

Language Sustainability in the Age of Artificial Intelligence
(La sostenibilidad lingüística en la era de la inteligencia artificial)

ANTONIO MARTÍNEZ-ARBOLEDA
<https://orcid.org/0000-0002-4391-5417>
sllama@leeds.ac.uk
University of Leeds (United Kingdom) <https://ror.org/024mrx33>

Fecha de recepción: 1 de diciembre de 2024

Fecha de aceptación: 28 de diciembre de 2024

Abstract: This essay explores philosophical, scientific, and political questions raised by Generative Artificial Intelligence’s growing role in human language. Building on cutting-edge developments in the field, it critically examines how automated systems that produce written text challenge our traditional ideas of language production and ownership. In doing so, it introduces innovative approaches to understanding language in the age of AI, with a particular focus on cultural and political responsibility. Central to the discussion is an emerging concept of “language sustainability” that stems from the reflections in this essay. By highlighting the profound consequences of AI for human language, the essay places concrete demands on public-interest actors such as governments and universities, and on our communities as a whole, as custodians of human language, to preserve and enhance our personal and social linguistic agency, offering recommendations to re-align technological innovation in Generative AI with human language sustainability.

Keywords: Artificial Intelligence. Languages. Sustainability. Technology. Politics.

Resumen: El presente ensayo aborda cuestiones filosóficas, políticas y científicas que surgen con el creciente protagonismo de la Inteligencia Artificial Generativa en el lenguaje humano. A partir de los últimos avances en este campo, examina de manera crítica cómo los sistemas automatizados de generación de texto amenazan nuestras concepciones tradicionales sobre la producción y la propiedad del lenguaje. Asimismo, ofrece nuevos enfoques para comprender el lenguaje en la era de la IA (Inteligencia Artificial), resaltando la importancia de la

responsabilidad cultural y política. Como resultado de las reflexiones aquí propuestas, cobra vida un concepto emergente de “sostenibilidad lingüística”. Al subrayar las profundas repercusiones de la IA en el lenguaje humano, el ensayo insta a actores de interés público, como universidades y gobiernos, y a la sociedad en su conjunto, como custodios de nuestro patrimonio lingüístico, a preservar y fortalecer tanto la agencia personal como la colectiva en el uso de la palabra. De este modo, ofrece recomendaciones para reorientar la innovación tecnológica de la IA hacia la sostenibilidad del lenguaje humano.

Palabras clave: Inteligencia Artificial. Lenguas. Sostenibilidad. Tecnología. Política.

1. Introduction

The search for human and environmental sustainability is not a new endeavour in our human trajectory. For many societies the necessity to look after our world and our species has long been an intrinsic part of their social ethics. However, sustainability has taken on renewed urgency. The dangers brought about by environmental degradation, injustice, and conflict have become greater, as well as more evident, in a world as globally connected as ours. One area that remains underexplored is cultural sustainability. While there is some academic attention to this topic, including work that examines its various dimensions (Meireis and Rippl 2019), language has not received so far significant focus, except when it comes to the protection of minoritised languages.

The adoption of the Sustainable Development Goals by the United Nations in the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012 has reinforced a solution-oriented global approach to sustainability designed to address specific challenges and threats. Indeed, sustainability is inherently contextual, as it is shaped by the issues perceived as critical at a given time. With the irruption of Generative AI in our lives, a question should be raised: Is AI a danger to global sustainability, or is it part of the solution? There are numerous critical views about the impact of AI in our societies, but to date there is no evident critiques on its impact on cultural sustainability, and more specifically on language sustainability. AI is a technology that produces “content” that is conveyed through the form of human natural language, yet human languages are not only formal modes of information exchange, but also repositories of memory, vehicles for the expressions of emotions and identities, and the very fabric with which human knowledge is woven.

In the face of globalisation, enforced cultural homogenisation, and linguistic discrimination, our main contemporary efforts in the area of language sustainability have focused on minoritised languages. Yet Generative AI brings about reasonable concerns fears for human languages as a whole. As AI-generated content permeates our lives, the potential loss of human agency, or at least a change in the mechanisms through which we exert agency in shaping language, presents serious questions that can be considered from a cultural sustainability perspective: Is the future of human language at a crossroads as significant as the advent of literacy or the invention of the printing press? Even though AI has been created by humans, what does it mean to have an artificial “speaker” if we can use such a term?

For some readers, the technopolitical reflections in this essay may seem out of place in our traditional fields of enquiry. However, the extent and depth of the potential impact on the future direction of human language development can only be truly appreciated when we integrate the discussion about Generative AI with questions around the technological and political underpinning of language as a product and drive of social relations.

In this essay, we will explore how current Generative Artificial Intelligence technology and, more importantly, our engagement with it, are beginning to shake some of our basic assumptions around language ownership and human agency. We will also look at what Generative AI means for our understanding of language as a social phenomenon. Finally, in this essay we suggest a technopolitical approach to language sustainability to address the evident risk of cultural degradation presented by automation.

The objective of this essay is not to deal with pressing questions around language, literature or translation education, but to reach a provisional challenge-based conceptualisation of Language Sustainability, to propose a course of political action that is congruent with the nature of the challenges outlined; and to suggest a new approach to research in a wide range of humanistic and scientific fields that is based on a nuanced understanding of what Generative AI entails for human language itself as an essential ingredient of our humanness and as a social phenomenon. We are mindful of the limitations of the scope of this essay. Fascinating questions specifically pertinent for our understanding of the impact of AI in language, such as how AI is shaping spoken language and multimodality, or the advanced capabilities of ChatGPT-4 to identify stylistic properties in narrations that generate empathy in the reader (Shen et al. 2024), or the pressing issue of emotional dependency of AI Agents (Mahari and Pataranutaporn 2024) will need to be explored in the coming years, probably under the new paradigm outlined in this essay, and subsequent contributions.

2. Generative AI as a Set of Technologies for Language and Cultures¹

Artificial Intelligence (AI) has become a wide-ranging prominent set of technologies, most notably Generative AI, offering tools and opportunities that were once the domain of science fiction. Generative AI services, like ChatGPT, have made access to the production of AI-generated content relatively straightforward for users, who turn to their interface for support in a variety of tasks. Generative AI's pervasiveness is exemplified by its seamless integration into everyday tools. A prime example is Microsoft Copilot, embedded directly into software like Microsoft Word (Microsoft n.d.). This integration allows users to engage with AI without leaving their writing environment, with real-time suggestions, corrections, and enhancements, almost invisibly supporting their writing process. Commercial AI platforms offer users the possibility to create their own specialised assistants and agents. An entire new industry is growing around these technologies and the flow of information in social media about AI is considerable. Yet, despite the increasing omnipresence of AI in our lives, understanding, even at a basic level, how they work behind the scenes can feel overwhelming and disempowering.

Throughout this essay, we will focus on the key technologies and processes underpinning language production by Generative AI that are particularly relevant for researchers, educators and policy makers. The idea is to provide relevant insights into how these systems function, equipping the reader with the knowledge to engage with AI tools in a more informed, confident, and responsible way, ethically and politically. While the overview of the technologies provided in this essay highlights practical implications, it is not meant to capture the full complexity and technical depth that one would encounter in specialised computing and engineering literature.

As Panu Korhonen said “AI is a solution in search of a problem” (Korhonen 2023). That statement resonates particularly well with educators and researchers in the Humanities. The hard truth is that we cannot “uninvent” AI nor prevent others from investing on AI, developing the technology, selling AI services, or using them within education and other public interest services. In the face of this challenge, this essay suggests that public-interest actors, including educators and cultural workers, move beyond being passive consumers of AI-driven digital services toward becoming active and literate co-creators of AI-enhanced educational and cultural tools (Martínez-Arboleda 2024), with a reasonable

¹ With thanks to Dr Noorhan Abbas, of the School of Computing at the University of Leeds, and Prof Francisco J. García-Peñalvo, of the Department of Computer Science and Automation at the Universidad de Salamanca, for their feedback on my early draft of those parts of this essay concerning the detail of AI technologies.

degree of technopolitical awareness. In order to facilitate that conversion into critical actors, we need first of all a basic understanding of the underlying components and processes of AI.

2.1. Generative AI: The Maths Engine Behind the Words

Generative AI is the technology that enables systems like ChatGPT to produce coherent, fluent text in response to prompts. Generative AI models are designed to create new content, whether it is text, images, or even music, based on patterns they have “learned” from large datasets. These systems can generate human-like verbal language, offering responses that feel conversational and aimed to be contextually appropriate. This ability to craft sentences, summarise information, and answer complex questions demonstrates the power of generative AI to deal with tasks that we often associate exclusively with human intelligence. However, these models do not “understand” language, at least in the way humans do. Instead, they rely on patterns “learned” from vast amounts of data.

Behind the outputs of generative AI systems lay Large Language Models (LLMs). Currently there are thousands of LLMs in the world, which continue to be improved and refined. They are called “models” because they represent complex structured mathematical frameworks. Most of the LLMs used now in education and daily life are considered “foundation models”, as they serve as a general-purpose foundation upon which more specialised applications can be built through customisation, a concept that is central to understanding of the impact of AI in language production and that we will discuss also in this essay.

LLMs are trained on vast datasets containing billions of words and phrases. This data, consisting of millions of texts from the internet and other sources, is processed by the system to identify intricate linguistic patterns with statistical analysis. Unlike humans, they can “gain knowledge” through exposure to symbolic information. Whereas humans typically learn, from a combination of sensory experience, social interaction, and formal education, LLMs can “learn” directly from data represented in a coded form, without the need of direct embodied experiences. Throughout this “learning” procedure, the models develop a sophisticated representation of language patterns, allowing them to predict the most likely sequence of words based on the context provided by the user. This enables them to generate text that flows naturally and appears coherent.

The performance of LLMs can be improved through fine-tuning, which is the process of adapting an existing LLM to a specific domain or function by training it on new, labelled data. For instance, using an example relevant to language

learning educators, if a LLM needs to handle linguistic queries, the model can be fine-tuned on relevant grammar rules or vocabulary, stored as machine-readable data, to enhance its accuracy and relevance. However, despite the possibility to fine-tuning and improve LLMs, the constant adaptation to new data and interactions, present a risk for language sustainability, as the volatility of their ‘learned’ language patterns may outpace human efforts to guide or moderate them, leading to potential misalignment with culturally significant norms and expressions.

There are other concepts and techniques that the readers might wish to explore for a deeper understanding of Large Language Models and how human languages (verbal and formal or computational) are core to AI computing. These are Natural Language Processing (NLP), which is the bridge between human language and AI systems; Machine learning, which is the foundational technique that allows AI systems to process data, detect patterns, and refine their performance, for instance by generating more pedagogically effective responses; Neural Networks, which can be defined as the core computational structures that enable LLMs to process language; and Reinforcement Learning from Human Feedback (RLHF), which contributes to the optimisation of AI responses through user feedback.

Finally, AI is not just about Large Language Models. Son et al. (2023) enumerate other technologies, that are relevant in our field of enquiry, but that given the focus of this essay will not be discussed here. These include Data-Driven Learning (DDL), Automated Writing Evaluation (AWE), Computerized Dynamic Assessment (CDA), Intelligent Tutoring Systems (ITSs) and Automatic Speech Recognition (ASR).

2.2. A Technology Inspired in Humans

LLMs are certainly not human beings, nor sentient. They do not “think” or “understand” the meaning of the words they generate. They simply predict statistically what comes next in a sequence of words. The outputs of LLMs may seem “intelligent” to most people, but it is important to remember that this intelligence is artificially driven by patterns in data, not by cognitive reasoning.

However, as a result of the capabilities, influence, and omni-presence of LLMs, there is a polarised public debate about the future of AI that verges around what we mean by “human”, as an attribute or adjective:

On the one hand, the reductionist belief that “AI will be able to do what any human can do” (Musk and Diamandis 2024). This positioning focuses on human activities to be carried out directly by AI. The autonomy of AI, its capability to interoperate within rich digital environments, and to analyse and use human

verbal language, at least formally, foreground this functionalist approach to humanness. This vision aligns with the techno-phoric discourse seeking to rally investment around technology, and at the same time is fuelling the techno-dystopian sentiments of many of AI's critics.

On the other, there is a view that conceives humans as unique beings, with an emotional, cognitive and artistic existence that cannot be replicated through technology, and whose cultural practices are about to be undermined by a pervasive technology. For this position, technology is perceived as something external and instrumental to human life and purpose; this stance underscores a fundamental belief in human irreducibility, the idea that intangible elements like emotional resonance, spiritual creativity, and cultural heritage cannot be reproduced by AI's pattern-based outputs (De Cremer and Kasparov 2021). Consequently, these critics often argue that machines, no matter how sophisticated, will lack the intrinsic awareness and aesthetic sensibility that inform human expressions of art, empathy, and moral choice (Expert Panel 2023) (Rothman 2024) (Lam 2023). These concerns go hand in hand with the fear that AI's widespread presence might trivialise or dilute essential human experiences, artistic endeavours, linguistic nuance and cultural rituals (Harari 2024) (Rothman 2024) (Lam 2023), relegating them to mere computational "simulations" rather than genuine acts of creation or understanding.

In our view, both positions overlook the nuanced interplay of technics and humanity, and this question will be hopefully resolved in this essay. However, before embarking upon theoretical reflections, the readers will benefit from a solid critical understanding of the affordances of the technology that has been developed around LLMs to date, and also an evaluation of their future as a technology. Unfortunately, too often we can see, in the media and academia, opinions about AI that are based solely on user experiences with ChatGPT and similar products, without much nuance about the actual technologies around Generative AI, which are essential to consider. That is the reason why within this essay, we intertwine a more informative, yet nuanced, approach about the nature and scope of the technologies with the critical analysis of the implications of AI for language.

2.3. A Billion of AI Voices: The Customised Agent

AI technologies allow for the functional differentiation and specialisation of the functions performed by LLMs. "Machines are polyvocal rather than univocal, containing multitudes rather than a singular author" (Elkins 2024). Apart from fine-tuning, explained in the previous section, there exist another set of techniques, known as "customisation", whereby any LLM can become the

foundation for millions of different specialised “voices”, which we call here Chatbots, Assistants, and Agents.

For cultural production and education, customisation mean that these applications can be tailored to their very subject matter, whether it is language learning, science, or humanities. They can also be customised to match the pedagogical approach of an institution or specific teaching methods, as one-size does not fit all, and become even tools for cultural exploration. Customisation ensures that the Agent aligns with the demands of the developer, who, in turn, is supposed to consider the needs and expectations of the user. This creates a special technopolitical and cultural relationship between the developer of the technology and the users that will need to be brought into the equation when discussing in later sections the political impact of AI on language sustainability and, more generally, on our cultures. With the proliferation of millions of specialized AI Agents, human authors and speakers might find themselves losing clear oversight of language flows, as each new ‘voice’ can subtly reshape meaning in ways that are neither transparent nor easily reversible.

2.3.1. Chatbots

These LLM-powered tools are some of the most common applications built on Large Language Models. They can be defined as dialogue software programs that use verbal human language to interact with humans and/or other “machines”. All of these tools can produce “statements”, but the most advanced ones can generate images, multimodal outputs, “converse” with other AI-powered tool, and generate instructions for other software and platforms that they are integrated with, for instance, send an email or one’s behalf, or make a decision and execute it through its interaction with other software. It is important at this point that we dedicate few paragraphs to explain what the capabilities of these technologies for one crucial reason: all of them rely on natural human language for their inputs and all of them generate outputs that take the form of human natural language.

LLM Chatbots are primarily designed to simulate human-like conversations (Casheekar et al. 2024). They are often categorised by their function, such as task-oriented, personal, customer service, social, entertainment, informational, or educational. (Casheekar et al. 2024). Early chatbots like Eliza (1960s) and even more recent ones, do not rely on Large Language Models. However, while earlier chatbots relied on pre-programmed responses, LLM Chatbots are more sophisticated, using Natural Language Processing (NLP) and deep learning to provide more contextually relevant and coherent responses (Casheekar et al. 2024).

The term “chatbot” can be misleading. On the one hand, it carries a relatively negative association, as it stems from the pre-LLMs era. Moreover, the word “chat” suggest that the interactions may be inconsequential and even banal. On the other, many of the LLM Chatbots that we see nowadays operating in education and commerce can be classed as LLM Assistants and even as LLM Agents, the other two categories below, because of their increased capabilities. This suggest that the term “chatbot” is increasingly used to refer to a certain type of interface, supporting a website, for instance, rather than a set of functionalities and capabilities.

2.3.2. Assistants

LLM Assistants are also conversational. They emerged in the mids 2010’s, look like LLM-based Chatbots, and can be considered a development from chatbots (Alier et al. 2025). Their specificity lies in that they are designed to manage effectively the context provided by the user, to retrieve relevant information (using Retrieval-Augmented Generation or RAG) on which to base accurately their responses, to follow instructions from their designer (Alier et al. 2025), for instance specifying the tone, style, register, type of content or extension in the interactions with the user, and to produce well-structured outputs. As explained by Alier et al. (2025), they use an embeddings database in combination with RAG to store data so that it can use large amounts of unstructured information. AI assistants also require strong software engineering skills and best practices in terms of deployment, scalability and security.

2.3.3. Agents

Agents are more focused on carrying out tasks and interacting within a digital environment (Su et al. 2024), which includes interacting with digital tools within their “reach”, such other AI agents, both in simulated and real-world environments. These interactions often occur cooperatively, showcasing their growing functionality and autonomy. Of particular importance for our discussion in this essay are “Language Agents” powered by LLM. They are defined by the fact that they use human language for both “thought” and “communication” (Su et al. 2024). Nowadays many LLM-powered Language Agents are effectively replacing chatbots and assistants. Also, since they can also “communicate” with humans, they are occupying the space of Chatbots and Assistants. Hellstrom (2024) identifies “conversational agents” as a key category within this evolving taxonomy, highlighting their role in bridging communication and operational functionalities. To reflect this broader shift, this essay adopts the term "agents"

to encompass the variety of AI generative applications now predominantly powered by LLMs.

The “learning” that LLM-powered Language Agents exhibit is considered a form of adaptation or “emergence” of behaviours, rather than explicit programmed learning (Takata et al. 2024). Their “learning” stems not only from interaction human users and with other Agents, but also with a) their environment, including the positioning of other agents (Takata et al. 2024), b) the domain-specific information linked to them through RAG technologies (Alier et al. 2025), and c) with the contents stored in its “memory” about previous interactions (Takata et al. 2024).

Crucially, as demonstrated by Takata et al., (2024) through their interactions LLM-powered Language Agents develop their own “personality” traits, “social” norms, and contribute to the propagation of novel ideas, which the authors call “hallucinations”.

We must not underestimate the importance of customisation in industry, education, and life in general. In an interview in AI Daily Brief on 26 December 2024, Nufar Gaspar (Gaspar 2024) anticipated that in 2025, at the current pace of growth, the number of individualised agents will exceed the population of human workers.

2.4. Prompt Engineering: Crafting Effective Interactions

Prompt engineering is crucial in shaping how AI applications, like Agents, respond to user inputs and is especially important in all sorts of contexts, including educational and cultural. Prompting itself, the action of sending a prompt to an Agent, or simply the generic interface of an LLM, functions as a unique type of programming, a way to interact that blends natural language (because it is written or uttered by the human user) and formal instruction, because the human utterance becomes prescriptive for the AI application, as if it were code (Burkhardt et al. 2024).

Alier et al. (2025) explicitly identifies prompt engineering as a key element in the development of AI-powered learning assistants, emphasising its role in defining assistant behaviour, interacting with RAG (Retrieval-Augmented Generation) and other tools, and the iterative design process. Casheekar et al. (2024) notes the importance of prompt design for in-context learning and to guide LLMs like ChatGPT to produce the desired outputs. Su et al. (2024) notes how LLM agents can learn mappings from context to actions through fine-tuning, requiring careful prompt design.

There are two distinct forms of prompt engineering, both essential for ensuring effective AI interaction:

Prompt engineering in one-to-one interactions: This occurs during real-time interactions between the user and the Agent. In this context, the user crafts prompts or queries dynamically, guiding the AI's responses based on immediate needs. For example, a teacher might ask the chatbot to provide an explanation of a specific grammar rule or to simulate a conversation in the target language. The effectiveness of this interaction depends on how well the prompt is framed, as it directs the chatbot to generate appropriate, coherent responses. This real-time prompt engineering is part of the learning process, allowing educators and learners to engage with the AI in a flexible, situational manner.

Prompt engineering as customisation: This form of prompt engineering happens during the setup or customisation phase of the Agent. Customisation techniques, which also include providing purpose specific data bases for the AI tool to feed from, are applied to LLMs that have been already fully trained, and do not affect the architecture of the LLM. With prompting as customisation, the developer of the Agent designs structured prompts and dialogue sequences that the Agent will use when interacting with users in specific contexts. This might involve pre-configuring how the Agent handles different types of inputs and how it responds to them.

Both forms of prompt engineering play a vital role in AI-powered content generation and interaction. The real-time, user-driven prompt engineering allows for immediate adaptability in conversations, while customisation prompt engineering ensures the Agent is prepared to manage specific tasks and align with objectives of the designer and developer of the Agent from the outset.

2.5. Reasoning, Abstraction, and Criticality

In search for greater levels of human-like capabilities, the AI industry has created the so-called “reasoning” LLMs. The substantial difference with mainstream LLMs, is that “reasoning models” respond to a user prompt by producing internally further context, through a technique called “chain of thought”. The LLM bases their response to the user in a process that start by generating, internally only, a set of possible responses. The LLM then conducts a sort of auto-adversarial exercise of comparison and distillation until it reaches the best possible answer. This functionality improves the quality of the actual, externalised responses although it takes longer for them to respond. Reasoning-focused LLMs share foundational similarities with older LLMs, as they are often based on Transformer architectures, but the difference is that divides tasks into so-called internal “multi agents”, enabling that process of contrast, collaboration, and verification. It is, what we could call in human terms, the production of options on which to “ponder”.

A recently tested methodology called Test-Timing Training, which can be considered a hybrid of fine-tuning and customisation, allows AI models to dynamically adapt during their interaction with the user by temporarily updating its parameters with specific data provided by the task. This allows the model to specialise immediately, during so-called “inference time”, the time in which it is producing the content, for novel or complex tasks that it has not explicitly been trained on, without permanently changing its structure. Interestingly, this methodology makes it more feasible to reach higher degrees of accuracy in “abstract thinking” without having to develop more comprehensive and powerful LLMs (Akyürek et al. 2024).

Finally, the advancements in educational technology proposed by authors such as Zhang et al. (2024), Jandra et al. (2024), and Yang et al. (2024) showcase the versatility of Large Language Models (LLMs) in creating new forms of interaction that promote critical thinking, moving beyond simple information delivery towards a more dynamic, personalised and engaging experience. The Socratic method, a key element in these developments, is implemented using LLMs to generate thoughtful questions that guide the user toward self-discovery, rather than providing direct answers. The ultimate goal of this type of customisation is to foster independent thinking and problem-solving skills.

Future developments in Generative LLMs will rely on enhanced auxiliary tools, techniques, and enhanced data handling around existing LLMs, rather than on larger LLM. According to Navani (2024) Scaling LLMs enlarging model size, dataset volume, and computational resources produces increasingly smaller improvements in performance relative to resource investment. Innovations like program synthesis integration (Chollet 2024) offer more promising pathways to enable robust “reasoning and abstraction”, which scaling alone cannot achieve.

In view of all the technological advances presented so far, LLMs open up key questions that will be the subject of theoretical analysis in this essay, looking at how the irruption of AI, through its models and agents, alters both the workings, and our understanding, of human language, and demands a clear public-interest positioning in terms of values and purpose.

3. The Political Economy of AI and its Impact on Language and Knowledge

One critical question for anyone concerned with the future direction of human languages, and human cultures in general is the differentiation between types of Large Language Models (LLMs) based on how they are made available and how they can be customised or deployed. If AI is going to play the central

role that has been anticipated, the question of ownership of the technology is fundamental, because they who own the tools, direct the production.

From the point of view of access and cost to the technology, broadly speaking, LLMs fall into two main categories:

Proprietary LLMs: These models, such as ChatGPT-4, are owned by private companies and typically cannot be fully downloaded or hosted on the servers of their users. This limits the ability of public interest institutional users, including universities, and their educators and researchers, or any other organisation or group, to modify or fine-tune the model in-house, therefore using their own resources, to meet specific needs of their students and researchers. Instead customisation is restricted within the vendor's platform, raising concerns about data privacy, control and cost. The industry is making an effort to simplify customisation within their platform for their users, who can adjust certain parameters or personalise interactions through user-friendly APIs. Prompt engineering has become the most used technique for customisation. For educators, this is a relatively accessible way to carry out light-touch limited adaptation of AI to the needs of their students. Proprietary models are still at the cutting-edge AI capabilities, but the latest models tend to be offered only via paid subscription, under software-as-a-service models.

Open-Source LLMs: On the other end of the spectrum are completely open-source LLMs, which are freely available for absolutely anyone with a sufficiently powerful computer, to download, host, and fully control. These models offer significant advantages in terms of customisation, as institutions, businesses, organisations, and individuals, can directly modify and fine-tune the model to suit the specific needs of their particular users, including specific cohorts of students and subjects, or specialised users, adding a rich knowledge base to their Agents. Additionally, using self-hosted open-source LLMs ensures that data exchanges remain within the institutional or individual own infrastructure, providing greater control over privacy and security and eliminating reliance on third-party platforms. This also enables deeper integration with other systems and allows for more innovative uses tailored to local contexts. True open-source AI is driven by open transparent collaboration of developers, which is considered a more ethical and more cost-effective way to operationalise the production of digital technologies. However, institutions and organisations wanting to develop their own AI operations may need to invest in digital infrastructure and skilled personnel to manage and fine-tune these models effectively, or collaborate in shared hosting, computing, and staff capabilities to achieve economies of scale.

An additional layer of complexity to this political equation is provided by the dominance of global languages such as English in AI systems. This poses a significant challenge to language diversity and cultural richness. Large Language Models are trained on vast datasets that underrepresent minoritised languages. This structural bias in AI, noted by Chesley (2020) and Bender et al. (2021), marginalises languages with smaller digital footprints. Moreover, accents, dialects, and varieties of languages, often central to the identity and cultural heritage speakers. These, alongside minoritised languages, are also at risk of being sidelined in AI tools. Payne, Austin, and Clemons (2024) argue that AI-driven systems tend to standardise language, reinforcing dominant varieties while marginalising non-standard accents and dialects. Thus, AI could undermine linguistic equity and sustainability both at global at local levels.

Clearly, the underlying economic reality underpinning AI presents clear political challenges, as our life activities become mediated by a further layer of technologies. For Burkhardt et al. (2024), the push towards AI-as-a-service models further centralises control, increasing dependence on a few providers. The authors argue that foundation models and prompting further strengthen Big Tech's dominance over computing and other economic sectors. This is due to, according to the authors, to several factors. Firstly, the deep interactions between users and Foundation models help companies to improve the models and their applications, creating a cycle where the provider benefit from user data and feedback. This data is then used to improve their commercial viability, often without direct compensation or control for users. Secondly, the vast amount of resources required to train the LLMs, for instance to cover the cost of assembling, curating and sanitising training data, or the high demand for compute power, favours large companies that can raise the necessary resources. Thirdly, foundation models, delivered via cloud-based services, can lock users into specific platforms, further centralising power. Companies that adopt these models may become heavily reliant on specific providers, making it difficult to switch to alternatives.

The potential for exclusion of educators, researchers, communities, and other public interest players from key aspects of the development and deployment of AI technologies is notable. The danger of losing agency in our knowledge preservation and construction cannot be underestimated. As proprietary and open-source models compete for influence, shifts in funding and data availability could cause sudden 'linguistic drift,' making certain linguistic registers or minority expressions fade from mainstream AI tools faster than communities can respond. Even worse, for minoritised or less-resourced languages, this concentration of power raises a critical danger: if their linguistic data is not

prioritised by leading providers or platforms, entire speech communities could lose collective agency over the evolution of their language, ceding it to market-driven algorithms.

4. AI, and the “Humanness” of Language

How do we deal, philosophically, with “utterances” or “texts” or “knowledge” when they are produced by a something that is not a human being made of flesh, nor engages with meaning as we humans do? Do we just dismiss those outputs as inconsequential?

4.1. *From Stochastic Parrot to Societal Partner*

The metaphor of the “stochastic parrot” (Bender et al. 2021) is used to differentiate the human from the not human language. However, given the technological affordances provided by customisation of LLMs, if anything, we should refer to AI as a gigantic throng of billions of parrots of all colours and sizes.

Given the advances in AI, analogies such as “team cognition”, “shared cognition” or “team-mate”, used in current literature about AI (Schmutz et al. 2024), tell us a slightly different story about the perceived and real influence of AI in the processing and production of knowledge using human language.

Williams and Bayne (2024) use the concept of “proto-assertion”, to refer to the assertion-like utterances of AI, comparing them with the assertions of a two-year old child who, sooner or later, becomes a competent speaker. Similarly, the role of AI in decision-making, for which Planzer et al. (2022: 932) envision the development of AI as “autonomous moral agents”, also points at a perceived incompleteness of the evolution of AI as a participant in societal decision-making.

These perspectives suggest that there exists a shared agreement that AI is increasingly viewed as a “partner in society and culture”, using the words of Hall (2024), although one that occupies the liminal space between tool and agent.

AI’s inability to replicate human intention, consciousness, and understanding is widely accepted, but nobody is granting AI human status, just vindicating the role of AI as a technological cognitive companion for human functions very intimately associated to our perceived existential essence, which includes the ability to produce language in the way we currently do, after of millennia of evolution. Yet if humans increasingly rely on AI ‘speakers,’ we risk surrendering part of our control over how new phrases, idioms, or even conceptual frames emerge, creating a subtle but pervasive fragmentation in shared cultural meaning-making.

4.2. *A New Type of Speaker?*

Human verbal language is an essential instrument and output of AI. In this section we will look at the provocative and controversial question of AI being considered, or not, a producer of human verbal language.

For Dominguez (2023), Generative AI does not produce human verbal language, or “lenguaje natural”, as in her work in Spanish. Without denying validity to Dominguez’s articulated explanation, that draws on the best theories on language, I would like to direct our attention beyond the binary question of whether it is human verbal language what AI produces, or not.

The thinking around this question is moving rapidly. For Elkins (2024), LLMs are not just stochastic parrots. She proposes that Chomsky’s views on human language are being challenged by the LLMs capabilities, as LLMs are able to deliver coherent utterances for whose production grammar is not a primary component.

If we look at the work of Takata et al. (2024) on the capacity of Agents to interact and learn from their social milieu with considerable autonomy, the conditions for the production of a type of linguistically formulated content by the Agents that looks increasingly more like a sort of “meaning”, as utterances stem from the social milieu of the Agents, are beginning to exist.

In my view, a different approach to any essentialist formulations, that verge on emotional revindications of a human identity perceived as under threat, is required.

We should start from the less controversial statements:

a) Generative AI tools, in their many forms and shapes, are becoming producers of “information” or “content” that is formulated and delivered formally through human verbal languages. With Williams and Bayne (2024), we agree that even if AI utterances cannot be considered fully-fledged acts of speech, AI displays “complex and flexible linguistic behaviour that closely resembles the behavioural profile of asserters”, but that is a matter for further discussion. “Unless we simply want to collapse the meaning of the verb “to author” into the meaning of the verb “to make”, LLMs make language, they do not author it” (Hayot 2024: 277). The idea of authorship will be later discussed.

b) Whatever AI entities “learn”, “write” and “say” is actually integrated into our human communication flows and stems from them. Does this mean that AI tools and systems have become “speakers” of human languages in practical terms? What is certain, leaving aside terminological and philosophical reservations, is that “information” or “content” produced by AI and formally coached in human verbal languages has an impact on our own meaning-making activities. What we read and listen in our interactions with AI has an effect on

our understanding of the world and conditions our relationships with others. What the AI “says” to us, and what we believe about their capabilities, shape the things that we say and how we say them. Profound questions arise from these undeniable facts about how human verbal languages, as dynamic systems reflecting cultural values, history, and narrative identity, will be influenced by AI language models and applications. Such a gradual outsourcing of language use to AI may not only reshape how we communicate, but also dilute the distinctly human interpretive layers of meaning, leaving crucial nuances vulnerable to algorithmic drift. Perhaps it is also time to revisit our ideas about those dynamic systems: “We do not speak language; language speaks us” (Hayot 2024: 277).

5. New Approaches to Authorship and Intertextuality

The advent of Generative Artificial Intelligence is prompting a re-evaluation of authorship and intertextuality across various creative and professional domains. What happens when someone writes and shares content that has been heavily influenced by an AI Agent? Is the person who publishes the content really the author of it? What are the relations between the different sources of knowledge, perspectives, and narratives brought together when we write with AI, or when AI writes by itself? This section focuses on the impact of AI on literary creation as a proxy to explore these changes, since the rich concepts developed in this area can be extrapolated to other content production activities, including scientific, artistic, educational, and business outputs.

Hopefully, AI will not transform literature to the point of erasing what we now consider traditional approaches to creativity, namely writing from scratch, on paper or word processor, or the oral composition of thought, from our cultural practices. However, as AI becomes a partner and mediator in our cognitive, creative and social engagements, new branches of literary creation appear. As explained below, AI will reshape key concepts and constructs in our disciplines.

5.1. AI-Supported Writing, Vicarious Writing, and Traditional Composition

An important distinction emerges when considering how humans incorporate AI into the creative process. On one end of the spectrum, we find traditional composition, where authors manually write, on paper or via a word processor, without any AI intervention. In the middle, there is AI-supported writing, in which a human author continuously interacts with an AI customised Agent or simply with a generic chat interface with an LLM such as that of ChatGPT, for instance, providing prompts or reacting to AI-generated suggestions line by line. Lastly, there is the possibility of vicarious writing, where a “writing designer”

configures and directs AI to generate the majority, or even the entirety, of a text with minimal direct human composition.

Each of these modes presents a different balance of agency and intention. Traditional composition foregrounds human creativity but can limit the scope of intertextual borrowings to what the writer alone brings. In this mode, the author is central, acting as the direct composer of every sentence. While theories from Roland Barthes (1989) and Michel Foucault (1998) question the fixity of meaning, suggesting the text's meaning is shaped by the reader or by the systems of discourse rather than solely by the author's intention, the author remains visibly present as the direct composer.

AI-supported writing invites fluid collaboration between human and machine, with iterative back-and-forth at the sentence or paragraph level. It introduces a collaborative dynamic that dilutes this "author function". In this mode, the human and AI become partners, with the human retaining some intention through prompting and editing, while also relinquishing a degree of control to the AI's suggestions. Even as the human guides the AI, the AI's suggestions inevitably shape the text, meaning that intention is never fully in the hands of the human author. AI-supported writing also exemplifies Barthes' (1989) idea that "the text is a tissue of quotations," now drawn from a large language model's (LLM's) vast training data. The LLM, in this sense, becomes a kind of archive of pre-existing texts that are reconfigured through the interaction with the human. Finally, vicarious writing further destabilises the "author function" of Foucault (1998). Here, the "writing designer" orchestrates the AI, obscuring the direct line-by-line authorship even further.

By contrast, vicarious writing centralises the human role in orchestrating and curating the AI's outputs rather than producing every word. It is this last mode that reshapes more profoundly our notion of "authorship," since it allows a creator to remain somewhat at arms-length from the actual linguistic composition, even while decisively influencing the final text. For the human author, this "writing becomes an act of conceptual curation or technological orchestration."

The co-existence of these three different modes of text creation raises several questions about AI's role as a "co-author". How should we understand the different types of collaborations and partnerships between human and AI that emerge through these modes of writing, and how do these affect our interpretations of the resulting AI-generated texts?

While Duede and So (2024) argue that meaning does not require human agency, drawing on theories that decentre the human in order to argue for the value of LLMs, Eric Hayot (2024) emphasises the continued importance of

human intentionality in assigning significance to AI outputs. If we accept that meaning is generated by a system of relations rather than by human intent (Duede and So 2024), then we can consider that in both forms AI-mediated production there is clearly one human author responsible for meaning-making, but operating under a new set of intertextual parameters. Gérard Genette's concept of intertextuality, often described as "literature in the second degree" (Genette 1982 as discussed in Lau and McManus 2024), suggests that all texts are fundamentally relational, existing within a complex network of references and drawing upon other texts. As Lau and McManus (2024) elaborate, intertextuality encompasses a wide range of relationships, including but not limited to, direct quotations, allusions, thematic borrowings, paraphrasing, and structural or stylistic similarities. For these authors the adoption of AI has foregrounded asymmetric intertextuality, which refers to one-sided relationships where one text references, quotes, or borrows from another, but without reciprocation from the source text, and where there is often a structural or semantic mismatch. This is the case with the training datasets of Large Language Models embed countless intertextual connections, but without explicit citation or acknowledgment in the way a human author might. Helgeson (2023) introduces the idea of "evasion" as the ability of texts to escape fixed meanings, embracing their continuous reshaping and integration into new contexts and intertextual productivity, where literature anticipates its own reinterpretation and reconfiguration. This shift highlights the role of AI in transforming relatively static intertextual connections into much more dynamic, iterative processes. As AI-generated texts can be continually reconfigured and reinterpreted, they foster an evolving landscape of diverse intertextual relationships where connections become, inevitably, less traceable. Additionally, in both AI-powered modes, a common thread emerges: the risk that rapid, AI-mediated textual proliferation may undermine stable reference points in language, making it harder for authors and readers alike to anchor meaning in shared cultural contexts.

5.2. The Empowerment of the Human Author

In the face of these challenges, a new framework for responsible, human-centred literary creation in the age of AI should include tangible technological opportunities for authors to take control of the creative process as a highly mediated and iterative engagement. Positioning both the AI-supported writer and the "writing designer" as collaborative producers and curators represents a new form of intentionality, directing intertextual productivity toward meaningful creations. Unfortunately, many of our current debates about Generative AI are based on the use of generic non-customised interfaces that connect directly to

LLM. This generates a sense of disenchantment and concern about the role of the author (Hayot 2023) as LLMs do not model language, but texts (Slater 2024) and the most popular generic user interfaces are still relatively limited to question and answer interactions.

In this respect, customisation of AI Agents with solid knowledge bases and appropriate Retrieval Augmented Generation tools, and the use of LLMs that are of smaller size and less prone to “hallucinations”, becomes the best way for humans using Generative AI, whether in vicarious writing or AI-powered mode, to retain greater control of the text. If we consider that AI Agents will play a more important role in the writing process of many content creators, the dynamics of intertextuality, albeit still very asymmetric, become more balanced and less threatening for human autonomy.

Quality vicarious writing is not devoid of human agency by any stretch of imagination. It involves choosing or creating the knowledge base (e.g., uploading specialist documents, providing domain-specific data); defining constraints and goals (e.g., specifying style, tone, or structural requirements); arranging prompt and response flows (e.g., building advanced prompt sequences or instructing the agent to self-iterate); and exercising curatorial judgment (e.g., selecting which AI-produced segments to keep, discard, or further refine). Additionally, AI-supported can feed an AI generic chat interface, or a specialised Agent with domain-specific texts, creating a new textual “weave” that that may be often invisible or incomprehensible to the reader but has its origin in responsible AI-supported work. These layers of interaction demonstrate that AI-mediated intertextuality is not merely a function of the LLM’s algorithmic architecture and socio-technical systems, whether they are interacting with a human author or not. Rather, it is the product of a more agentic textual interplay, guided by a human designer actively directing and enhancing the creative process, whether it is at arms length or more closely.

To conclude this section, the use of the technologies presented so far in this essay will allow AI to act as both a mirror, reflecting cultural data, and a molder, shaping new forms, of literary expression, and more generally human expression. The integration of AI in our creative processes with its capabilities introduces collaborative and iterative processes of creation that intertwines human creativity at technological, technical and literary levels in a constant interaction. Writing with AI involves mixing and remixing our own work with pieces of the vast cultural heritage ingested by the LLMs in their training, which are the outcome of our collective ingenuity, and our collective stupidity. Generative AI also act as a catalyst for the redefinition of intertextuality, altering the politics of knowledge creation by redefining relationships in the corresponding content

ecosystems, be it literary, scientific, or else. This challenges what it means to be an author. However, there is a technological layer of mediation, knowledge bases and Agents, that can be added by the author, direct or remote, individual or corporate, to the process. This intervention defines how the texts produced will relate to social and literary contexts and structures. While the power of AI might seem untamable, it can be more effectively directed through the skills of a technologically-aware writer. Nevertheless, authors who rely heavily on AI might discover their own voice gradually 'dispersed' into algorithmically generated suggestions, raising the specter of a diffuse authorship in which personal style and intentional meaning-making become more elusive.

Another downside of this new paradigm is the apparent lack of shared cultural and historical context in AI-produced texts. AI alters the nature and purpose of literary analysis as we know it. Although there is important work on the identification of asymmetric intertextuality (Lau and McManus 2024), our new paradigm puts textual interpretation between a rock and a hard place. We will deal with this question in the section dedicated to the new methods and science for language.

6. The Tetradic, or Four-way, Mediation

From an epistemological point of view, writing with AI as an individual means managing our present individual, yet socially constructed human inputs in a multidimensional mixer. Generative AI-writing brings together the past and the present, and the collective and the individual, through a more complex process than traditional writing: the individuality and presentness of the writer-user interacts with the individual past input that has been provided by the designers of the AI Agents, which, in turn, acts upon the synthetic version of the collective past resulting from the training of the LLM. However, AI applications are more than mere tools supporting human knowledge construction: they are political linguistic mediators, who articulate, as the text is being produced, a sort of tetradic mediation, a four-ways relationship between these four nodes of knowledge, language, and power that goes beyond a purely epistemological combination of inputs:

a) The collective intellectual, cultural and historic foundations of AI, represented by the vast repositories of human knowledge used in the training of AI, embedded algorithmically in Large Language Models, which become both participants in and a curator of our linguistic and cultural heritage.

b) The collectives that fund, control and design the technologies. This includes the companies that control the trajectories and development of AI technologies according to market-driven or innovation-focused agendas, and

also those who have access to the technology and participate in the design of Agents and other technologies. The power invested on these “corporate” actors, that is not just the simple arithmetic addition of the individual inputs of those who work for them, shape the direction of linguistic norms and practices, and the preservation and production of knowledge. In this second node of the tetradic relation, we must also include emerging public-interest actors who are designing and funding open-source or community-oriented AI. Their influence, while currently limited, can radically change the power dynamics and the distribution of costs and benefits of AI-driven language production. As the literature on the political economy of digital services in education shows (Johnston et al. 2022) (Kerssens and Van Djick 2018), this node constitutes the main space of struggle between community-driven forces and capital-oriented interest.

c) Human users, that partner with AI, whose needs, inputs and interpretations shape, through individual expression and prompting, the responses and functionalities of IA, or even the design of their own Agents. This includes the humans who write “vicariously” through automated processes that they build and control.

d) The authors of the texts whose writings have been incorporated into the knowledge base of the enrich the process, be it by uploading the document to the chat interface or as part of the customisation of an AI agent.

This tetradic relationship reveals that our AI-supported meaning making processes involve an interplay between up-to four sets of nodes. Yet the volatile interplay of these four nodes can produce linguistic shifts at a speed no single actor fully controls, risking a runaway effect in which collective language norms evolve faster than communities or authors can mediate. This highlights the challenges and responsibilities that come with the adoption, or implementation, of Generative AI in our lives, not only politically, as the newcomer is not just a simple guest at the table, but an influential chef in the kitchen of human knowledge, but educationally, as critical AI literacies will need to be fostered with an understanding of Generative AI’s underpinning processes and actors, and not just as users’ digital skills. Evaluation skills, and ethics codes are essential, as the proliferation of texts produced by low-quality Agents, with little or no human user input, and no knowledge base, can deteriorate the value and richness of our own cultures. Synthetic texts, or texts produced with little or no human user direct intervention, a sort of arms-length extremely vicarious authorship, can play a role in the development of new data for the fine-tuning of LLMs (Chang et al. 2024) and have commercial uses (Hann 2024), but it has also become a real threat for language sustainability, as the work of Brooks et al. (2024) suggests. Without explicit safeguards, the synergy among the four components can erode the agency

of speakers and writers, particularly when ill-informed or profit-driven decisions in node (b) overshadow local cultural needs or the historical continuity encoded in node (a).

7. AI as Technological Epiphylogenesis: The Human Journey

To better understand AI's role in human culture, we should turn to Bernard Stiegler's concept of epiphylogenesis ("Epi-" (ἐπι): prefix meaning "upon", "in addition to", or "on top of"; "Phylo-" (φύλον): Referring to "tribe", "race", or "species", often used in biological terms to describe evolutionary development (as in "phylogeny"); "Genesis" (γένεσις): Meaning "origin", "creation", or "formation". Stiegler (1998) argues that technology functions as a "prosthesis" of the human, enabling the exteriorization and accumulation of collective memory. Our body is the "original prosthesis", as explained by Hayles (1999).

For Roberts (2005), Stiegler's framework emphasises the rupture of technics, when the human, as a living being, becomes intertwined in its evolution with the non-living, or inorganic matter, in the form of tools. However, Derrida's notion of "différance" challenges this notion of a clear origin, as for Derrida, the human is constituted through a continuous interplay between interiority and exteriority, without a definitive point of emergence. That is why we need to frame AI's role not as a rupture but as part of the ongoing co-evolution of technics and humanity. AI operates within a zone of uncertainty or "aporetic" space, a concept also used by Stigler (Roberts 2005), that is both human and non-human, simultaneously a product and co-agent in the cultural process. From this perspective, AI is not merely an inert tool but an extension of humanity's cognitive and cultural trajectory. AI is just a new ingredient of this process of epiphylogenesis: a perpetual interplay of exteriorization and constitution that projects human existence outwards, in the form of external migration that builds upon previous layers of human cultural memory and technology.

Like writing or other technical supports, AI preserves and processes human knowledge, influencing and reshaping societal structures. However, because of the training of AI Large Language Models with vast amounts of texts encompassing all our written knowledge, and the AI capabilities, the process of "assemblage" and self-exteriorisation looks almost totalising, and produces a sense "hyperacceleration" (Social Ecologies 2016). This, in turns, generates an existential vertigo, as we speculate with AI's quasi-human status because how it replicates human traits and because of its capacity to act as a tertiary memory system. Coping with the idea that humans have a sort of challenger is complicated. AI training mashes up, distils and repack our knowledge into algorithms. Unlike large libraries, which can be contained physically in buildings,

the relative intangibility of algorithms that host AI capabilities, take human knowledge to a further quasi-spiritual state of self-existence. That is a sort of collective act of transcending which also terrifies us.

In reality, the trajectory of AI as a technology is just part of an intrinsic thread of our journey as a species. With Stiegler (1998), we must consider technology as a supplement of the human, even though tools are also used by other animals (Shumaker et al. 2011). AI is another step in that process that connects our existence and culture in a chain of superimposing “prosthesis”. AI is as human or unhuman as writing, books, cars, coding, mobile phones, or microchips.

Unfortunately, this human journey has been riddled with moments where the tools that were meant to extend our capacities instead risked constraining them, particularly due to the imbalances generated by the capitalist system. If this process of exteriorization, whereby our knowledge, culture, and identity are projected outward into technological forms, is left unchecked, it could reach a halt or even reverse its benefits. AI’s potential impact on human language on a global scale challenges our sense of agency and the foundations of cultural and linguistic diversity.

8. Defining Language Sustainability in the Age of AI

Language, as a vessel of memory and a canvass for emotions and identities, must remain tightly attached to the sphere of human agency. To sustain humanity, we must also sustain language as a cultural and social treasure, resisting the allure of efficiency and uniformity in favour of diversity, creativity, and shared ownership. Language sustainability is an essential component of the human journey of externalisation, and human individual and social control of our direction and purpose of travel cannot be left in the hands of AI, the last prosthesis incorporated to our toolkit.

Therefore, after having examined some of the key aspects of the new technological context for human language, it seems appropriate to attempt to define, at least provisionally, what we mean by Language Sustainability. This challenge-based conceptualisation will have to be developed and refined in further work as other issues resulting from the development and adoption of AI, and not only Generative AI, are identified and discussed.

Language Sustainability can be defined as the aspiration of all human communities to maintain democratic control of their languages and their associated dialects, registers, and cultural practices, to thrive, adapt, and remain vital in the face of socio-technical transformations. Our emerging concept involves:

a) Preserving linguistic diversity and cultural heritage encoded in language, ensuring that minoritised and non-dominant forms of expression are neither marginalised nor erased by globalising technological forces.

b) Upholding human agency in shaping language norms and usage, recognising that technologies like AI, though powerful mediators, must remain accountable to the communities that those technologies serve.

c) Promoting equitable access to the digital and material infrastructures needed for robust language use, so that no community is substantially excluded from the linguistic and cultural benefits offered by advanced AI systems.

d) Safeguarding plurality in language technologies, encouraging diverse, open, and context-sensitive AI models that reflect the values, knowledge, and identity of the communities involved.

e) Ensuring a collaborative stewardship of linguistic traditions and innovations, where public-interest actors, academic institutions, and local communities actively shape AI's ongoing influence on human expression, rather than passively receiving its outputs.

9. New Methods and Fields of Enquiry

The fostering of Language Sustainability needs to stem not only from political determination. It also needs to be supported in as much as possible in scientific evidence and humanistic critique. As a technology, AI represents a bigger step in our trajectory as a species who thinks recursively, talks, listens, reads, and writes. Unlike with the other technologies like internet, mass media, the print or writing, with AI the medium has also become a messenger, and an increasingly influential one. Considering the earlier discussions about large language models (LLMs), customisation, political economy Linguistics will have to expand and reconfigure its focus along the following lines of enquiry:

9.1. *Expanding Linguistics into new fields*

Considering the earlier discussions about large language models (LLMs), customisation, political economy Linguistics will have to expand and reconfigure its focus along the following lines of enquiry:

a) AI-Driven Linguistic Variation: Traditional sociolinguistics has long examined how social factors such as class, ethnicity, age or gender, shape language use. With LLMs, we will see the emergence of AI-driven registers, dialects and styles produced or influenced by algorithmic suggestions. Researchers will need to study how these “machine-led” linguistic variations are received within human language usage.

b) Human Diglossia and Linguistic Stratification in the Face of AI: Traditional diglossia describes the coexistence of “high” and “low” varieties of a language, often assigned distinct social functions. With LLM-based tools, there is a risk that standard or prestigious forms will be reinforced, while minority or marginal forms are insufficiently modelled or overlooked. Sociolinguists will have to develop new frameworks to capture how AI either reinforces or disrupts existing hierarchies and stratifications, especially in multilingual settings where the presence (or absence) of AI support can either uplift or marginalise certain language varieties.

c) AI Language Production and Symbolic Power: Because AI-generated outputs rely on vast training datasets and proprietary algorithms, questions of symbolic power arise. Who decides which language forms are “valid” or “accurate,” and how are these decisions inscribed in AI systems? Further, which cultural norms become encoded in AI “defaults”? Sociolinguists and critical theorists must collaborate to trace the flows of symbolic capital within AI-mediated communication. This might entail examining the political economy of data ownership, relating back to who funds and controls LLMs, and studying how those decisions shape language norms across the globe.

d) Secondary Orality and Multimodality in AI-Mediated Communication: Extending the idea of secondary orality, originally linked to radio and television, AI-mediated communication relies on new forms of “spoken-like” text generation where the boundary between speech and writing becomes ambiguous. As chatbots and agents offer voice and text interfaces, we encounter a multimodal environment (text, voice, images, and more) that merges the immediacy of oral language with the permanence of written text. Researchers will need to adapt existing models of discourse analysis to account for these hybrid registers, asking how human–AI interactions differ from or mimic classic human-to-human oral traditions.

e) AI-Driven Narratives, Identities, and Memory: Given that LLMs can incorporate vast cultural, historical, and literary materials, they shape collective memory and have the power to “author” or reframe narratives about human identity. This will prompt new lines of inquiry into how communities adapt, resist, or embrace these AI reformulations of cultural stories. Scholars must study how individuals and groups use AI tools to reaffirm or question their identities, to construct new communal narratives, or to revive narratives that were marginalised before. Here, sociolinguistics crosses into anthropology, cultural studies, and memory studies in order to evaluate how machine outputs modify or reinforce existing identity markers.

f) Human-Machine Collaboration and Linguistic Agency: The role of the human user in shaping AI outputs—through prompting, fine-tuning, or editing—represents a shared authorship scenario. This challenges existing ideas about how language is produced and who holds agency in discourse. Scholars need to investigate new configurations of co-authorship, examining how knowledge, intentions, and creativity are distributed between humans and machines. This research will also require a political lens, given that the large-scale use of AI in education, commerce, and the public sphere may shift linguistic agency away from individuals to the developers or owners of AI systems.

g) AI Applications as “Speech Act” Makers: Building on the notion that LLM outputs can imitate or propose speech acts, sociolinguists will need to refine or extend speech act theory to situations where the “speaker” is not a human but an algorithmic entity. This includes examining how AI suggestions shape human utterances in real time (e.g., autocomplete and text suggestions) and how AI “utterances” acquire illocutionary force in legal, educational, or professional contexts. Importantly, the ethical and technopolitical stakes are high, as AI speech acts can validate certain discourses while silencing or ignoring others.

9.2. Approaches to Methodology

The development of these new lines of enquiry has also consequences for methods of research and analysis in the study of language. Large corpora of AI-generated text must be examined with new critical filters, combining existing computational methods with qualitative, critical, and interpretive approaches, ensuring that the “why” and “for whom” of AI-generated language are adequately explored. The fieldwork will also evolve to encompass human-machine interactions as legitimate sites of language use, including classrooms with AI tutors, workplaces with automated assistants, social media forums mediated by agents, or AI-driven literature, amongst others. In this new scenario for language science, concepts like “native speaker,” “speech community,” or “language competence” may need redefinition.

As a way of example, let us reflect on the impact of generative AI in textual analysis, in its various forms. Apart from the use of AI for the analysis of corpora, a well-known application of these technologies, amongst other uses in linguistics, to the analysis of text, will hermeneutics themselves change as a result of the complex provenance of AI texts? The question is of relevance also because of what hermeneutics mean in the history of human knowledge and culture. Gumbrecht (2022) identifies “interpretation” and “meaning attribution” as the dominant practices in the Humanities, a legacy from Wilhelm Dilthey,

Gumbrecht claims, and certainly two cultural practices that align human knowledge to the values of the Enlightenment.

If anything, when interpreting an AI-cogenerated or generated text, the politics behind the text, and performed within the text, will require greater attention, and more tools of analysis to assess the AI-human dynamics of the text as a product and as a process. The identification and understanding of the AI contribution to a text, in many possible ways, including framing, will require to inclusion of AI Agent 's knowledge bases, instructions, and characteristics as an underlying voice or factor within that text.

With the adoption of greater levels of AI-powered multimodality, adding an extra experiential layer to literature consumption, the study of literature will also have to focus more on what Gumbrecht considers the material conditions of communication, how the reader experiences culture in a more physical sense. But, as Ramos de Souza's (2023) critique suggests, an attempt to move beyond interpretation and meaning by focusing on material conditions will not fully escape the underlying logic, and the necessity, of hermeneutics. The real obstacle for these renewed hermeneutics lies in the inevitability of the "evasion" of the text (Helgeson 2023), resulting from intertextual productivity and continual reshaping of texts into new contexts. In this scenario, the traceability of different texts will complicate any scientific approach to textual analysis. The textual analytical tools will have to be highly refined and probably, paradoxically, powered by AI itself.

To conclude this section, we must emphasise the great challenge ahead for qualitative and quantitative research on AI-linguistics, as well as other fields such as education, as a result of the proliferation of AI-agents with their own individuality in terms of knowledge base, functionalities and purpose. The findings of great research carried out so far on AI, for instance, the work of Benavides et al., (2025), one of the most comprehensive and well informed pieces on the use of AI in Higher Education, will not be applicable to the research questions explored in their work when the interactions of the users are carried out with specialised AI-Agents, instead of the generic chatbot of ChatGPT, as it is the case in that study. The demands on the research community to explore the impact of AI, within language, education or other social sciences, when faced with crowds of individually different AI-agents will be extraordinary, if not insurmountable. Academic professional of knowledge in their respective fields may have to focus more on critical and intellectual assessment of concepts, principles and practices, and knowledge activism, faced with the impossibility to capture verifiable data on the vastness of situations, and data, to be explored.

10. Responsibilities and Demands

The concentration of power in the hands of a few large tech companies that control the development and deployment of key AI technologies exacerbates existing inequalities, fuelling worries about the monopolisation of AI, which will also lead to exacerbating economic and geopolitical differences between the Global North and the Global South.

What can be done about this? Halt the development of foundation models for six months as an open letter signed by many researchers, critics, practitioners, and tech moguls has recently proposed? Create purpose-built regulations focusing on safety and transparency rules? Extend and apply copyright laws more strictly? Foster the open-source movements already seen by some as powerful alternatives to Big Tech companies? Unbundle services and break up companies that have become too large? (Burkhard and Rieder 2024: 12).

In this respect, Governments must act to address the monopolisation of AI technologies by a few large corporations, ensuring that regulatory frameworks promote transparency, fairness, and inclusivity, with a focus on decentralisation and diversity, directing international co-operation to capacity building and digital sovereignty, to ensure, language sustainability, and more generally economic, cultural and educational sustainability.

Universities and other public interest organisations are called upon to invest in the building of multidisciplinary and multiprofessional digital ecosystems across universities, for instance through supra-institutional consortia. An example to consider is SURF, in the Netherlands, a co-operative of universities for the provision of digital services to its members (SURF, n.d.). This type initiatives would enable effective collaboration beyond closed and restrictive commercial platforms, allowing for the development of AI systems that support educational, cultural and language sustainability. Crucially, since the university sector is hugely atomised, collaboration is even more important for achieving sufficient economies of scale to balance their relationship with big technology providers and ensure a minimum of digital autonomy for themselves, as organisations, and their professionals. That means sharing digital infrastructure, hosting, computing, and staff capabilities with the involvement of other public interest actors, collaborating with open-source communities and businesses, but always retaining control and ownership of the systems developed. As argued by Korseberg and Elken (2024), AI is not a moving target too risky to pursue.

Universities, as key guardians of human knowledge, need to be proactive. A merely reactive regulatory approach is unambitious.

In line with this, universities and public interest actors should work to develop AI knowledge bases for AI Agents and other AI technologies on each knowledge domain. The building and management of these subject repositories should be driven by experts in each subject in order to guarantee accuracy, relevance, and cultural sensitivity. This is not about reinventing knowledge, but about establishing new approaches to curation that make knowledge much more accessible for responsible AI Agents development and other AI related uses. For obvious reasons of economy of scale, the immense task of creating and curating knowledge bases for public interest AI cannot be undertaken by each institution individually, but through inter-institutional, or even supra-institutional open knowledge comprehensive partnerships, as part of wider digital ecosystems of integrated knowledge, infrastructure and capabilities. By promoting open collaboration and sharing of resources across institutions, universities can help break down silos, often reinforced by their choosing of digital platform providers, also for AI, and support global communities and sustainability. This proposal should not be read as a call for the unification of all digital infrastructure for research, education and public interest cultural dissemination in our planet, In our multipolar and regionalised world, many nodes of digital collaboration can live together. However, greater global efforts for the standardisation of open knowledge bases for AI, ensuring Global South and minoritised cultures the presence they deserve, would facilitate our much-needed intercultural enrichment.

In this respect, the UNESCO Recommendation on Open Educational Resources OER (UNESCO 2019) provide principles for the design of sustainable approaches to contribute to the mission of knowledge equity and democratisation pursued by actors across the world (Knowledge Equity Network 2023). The need for integrated approaches to open knowledge is thoughtfully explored in Ramírez-Montoya et al. (2022), who propose a vision for open knowledge ecosystems. Although the UNESCO Declaration of Dubai (UNESCO 2024) suggests the need for AI to be considered a Digital Public Good, the Declaration fall shorts of making concrete recommendations on openness of AI applications. In this sense, the work of communities such as the AI Alliance (AI Alliance n.d.) presents invaluable principles for a sustainable future with AI, and is also an example of how the public interest in the area of AI can be promoted in collaboration with responsible and ethically minded private actors.

Collaborative Partnerships of linguists, ethicists, technologists, and policymakers should be fostered, as the societal implications of AI's linguistic roles demand multi-disciplinary expertise. However, the limitations of standard empirical work to capture the complexity and variability of AI-human interactions in a world of AI-agents suggests that a renewed focus on philosophical inquiry and collective political engagement may prove essential for guiding the responsible integration of AI into society. Consequently, researchers in AI linguistics, education, and the broader social sciences may need to adopt novel modes of inquiry and advocacy that emphasise ethical reflection, critical evaluation of underlying assumptions, and an active involvement, driven by expertise and values, rather than simply scientific knowledge, on AI actual developments.

Governments must play a pivotal role by enacting policies that ensure AI tools are developed in ways that promote linguistic diversity and inclusivity, ensuring that AI development is guided by public interest, knowledge equity, and openness. Governments also need to ensure that the benefits of AI are equitably distributed, with a focus on supporting underrepresented and indigenous languages, and actively addressing Global North-Global South imbalances, directing international co-operation to capacity building and digital sovereignty in the Global South.

Conclusion

As Generative AI becomes increasingly interwoven into our communicative and cultural fabric, its capacity to both redefine and erode linguistic agency raises profound questions about the future of language as a shared, human-centred resource. By reflecting upon the scale and speed at which AI can reshape language, and by recognising the multifaceted interplay of political, economic, and cultural forces that influence the technology, we can more responsibly guide AI's trajectory. Ultimately, safeguarding language sustainability in the AI era demands collaborative, cross-sectoral efforts —uniting policymakers, educators, researchers, and communities to preserve linguistic diversity, uphold equity of expression, and maintain a critical awareness of AI's role in shaping our collective narratives.

In the face of the challenges revealed in this essay, the public interest needs stronger presence and agency in the dynamics of AI adoption. We cannot simply expect that government regulation will save us from a not-so-unlikely dystopian future. Educators, researchers, and cultural workers should create their own agendas, aligned with the wider goal of knowledge equity. As discussed by Olojede (2024), Critical Theory of Technology offers a clear route of democratic

interventions, before and after the adoption of technologies, that inform the rationale of the proposals outlined in this essay. With Richard Hall, the potential for “commoning” presented by Artificial Intelligence becomes an opportunity for reimagining mass intellectuality, appropriating and repurposing AI for social emancipation. (Hall 2024: 12), but this requires concerted knowledge-equity driven effort from all public-interest actors.

References

- ABEGLÉN, Sandra; NERANTZI, Chrissi; MARTÍNEZ-ARBOLEDA, Antonio; KARATSIORI, Marianna; ATENAS, Javiera; ROWELL, Chris (eds.), *Towards AI Literacy: 101+ Creative and Critical Practices, Perspectives and Purposes*. #creativeHE, 2024. Accessed at: <https://doi.org/10.5281/zenodo.11613520>
- AI ALLIANCE (n.d.), *About AIA*. Accessed at: <https://thealliance.ai/about-aia>
- AKYÜREK, Ekin; DAMANI, Mehul; QIU, Linlu; GUO, Han; KIM, Yoon; ANDREAS, Jacob, “The Surprising Effectiveness of Test-Time Training for Abstract Reasoning.” In: *arXiv*. 2024. Accessed at: <https://doi.org/10.48550/arXiv.2411.07279>
- ALIER, Marc; PEREIRA, Juanan; GARCÍA-PEÑALVO, Francisco José; CASAN, María Jose; CABRÉ, Jose, “LAMB: An Open-Source Software Framework to Create Artificial Intelligence Assistants Deployed and Integrated into Learning Management Systems.” In: *Computer Standards & Interfaces*, 92, 2025. Accessed at: <https://doi.org/10.1016/j.csi.2024.103940>
- BARTHES, Roland, *Image, Music, Text*. London: Fontana Press. 1977.
- BENAVIDES-LARA, Mario; RENDÓN CAZALES, Víctor Jesús; RIVAS, Nancy Escalante; MARTÍNEZ HERNÁNDEZ, Ana María del Pilar; SÁNCHEZ MENDIOLA, Melchor, “Presencia y uso de la inteligencia artificial generativa en la Universidad Nacional Autónoma de México”. In: *Revista Digital Universitaria*, 26, 1, 2025. Accessed at: <https://www.revista.unam.mx/ojs/index.php/rdu/article/view/3104>
- BENDER, Emily M.; GEBRU, Timnit; MCMILLAN-MAJOR, Angelina; SHMITCHELL, Shmargaret, “On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?” In: *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency*. Association for Computing Machinery. New York, 2021, pp. 610-623. Accessed at: <https://doi.org/10.1145/3442188.3445922>
- BROOKS, Creston; EGGERT, Samuel; PESKOFF, Denis, “The Rise of AI-Generated Content in Wikipedia.” In: *Proceedings of the 38th Workshop on Fine-*

- Tuning in Machine Learning (NeurIPS 2024)*. Princeton University, 2024. Accessed at: <https://arxiv.org/abs/2410.08044>
- BURKHARDT, Sarah; RIEDER, Bernhard, “Foundation Models Are Platform Models: Prompting and the Political Economy of AI.” In: *Big Data & Society*, 11, 2, 2024.
- CASHEEKAR, Avyay; LAHIRI, Archit; RATH, Kanishk; PRABHAKAR, Kaushik Sanjay; SRINIVASAN, Kathiravan, “A contemporary review on chatbots, AI-powered virtual conversational agents, ChatGPT: Applications, open challenges and future research directions.” In: *Computer Science Review*, 52, 2024. Accessed at: <https://doi.org/10.1016/j.cosrev.2024.100632>
- CHAN, Yung-Chieh; PU, George; SHANKER, Apaar; SURESH, Parth; JENKS, Penn; HEYER, John; DENTON, Sam, “Balancing Cost and Effectiveness of Synthetic Data Generation Strategies for LLMs.” In: *Proceedings of the 38th Workshop on Fine-Tuning in Machine Learning (NeurIPS 2024)*. Scale AI, 2024. Accessed at: <https://arxiv.org/abs/2409.19759>
- CHESLEY, Paula, “Natural Language Processing and the Marginalization of Minority Languages.” In: *Linguistic Justice in the Digital Age*, 2020.
- CHOLLET, François, “It’s Not About Scale, It’s About Abstraction.” In: *YouTube*, 2024. Accessed at: https://youtu.be/s7_NlkBwdj8
- DE CREMER, David; KASPAROV, Garry, “AI Should Augment Human Intelligence, Not Replace It.” In: *Harvard Business Review*. March 18, 2021. Accessed at: <https://hbr.org/2021/03/ai-should-augment-human-intelligence-not-replace-it>
- DOMÍNGUEZ GARCÍA, María Noemí, “El hablar y los participantes en la interacción comunicativa: cuando el interlocutor es artificial”. In: *Biblioteca de Babel: Revista de Filología Hispánica*. Vol. extra. 1, 2023, pp. 409-431. Accessed at: <https://doi.org/10.15366/bibliotecababel2023.extra1.017>
- ELKINS, Katherine, “AI Comes for the Author.” In: *Poetics Today*, 45, 2, 2024, pp. 267-274. Accessed at: <https://doi.org/10.1215/03335372-11092884>.
- EXPERT PANEL, “Why AI Will Never Fully Replace Humans In 19 Agency Service Areas.” In: *Forbes*. May 10, 2023. Accessed at: <https://www.forbes.com/councils/forbesagencycouncil/2023/05/10/why-ai-will-never-fully-replace-humans-in-19-agency-service-areas/>
- GASPAR, Nufar, “25 Agent Predictions for 2025-Part 1.” In: *The AI Daily Brief (Spotify)*, 2024. Accessed at: <https://open.spotify.com/episode/05I3VCY19KF6zZzXGplr2j>
- GUMBRECHT, Hans Ulrich, “A Pioneer on His Work: An Interview with Hans Ulrich Gumbrecht.” In: *Journal of Foreign Languages and Cultures*, 6, 2, 2022, pp. 4-9. Accessed at: <https://doi.org/10.53397/hunnu.jflc.202202001>

- HALL, Richard, "Generative AI and Re-Weaving a Pedagogical Horizon of Social Possibility." In: *International Journal of Educational Technology in Higher Education*, 21, 2024. Accessed at: <https://doi.org/10.1186/s41239-024-00445-6>
- HANN, Tobias, "Introducing Synthetic Text to Overcome AI Training Plateau and Unlock High-Value Proprietary Text Data." In: *MOSTLY AI*. October 1, 2024. Accessed at: <https://mostly.ai/blog/introducing-synthetic-text-to-overcome-ai-training-plateau-and-unlock-high-value-proprietary-text-data>
- HARARI, Yuval Noah, "Why AI poses an existential danger to humanity." In: *The Globe and Mail*. September 6, 2024. Accessed at: <https://www.theglobeandmail.com/opinion/article-why-ai-poses-an-existential-danger-to-humanity/>
- HAYOT, Eric, "Only Persons Intend." In: *Poetics Today*, 45, 2, 2024, pp. 275-281. Accessed at: <https://doi.org/10.1215/03335372-11092898>
- HELGESSION, Stefan, "The Text Is Dead! Long Live the Text!" In: *Deutsche Vierteljahrsschrift für Literaturwissenschaft und Geistesgeschichte*, 97, 2023, pp. 1033-1040. Accessed at: <https://doi.org/10.1007/s41245-023-00230-9>
- HELLSTROM, Erich, "7 Types of LLM Agents: A Comprehensive Guide." In: *PromptLayer*. November 21, 2024. Accessed at: <https://blog.promptlayer.com/types-of-llm-agent/>
- JOHNSTON, Bill; MACNEILL, Sheila.; SMYTH, Keith, "Neoliberalism and the Digital University: The Political Economy of Learning in the Twenty-First Century." In: *Conceptualising the Digital University*. (Digital Education and Learning). Cham: Palgrave Macmillan, 2018. Accessed at: https://doi.org/10.1007/978-3-319-99160-3_1
- KERSSENS, Niels; VAN DIJCK, José, "Governed by Edtech? Valuing Pedagogical Autonomy in a Platform Society." In: *Harvard Educational Review*, 92, 2, 2022. Accessed at: https://dspace.library.uu.nl/bitstream/handle/1874/421489/KerssensVanDijck_HER.pdf
- KNOWLEDGE EQUITY NETWORK (n.d.), "Declaration on Knowledge Equity." In: *Knowledge Equity Network*. Accessed at: <https://knowledgeequitynetwork.org/the-declaration>
- KORHONEN, Panu, "AI is a Solution in Search of a Problem." In: *UX Collective*. February 2, 2023. Accessed at: <https://uxdesign.cc/ai-is-a-solution-in-search-of-a-problem-ab4c6e818206>
- LAM, Vivian, "Human Art Already Has So Much in Common With AI." In: *Wired*. February 24, 2023. Accessed at: <https://www.wired.com/story/generative-art-algorithms-creativity/>

- MARTÍNEZ-ARBOLEDA, Antonio, “A knowledge equity approach to Gen AI in universities.” In: Abegglen, Sandra; Nerantzi, Chrissi; Martínez-Arboleda, Antonio; Karatsiori, Marianna; Atenas, Javiera; Rowell, Chris (eds.), *Towards AI Literacy: 101+ Creative and Critical Practices, Perspectives and Purposes*. #creativeHE, 2024. Accessed at: <https://doi.org/10.5281/zenodo.11613520>
- MAHARI, Robert; PATARANUTAPORN, Pat, “We need to prepare for ‘addictive intelligence.’” In: *MIT Technology Review*. August 5, 2024. Accessed at: <https://www.technologyreview.com/2024/08/05/1095600/we-need-to-prepare-for-addictive-intelligence>
- MICROSOFT (n.d.), “Chat with Copilot about your Word document.” Accessed at: <https://support.microsoft.com/en-us/office/chat-with-copilot-about-your-word-document-4482c688-a495-4571-bfcd-4a9fc6608090>
- MEIREIS, Torsten; RIPPL, Gabriele (eds.), *Cultural Sustainability: Perspectives from the Humanities and Social Sciences*. Routledge & CRC Press, 2019.
- MUSK, Elon; DIAMANDIS, Peter H., “Special Conversation: The Future of AI.” In: *8th Edition of the Future Investment Initiative*. King Abdulaziz International Conference Center, Riyadh. 29 October 2024. Accessed at: <https://youtu.be/3JkkWfzc4Jg>
- NAVANI, Dhiren Amar, “The Commoditization of LLMs.” In: *Communications of the ACM*. September 12, 2024. Accessed at: <https://cacm.acm.org/blogcacm/the-commoditization-of-llms/>
- OLOJEDE, H. T., “Techno-solutionism a Fact or Farce? A Critical Assessment of GenAI in Open and Distance Education.” In: *Journal of Ethics in Higher Education*, 4, 2024, pp. 193-216. Accessed at: <https://doi.org/10.26034/fr.jehe.2024.5963>
- PAYNE, Ameena L.; AUSTIN, Tasha; CLEMONS, Aris M., “Beyond the Front Yard: The Dehumanizing Message of Accent-Altering Technology.” In: *Applied Linguistics*, 45, 2024, pp. 553–560. Accessed at: <https://doi.org/10.1093/applin/amae002>
- PFLANZER, Michael; TRAYLOR, Zachary; LYONS, Joseph. B.; DUBLJEVIĆET, Veljko; NAM, Chang S., “Ethics in human-AI teaming: Principles and perspectives.” In: *AI Ethics*, 3, 2023, pp. 917-935. Accessed at: <https://doi.org/10.1007/s43681-022-00214-z>
- PHELAN, James, “ChatGPT and the Territory of Contemporary Narratology; or, A Rhetorical River Runs Through It.” In: *Poetics Today*, 45, 2, 2024, pp. 197-205. Accessed at: <https://doi.org/10.1215/03335372-11092778>
- RAMÍREZ-MONTOYA, María Soledad; ZAVALA, Genaro; GONZÁLEZ-PÉREZ, Laura Icela; GARCÍA GONZÁLEZ, Abel; BURGOS AGUILAR, José Vladmir,

- Ecosistema abierto en el futuro de la educación. Research Lab Report.* Institute for the Future of Education, 2022. Accessed at: <https://hdl.handle.net/11285/650005/>
- RAMOS DE SOUZA, Gustavo, “Who’s Afraid of Derrida?: Gumbrecht and the metaphysics of presence.” In: *Brazilian Journal of Presence Studies*, 13, 2, 2023, pp. 1-32. Accessed at: <http://dx.doi.org/10.1590/2237-2660126100vs02>
- ROBERTS, Ben, “Stiegler Reading Derrida: The Prosthesis of Deconstruction in Technics.” In: *Postmodern Culture*, 16, 1, 2005. Accessed at: <https://pmc.iath.virginia.edu/issue.905/16.1roberts.html>
- ROTHMAN, Joshua, “In the Age of A.I., What Makes People Unique?” In: *The New Yorker*. August 6, 2024. Accessed at: <https://www.newyorker.com/magazine/2024/08/12/in-the-age-of-ai-what-makes-people-unique>
- SCHMUTZ, Jan B.; OUTLAND, Neal; KERSTAN, Sophie; GEORGANTA, Eleni; ULFERT, Anna-Sophie, “AI-teaming: Redefining collaboration in the digital era.” In: *Current Opinion in Psychology*, 58, 2024. Accessed at: <https://doi.org/10.1016/j.copsyc.2024.101837>
- SHEN, Jocelyn; MIRE, Joel; PARK, Hae Won; BREAZEAL, Cynthia; SAP, Maarten, “HEART-Felt Narratives: Tracing Empathy and Narrative Style in Personal Stories with LLMs.” In: *Proceedings of the 2024 Conference on Empirical Methods in Natural Language Processing*. Association for Computational Linguistics, 2024, pp. 1026-1046.
- SHUMAKER, Robert; WALKUP, Kristina; BECK, Benjamin, *Animal Tool Behavior: The Use and Manufacture of Tools by Animals*. Baltimore: Johns Hopkins University Press, 2011.
- SOCIAL ECOLOGIES, “Epiphylogenesis: On Becoming Machine.” December 13, 2016. Accessed at: <https://socialecologies.wordpress.com/2016/12/13/epiphylogenesis-on-becoming-machine/>
- SON, Jeong-Bae; RUŽIĆ, Natasha Kathleen; PHILPOTT, Andrew, “Artificial Intelligence Technologies and Applications for Language Learning and Teaching.” In: *Journal of China Computer-Assisted Language Learning*, 2023. Accessed at: <https://doi.org/10.1515/jccall-2023-0015>
- STIEGLER, Bernard, *Technics and time*. Stanford, California: Stanford University Press, 1998.
- SU, Yu; YANG, Diyi; YAO, Shunyu; YU, Tao, “Language Agents: Foundations, Prospects, and Risks.” In: *EMNLP Tutorials*, 2024. Accessed at: <https://arxiv.org/pdf/2406.17199>
- SURF (n.d.), “About SURF.” Accessed at: <https://www.surf.nl/en/about>

- TAKATA, Ryosuke; MASUMORI, Atsushi; IKEGAMI, Takashi, “Spontaneous Emergence of Agent Individuality Through Social Interactions in Large Language Model-Based Communities.” In: *Entropy*, 26, 2024. Accessed at: <https://doi.org/10.3390/e26121092>
- UNESCO, “The 2019 UNESCO Recommendation on Open Educational Resources (OER).” 2019. Accessed at: <https://unesdoc.unesco.org/ark:/48223/pf0000383205>
- , “Dubai Declaration on Open Educational Resources (OER): digital public goods and emerging technologies for equitable and inclusive access to knowledge.” 2024. Accessed at: <https://unesdoc.unesco.org/ark:/48223/pf0000392271.locale=en>
- WILLIAMS, Iwan; BAYNE, Tim, “Chatting with Bots: AI, Speech Acts, and the Edge of Assertion.” In: *arXiv: Computation and Language (cs.CL)*, 2024. Accessed at: <https://doi.org/10.48550/arXiv.2410.16645>
- YANG, Zhihao; ZHU, Zhengzhou, “Heuristic question sequence generation based on retrieval augmentation”. In: *Education and Lifelong Development Research*, 1, 2, 2024, pp. 72-82. Accessed at: <https://doi.org/10.46690/elder.2024.02.03>
- ZHANG, Liang; LIN, Jionghao; KUANG, Ziyi; SHENG, Xu; XIANGEN, Hu., “SPL: A Socratic Playground for Learning Powered by Large Language Model.” In: *arXiv: Computation and Language (cs.CL)*, 2024. Accessed at: <https://arxiv.org/abs/2406.13919>