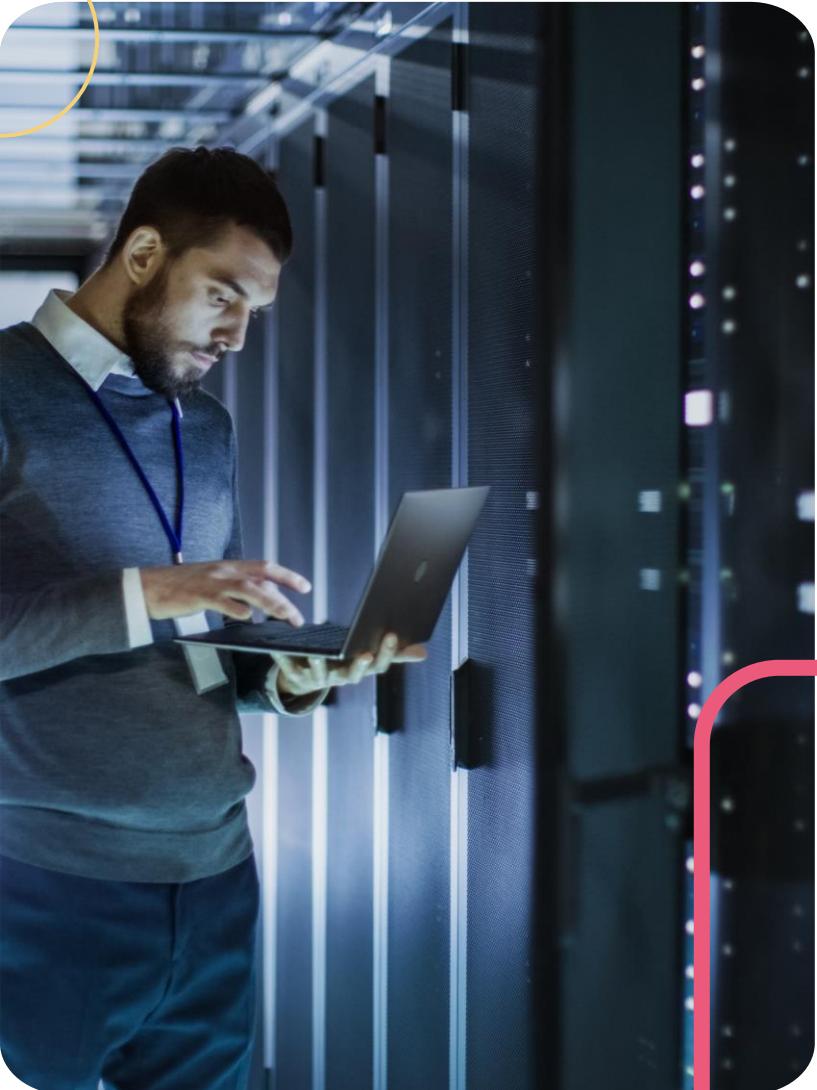


Diploma in Computer Science

Enter Computer Science



Objectives

Defining Computer Science



The road to modern-day computing



Applications of computing



Opportunities in the field of Computer Science





Defining Computer Science



What is Computer Science?

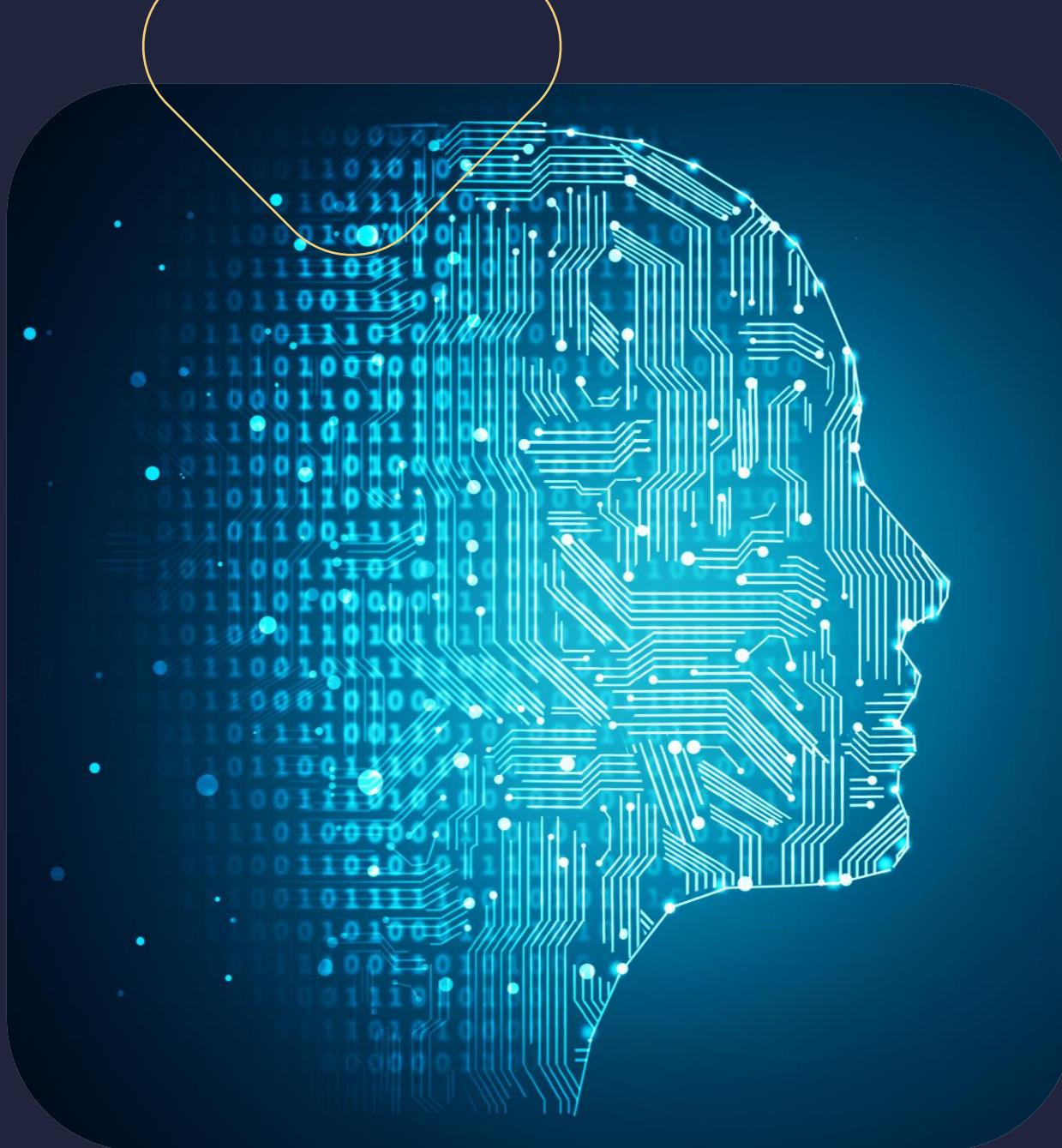
- Study of computational systems
- How computers 'think' and how we help them to solve problems for us



The process



- Starts out theoretically
- Moves into development of the system
- Ends at application – the deployment of the system



- Artificial intelligence
- Computer systems and networks
- Database systems
- Human computer interaction
- Vision and graphics
- Software engineering
- Bioinformatics
- Theory of computation

Key terms

Programming

- Creation of instructions that a computer can understand

Coding

- Same meaning as programming

Language

- Specific method for communication





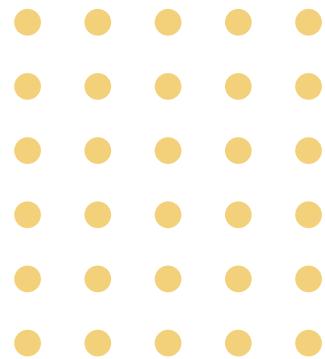
Why do we need computing?

Repetitive tasks are easier

- Imagine a grocery store cashier had to calculate the cost of groceries by hand?

Complex tasks achieved faster

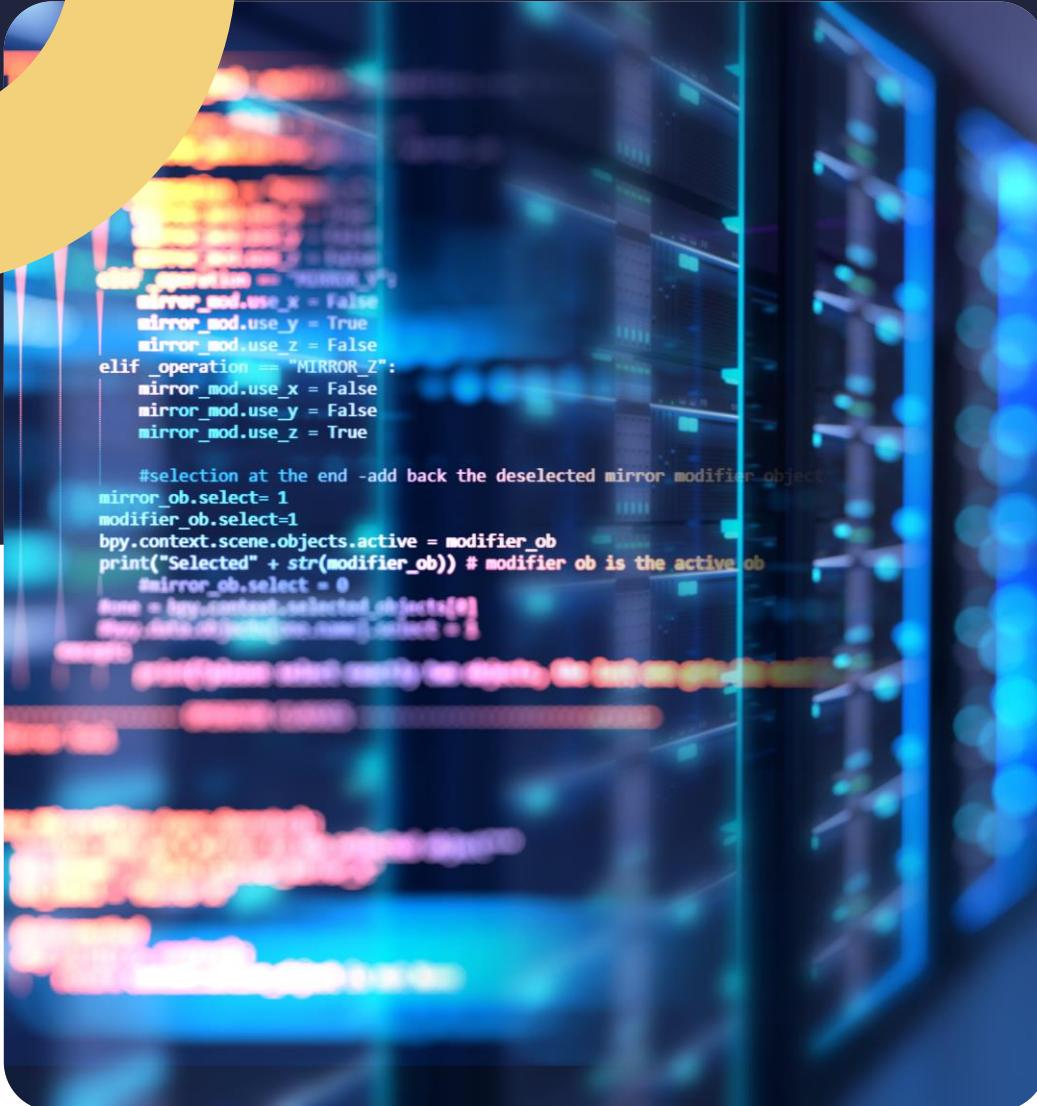
- Could you find a topic in a 2000-page printed pdf quickly?



Accuracy

A computer is only as accurate as the data it is provided with

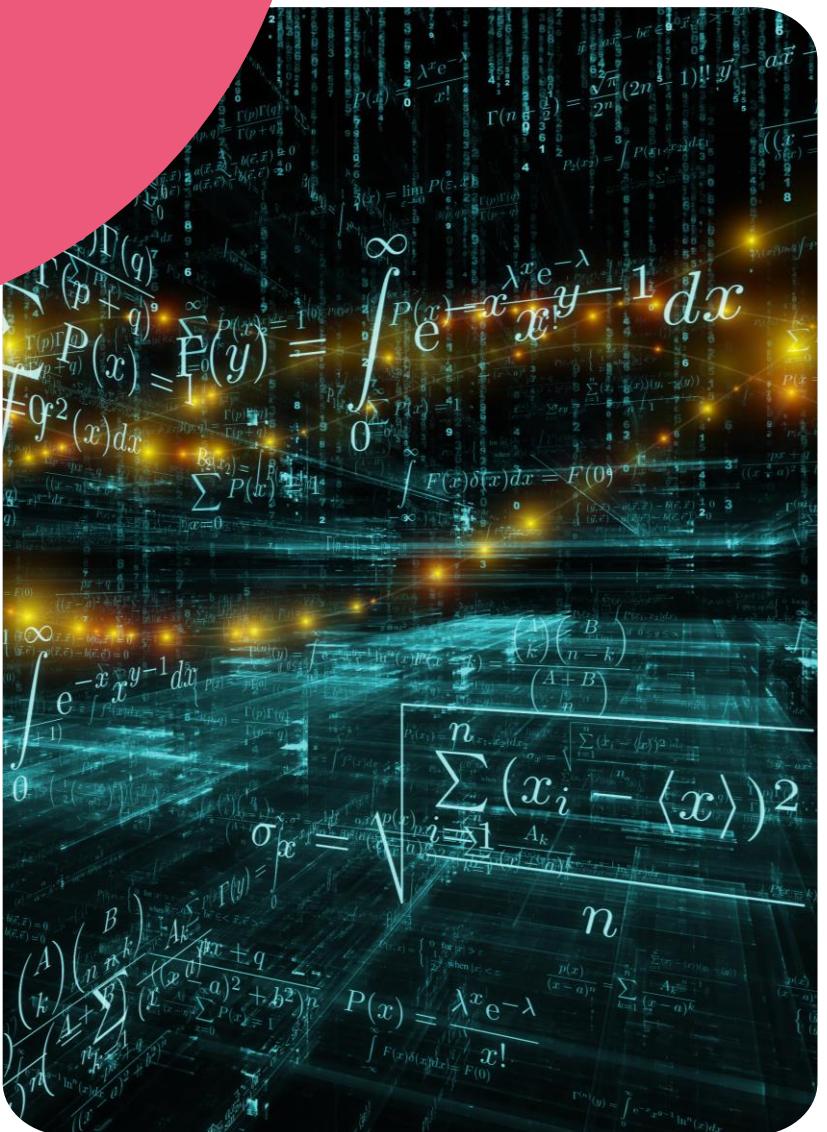
- You put garbage in, you get garbage out!
- Computers are getting smarter and can reject common “garbage” before it is processed.



- Nature is mathematical
- Many aspects in nature can be described using mathematical expressions
- Fibonacci sequence is arguably the most popular

Computing & Maths

The relationship between them



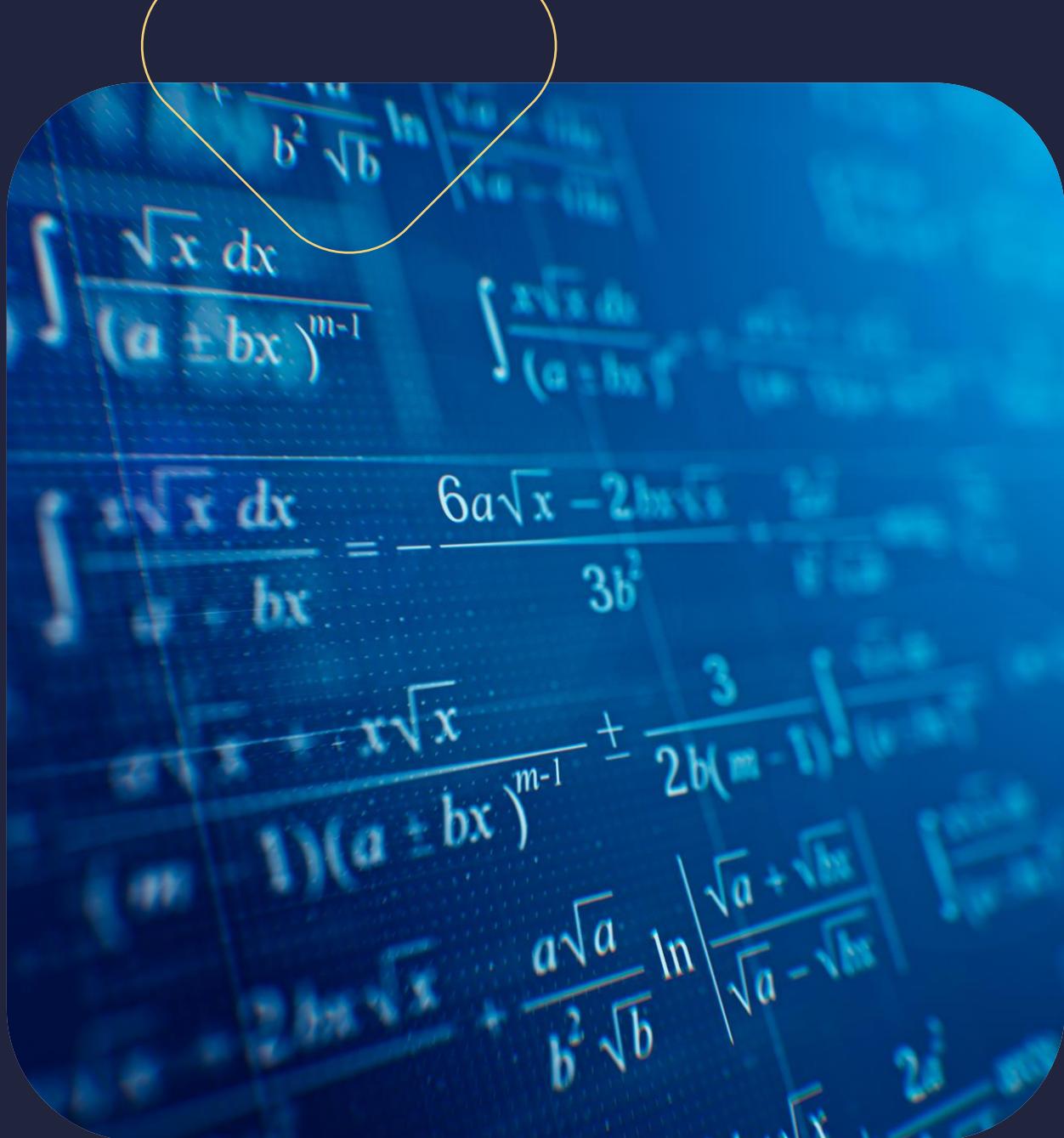
Playing video games

E.g. Need For Speed

Everything in the scenes, the trees, the road, the cars, the voices, the people...

These are all mathematical expressions!





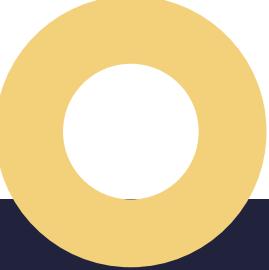
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Maths in our everyday lives

- Where a ball lands
- The top speed of a car
- The shape of leaves
- The motion sequence of flapping wings
- The path an ant follows
- Weight ratio and bones
- Arm and leg proportions
- Patterns on your fingerprints
- Features of the face

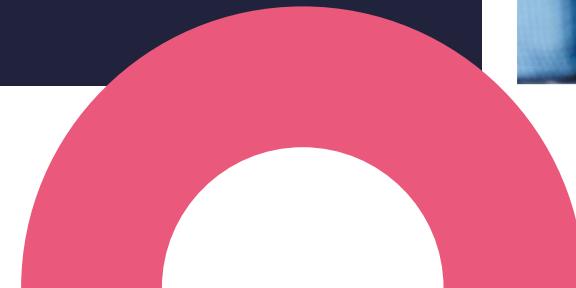


- Computers help us understand these models
- It is the job of a computer scientist to formulate them and take advantage of the speed and power that computers offer



DID YOU KNOW?

Pilots learn how to fly without leaving the ground – computers accurately model and replicate scenarios they'll experience in the skies.





The history of computers



A detour into the museum...

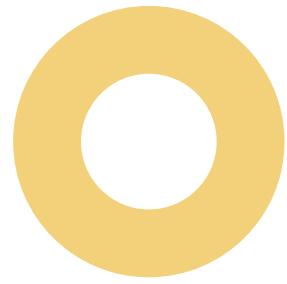
Computers existed as far back as two millennia ago in the form of abaci, used by Mesopotamians for simple calculations.



Charles Babbage

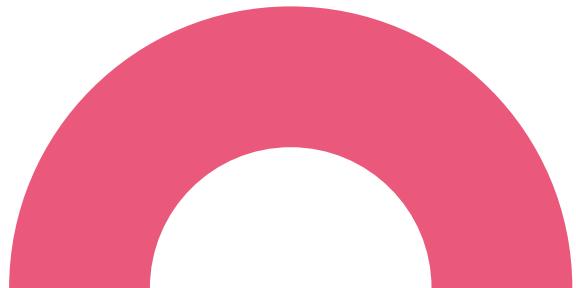
The father of the computer

- British mathematician, inventor, engineer, philosopher
- Built the “Difference Engine”
- Automatic calculator, mechanising a series of calculations
- Storage designed to output to a soft material



First Generation

- The Electronic Numerical Integrator and Computer (ENIAC) was the world's first general purpose computer.
- It was programmable – the catalyst for computer science.
- Used for weather predictions, cosmic ray studies, random number studies, wind tunnel design and more.



A black and white portrait of John Von Neumann, a man with dark hair and a receding hairline, wearing a suit and tie. He is looking slightly to the left of the camera.

John Von Neumann

Improved the ENIAC

- Made it easier to programme
- Author of the Von Neumann architecture – the base design of all modern computers
- Programming was still not “easy”, involving weeks of downtime

Second Generation

- The Universal Automatic Computer (UNIVAC) was introduced in 1951, famous for predicting the US election
- Stored programs and operating systems introduced, sprouting many programming languages
- New terms such as bits and bytes were used and became commonplace



DID YOU KNOW?

Your phone carries more processing power than the computer that sent the first astronauts to the moon!





- Parallel computing, multitasking, graphics and sound
- Computers became far more capable and useful
- The introduction of integrated circuits meant computers could be smaller, more powerful and less likely to break

3rd, 4th, & 5th Generation

Taking computers to the next level

The Future

- Artificial intelligence
- Internet of Things
- Machine learning
- Quantum computing





Artificial Intelligence

Mimicking human intelligence

- A human evaluator would communicate with subjects A (a machine) and B (a human) via a text-only channel
- In 2014, a programme called Eugene Goostman passed the Turing test
- The Turing test is passed if a computer is mistaken for a human more than 30% of the time

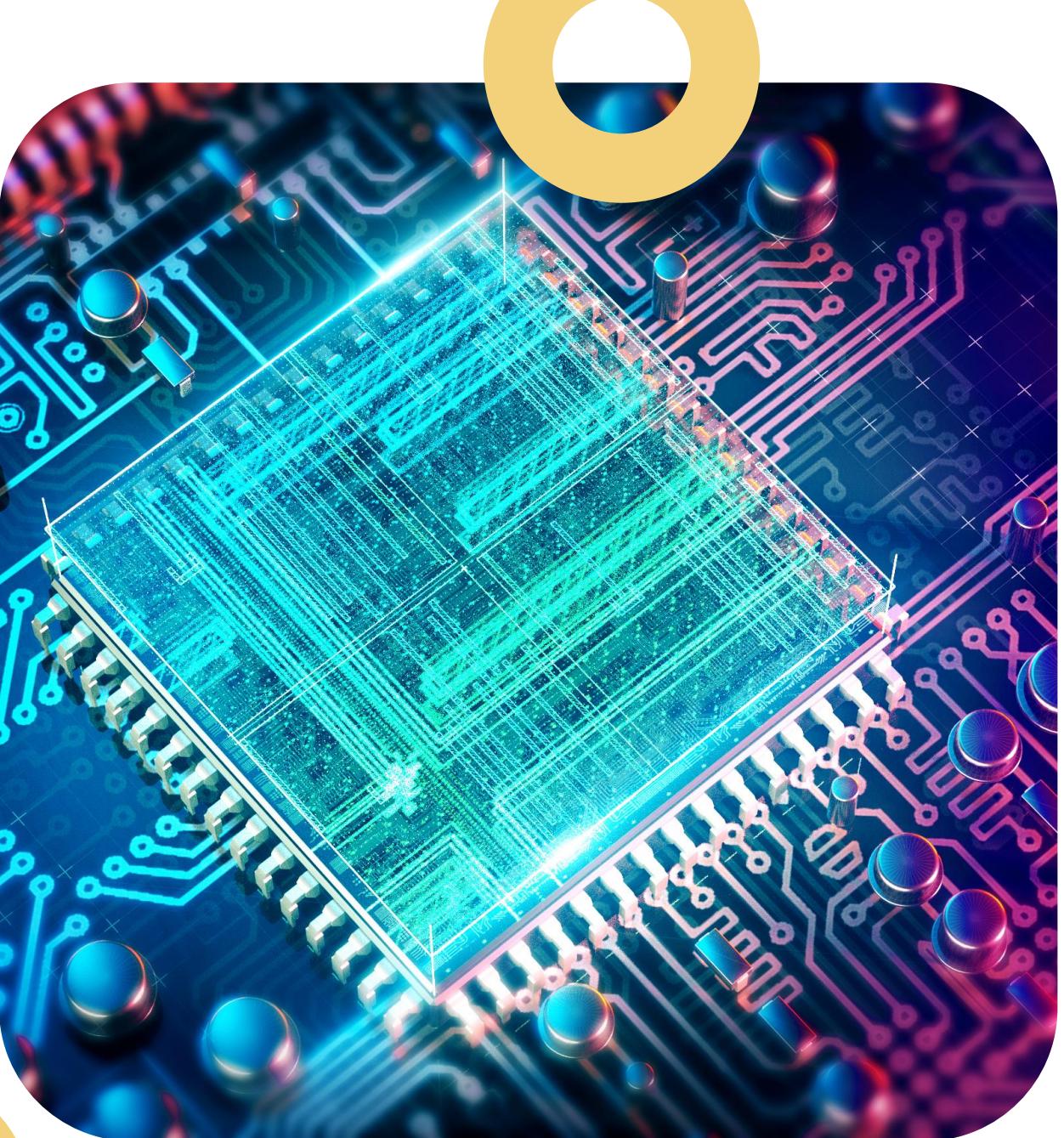


- Self-driving cars & other autonomous vehicles
- Advances in communications enables computers to gather staggering amounts of info, process it and produce output at fast speeds

AI Advancements

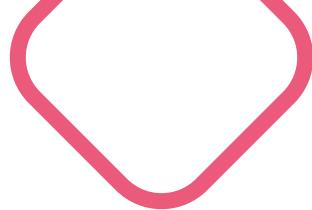
Quantum Computing

- Will overtake current computing capacity many times over
- Promises to make changes to the 2-bit system that every computer currently uses
- To date it is mostly theory-based but working demos have been produced





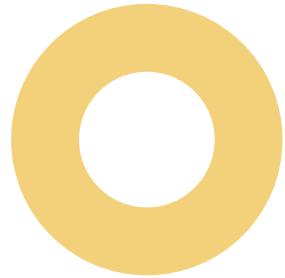
Applications of computing



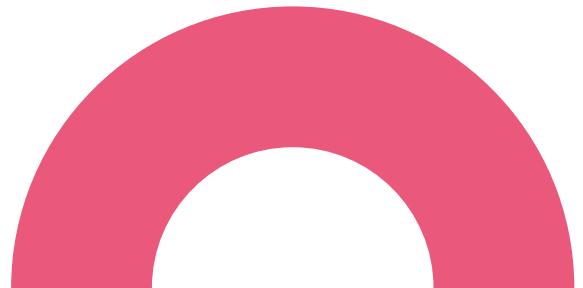


Business Operations

- Stock markets
- Payroll calculations
- Budgeting
- Sales analysis
- Financial analysis
- Performance analysis



- ATMs are completely automated
- Most banking operations can be done in real-time
- Global payment partners (e.g. PayPal) enable limitless transactions
- Business communications are almost entirely digital





- Systems development
- Data analysis
- Mobile front-end development
- Mobile back-end development

Trending Professions

Requirements

- Bespoke software
- Analysis of the business model and operations with tailored solutions
- Database maintenance
- Efficient manufacturing with computer-controlled robots





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Consumer Electronics

- Internet Of Things
- “Smart” device – data gathering and / or processing ability
- Integrated circuits are now so small they can fit in almost any device
- Apple Inc., YouTube, Facebook, Tiktok

Smartphones

Evolved from simple “bricks” to the single most used type of gadget for content consumption.

There is constant focus on improving the user experience.

Some devices now ship with AI chips built-in to further enhance the computing experience.





Consumer Electronics

- Many electronic items are now able to respond to natural language commands
- Assistive tech for differently-abled individuals
- Robotic arms controlled by thoughts alone
- A lot of research around tech that lives inside the body
- Smarter electronics make life easier and safer



Science & Research

Achievements possible with computing

- Scientists can accurately model complex scenarios and analyse in detail
- Computers have been used in research since the 1960s
- Weather forecasts are now more accurate
- Humanity has been able to safely leave- and return to earth
- Fabrication of even better computers



Recap

- The foundation and roots of computer science
- Applications of computer science
- Limitless opportunities