Generative Artificial Intelligence in Higher Education: A 360° Perspective

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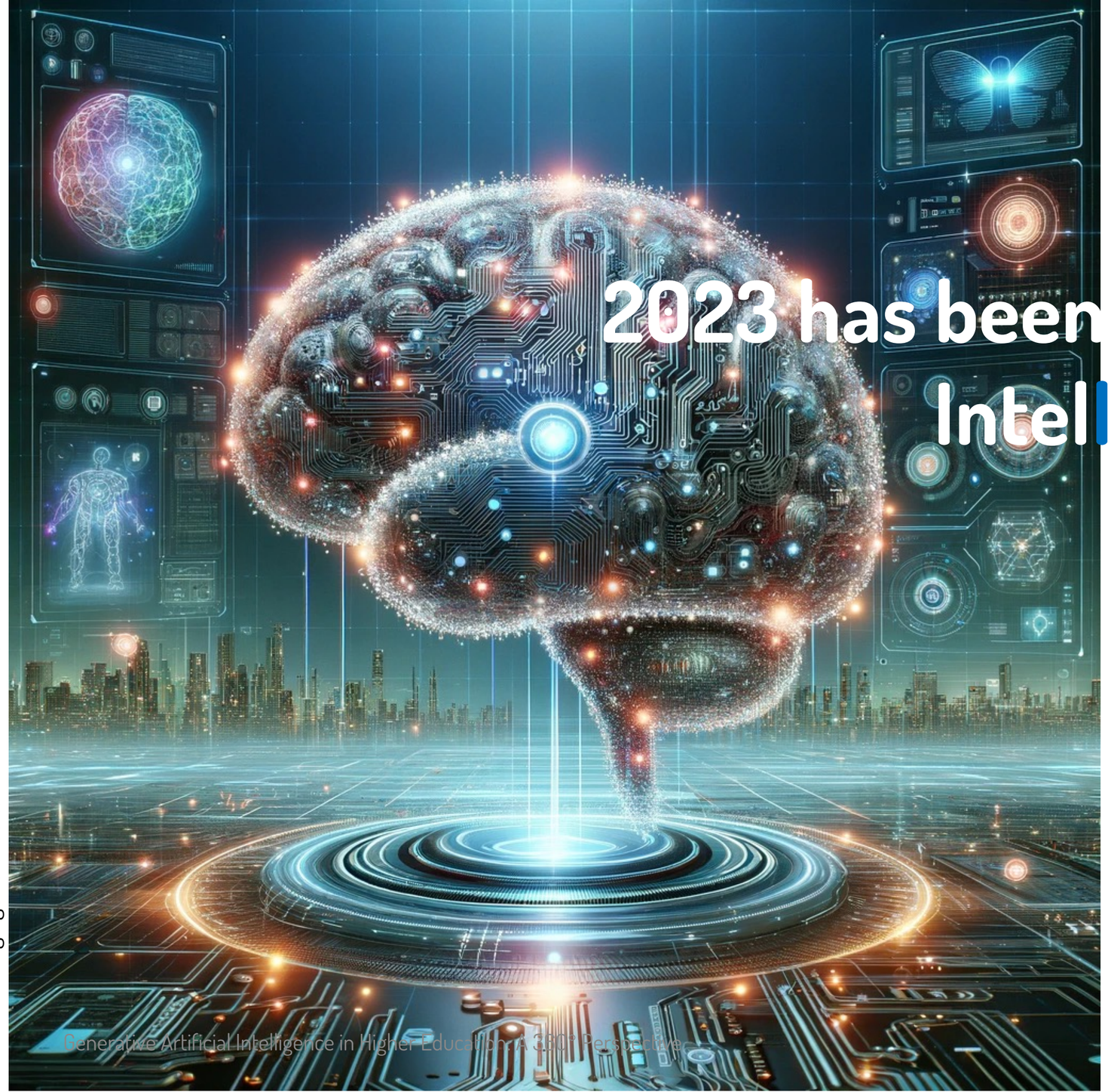

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2023 has been the year of Artificial Intelligence disruption [1, 2]

Reality in every domain

Integration into everyday life

Changes in the perception of professional activities

Automatic content generation

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How we have changed

Status in January 2023

- A disruptive application, ChatGPT. A freely accessible chatbot that answers requests in natural language through a straightforward interface [3]
- Within 5 days, ChatGPT had surpassed one million users. By the end of January, it had already reached 100 million users [4]
- ChatGPT is based on GPT 3.5 [5], a Large Language Model (LLM) with a 175 billion-parameter architecture capable of handling a context window of 4,096 tokens (about 2,500 words)
- Extremist positions: from enthusiasm to unbridled fear [6, 7], from the most naïve position of absolute confidence to the most recalcitrant contempt [8]

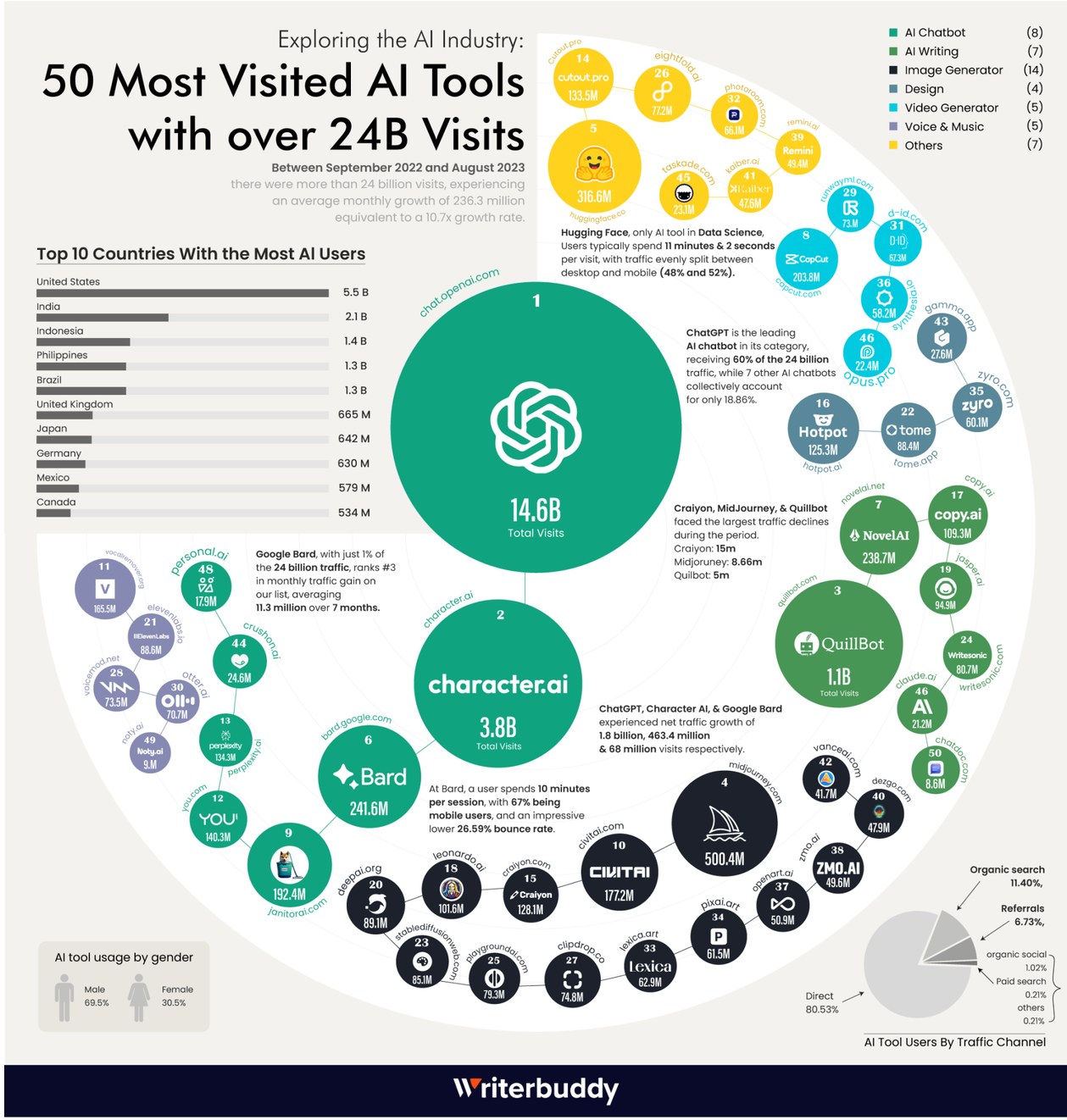
Status in January 2024

- ChatGPT is the leading artificial intelligence application, with some 14 billion views [9] (approximately 1.5 billion visits per month) and some 180 million users [10]
- There is a paid version of ChatGPT (ChatGPT plus) and a free access version
- ChatGPT plus is based on GPT 4.0 [11], with a context window of 8,192 tokens
- Information about GPT 4.0 has not been opened to the community. It is estimated to be a model of about 1.8 trillion parameters organized as a MoE (Mixture of Experts), with 16 experts of 111 billion parameters, plus the trunk part of 55 billion parameters, activating only two experts for each inference (280 billion parameters) [12, 13]
- ...

How we have changed

Status in January 2024

- ChatGPT is not alone. Google has launched Bard and, recently, what is supposed to be the most powerful LLM to date, Gemini [14-16]

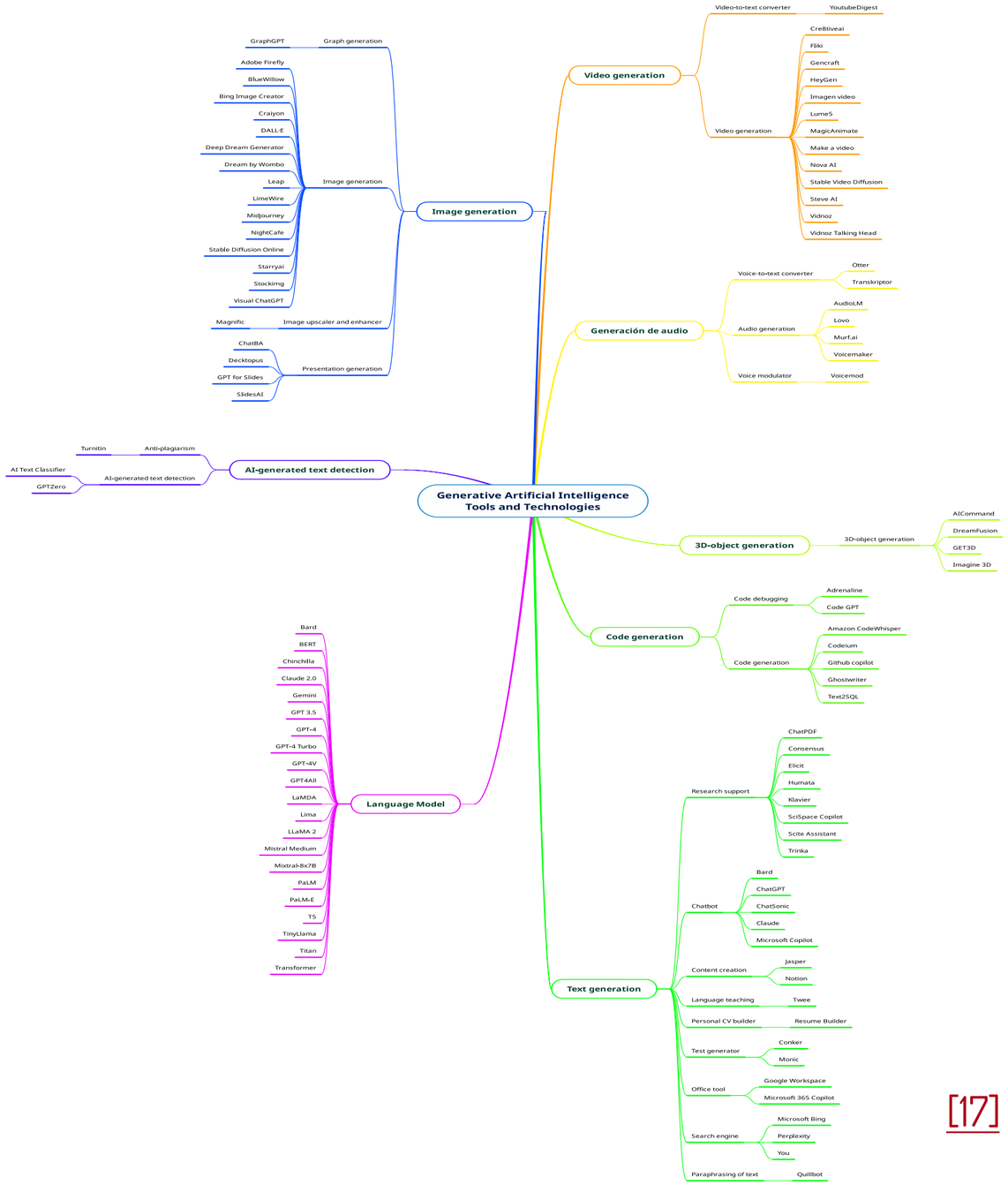


https://bit.ly/4aSJqLk [9]

How we have changed

Status in January 2024

- ChatGPT is not alone. Google has launched Bard and, recently, what is supposed to be the most powerful LLM to date, Gemini [14-16]
- The offer of "smart" applications with potential educational and/or academic uses is growing daily. Visit, for example, Futurepedia (https://www.futurepedia.io/) or All Things AI (https://allthingsai.com/)

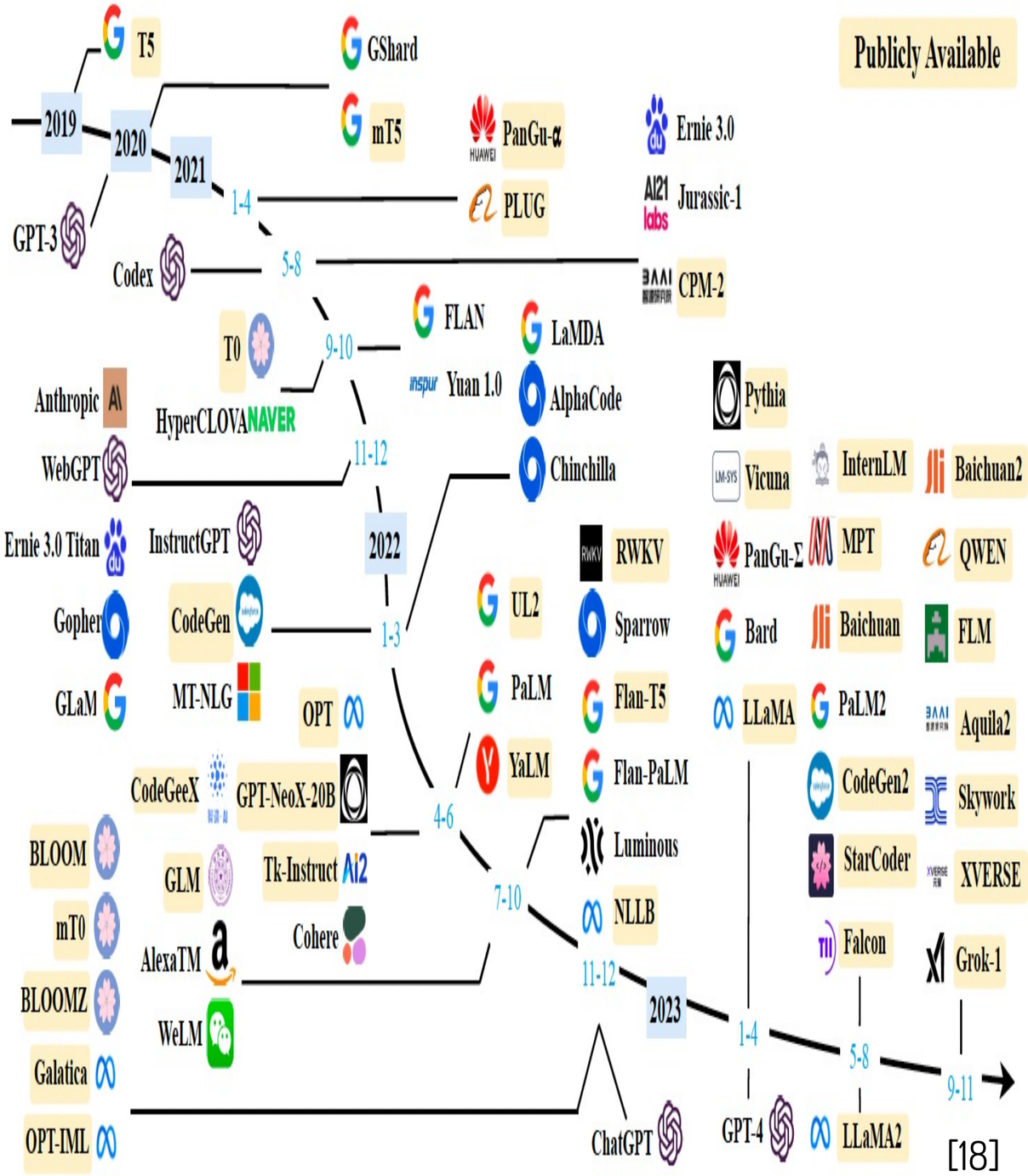


[17]

How we have changed

Status in January 2024

- ChatGPT is not alone. Google has launched Bard and, recently, what is supposed to be the most powerful LLM to date, Gemini [14-16]
- The offer of "smart" applications with potential educational and/or academic uses is growing daily. Visit, for example, Futurepedia (https://www.futurepedia.io/) or All Things AI (https://allthingsai.com/)
- LLM offerings are constantly growing
- LLMs being extended by Large Multimodal Models (LMM) [19] with multimodal skills, such as visual comprehension, e.g. Gemini [14-16] or GPT-4V [20-22]



A branch of Artificial Intelligence is the cause of the technological disruption of this last year [23]

Image generated with DALL-E 3 from ChatGPT Plus

Generative Artificial Intelligence [25]

Production of previously unseen synthetic content, in any form and to support any task, through generative modelling [26]

Disruptive moment: when the digitized product or service outperforms the analog product or service in terms of efficiency or cost [24]

Image generated with DALL-E 3 from ChatGPT Plus

Citizen perception

“Any sufficiently advanced technology is indistinguishable from magic”

Clarke’s Third Law [27]

“An analysis of the history of technology shows that technological change is exponential, contrary to the ‘intuitive linear’ view of common sense. Thus, in the 21st century we will not live through 100 years of progress, but rather 20,000 (at the current rate)”

Ray Kurzweil’s Law of Accelerating Returns [28]

And regarding (higher) education... [29]

Generating educational content in digital format (text, image, video, presentations, audio, etc.) is a reality

These contents are of sufficient quality to be used as teaching materials or as results of a teaching activity without the possibility (in most cases) of detecting their origin with sufficient certainty

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The debate must now turn to how to teach and learn in the age of Artificial Intelligence

- Reflect on how
  - Preparing the population for an ever-changing world
  - Influence of Artificial Intelligence on the teaching/learning process
  - Affect new knowledge, skills, competencies, and values for life and work in the age of Artificial Intelligence

https://bit.ly/3mlryls

[29]

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Reality of our society

Humans

versus

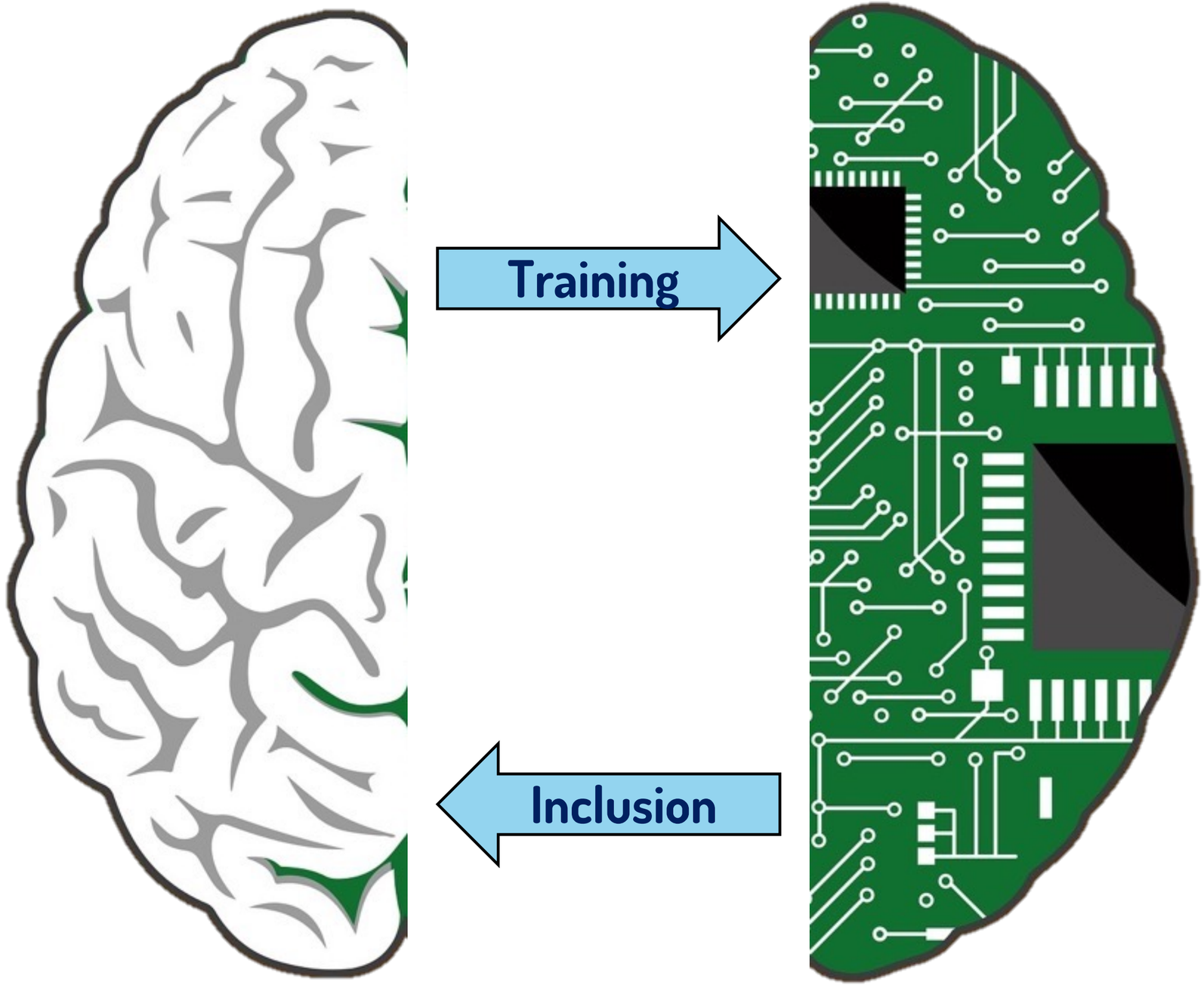
artificial intelligence

Humans-without-AI

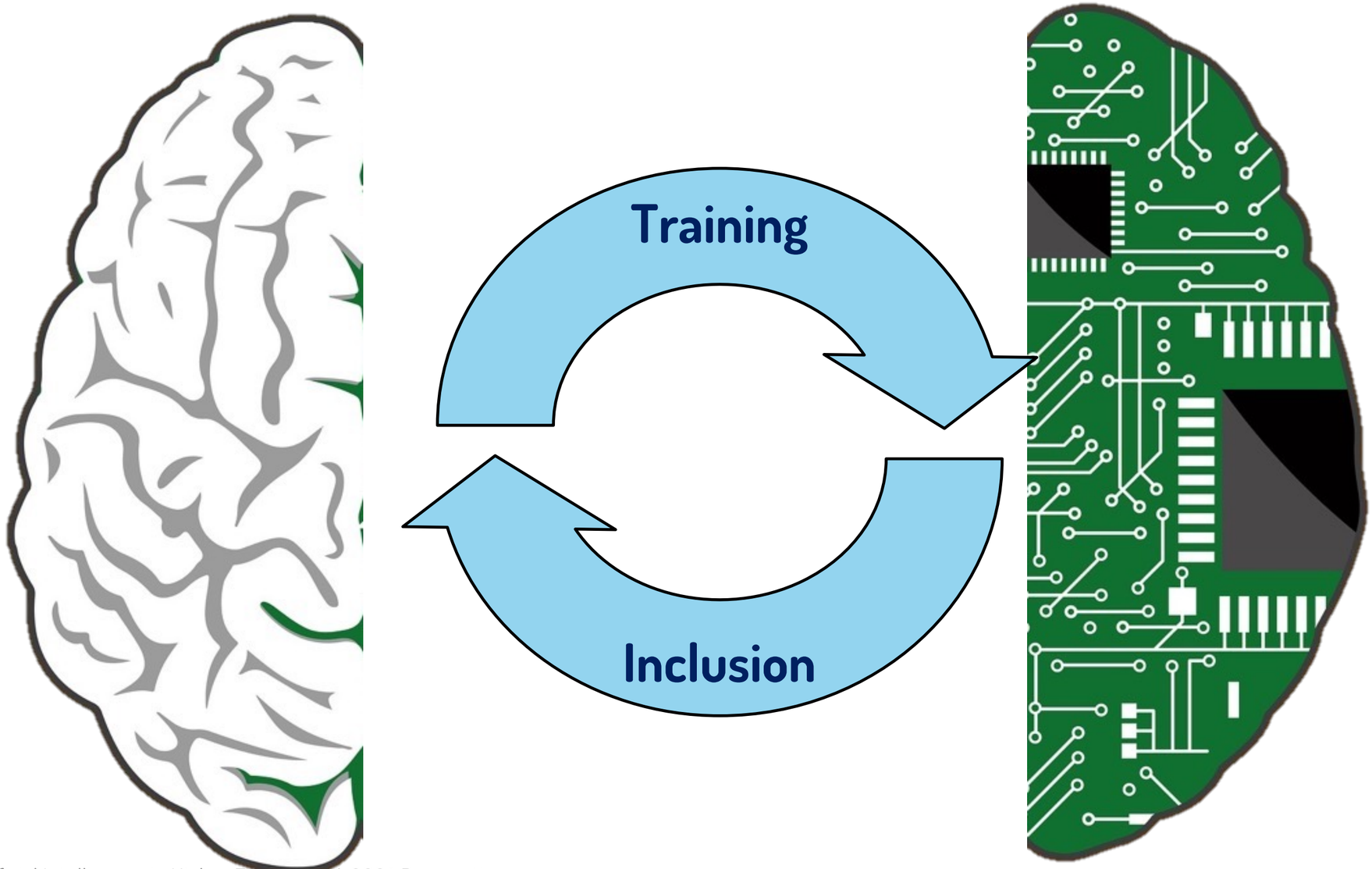
versus

humans-with-IA

A great challenge [29]



A great challenge [29]



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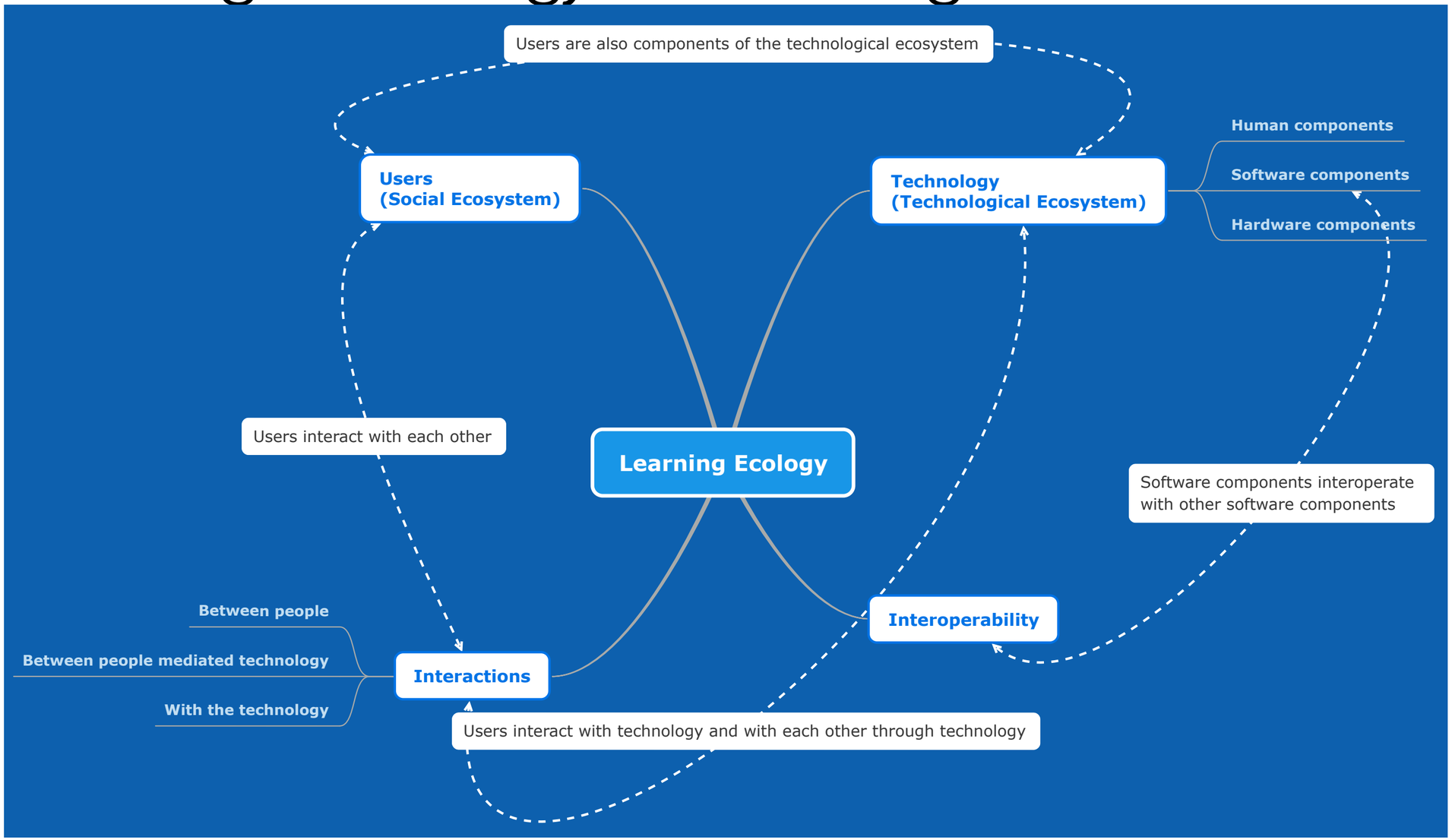
Generative AI: 360° view of its benefits, risks and educational challenges [30, 31]

Defining an ecology for learning [32]



Positive impact

- Enriching educational content [33]
- Encouraging their creativity [34]
- Improving productivity [35]
- Support in evaluation [36]
- Facilitates personalized learning [37]
- Digital competence of teachers [38]

Good practices

- Lifelong learning [46]
- Balanced integration [31]
- Promoting ethical behavior and data protection [47]
- Development of complementary educational content [41]
- Virtual assistant for the teaching staff [48]
- New forms of assessment [49]

Teachers

ctive

Negative aspects and risks

- Teacher reluctance to have students use these tools [39]
- Overestimation of generative Artificial Intelligence [40]
- Inappropriate use [41]
- Technological dependence [42]
- Authorship loss [43]
- Depersonalization [44]
- Privacy [45]

Future challenges

- The digital transformation in the classroom involves the natural integration of Artificial Intelligence [31]
- Collaborative development of more specific and economical to sustain language models (e.g., Small Language Models (SLM) [50])

Positive impact

- Critical thinking and creativity [51]
- Prototyping ideas [45]
- Personalized learning [52]
- Improved productivity [48]
- Access to more innovative resources [53]
- Development of digital skills [54]

Negative aspects and risks

- Dishonest use [55]
- Superficial learning [56]
- Possible lack of knowledge to curate the information received [41]
- Lack of critical thinking and creativity [57]
- Depersonalization [44]
- Inequitable access [35]

Students

Good practices

- Support in linguistic [35] and writing skills [48]
- Support for summary information [53]
- Virtual assistant for students [7]
- Socratic opponent [46]
- Ethical awareness [58]

Future challenges

- Preparing for the future of work in the age of Artificial Intelligence [59]
- Need for lifelong and informal learning [46]

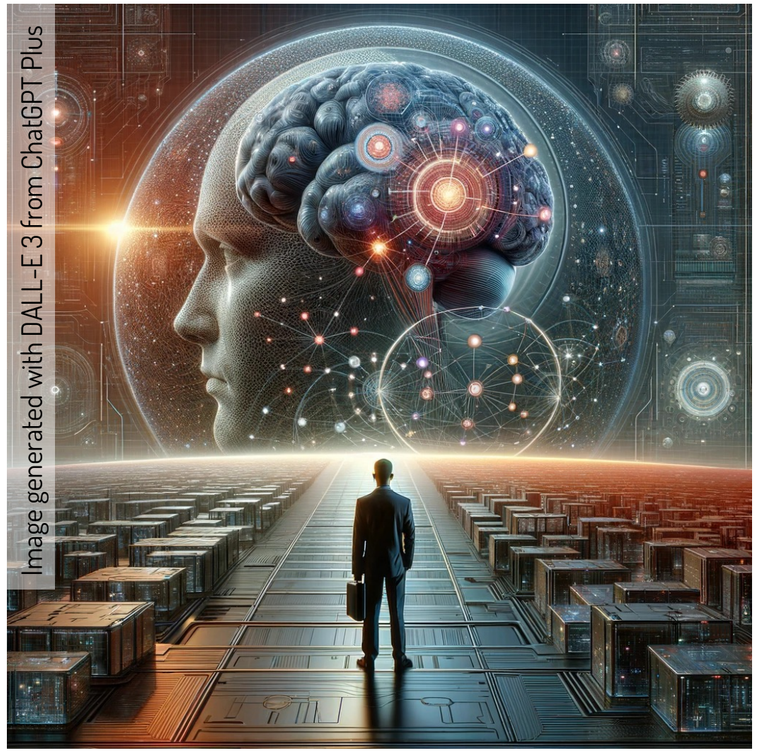
ctive

Positive impact

- Improving administrative efficiency [60]
- Improving academic analytics [61]
- Enriching the educational process [42]
- Increasing competitiveness [62]

Good practices

- Student and teacher training [7]
- Review of teaching methods [63]
- Exploring new forms of assessment [31]
- Development of codes of ethics and general guidelines [64]
- Collaboration and strategy setting[60]



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Decision makers

Negative aspects and risks

- Unequal access to these technologies [35]
- Data security and privacy [45]
- Technology dependencies of private companies [60]
- Biases in training sources [51]
- Environmental impact [33]

Future challenges

- Review of curricular content [65]
- Integration of Artificial Intelligence in the Digital Transformation Strategy [60]
- Improving change management [60]
- Ensuring equity and Access [66-68]

ective

Positive impact

- Innovation and creativity in learning technologies [69]
- Evolution of technological ecosystems for learning [70]

Good practices

- Improving the user experience of learning technologies [75]
- Development of an ethical [47] and explainable [76]

Image generated with DALL-E 3 from ChatGPT Plus

Software Enginners

Negative aspects and risks

- Biases in training sources [71]
- Complexity and maintenance [72]
- Dependence on third-party APIs [60]
- Data security and privacy [73]
- Environmental impact [74]

Future challenges

- Definition of a new generation of educational applications [77] (*smart apps*)
- Interdisciplinarity [78] to ensure that people learn [79]
- Constant technological upgrading [80]
- Reducing the environmental impact [81]

Image generated with DALL-E 3 from ChatGPT Plus

Conclusions

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“ Technology is neither good nor bad, nor is it neutral

Melvin Kranzberg [82]

Students at all educational levels **already** use generative artificial intelligence tools (ChatGPT and others) [83]

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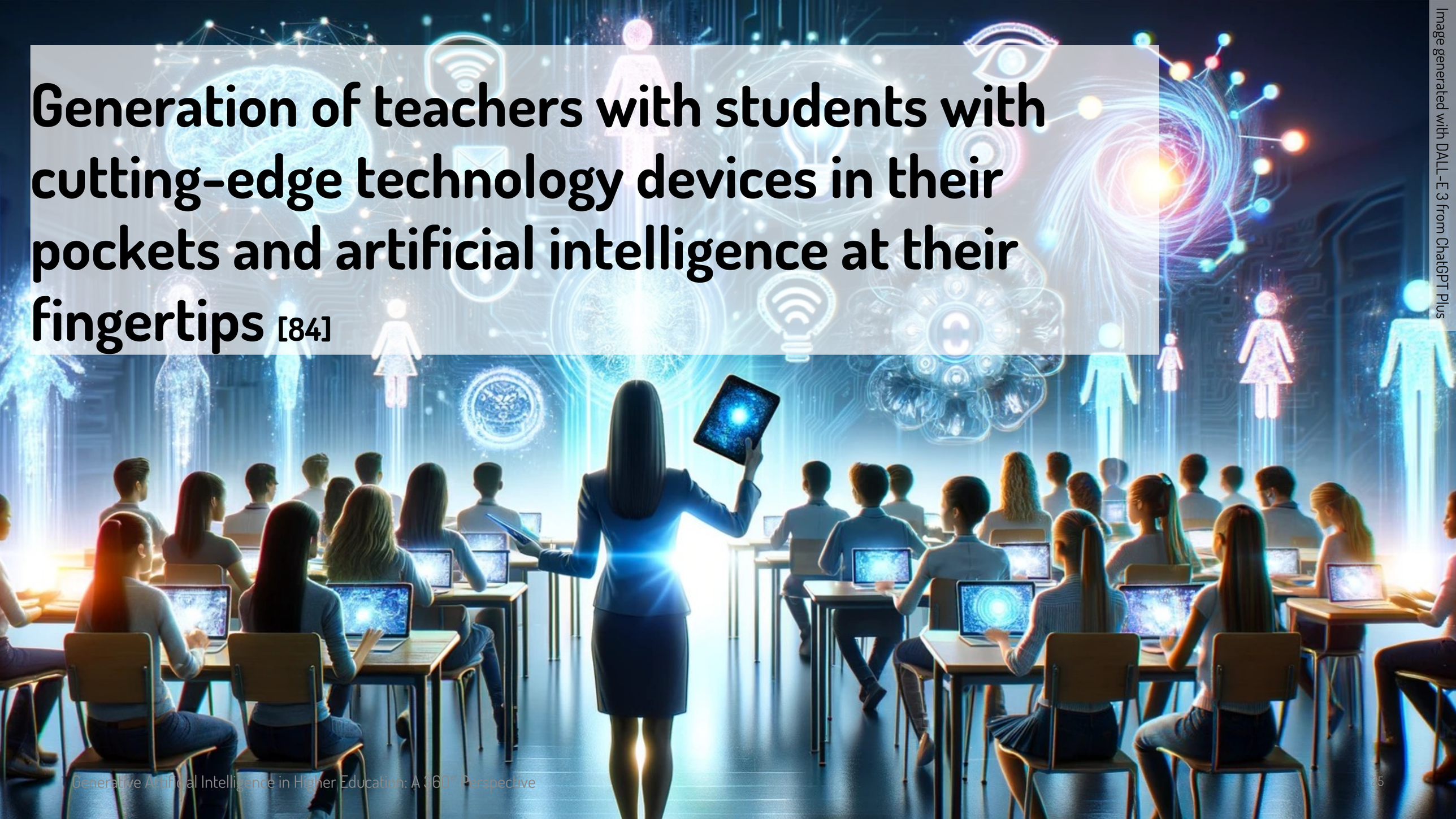
Generation of teachers with students with cutting-edge technology devices in their pockets and artificial intelligence at their fingertips [84]



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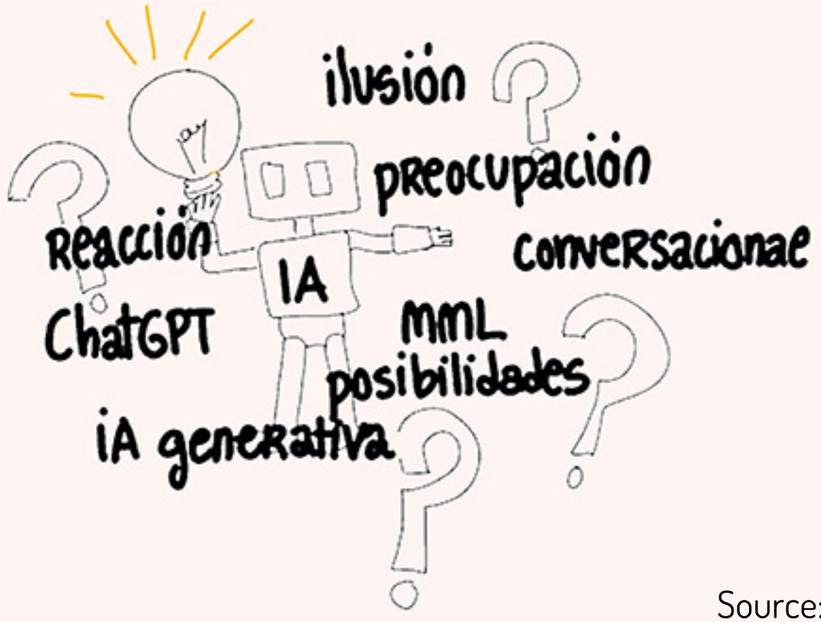
> There are reasons for excitement and concern, yet we must prevent one from overshadowing the other [...] the leap in AI, and potentially in its educational application (EdAI) [...], with ChatGPT as the flagship, necessitates relentless study, design, experimentation, and evaluation. This should be done with caution yet boldness, embracing the new possibilities. Let us discard the notion that technology, being material and mercenary, will ruin an education that is spiritual and selfless

Mariano Fernández Enguita [85]



Source: [85]

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In the face of the temptation to prohibit the use of these tools in educational settings, it is vital to emphasize understanding **what they can contribute**, for instance, **to teaching/learning and research processes**, such as critical analysis, source comparison, or the selection and formulation of appropriate questions [86]

Image generated with DALL-E 3 from ChatGPT Plus

Many of the issues and dangers identified in the educational context have yet to arise due to the emergence of ChatGPT or other similar applications. They already existed, have been approached from various perspectives, and have remained unresolved. However, the potential of these technologies and the effect of their rapid penetration are magnifying some of these issues more than ever before [31]

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AI, especially with its ability to **create content indistinguishable from human production** and **interact with users through natural language**, represents one of our **most socially disruptive technological means**. We are just beginning to imagine the possibilities, risks, and challenges that this technology opens up. However, **it is essential to recognize that the future we may build on this foundation cannot be solely in the hands of technologists**. There must be **spaces for inter- and transdisciplinary co-creation** that ensure the **ethical, safe, and inclusive** development of a technology that, not so long ago, we would have considered science fiction

Image generated with DALL-E 3 from ChatGPT Plus

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