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The current context of Computer Science

MODULE 1 / UNIT 2 / 0.4

MOISES M. MARTINEZ

FUNDAMENTALS OF COMPUTER ENGINEERING

2025/2026

Which career path do you envision pursuing upon the completion of your degree?

The important questions

01

The important questions

What does it mean Computer Science (CS)?

What is Computer Engineering (CE)?

What does a Computer Engineer (CE) do?

What are the responsibilities for an individual in this role?

What does it mean Computer Science (CS)?

The study of **computers** and **computing**, including their theoretical and algorithmic foundations, hardware and software, and their uses for processing information. The discipline of computer science includes the study of algorithms and data structures, computer and network design, modelling data and information processes, and artificial intelligence.

What is Computer Engineering (CI)?

Computer engineering constitutes a subdiscipline within the domain of electrical engineering, wherein it amalgamates various facets of **computer science** and electronic engineering essential for the conception and construction of computer hardware and software.

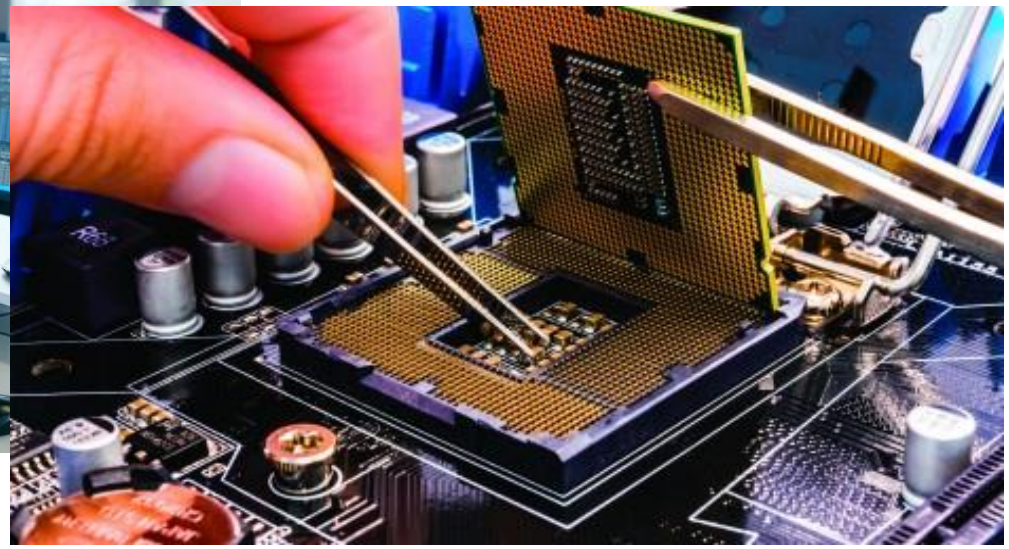
What does a Computer Engineer do?

Computer engineers are engaged in diverse facets of computing, encompassing hardware and software realms. Their responsibilities span from conceptualizing and designing individual **microcontrollers**, **microprocessors**, **personal computers**, and **supercomputers** to intricate circuit design. These professionals are also tasked with software and firmware development for embedded **microcontrollers**, **chip** design, analog **sensor** design, mixed-signal circuit board design, operating system creation, as well as the development of **software** systems, **robotic** systems, **control** systems, and **artificial intelligence** systems.

What are the responsibilities for an individual in this role?

Computer engineers deliver Information Technology (IT) solutions, primarily addressing the requirements of individuals and organizations, through the utilization of:

- Hardware
- Software



Why are we here?

02

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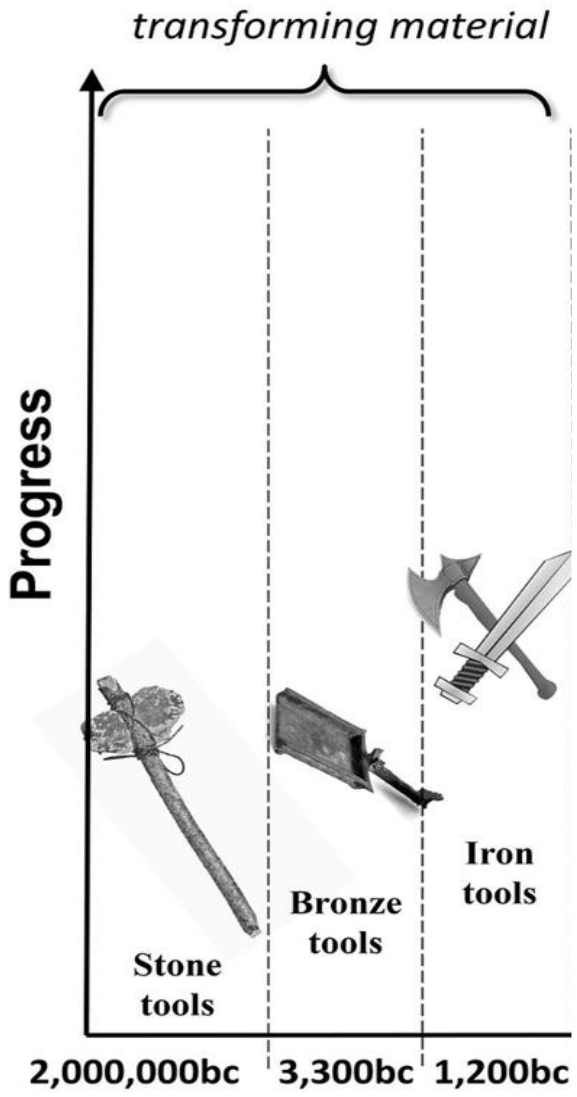

Based on Hilbert (2020). Digital technology and social change: The digital transformation of society from a historical perspective. *Dialogues in Clinical Neuroscience, 22*(2), 189–194. https://doi.org/10.31887/DCNS.2020.22.2/mhilbert

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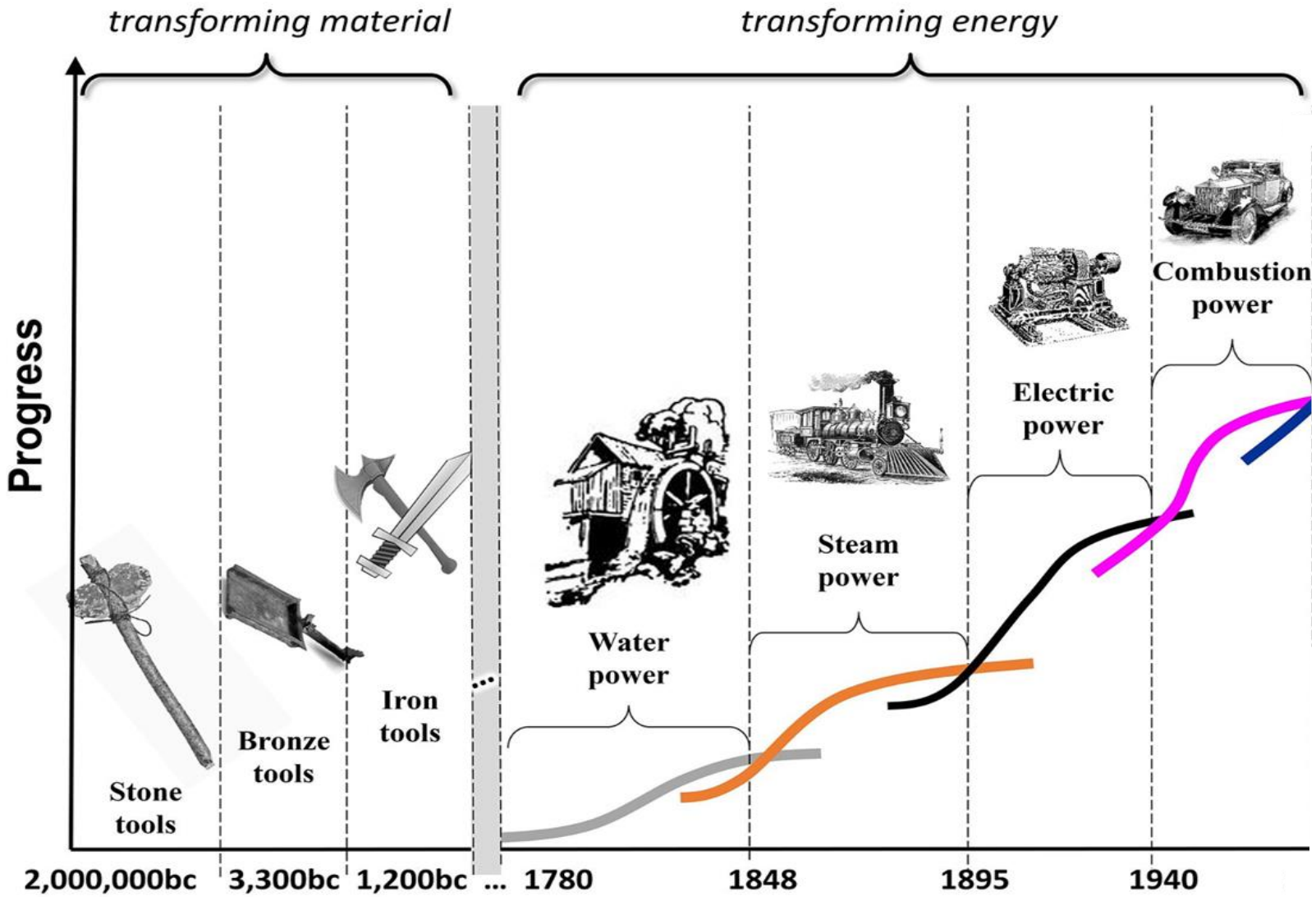

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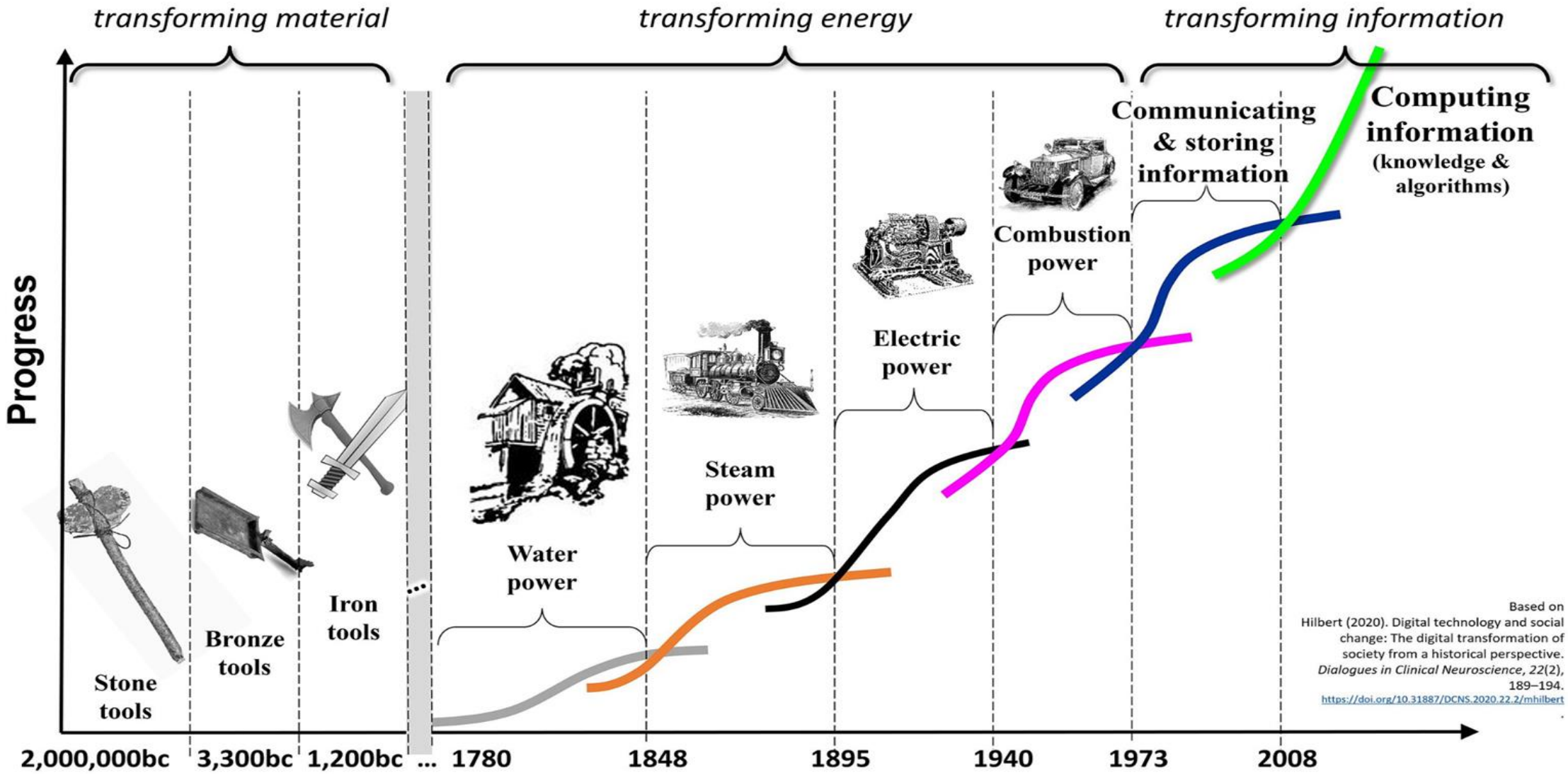

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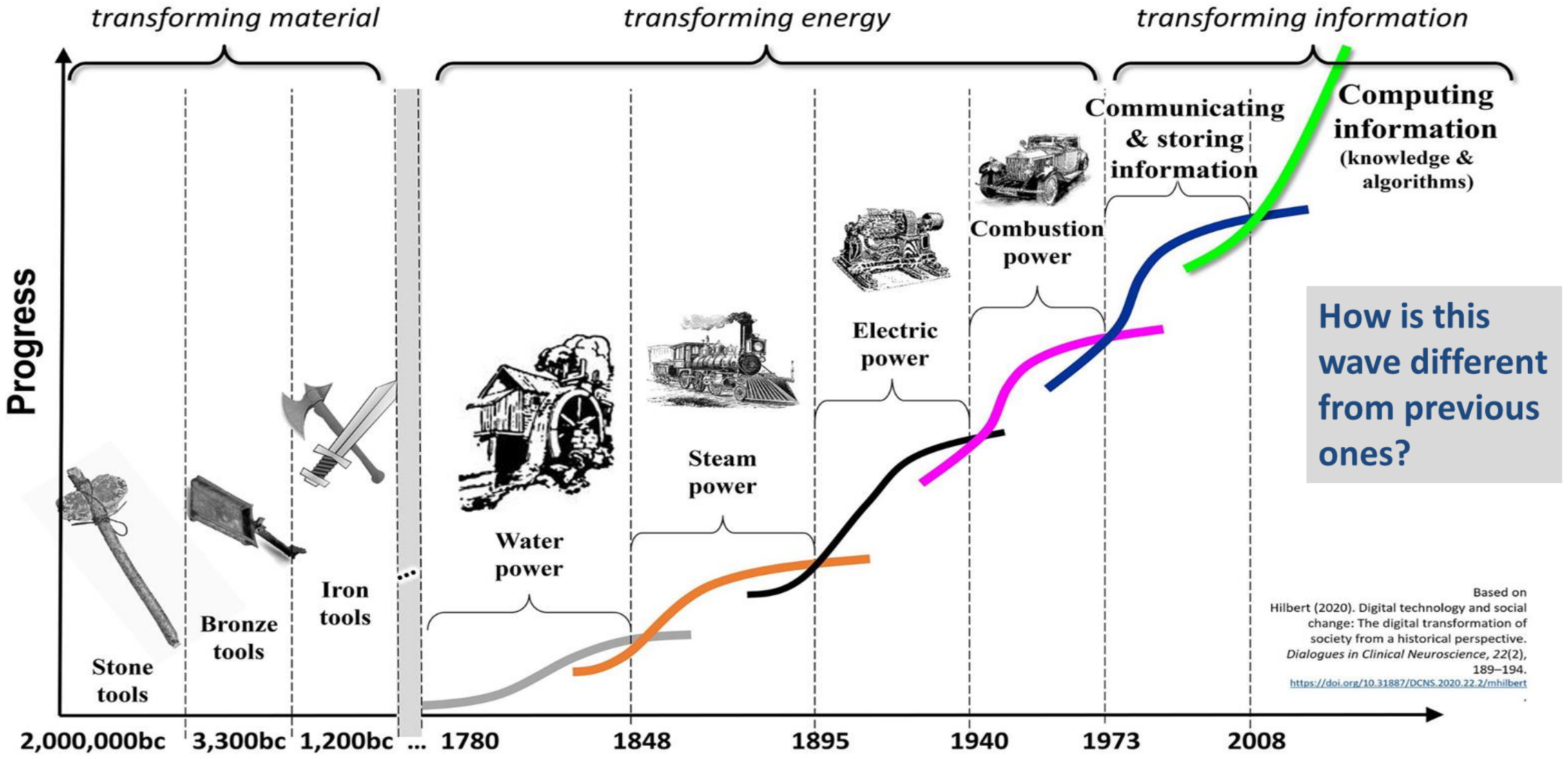

How is this wave different from previous ones?

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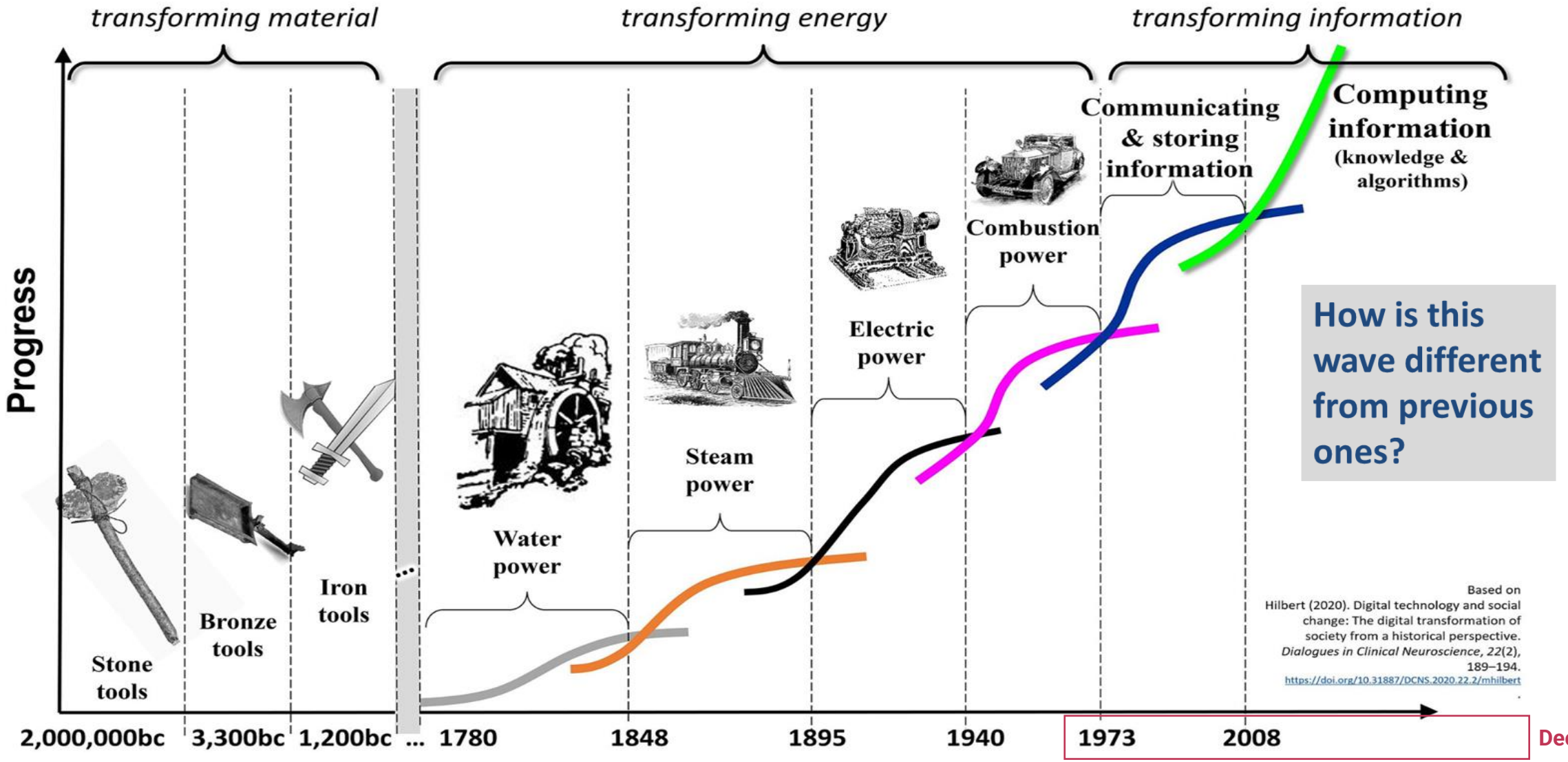


Why are we here?

The information wave

03

The information wave

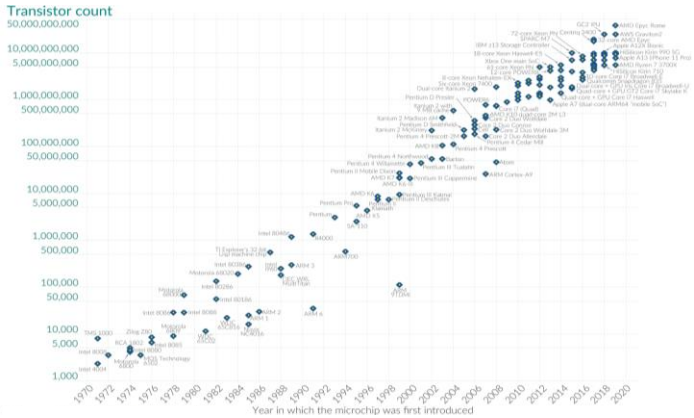
The **Information Wave** refers to a period marked by the rapid accumulation, dissemination, and processing of information, profoundly transforming society, culture, and human interactions.

- The proliferation of digital technologies, including personal computers, laptops, the Internet, and mobile devices.
- The facilitation of instantaneous global communication and information dissemination.
- The exponential growth in data generation, aggregation, and analytical capabilities (Big Data).
- The widespread accessibility of information, empowering individual and collective agency.
- The development of sophisticated algorithms for processing and deriving insights from large datasets.
- The integration of remote work, online learning, and digital collaboration as standard practices.

The information wave

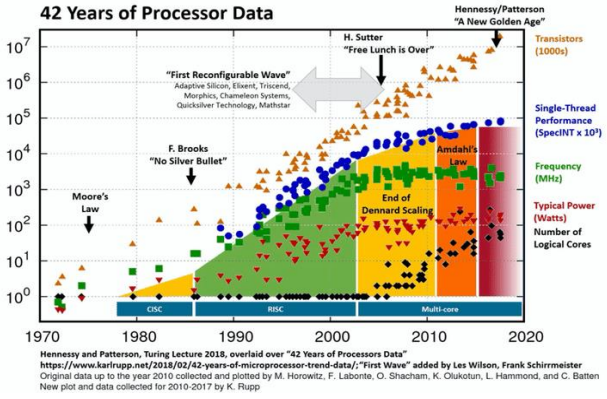
The Moore's Law

In 1965, Gordon Moore postulated that approximately every two years (18 months), the quantity of transistors on microchips would exhibit a twofold increase. Known as Moore's Law, this phenomenon implies that computational advancement will undergo substantial acceleration, resulting in smaller and more efficient systems over time.

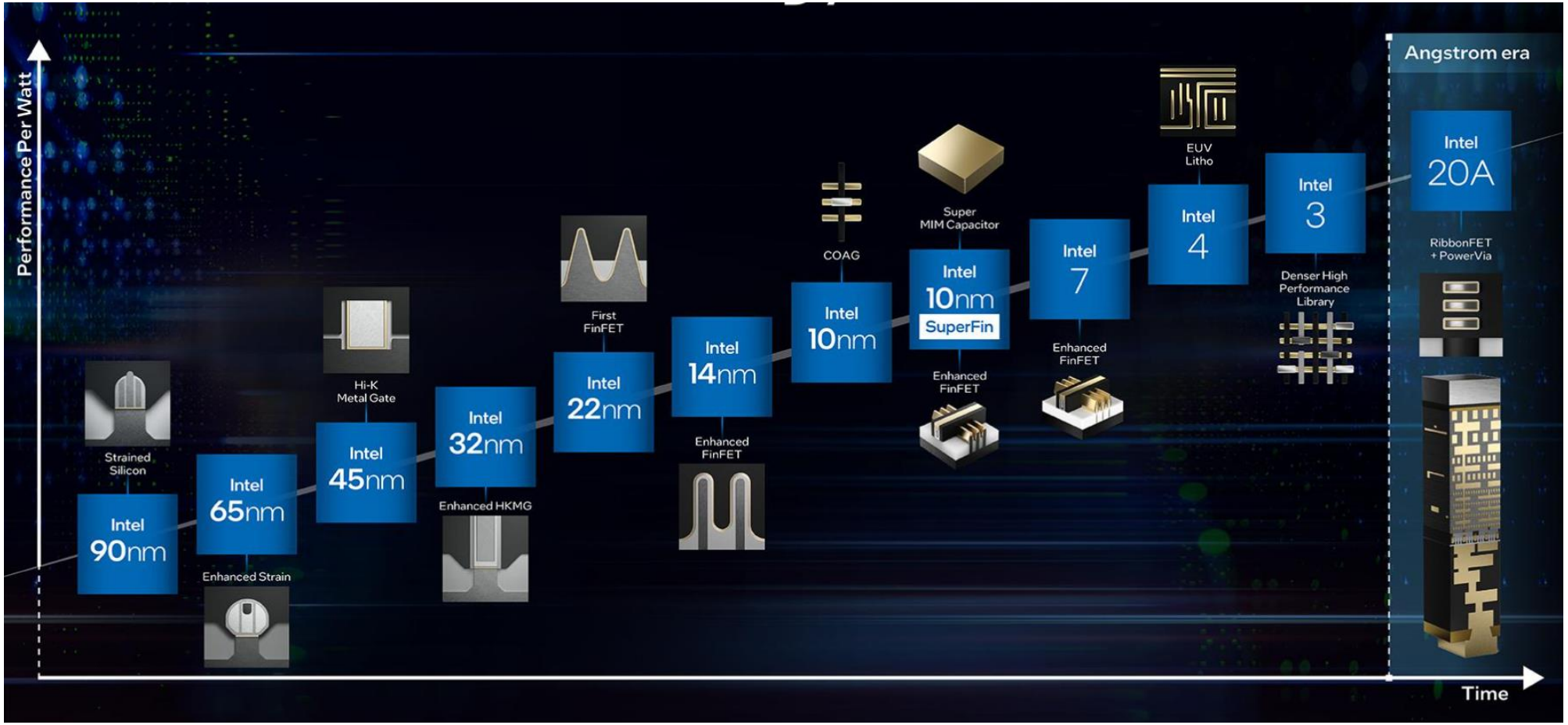


Moore's Law is projected to reach its conclusion at some point during the 2020s.

The impetus for this slowdown stems from the inherent constraints posed by shrinking transistors within increasingly compact circuits, particularly with regard to elevated operating temperatures. This is primarily attributable to the escalating energy requirements for cooling the transistors, surpassing the actual energy consumption of the transistor itself.



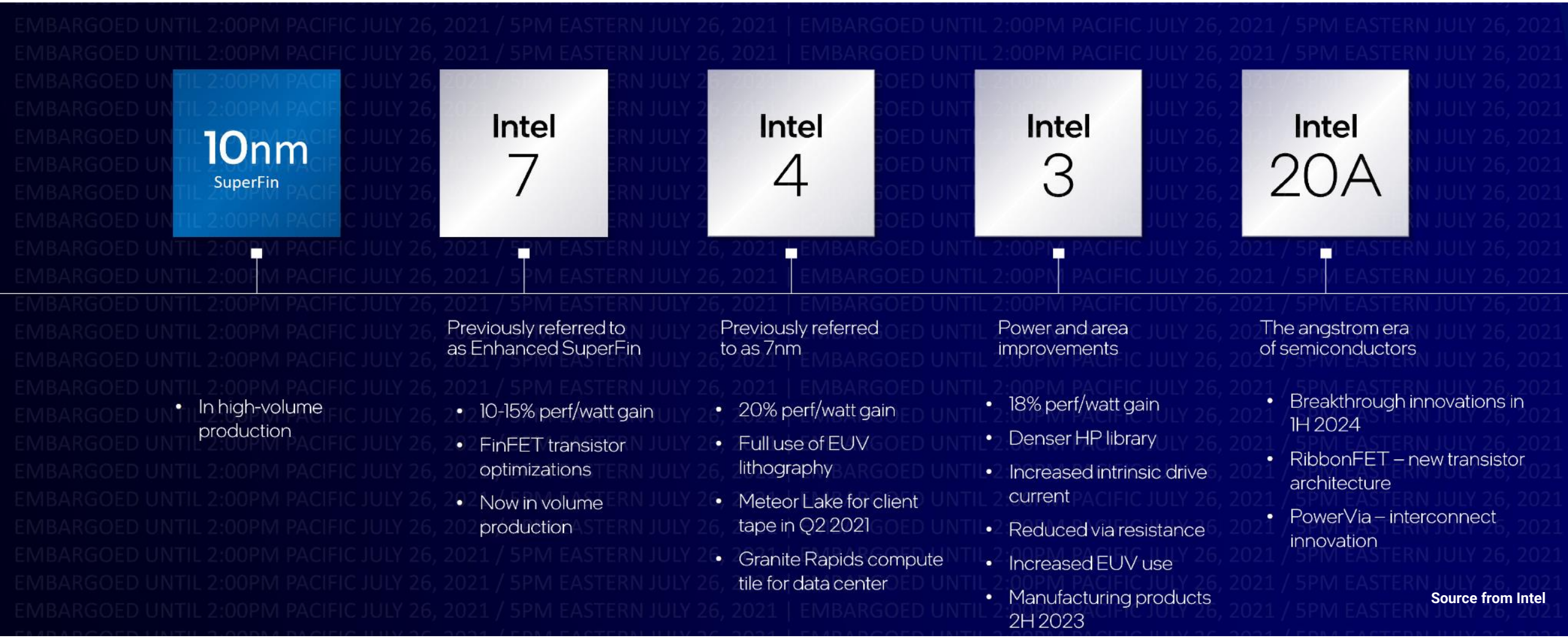
The Moore's Law



Source from Intel

The information wave

The Moore's Law



Source from Intel

The benefits

04

The benefits

What societal advantages or benefits does the field of computer engineering offer?

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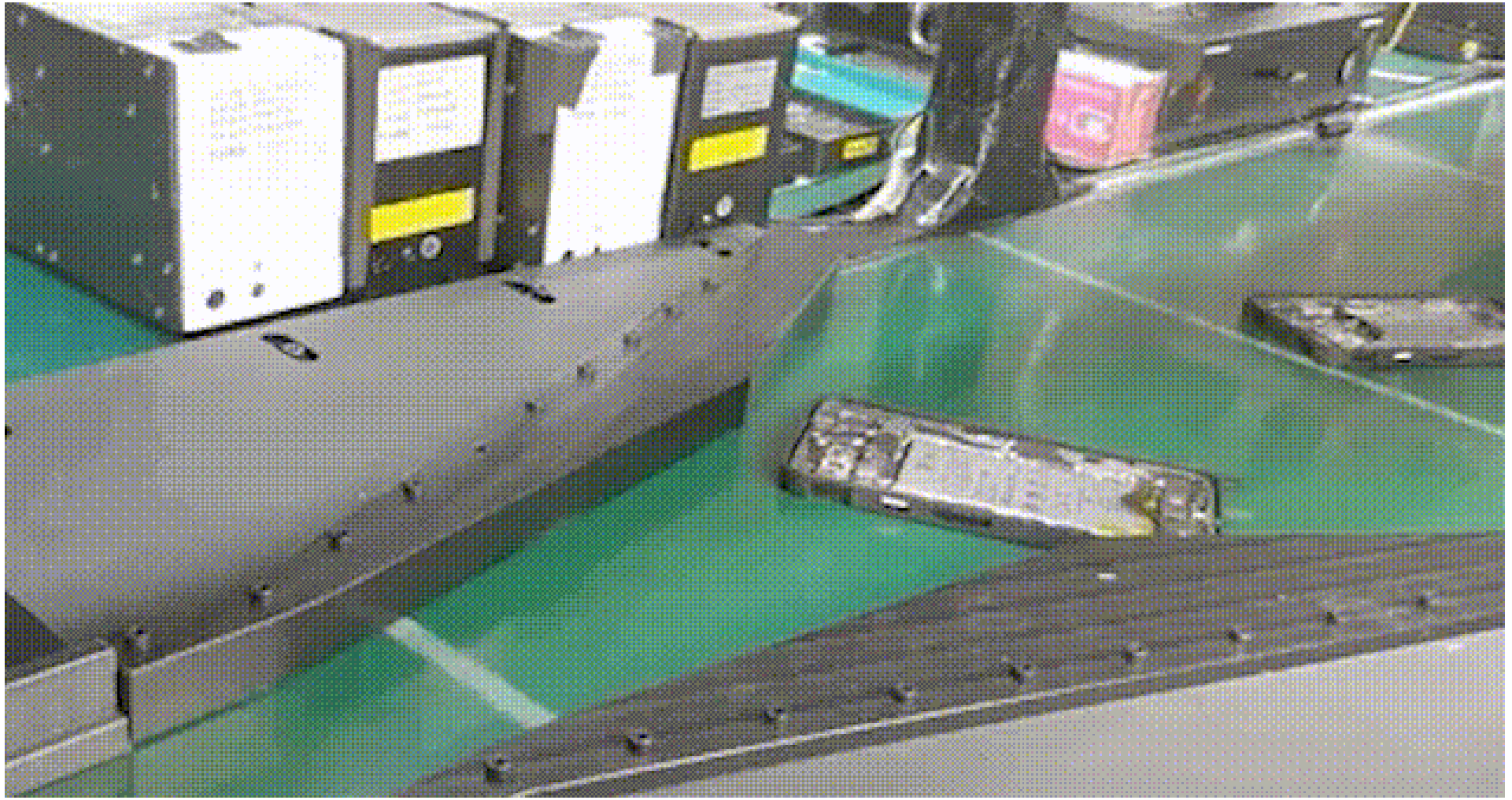

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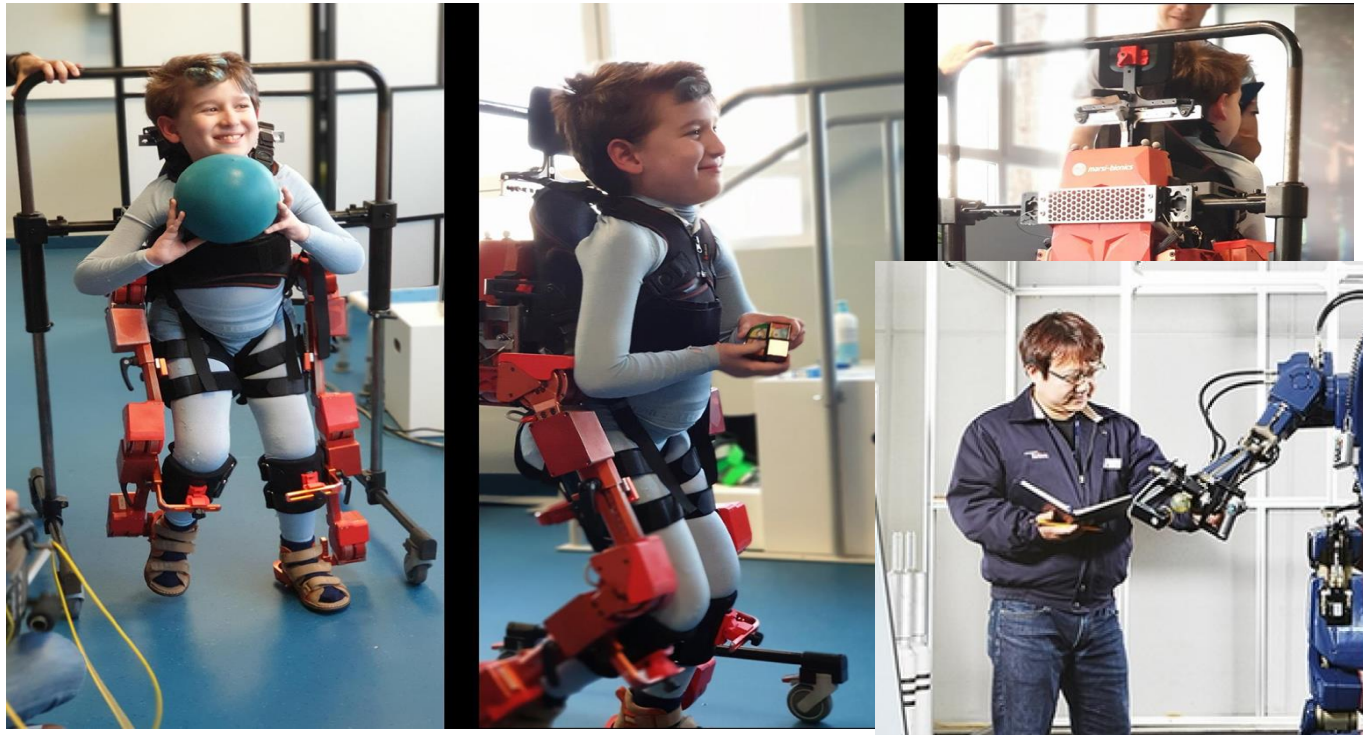

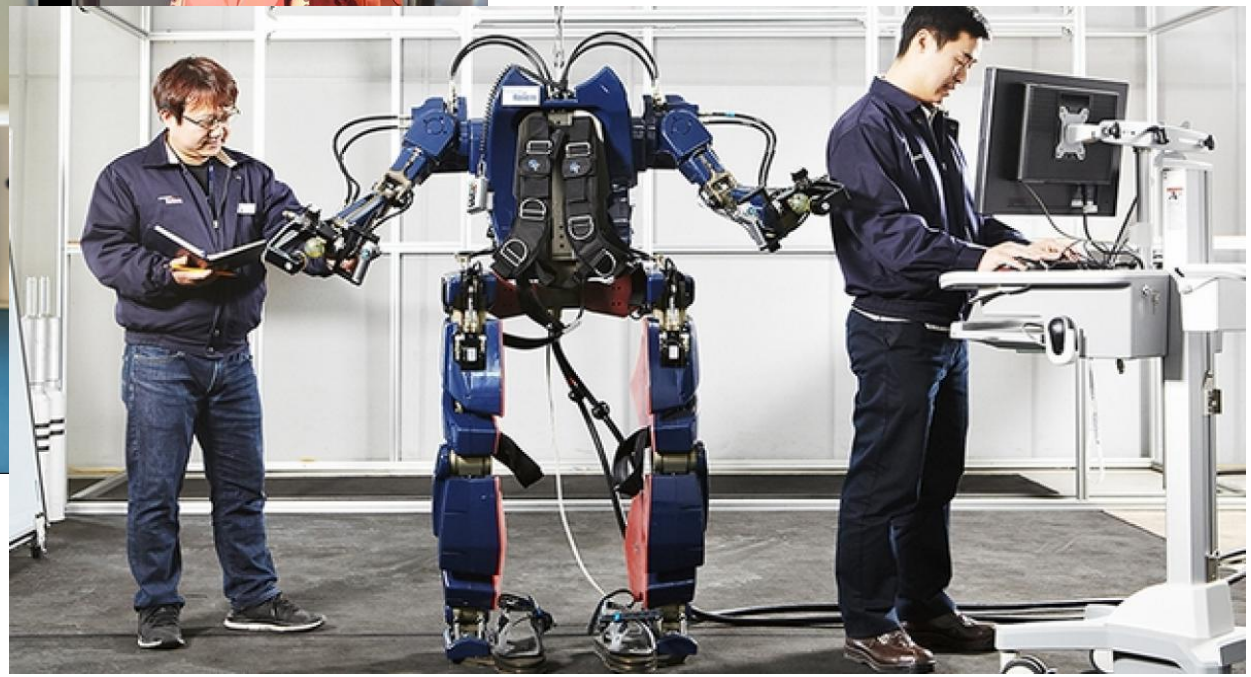

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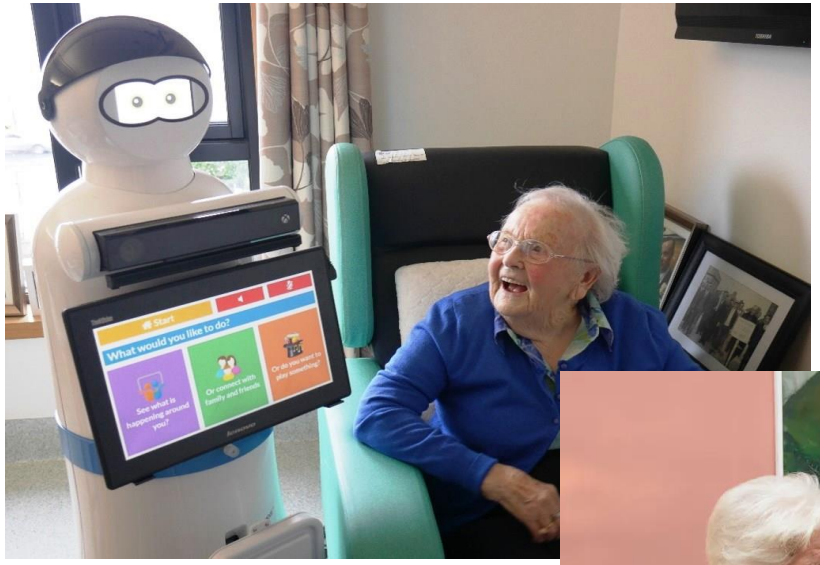

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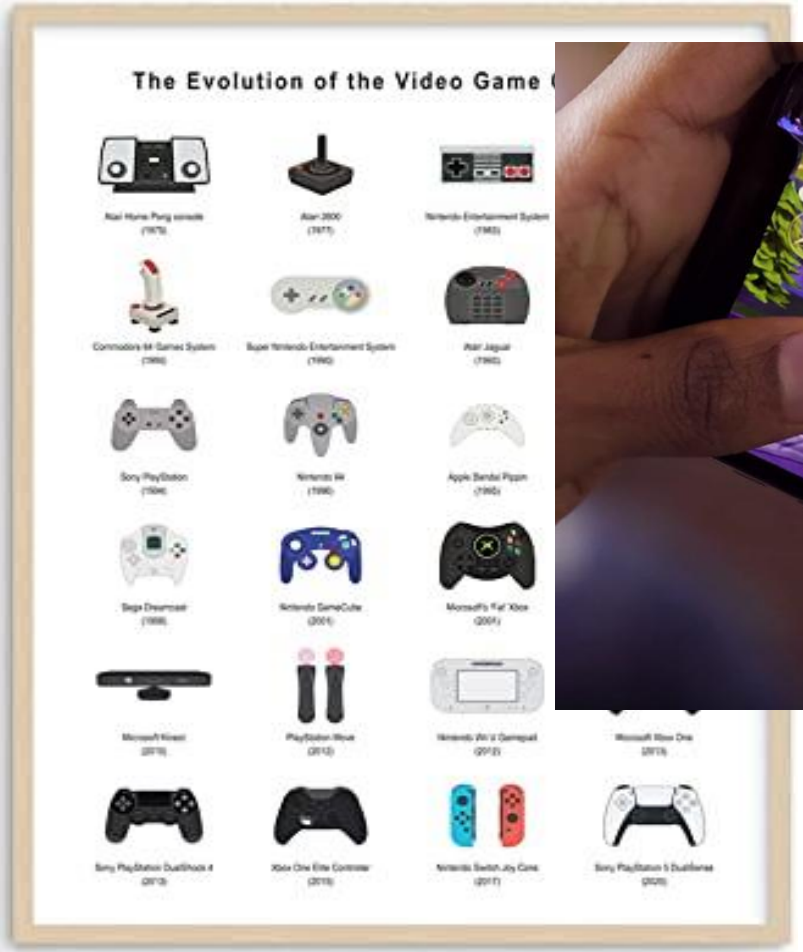


The benefits

What societal advantages or benefits does the field of computer engineering offer?

The benefits

What societal advantages or benefits does the field of computer engineering offer?

Broaden and Improve our opportunities for a successful life

What challenges and concerns does Computer Engineering pose to contemporary society?

The benefits

Thinking about ……

- What types of information are found on Social Media Platforms?
- Are you conscious of the Information you share?
- Regarding the terms of service for certain applications, Are you informed?
- Do you know if there are laws to protect the users?
- Can we control Artificial Intelligence?
- Do you know if there are laws to control how AI is created and used?
- ……

The holistic education of a Computer Engineer

05

The holistic education of a Computer Engineer

The holistic education of a computer engineer encompasses a comprehensive approach to developing not only technical expertise but also a wide range of complementary skills and knowledge areas that prepare students to excel in the rapidly evolving field of computer engineering.

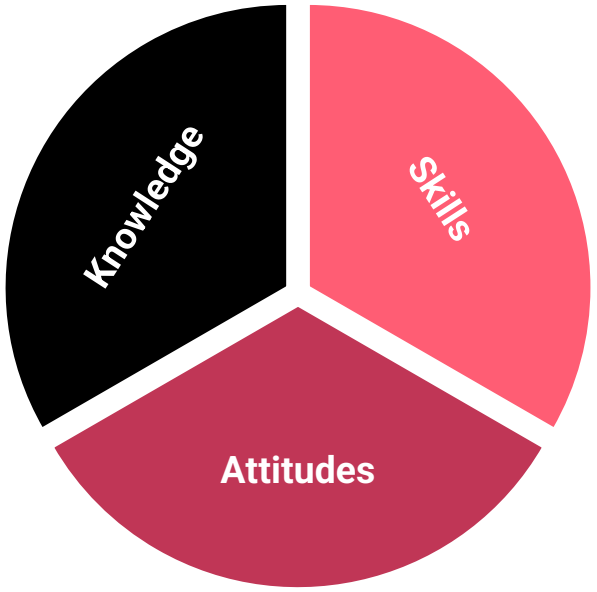
- Technical skills.
- Problem-Solving skills.
- Ethical and Social Awareness of the technology.
- Communication.
- Individual and teamwork.

Thinking about ……

- What attributes should a computer engineer have to fulfil their role in such a dynamic environment?
- What skill set is essential for a computer engineer?
- What experiential background is beneficial?
- What is the difference between soft and hard skills?
- Could you explain the significance of soft skills in this context?
- ……

Thinking about ……

In order to cultivate a well-rounded future engineer, it is recognized that personal and professional competencies encompass a spectrum beyond mere knowledge acquisition.



- **Knowledge** refers to the theoretical understanding and information that a computer engineer possesses, encompassing the principles, concepts, and facts related to computer science and engineering.
- **Skills** refer to the ability to apply knowledge in practical, real-world situations to solve problems.
- **Attitudes** refer to the mindset, values, and behavioural tendencies that influence how a computer engineer approaches their work, interacts with others, and responds to challenges.

Thinking about ……

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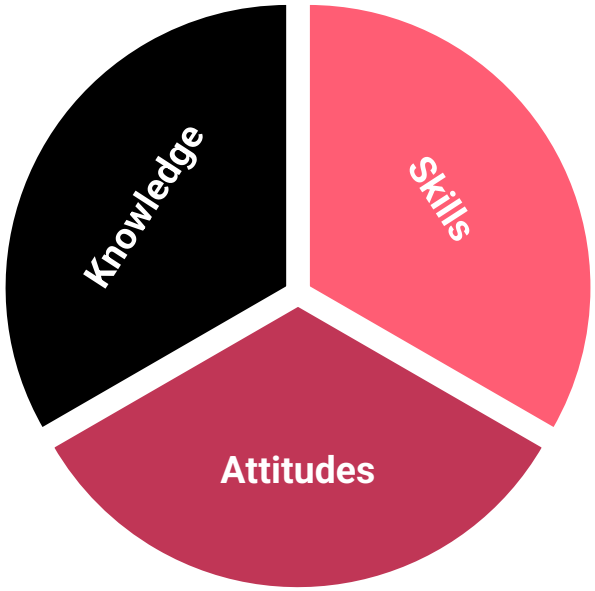

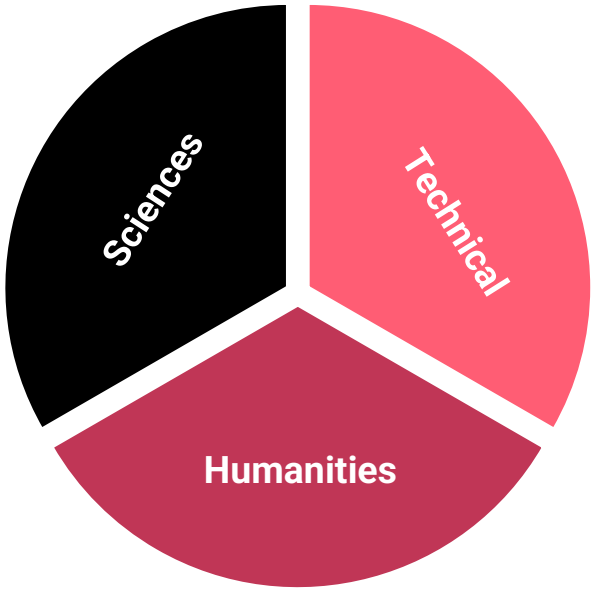

A computer engineer's growth and success depends on the continuous and balanced development of knowledge, skills, and attitudes.

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