Generative Artificial Intelligence: New Scenarios in Teaching, Learning, and Communication

Francisco José García-Peñalvo

GRIAL research group
Dpto. Informática y Automática
Instituto Universitario de Ciencias de la Educación
Universidad de Salamanca (https://ror.org/02f40zc51), Salamanca, Spain
fgarcia@usal.es
https://orcid.org/0000-0001-9987-5584
http://grial.usal.es
https://twitter.com/frangp

Abstract

Keynote at the VIII Congreso Internacional de Estudios sobre Medios de Comunicación, held in Universidad Complutense de Madrid on September 6th, 2023.

In recent years, the landscape of Artificial Intelligence (AI) has witnessed a seismic shift with the emergence of Generative Artificial Intelligence (GenAI). This keynote explored the ground-breaking applications of GenAI in reshaping the arenas of teaching, learning, and communication.

The historical trajectory of AI, from its inception to its current pinnacle, has been meteoric. Traditional AI models, mainly rule-based and deterministic, have evolved into sophisticated generative models capable of creating content that is often indistinguishable from that crafted by humans. Key exemplars in this category include the GPT series and DALL-E from OpenAI.

Nevertheless, what exactly is GenAI? Unlike traditional AI models that are primarily reactive, GenAI models can produce new, previously unseen content. Their inherent characteristics enable them to simulate the process of human creation. Algorithms such as Generative Adversarial Networks (GAN), Long Short-Term Memory networks (LSTM), and Transformers stand as a testament to the diversity and capability of generative models. Applying these models transcends sectors, presenting immense opportunities and challenges in equal measure.

The sphere of education stands on the cusp of a revolution thanks to GenAI. Personalised learning, a goal long sought by educators, is now a palpable reality. GenAI can tailor educational pathways to fit individual student needs, thus ensuring that no student is left behind. Beyond personalisation, virtual tutoring systems have started to bridge the gap in areas with teacher shortages. Equipped with GenAI, these systems can provide instantaneous feedback, ensuring continual student progress.

Content creation, an integral facet of education, has also benefitted from GenAI. GenAI is pivotal in generating reading materials customised to each student's reading level and formulating challenging questions based on current curricula. Moreover, GenAI fosters creativity among students. Tools equipped with generative models can assist students in crafting art, composing music, or even writing essays, all tailored to their unique style and preferences.

Shifting the lens to communication, the potential of GenAI is equally profound. Automated content generation, once a lofty ideal, is now commonplace. News articles, financial reports, and even creative pieces can be produced by GenAI, often at speeds unmatched by humans. Personalised marketing campaigns harnessing the power of GenAI can target potential consumers with unparalleled precision, ensuring maximum outreach and engagement. Real-time translation, a boon in our increasingly globalised world, has seen leaps in accuracy thanks to generative models. Lastly, natural language processing, a subset of GenAI, has augmented human-computer interactions, making them more intuitive and organic.

However, with immense power comes immense responsibility. The adoption of GenAI is full of challenges. Ensuring the accuracy and appropriateness of generated content is paramount. We need robust quality control mechanisms to mitigate the risk of misinformation or inappropriate content generation. Moreover, the sheer dependency on machines raises concerns. More reliance on AI could lead to cognitive stagnation in students, thwarting the very purpose of education. Additionally, the scalability of these models, given their intensive processing power and data requirements, is an area of concern.

Ethically, the canvas of GenAI is mottled with grey. AI models, reflecting the data they are trained on, can inadvertently perpetuate societal biases. Ensuring these models are equitable and do not further deepen societal divides is crucial. The potential job displacement due to the widespread adoption of GenAI is a looming concern. GenAI takes over tasks once reserved for humans, so we must ensure a just transition for those affected. Lastly, the issue of authenticity remains salient. In a world where distinguishing between human and AI-generated content becomes increasingly challenging, ensuring trust and transparency is paramount.

In conclusion, the future illuminated by Generative Artificial Intelligence is both promising and perplexing. As GenAI continues to reshape teaching, learning, and communication paradigms, our collective responsibility is to ensure that its journey is anchored in ethics, equity, and excellence.

Keywords
Artificial Intelligence; Generative Artificial Intelligence; ChatGPT; Education; Communication

Link to the presentation
https://zenodo.org/record/8311708

DOI
10.5281/zenodo.8311708

Recommended citation
F. J. García-Peñalvo, "Generative Artificial Intelligence: New Scenarios in Teaching, Learning, and Communication," VIII Congreso Internacional de Estudios sobre Medios de Comunicación. Universidad Complutense de Madrid, España, 6 de septiembre de 2023. Available from: https://bit.ly/47VXSR4. doi: 10.5281/zenodo.8311708.

References

[1] F. J. García-Peñalvo, "Uso de ChatGPT en Educación Superior: Implicaciones y Retos," presented in Conversatorio Uso de la Inteligencia Artificial en Educación Superior: Implicaciones y Retos, Universidad Nacional de Costa Rica, 12 de abril de 2023, 2023. Available from: https://bit.ly/3KUXtFd. doi: 10.5281/zenodo.7821173

[2] S. Altman. (2023). Planning for AGI and beyond. In: *OpenAI*. Available from: https://bit.ly/3IziovT

[3] S. Bubeck *et al.*, "Sparks of Artificial General Intelligence: Early experiments with GPT-4," *arXiv,* art. arXiv:2303.12712v5, 2023. doi: 10.48550/arXiv.2303.12712.

[4] S. Altman, G. Brockman and I. Sutskever. (2023). Governance of superintelligence. In: *OpenAI*. Available from: https://bit.ly/3q6NFjv

[5] N. J. Nilsson, *Principles of Artificial Intelligence* (Symbolic Computation). Berlin: Springer-Verlag, 1982.

[6] J. McCarthy, "What is Artificial Intelligence?," Computer Science Department. Stanford University, Stanford, USA, 2007. Available from: https://bit.ly/3WjNu02

[7] R. Therón, "Inteligencia Artificial en la Enseñanza de Idiomas. Herramientas y aplicaciones," presented in Inteligencia artificial en la enseñanza de idiomas: Herramientas y aplicaciones, Salamanca, España, 2023.

[8] M. Alier-Forment and F. Llorens-Largo, "Cabalga el Cometa," in *EP-31 Las Alucinaciones de ChatGPT con Faraón Llorens*. España, 2023. https://bit.ly/3ZCNBVT

[9] T. van der Zant, M. Kouw and L. Schomaker, "Generative artificial intelligence," in *Philosophy and Theory of Artificial Intelligence*, V. C. Müller, Ed. Studies in Applied Philosophy, Epistemology and Rational Ethics, no. 5, pp. 107-120, Berlin: Springer-Verlag, 2013. doi: 10.1007/978-3-642-31674-6_8.

[10] P. H. Diamandis and S. Kotler, *Bold: How to go big, create wealth and impact the world*. New York, NY, USA: Simon and Schuster, 2015.

[11] A. J. Argüelles-Cruz, "Plataformas de inteligencia artificial en el futuro de la educación," presented in Institute for the Future of Education Seminar, Monterrey, México, 2023. Available from: https://bit.ly/4144vfJ

[12] F. J. García-Peñalvo and A. Vázquez-Ingelmo, "What do we mean by GenAI? A systematic mapping of the evolution, trends, and techniques involved in Generative AI," *International Journal of Interactive Multimedia and Artificial Intelligence,* vol. In Press, 2023. doi: 10.9781/ijimai.2023.07.006.

[13] F. J. García-Peñalvo, "La integración de la inteligencia artificial generativa en la práctica docente," V Seminário Escola Digital: A Educação na Era da Inteligência Artificial. Centro de Competência TIC da Escola Superior de Educação do Instituto Politécnico de Bragança (CCTIC), Portugal, 21 de abril de 2023. Available from: https://bit.ly/3AhcCKI. doi: 10.5281/zenodo.7853091.

[14] W. X. Zhao *et al.*, "A Survey of Large Language Models," *arXiv,* art. arXiv:2303.18223v11, 2023. doi: 10.48550/arXiv.2303.18223.

[15] F. J. García-Peñalvo, "Cómo se percibe la Inteligencia Artificial en la educación tras el lanzamiento de ChatGPT," Foro Internacional "La Inteligencia Artificial y la Docencia Científica". Centro de Investigaciones Económicas, Administrativas y Sociales del Instituto Politécnico Nacional, México, 24 de mayo de 2023. Available from: https://bit.ly/45rtrB3. doi: 10.5281/zenodo.7967327.

[16] A. Martínez Arboleda, "Producción y análisis de textos con ChatGPT," presented in Evento ReCrea, México, 2023. Available from: http://bit.ly/3m1ZSnX

[17] N. Chomsky, I. Roberts and J. Watumull, "The False Promise of ChatGPT," in *The New York Times,* New York, USA, 2023. http://bit.ly/3GycXfx

[18] E. Lee. (2023). Is ChatGPT a False Promise? In: *Berkeley Blog*. Available from: http://bit.ly/3UlHsv1

[19] B. Gates. (2023). The Age of AI has begun. In: *GatesNotes*. Available from: http://bit.ly/3nZjFF4

[20] R. Johinke, R. Cummings and F. Di Lauro, "Reclaiming the technology of higher education for teaching digital writing in a post—pandemic world," *Journal of University Teaching and Learning Practice,* vol. 20, no. 2, art. 01, 2023. doi: 10.53761/1.20.02.01.

[21] W. M. Lim, A. Gunasekara, J. L. Pallant, J. I. Pallant and E. Pechenkina, "Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators," *International Journal of Management Education,* vol. 21, no. 2, art. 100790, 2023. doi: 10.1016/j.ijme.2023.100790.

[22] F. Llorens-Largo. (2019). Las tecnologías en la educación: características deseables, efectos perversos. In: *Universídad*. Available from: https://bit.ly/3SxO72D

[23] T. Wang and E. C. K. Cheng, "An investigation of barriers to Hong Kong K-12 schools incorporating Artificial Intelligence in education," *Computers and Education: Artificial Intelligence,* vol. 2, art. 100031, 2021. doi: 10.1016/j.caeai.2021.100031.

[24] W. Ma, O. O. Adesope, J. C. Nesbit and Q. Liu, "Intelligent tutoring systems and learning outcomes: A meta-analysis," *Journal of Educational Psychology,* vol. 106, no. 4, pp. 901-918, 2014. doi: 10.1037/a0037123.
[25] R. Yilmaz *et al.*, "Smart MOOC integrated with intelligent tutoring: A system architecture and framework model proposal," *Computers and Education: Artificial Intelligence,* vol. 3, art. 100092, 2022. doi: 10.1016/j.caeai.2022.100092.
[26] F. J. García-Peñalvo, "Learning Analytics as a Breakthrough in Educational Improvement," in *Radical Solutions and Learning Analytics: Personalised Learning and Teaching Through Big Data*, D. Burgos, Ed. Lecture Notes in Educational Technology, pp. 1-15, Singapore: Springer Singapore, 2020. doi: 10.1007/978-981-15-4526-9_1.
[27] C. Lang, G. Siemens, A. F. Wise, D. Gašević and A. Merceron Eds., "The Handbook of Learning Analytics." Vancouver, BC, Canada: SoLAR, 2022. doi: 10.18608/hla22.
[28] A. J. Berlanga and F. J. García-Peñalvo, "IMS LD reusable elements for adaptive learning designs," *Journal of Interactive Media in Education,* vol. 11, 2005.
[29] A. J. Berlanga and F. J. García-Peñalvo, "Learning Technology Specifications: Semantic Objects for Adaptive Learning Environments," *International Journal of Learning Technology,* vol. 1, no. 4, pp. 458-472, 2005. doi: 10.1504/IJLT.2005.007155.
[30] S.-T. Chu, G.-J. Hwang and Y.-F. Tu, "Artificial intelligence-based robots in education: A systematic review of selected SSCI publications," *Computers and Education: Artificial Intelligence,* vol. 3, art. 100091, 2022. doi: 10.1016/j.caeai.2022.100091.
[31] S. Marcos-Pablos and F. J. García-Peñalvo, "Emotional Intelligence in Robotics: A Scoping Review," in *New Trends in Disruptive Technologies, Tech Ethics and Artificial Intelligence*, J. F. de Paz Santana, D. H. de la Iglesia and A. J. López Rivero, Eds. Advances in Intelligent Systems and Computing no. 1410, pp. 66-75, Cham, Switzerland: Springer International Publishing, 2022. doi: 10.1007/978-3-030-87687-6_7.
[32] Y. Jin, P. Li, W. Wang, S. Zhang, D. Lin and C. Yin, "GAN-based pencil drawing learning system for art education on large-scale image datasets with learning analytics," *Interactive Learning Environments,* pp. 1-18, 2019. doi: 10.1080/10494820.2019.1636827.
[33] H. Vartiainen and M. Tedre, "Using artificial intelligence in craft education: crafting with text-to-image generative models," *Digital Creativity,* vol. 34, no. 1, pp. 1-21, 2023. doi: 10.1080/14626268.2023.2174557.
[34] F. J. García-Peñalvo, F. Llorens-Largo and J. Vidal, "The new reality of education in the face of advances in generative artificial intelligence," *RIED: Revista Iberoamericana de Educación a Distancia,* vol. 27, no. 1, 2024. doi: 10.5944/ried.27.1.
[35] S. Barro. (2023). La pregunta equivocada sobre el uso de ChatGPT en la educación. In: *Universídad*. Available from: https://bit.ly/41LcAq9
[36] E. Sabzalieva and A. Valentini, "ChatGPT and artificial intelligence in higher education: Quick start guide," UNESCO and UNESCO International Institute for Higher Education in Latin America and the Caribbean (IESALC), Paris, France; Caracas, Venezuela, ED/HE/IESALC/IP/2023/12, 2023. Available from: https://bit.ly/3oeYm2f
[37] A. Herft, "A Teacher's Prompt Guide to ChatGPT aligned with 'What Works Best'," 2023. Available from: https://bit.ly/3K9z6my
[38] J. M. Flores-Vivar and F. J. García-Peñalvo, "Reflections on the ethics, potential, and challenges of artificial intelligence in the framework of quality education (SDG4)," *Comunicar,* vol. 31, no. 74, pp. 35-44, 2023. doi: 10.3916/C74-2023-03.
[39] H. Khosravi *et al.*, "Explainable Artificial Intelligence in education," *Computers and Education: Artificial Intelligence,* vol. 3, art. 100074, 2022. doi: 10.1016/j.caeai.2022.100074.
[40] A. Bozkurt, "Generative artificial intelligence (AI) powered conversational educational agents: The inevitable paradigm shift," *Asian Journal of Distance Education,* vol. 18, no. 1, pp. 198-204, 2023. doi: 10.5281/zenodo.7716416.
[41] M. Perkins, "Academic Integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond," *Journal of University Teaching and Learning Practice,* vol. 20, no. 2, art. 07, 2023. doi: 10.53761/1.20.02.07.
[42] F. J. García-Peñalvo, "The perception of Artificial Intelligence in educational contexts after the launch of ChatGPT: Disruption or Panic?," *Education in the Knowledge Society,* vol. 24, art. e31279, 2023. doi: 10.14201/eks.31279.
[43] F. J. García-Peñalvo, "Avoiding the Dark Side of Digital Transformation in Teaching. An Institutional Reference Framework for eLearning in Higher Education," *Sustainability,* vol. 13, no. 4, art. 2023, 2021. doi: 10.3390/su13042023.

[44] F. J. García-Peñalvo, "Digital Transformation in the Universities: Implications of the COVID-19 Pandemic," *Education in the Knowledge Society,* vol. 22, art. e25465, 2021. doi: 10.14201/eks.25465.
[45] E. P. H. Choi, J. J. Lee, M. H. Ho, J. Y. Y. Kwok and K. Y. W. Lok, "Chatting or cheating? The impacts of ChatGPT and other artificial intelligence language models on nurse education," *Nurse Education Today,* vol. 125, art. 105796, 2023. doi: 10.1016/j.nedt.2023.105796
[46] C. Nerantzi, S. Abegglen, M. Karatsiori and A. M. Arboleda Eds., "100+ Creative ideas to use AI in education." 2023. Available from: http://bit.ly/3KSUkWf
[47] T. Trust, "ChatGPT & Education," University of Massachusetts Amherst, USA, 2023. Available from: http://bit.ly/3ZoNagm. doi: 10.25416/NTR.21901629.v1.
[48] F. J. García-Peñalvo, M. Á. Conde, M. Johnson and M. Alier, "Knowledge co-creation process based on informal learning competences tagging and recognition," *International Journal of Human Capital and Information Technology Professionals (IJHCITP),* vol. 4, no. 4, pp. 18-30, 2013. doi: 10.4018/ijhcitp.2013100102.