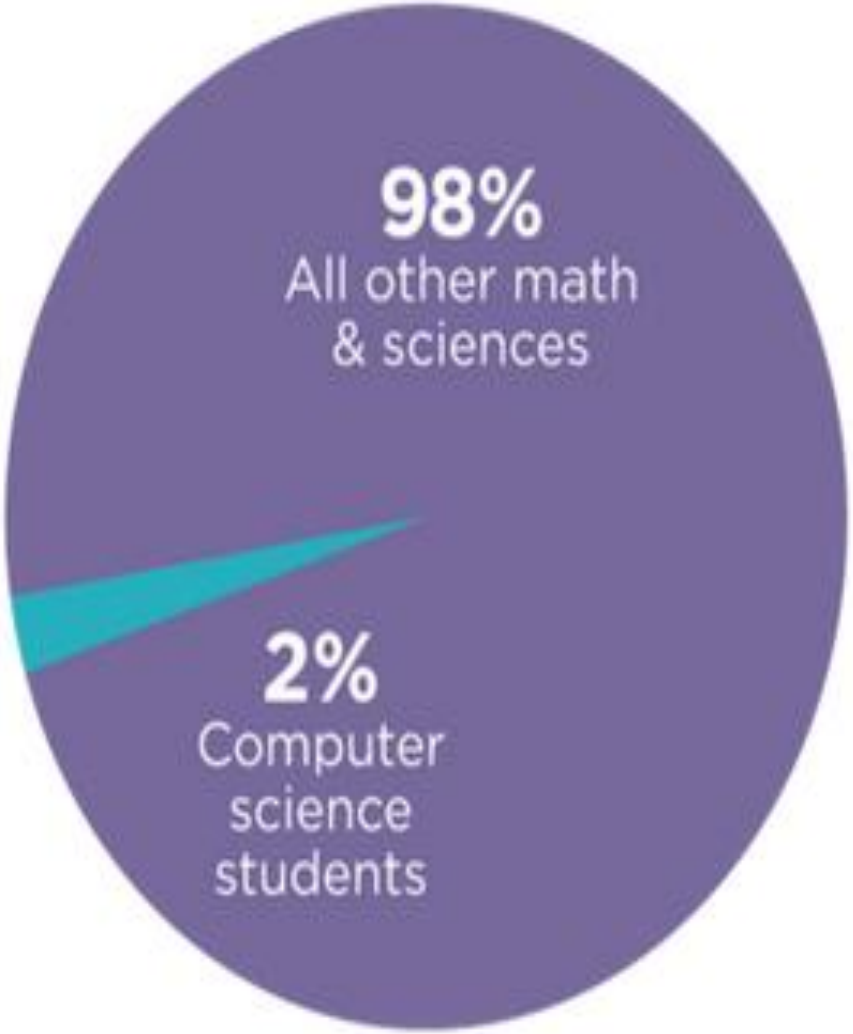
1955-2011

"Everyone should learn how to code, it teaches you how to think."





Jobs



Students

These are the top 10 skills for 2025. Image: World Economic Forum

Ref: https://www.weforum.org/agenda/2020/10/top-10-work-skills-of-tomorrow-how-long-it-takes-to-learn-them/

Home Assignment

- Create your own Gmail email address; if you don’t have one.
- You all will be joining **Google Classroom** for class contents and materials and assignment.

Google Classroom:

- https://classroom.google.com/c/NTc0MzQxNzE0MzE1
- Code for Joining: rklb5me
- Lab Manual
- SIF

Last topic of Chapter: Introduction

- Ethical, Social and Legal Repercussions
  - Home work
  - Verbal presentation in the next class

1st Week Lab Homework:

- Create and Fill Student Information Form (SIF) in MS word and Submit the Softcopy in the Google Classroom.


Any
Questions