

ARTISTIC TECHNODIVERSITY: A CRITICAL PERSPECTIVE ON ARTIFICIAL INTELLIGENCE IN MUSICAL CREATION¹

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Abstract: Given the rapid proliferation of Artificial Intelligence (AI) within the musical landscape, this article offers a reflexive and practical analysis of its implications for sonic creation. We problematize the ethical and commercial biases inherent in generative tools, critiquing the reductive “human versus machine” dualism that dominates contemporary discourse. To address these complexities, we propose a theoretical framework centered on the concept of Artistic Technodiversity, synthesizing Latour’s ‘quasi-objects’, Tsing’s ‘polyphonic assemblages’, and Hui’s ‘technodiversity’. By deconstructing the pervasive metaphors of the technology industry, this study advocates for a decentralized and pluralistic engagement with digital tools. After exploring these theoretical foundations, we moved on to a practical interrogation of four case studies including practices ranging from sound installation to guided improvisation.

Keywords: Artificial Intelligence; Technodiversity; Musical Creation; Creative Processes.

TECNODIVERSIDADE ARTÍSTICA: UMA PERSPECTIVA CRÍTICA SOBRE A INTELIGÊNCIA ARTIFICIAL NA CRIAÇÃO MUSICAL

Resumo: Diante da rápida proliferação da Inteligência Artificial (IA) no cenário musical, este artigo oferece uma análise reflexiva e prática de suas implicações para a criação sonora. Problematicamos os vieses éticos e comerciais inerentes às ferramentas generativas da atualidade, criticando o dualismo redutor entre “humano versus máquina” que domina o discurso contemporâneo. Para abordar tais complexidades, propomos um arcabouço teórico centrado no conceito de ‘tecnodiversidade artística’, sintetizando os ‘quase-objetos’ de Latour, as ‘montagens polifônicas’ de Tsing e a ‘tecnodiversidade’ de Hui. Ao desconstruir as metáforas onipresentes da indústria tecnológica, este estudo defende um engajamento descentralizado e pluralista com as ferramentas digitais. Após explorar esses fundamentos teóricos, transitamos para uma investigação prática de quatro estudos de caso que abrangem práticas que vão desde a instalação sonora à improvisação guiada.

Palavras-chave: Inteligência Artificial; Tecnodiversidade; Criação Musical; Processos Criativos.

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Introduction

The discourse on AI oscillates between enthusiasm for enhancing human capabilities and fear regarding the concentration of power stemming from the replication of social biases by technologies developed in specific sociopolitical and economic contexts (HUI, 2023, p. 6). This polarization reflects a human-machine duality that limits the analytical scope concerning the complex interactions emerging from our relationship with technology. Such narratives also align with a transhumanist⁴ ideology that aims to disseminate a superintelligence capable of resolving all of humanity's problems, when, in fact, they contribute to the propagation of prejudices and apocalyptic theories (GEBRU; TORRES, 2024). In the realm of art, discussions gravitate toward issues of copyright, creativity, human-machine co-creation, and artistic standardization (ZYLINSKA, 2024). Debates also persist regarding the capacity of machines for creativity and how these discourses, particularly when driven by commercial interests, can hinder the relationship between humans and machines in the creative process (BODEN, 2009, 2021; BOWN et al., 2020; DAVIS, 2021; ZYLINSKA, 2024). Consequently, it is crucial to mobilize a theoretical framework that offers an alternative to centered and monolithic views of this technology, proposing a decentralized mode of thought that is also applicable to artistic processes.

This article aims to offer a critical, theoretical, and practical reflection on AI in art, from a non-hegemonic perspective, structured as follows: (1) a philosophical and anthropological perspective grounded in the conceptions of Bruno Latour (1994) and Anna Tsing (2015), whose works contribute to overcoming the human-machine and human-nature duality; (2) a proposal for technical appropriation based on the concept of *technodiversity*, drawing on Hui's (2020) path for the diversification of technical thought beyond a Western *monotechnology*; and (3) a case study of four artistic projects that employ AI resources, analyzed through the perspective we term *artistic technodiversity*.

⁴ An ideology that views technology as a path to transcend the fundamental limitations of the human condition—such as disease, aging, and even death—promoting an optimistic vision of the possibilities of a post-human future (MORE; VITA-MORE, 2013).

1. Deconstructing *transhumanism*

According to Simondon, the primary cause of alienation in the contemporary world regarding technology stems from a lack of knowledge concerning the nature and essence of the machine's functioning (SIMONDON, 2020). The use of technological resources, when confined to the conceptual frameworks in which they were designed, significantly limits our creative autonomy and capacity for action. Given the complexity of AI resources — the focus of this work — the challenge lies in determining how to employ them without succumbing to dependency and alienation. It is precisely as a response to this limitation that we propose a technical appropriation, aiming for a more conscious and engaged mode of interaction with the machine. We do not advocate that all artists become programmers or computer scientists; appropriation occurs more through a conscious stance than through technical mastery itself. Latour recognizes that “the more the individual is dependent, the less they are free; however, when the person recognizes themselves as dependent, the greater is their margin of action” (LATOUR, 2021, p. 85, ot⁵), and continues:

When the individual attempts to disentangle themselves from things, they constantly stumble upon their limits, moan and complain, are invaded by sad passions, leaving them with little more than indignation and resentment. Yet when the person extends themselves, repopulates, gains distance, we notice that they literally disperse, distribute themselves, mix and recover, little by little, powers to act that they could not even imagine having (LATOUR, 2021, p. 85, ot).

Acknowledging the technical, conceptual, ethical, and human limits of AI, alongside adopting a critical stance regarding this technology, enables a departure from the profit and productivity biases that currently drive technological advancement. This constitutes a political, social, and artistic act. Exercising this distance to achieve a broader comprehension of AI is decisive for grasping the proposed concepts of *technodiversity* and technological appropriation. Consequently, we undertake a critical discussion that first reflects on the advancement of this technology today, observing it from a macro perspective before proposing an analysis of its applications in the realms of music and art.

⁵ Our translation

1.1 *Hybrids or quasi-objects*

The rise of complex entities such as expert systems and digital machines, which in the current context encompass AI, constitutes the materialization of a crisis of representation that Latour calls the *proliferation of hybrids* (LATOUR, 1994, p. 10). Latour defines *hybrids (or quasi-objects)* as the third state of things and subjects; they are beings that originate in the space of mediation (or translation) kept clandestine by the modern constitution. These *hybrids* refuse to be imprisoned in the object-subject duality, nor can they be reduced to mere mixtures of pure forms; “they sketch out imbroglis of science, politics, economy, law, religion, technology, fiction”(LATOUR, 1994, p. 10). Within this conjecture, it is possible to suggest that AI resources act as mediators in sociotechnical networks, distinguishing themselves from simple intermediaries that merely transport pure information. Understanding artificial intelligence as a *hybrid agent* allows us to counter the view of a transhumanist and/or post-human ideology. AI can be seen not as a substitute for the human being, but rather as an agent of active mediation. It transcends the role of a passive intermediary, behaving as an actor that, according to Latour’s conception, possesses the capacity to translate and simultaneously redefine the information it conveys. Consequently, an AI system functions as the stabilization of a heterogeneous network of associations comprising the algorithm (code), the hardware (server), the data (training sets), the engineer (programmer), and the user (interactor). It is within this assembly that the AI establishes itself as a mediator: its operations are not neutral transmissions, but complex translations born from the friction and negotiation between these human and non-human actors. When we refer to the term *agent* we are proposing that AI possesses, as Viveiros de Castro (2013) states, a frozen human action and therefore an intentionality or agency of those who created them. That is to say going against a logic of replacing the human with the machine involves recognizing the human actions that this technology carries.

Applying this discussion to artistic creation enables a shift in focus from a “creative machine” to the mediation of the creative process assisted by AI. In this scenario, artistic practice becomes the field where this construction of subjects and objects is most evident, undoing the illusion of a technology detached from human

practices. When the focus is no longer on whether AI resources will replace humans, even in the arts, we contribute to the deconstruction of human-machine dualities and begin to observe this network of actors (LATOUR, 2011) that are mutually dependent.

It is from this point of consciousness, grounded in a philosophical and anthropological perspective, that a critical stance emerges regarding the current technological revolution. This revolution is often masked by anthropomorphic metaphors that obscure our understanding and, consequently, the application of these technological resources in the arts and human life in general. Although understanding AI as a mediator of this sociotechnical network overcomes transhumanist ideology and allows for the denaturalization of technology (viewing AI as neither pure technique nor pure human), it does not automatically direct a critique toward the political-economic context. Issues of bias, the precarization of labor, and the concentration of power necessitate further analysis through the lens of the capitalist relationships we build with this technology (FAUSTINO, 2023). While conceptual and ethical critiques are fundamental to elucidating technology, creative practice offers a praxis of appropriation capable of contesting the proletarianization (STIEGLER, 2010) of art in the current technical landscape mediated by AI. It is here that the concepts of technological appropriation and the argument for AI regulation and decentralization become relevant, and where the work of Anna Tsing (2015) proves useful.

1.2 Polyphonic Assemblage as a path to Technodiversity

This theoretical discussion regarding AI is primarily justified by what Rouvroy and Berns term *Algorithmic Governmentality*: “a certain type of (a)normative or (a)political rationality that rests on the collection, aggregation, and automated analysis of data in massive quantities so as to model, anticipate, and affect, by anticipation, possible behaviors” (ROUVROY; BERNS, 2015, p. 42, ot)⁶. In artistic production, the indiscriminate exploitation of data from works, pieces, and aesthetic experiences to create generative tools for sound, video, image, and music primarily serves the goals of

⁶ See also (VOROPAI, 2023).

productivity, profit, and wealth concentration for major technology companies (GEBRU et al., 2023, p. 363). Furthermore, this practice results in the standardization of artistic outputs, contributing to the dissemination of prejudices and norms that marginalize productions originating outside the world's major markets and cultural centers (ZYLINSKA, 2020). Bateson (1999, p. 492) characterizes this process of eugenics via technology as an *ecology of bad ideas*:

Let us now consider what happens when you make the epistemological error of choosing the wrong unit: you end up with the species versus the other species around it or versus the environment in which it operates. Man against nature. You end up, in fact, with Kaneohe Bay polluted, Lake Erie a slimy green mess, and "Let's build bigger atom bombs to kill off the next-door neighbors." There is an ecology of bad ideas, just as there is an ecology of weeds, and it is characteristic of the system that basic error propagates itself. It branches out like a rooted parasite through the tissues of life, and everything gets into a rather peculiar mess. When you narrow down your epistemology and act on the premise "What interests me is me, or my organization, or my species," you chop off consideration of other loops of the loop structure. You decide that you want to get rid of the by-products of human life and that Lake Erie will be a good place to put them. You forget that the eco-mental system called Lake Erie is a part of your wider eco-mental system—and that if Lake Erie is driven insane, its insanity is incorporated in the larger system of your thought and experience (BATESON, 1999, p. 492).

Bateson further argues that serious epistemological errors are difficult to disentangle because the erroneous premises are functional and thus remain unperceived (BATESON, 1999, p. 493). Critiquing and countering the post-humanist drive toward AI acceleration is essential to fostering a *technodiversity* of these resources in both social life and art. The problem of bias, or of this *ecology of bad ideas*, is that it benefits only social groups that share similar cultural, social, and economic backgrounds, thereby marginalizing difference, which is a direct result of capitalist policy.

Although Latour's concepts contribute to an understanding of how AI functions within this sociotechnical entanglement, he does not offer a way out of the relationships inherent in this new mode of being. This mode emerges from an encounter defined by precarious capitalist conditions, such as low-paid data labeling workers, dependence on lithium mining in conflict zones, the exhaustion of human attention, and the unauthorized and unremunerated use of artists' work as data. All of these, inherently

based on exploitation and inequality, are mechanisms which converge to render the system economically viable.

To counter this universalizing logic, the concept of *polyphonic assemblage*, proposed by Anna Tsing (2015), focuses on scenarios where construction fails or on the landscapes of ruin left behind by capitalism. Tsing's central interest lies in the process of coexistence. She employs the metaphor of *polyphony* (exemplified by the madrigal and the fugue) to highlight that encounters between diverse beings are frequently characterized by uncertainty, disharmony, and diversity. In these assemblages, the objective is not stability, but rather the manifestation of a provisional coexistence in environments that have been significantly disturbed and *contaminated*.

Precarity is the condition of being vulnerable to others. Unpredictable encounters transform us; we are not in control, even of ourselves. Unable to rely on a stable structure of community, we are thrown into shifting assemblages, which remake us as well as our others (TSING, 2015, p. 20).

Tsing critiques capitalist scalability which seeks reproduction and expansion without limit, because it ignores the complexity and precarity of ecosystems. Commercial AI, embedded within this model, operates as a *monoculture*, fostering a narrow, consumer-driven perspective for big tech companies. The *polyphonic assemblage*, by celebrating the local, the precarious, and the indeterminate, suggests AI not as a universal tool, but as a technical-cultural organism in constant contamination with its multiple environments.

How does a gathering become a “happening,” that is, greater than a sum of its parts? One answer is contamination. We are contaminated by our encounters; they change who we are as we make way for others (TSING, 2015, p. 27).

We inhabit an environment contaminated by new technologies that modify social and economic landscapes, giving rise to new “ways of making worlds” (TSING, 2015, p. 22). Within this context, Tsing critiques the logic of universalization: a product of the capitalist economy that also permeates scientific production. This logic is directly observable in the deployment of commercial AI in recent years, which, rather than

adapting to these new worlds, establishes itself as a dominant model of *monotechnology* (HUI, 2022).

To mix scientific and vernacular forms of evidence invites accusations of bowing down to science. Yet this assumes a monolithic science that digests all practices into a single agenda. Instead, I offer stories built through layered and disparate practices of knowing and being. If the components clash with each other, this only enlarges what such stories can do (TSING, 2015, p. 159).

In contrast to a market increasingly dominated by a few institutions, in which the pursuit of a *monoculture*, a *monotechnology*, and a *monolithic science* prevails, Tsing proposes encounter, contamination, and diversity as practices for the emergence of new approaches situated on the margins of capitalist ideology. Given the concentration of technical, intellectual, and financial resources within large corporations, which drives the production of technological artifacts functionally oriented primarily by the logic of profit and productivity, the appropriation of these artifacts in art constitutes what Tsing describes as “living in the ruins of capitalism.” The capacity to generate new possibilities of use from these encounters can open pathways for a new type of artistic experience. This perspective aligns with what Hui terms *technodiversity*, which is discussed below. Beyond merely providing a theoretical framework, this project aims to manifest *technodiversity* through artistic practice.

2. Towards an *artistic technodiversity*

Derived from the notion of *cosmotechnics* developed by Yuk Hui, *technodiversity* emerges as an alternative to the view of a *monolithic*, universal, and hegemonic technology. Hui begins with the realization that, in modernity, technics has been severed from cosmologies — the symbolic, ethical, and spiritual systems that historically oriented it — becoming governed instead predominantly by an instrumental, economic, and productivist logic.

Technics remained unconscious, then, and yet this unconsciousness began to produce significant effects in the life of the mind at a certain moment in European history, namely the modern era, and this unconsciousness culminated during the Industrial Revolution. The

transformation of this unconsciousness to consciousness characterises the contemporary technological condition. It is a turn, in which one attempts to render technics a part of consciousness, but not consciousness itself (which is why we can understand it as instrumental rationality) (HUI, 2022, p. 225).

In *The Question Concerning Technology in China* (HUI, 2022), Hui argues that technics is never neutral, proposing instead that it remains inherently inseparable from a worldview he terms *cosmology*. This framework suggests that diverse cultures integrate technical practices with their distinct conceptions of the world, nature, ethics, and existence. From this perspective, the West, particularly since the Industrial Revolution, would have precipitated a rupture between technics and cosmos by displacing *local cosmologies* in favor of a mechanistic and universalist view. Under such a paradigm, technics arguably ceases to be an expression of a way of life, being reduced instead to a mere instrument for the domination of nature and the optimization of processes (HUI, 2022, p. 19).

Technodiversity does not just mean that different countries produce the same type of technology (monotechnology) under different brands and with slightly different attributes. In fact, it refers to a multiplicity of cosmotechnics that differ from one another in their values, epistemologies, and forms of existence (HUI, 2020, p. 201, ot).

Hui's conception of *cosmotechnics* resonates with Simondon's discourse on the cultural artifact; specifically, that technical objects are not merely functional entities and resist reduction to mere *instrumentality*. Instead, they embody symbolic, cultural, and social dimensions throughout their ontogenesis, assemblage, and operation. Rather than isolated objects serving pragmatic tasks or commodified gadgets within late-capitalist consumer society, technical artifacts represent the materialization of human thoughts and gestures crystallized in their mechanisms and operational modes, wherein stereotyped human ideas and gestures are translated and deposited, available for their technical resumption (PADOVANI, 2018, p. 37). When interacting with these objects, we are engaging with the human reality locked within them: they embody symbolic, ideological, and cultural values, serving as an expression of the social *associated milieu* in which they were conceived and developed. Both Hui and Simondon reject the notion of autonomous technology devoid of links to the modes of life and cosmologies that

provide its origin and meaning. They argue that these relationships, severed during European modernity, result in a loss of understanding regarding the genesis of objects and their integration with the cultural milieu. For Simondon, this rupture ultimately culminates in technical alienation.

The main cause of alienation in the contemporary world resides in this lack of knowledge of the machine, which is not an alienation caused by the machine, but by the lack of knowledge of its nature and its essence, by its absence from the world of meanings, and by its omission from the table of values and concepts that are part of culture (SIMONDON, 2020, p. 44).

A limited comprehension of, or a strictly utilitarian engagement with, technical artifacts — one lacking in cognitive, artisanal, and psychophysiological depth — precludes the user's ability to interpret the human dimension inscribed within the machine. This superficial relationship facilitates a passive adoption of the inherent biases the machine carries inscribed in its mechanisms. Simondon's project of *mechanology* as a field of transdisciplinary and critical study of technical objects and Hui's proposal of *technodiversity* constitute a categorical refusal of such limited perspective, advocating instead for the necessity of plural relationships between technics and the world. If technics is inseparable from a cultural reality and cultures are inherently plural, then it follows that technologies must also be interpreted, developed, and appropriated in multiple ways, according to the diverse cosmologies that compose human existence.

This perspective implies that the utilization of Artificial Intelligence in musical creation must transcend the status of mere utility or instrumentality entailed by its pretense homogeneity and anthropomorphic standardization. Instead, it should be approached as a field for technical, aesthetic, and dialectic appropriation, moving beyond the dominant paradigms of transhumanist positivism, proletarianized application, and human substitution. As Hui suggests, "the possibility here is not to refuse modern technology, but to analyze the possibility of different technological futures" (HUI, 2020, p. 46, ot).

Zylinska (2020) observes that much of the artistic production involving AI is constrained by a logic of automation and superficial aestheticization, often decoupled

from a critical reflection on the underlying technical systems. However, transformative potential exists in practices that transcend mere reproduction or media generation, acting instead to dismantle, reinvent, and propose new regimes of sensibility and perception. This is exemplified by practitioners who reject standardized Software-as-a-Service (SaaS) platforms to develop their own open-source tools, datasets, and custom interfaces, or who repurpose AI models as core engines for personal audio and video programming rather than mere media generators. By subverting industrial applications through such critical-dialectical interventions and reconfiguring the infrastructure of the machine, these artists move beyond instrumental utility to foster *technodiverse* investigations that diverge from the dominant standards of the technology industry.

This paradigm of generative media and automation reinforces and prioritizes the significance of the finished product grounded in the premise that music and art reside exclusively within the work, the object, the score, or the phonogram. The underlying assumption is that art can be reduced not only to its final product (the sounds of a composition, the images of a painting, the verses of a poem) but also, more problematically, to the digital media file that contains it (an audio file, an image file, a text file).

On the one hand, this reification of art into digital bits reinforces the notion that artistic value is reducible to the final product, effectively disregarding the creative, social, and cultural processes that inform its presentation, reception, and experience, as well as the inherent physical and sensory materiality of art itself. On the other hand, it diminishes the technological dimension of human production to a purely alienated and instrumental utility. Here, technology is relegated to a digital allegory of the Fordist assembly line, a condition so poignantly depicted, way before the digital age, by Chaplin in *Modern Times* (1936).

The autonomous generation of media forces a confrontation with the historical definitions of art, akin to the reproducibility question posed by photography, phonography, and cinema in their respective eras (BENJAMIN, 1936). However, if the capitalist paradigm of AI platforms reduces art to the output of a digital assembly line, a *technodiverse* approach must relocate the artistic site from the product to the technical relation itself. This shift does not merely prioritize process over result; it demands an active engagement with the technological dimension that mediate creative agency.

Such a conscious appropriation aligns with Yuk Hui's assertion that technical inventions always possess a transformative potential that exceeds their initial mental schemes (HUI, 2020, p. 161). As Coeckelbergh (2020) and Santaella (2022) suggest, engaging with AI is less about the delegation of tasks and more about a fundamental reflection on the evolving relationships between human and non-human entities. In this context, *artistic technodiversity* emerges not as a specialized technical pursuit, but as a critical resistance to instrumental alienation. The new AI tools require us to undertake a *mechanological* gesture of study in interpreting, and understanding the operational principles and mechanisms while, at the same time, appropriating them in creative contexts. This Simondonian approach, we believe, may lead to overcome the technopolitical alienation related to the contemporary uses of platform-based AI services and the embedded biases these systems offer.

3. Case Studies

Strategies involving AI in music are not a recent phenomenon, tracing their origins back to the 1950s when the foundational studies and applications were first developed (ACIL, 2024). However, the focus of this work is directed toward the emerging models that have surfaced since 2021. During this period, significant research has been conducted to develop tools and resources for the artistic domain (CAILLON; ESLING, 2021, 2021; DE OLIVEIRA; PADOVANI, 2022, 2025; FIORINI; BROCHEC, 2024; FIORINI; MALT, 2023, 2023; TREMBLAY et al., 2019, among others). While these works often adopt a technical and pragmatic approach, frequently serving as examples that decentralize technological resources from the proprietary control of large corporations, our primary interest lies in the creative application of these resources within musical pieces and experiences. Consequently, we present four projects: *Sonifying the Arctic* and *Stacco*, developed by the Intelligent Instruments Lab⁷; *Esboços* (2024) by Rogério Vasconcelos; and *Inconsciente Artificial* (2025) by the one of the authors. These projects

⁷ Interdisciplinary research group base in Iceland that investigates the role of AI in new musical instruments. Available at: . Accessed on Oct 24, 2025.

exemplify the decentralized use of AI resources and reinforce the concept of technical appropriation, both of which are central to the notion of *artistic technodiversity*.

3.1 Sonifying the Arctic (2024)

The project *Sonifying the Arctic*⁸ (AIDE et al., 2024) is an immersive and exploratory sound installation that reconceptualizes the acoustic environment of *Jökulsárlón National Park* in Iceland through the use of sonification techniques. The work seeks to foster a new perception of climate change by focusing on the communication and dissemination of information through the *affectivization* of data (AIDE et al., 2024, p. 2). This approach explores auditory representations of the complex relationships inherent in environmental transformations.

To achieve this, the artists utilized two distinct types of data collected within the Arctic region. These included climate data such as temperature, wind speed, humidity, and precipitation gathered from a field station, alongside sound data captured via *AudioMoth*⁹ devices, which provided environmental recordings spanning a six-month period.

The creative process aimed to produce a form of digital sound impression, an approach that involved the sonification of spectrograms and the processing of field recording samples through granular synthesis (Figure 1). The resulting auditory display conveys environmental changes by comparing specific data points. While the sound aesthetic resembles ambient music, it incorporates elements of sharp contrast driven by data mappings to make fluctuations in the dataset more perceptible. Within the installation, the recorded sounds served as sound grains, while the environmental data were utilized as parameters to process them.

⁸ Available at: <https://www.youtube.com/watch?v=tEh8JMY4g_8>. Accessed on Oct 24, 2025.

⁹ Open-source acoustic monitoring device used to make sound recordings of wildlife.

Figure 1 - Locais de gravação em *Sonifying the Arctic*

Fonte: Disponível em: <<https://www.youtube.com/watch?v=whyOJVutc84>>. Acesso em: 12 mar 2026.

A significant technical challenge identified by the authors was the interaction between the two datasets, as the climate and sound data presented substantial differences in volume and temporal resolution. While the climate data spanned two and a half years at fifteen-minute intervals, the sound data covered only six months with one-minute recordings every five minutes. To resolve this disparity and impute the missing information, the authors utilized an autoencoder technique originally developed by Macias et al., (2021) for clinical medical data imputation. The primary objective was to explore how these autoencoders would influence the sonification process within an artistic framework.

The appropriation of technical instruments, initially designed for clinical data analysis, as a medium for sound creation not only subverts the original function of the tool but also promotes aesthetic and political experimentation with technology. In the absence of specific tools designed for the highly particular demands of the project, the artists undertook a creative appropriation of a technical solution developed for medicine, a field that is substantially better funded and supported by more robust research investments than the arts.

This application within an artistic piece exemplifies what Tsing describes as “living in the ruins of capitalism,” a concept referring to the emergence of new practices from these unexpected and heterogeneous technological encounters.

Beyond the creative utilization of a tool, this project establishes a critical posture regarding the environmental damage caused by the unchecked exploitation of natural resources, a process in which AI technologies are also deeply implicated.

3.2 *Stacco* (2024)

The project *Stacco*¹⁰ (PRIVATO; SHEPARDSON, 2024) is a digital musical instrument (DMI) developed to facilitate interaction, composition, and intuitive navigation of latent parameters within neural sound synthesis. In the field of audio, the use of neural audio synthesis (NAS) methods, such as RAVE¹¹ streaming autoencoders (CAILLON; ESLING, 2021), has grown significantly because they effectively map audio to control signals in an abstract latent space with low latency. However, the incorporation of these models often fails to expose the processes that lead to the generation of their results, and they tend to distribute the sound characteristics of the dataset unpredictably. It is within this context that *Stacco* operates, seeking to explore the operational possibilities of these latent spaces in practical musical scenarios.

Technically, *Stacco* consists of a laser-cut oval box containing a *Bela*¹² microcontroller and four magnetic attractors (Figure 2). Each attractor combines a magnetometer with a set of magnets located symmetrically below a wooden surface. The performer interacts with the instrument by manipulating magnetic spheres across this surface. The sensors detect changes in the nearby magnetic fields and provide eight continuous data streams. These values are mapped directly to control the RAVE decoder, thereby manipulating the primary parameters of the latent space (PRIVATO; SHEPARDSON, 2024, p. 3 - 5).

¹⁰ Available at: <<https://iil.is/research/stacco>>. Accessed on Oct 24, 2025.

¹¹ *Real-time Audio Variational Encoder*.

¹² Bela is an open-source platform for creating interaction with sensors and sound. Available at: <<https://learn.bela.io/>>. Accessed on Oct 24, 2025.

Figure 2 - *Stacco*

Fonte: Disponível em: <<https://iil.is/research/stacco>>. Acesso em: 24 out de 2025

The project is not limited to manipulation but also investigates methods to stabilize this latent space for the musician. Given the arbitrariness in the distribution of sound characteristics, the authors explored an algorithmic technique known as *model stitching* for application in RAVE. This technical process involves adapting latent spaces between different models, even those trained with the same data but using distinct random seeds. For this purpose, an adapter is adjusted to allow the encoder of one model to communicate with the decoder of another. This technique enables the instrument to maintain a stable mapping from sensor to sound when switching between different RAVE models.

To assist in navigation and the recall of gestures within the latent space, the artists encouraged the use of sketches where performers drew notations directly on the surface of the instrument to facilitate the memorization and repetition of specific trajectories.

The instrument, viewed as a technical-cultural artifact, requires the artist to develop a conscious and critical posture regarding the internal mechanics of the machine. The complexity and unpredictability of the magnetic fields, which mirror the entanglement of the latent space, compel the performer to confront the inherently unpredictable nature of these computational environments. This project underlines the fact that the understanding and perception of the model are redefined through the

performer's practice, artistic intention, and the specific resources afforded by the interface.

Both the training of a proprietary database and the concerted effort to achieve greater control over the tool, specifically RAVE, exemplify a form of *technodiversity* applied to the project's development. In this specific case, we observe the emergence of a new musical instrument that necessitates new ways of thinking, writing, and performing. This evolution arises from the creative appropriation of emerging technological resources that facilitate a novel artistic trajectory.

3.3 Esboços (2024)

The audiovisual piece *Esboços (2024)*¹³, by composer Rogério Vasconcelos (2025), was developed using images generated by AI within the *ComfyUI*¹⁴ environment. Unlike commercial platforms, *ComfyUI* offers significant flexibility in the selection of models and the configuration of processing and learning workflows. Supported by an extensive and open community of developers, this platform enables the creation of diverse approaches and personalized creative flows. While it is an open platform that provides the user with greater control over the end result, its standard application remains closely aligned with conventional tools.

In *Esboços*, the video frames were developed individually, featuring images generated by AI from photographs and film scenes selected by the composer. Although the piece is divided into three parts, they share a methodology for image generation consisting of: (1) the selection of a central model; (2) the choice of a reference image to guide the generation of new imagery through the IPAdapter, which facilitates image generation guided by visual prompts; and (3) the selection of a second image for more precise control of the video frame sequence using ControlNet. This latter tool allows the model to generate images based on geometric layouts, poses, and specific compositions, thereby maintaining the visual coherence dictated by the diffusion model.

¹³ Available at: <<https://www.youtube.com/watch?v=TlgHxz6NB0k>>. Accessed on Dec 02, 2025.

¹⁴ Open-source node-based program for image and audio generation that uses Stable Diffusion as a base model. Available at: <www.comfyui.org>. Accessed on Dec 02, 2025.

The image utilized in ControlNet was altered during each iteration of the generation process. In this stage, frames were extracted from scenes in the films *The Mirror* (1975) by Andrei Tarkovsky and *Zabriskie Point* (1970) by Michelangelo Antonioni. The process was automated via Python, where each generation cycle selected a frame from a film scene sequence to ensure the movement intended by the composer.

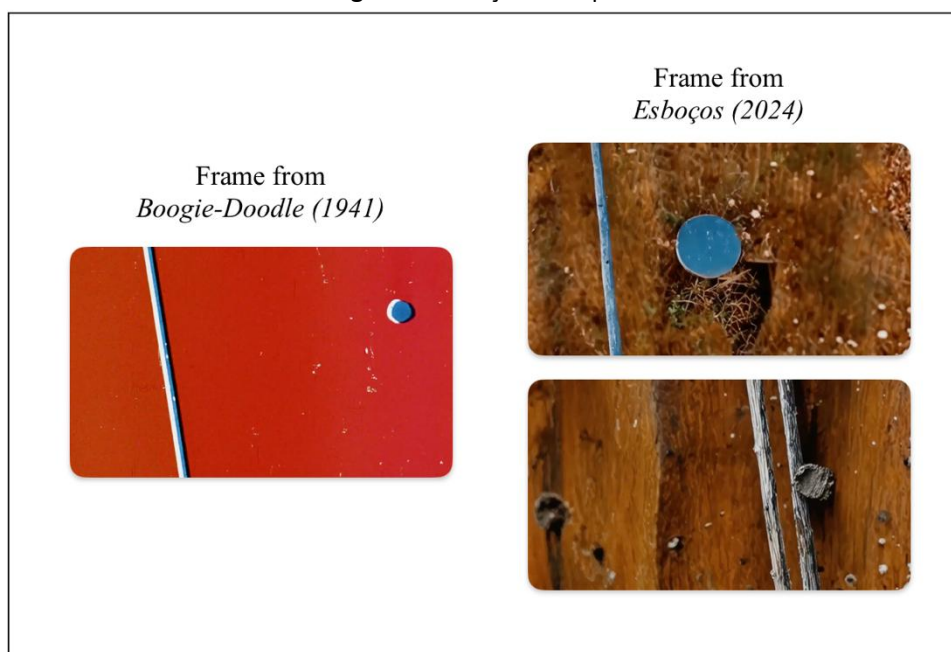
Figure 3 - Esboços example 1



Fonte: Developed by the authors

Based on this technical workflow, the first part of the piece uses a photograph by Sebastião Salgado (2019) taken during the exploration of the Serra Pelada¹⁵ gold mine as the IPAdapter and frames from Antonioni's film for the ControlNet (Figure 3). In the second section, frames from the animation *Boogie-Doodle* (1941) by Norman McLaren were used as the IPAdapter, while a scene from *The Mirror* served as the ControlNet (Figure 4). Finally, in the third and last part, the scene from Tarkovsky's film is utilized as the IPAdapter and Antonioni's as the ControlNet.

¹⁵ Gold mining area in the state of Pará that attracted more than 100,000 people during the 1980s.

Figure 4 - *Esboços* example 2

Fonte: Developed by the authors

Regarding the music, all sound synthesis processes employed symbolic AI, exploring objects available in the *PyO* library for Python. The creative process of this work demonstrates a sophisticated use of video and sound creation tools involving AI processes that are detached from mainstream, popular, or commercial resources. Furthermore, it highlights the possibility of an interaction that affords the artist greater control over the final result.

3.5 *Inconsciente Artificial* (2025)

The piece *Inconsciente Artificial* (2025)¹⁶, composed for bandoneon, saxophone, and *Somax*²¹⁷, problematizes *transhumanist* notions of the machine overcoming the human by utilizing the poetic concept of dreams (ROMAGNA;

¹⁶ Available at: <<https://www.youtube.com/watch?v=iJCijb4HceE&t=93s>>. Accessed on Dec 02, 2025.

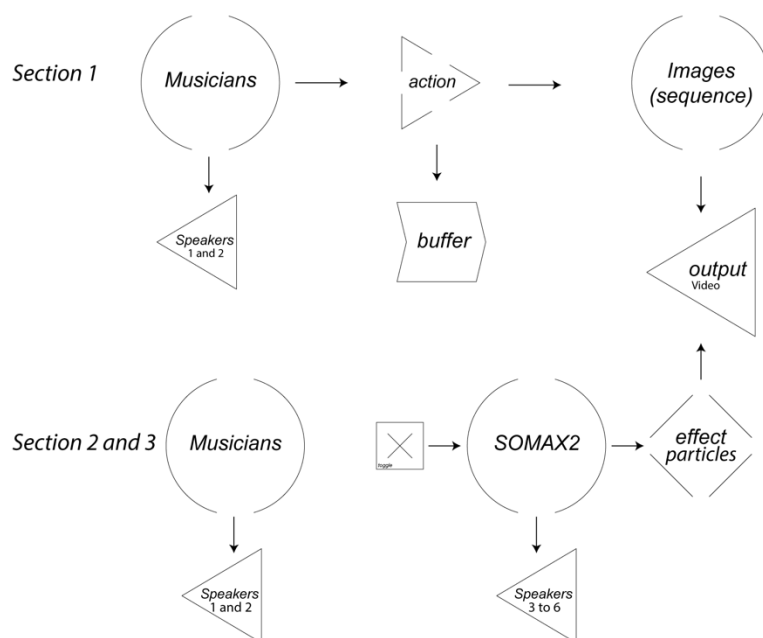
¹⁷ Application for music, improvisation, and composition using AI with machine listening, a cognitive memory activation model, multi-agent architecture, a complete application interface for patching and agent control, and a complete API for the Max library. Developed by IRCAM Paris. Available at: <<https://forum.ircam.fr/projects/detail/somax-2/>>. Accessed on Dec 02, 2025.

PADOVANI, 2025). From a technical perspective, the performance unfolds as a guided improvisation between the saxophone, bandoneon, and Somax2.

Somax2 is a software environment designed for musical improvisation and composition that leverages AI through machine listening, a cognitive memory activation model, and a multi-agent architecture. Its interface permits the precise adjustment and control of agents, complemented by a comprehensive API for the Max¹⁸ library. Developed in Max and Python, the system operates on a generative AI model that facilitates automatic, real-time improvisations that remain coherent with both the style of the internal corpus and the evolving external musical context (FIORINI; MALT, 2023, p. 389). During our study of the anthropomorphic metaphors of AI, we observed that most allegories propagated by the technology industry refer to mental processes and abilities for which there is no definitive scientific understanding. As Boden (2021) states, issues such as creativity, which is often considered the apex of human intelligence, remain extremely mysterious to science. If it is not evident how new ideas arise in people, it is even less so in computers (BODEN, 2021, p. 96). Given this conceptual gap in the understanding of AI-driven creativity, we turned toward a fundamentally human and equally enigmatic domain: the unconscious, materialized through the concept of the dream.

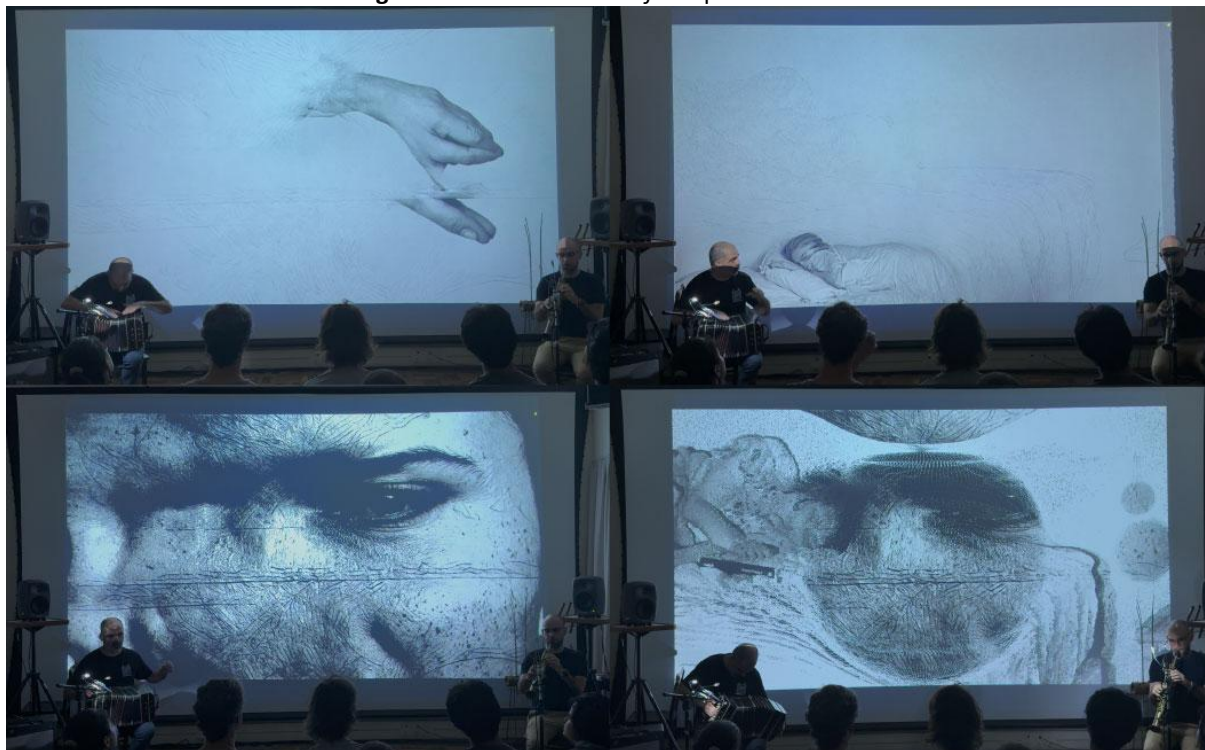
Starting from the premise that the dream is a space of mental freedom (FOUCAULT, 2002; RIBEIRO, 2020), we sought a musical analogue for this manifestation of the unconscious in the form of improvisation. This act involves playing something instantaneously that has not yet materialized, arising as a reflex of the mind in response to sound interaction, the environment, or a previously established but loosely defined framework. It was in this spirit that we opted for an improvisational performance. In *Inconsciente Artificial*, we defined three sections with distinct sound aesthetics, explored through improvisation within a mutual relationship between human musicians and the machine's responses. These moments of improvisation represent the act of dreaming, which is the creation of a narrative in real-time. The allegory proposed in the piece suggests that the machine, lacking the capacity to dream, instead appropriates and stores information by utilizing the sound corpus of the Somax2 buffer.

¹⁸ Visual programming environment for the development of real-time interactive software, applied to audio, video, and system control. Available at: <<https://cycling74.com/>>. Accessed on Dec 02, 2025.

Figure - Inconsciente Artificial form¹⁹**Fonte:** (ROMAGNA; PADOVANI, 2025)

In the second and third sections of the piece, the musicians interact with Somax2. Within these sections, we explored the concept that, while the machine lacks the capacity to dream, its interaction with the musicians can stimulate the production of dreams in the human as a creative stimulus. This is evidenced by how the improvisation changed direction in reaction to the material generated by the program.

¹⁹ The visual language used in this graph is part of a methodological proposal by researcher Marije Baalman for describing sound and visual processes in the analysis and documentation of works involving interactive systems. A detailed record of the symbology is available in the book *Composing Interactions* (BAALMAN, 2022).

Figure 6 - *Inconsciente Artificial* performance

Fonte: (ROMAGNA; PADOVANI, 2025)

Finally, the piece reflected on how interaction with AI tools can contribute to creativity, reaffirming the central role of human subjectivity in the creative process rather than aiming for its replacement.

4 Practical reflections

For Hui, human creativity must take a radically different direction and elevate human-machine relations above the economic theory of replacement and the fantasies of interactivity (HUI, 2023, p. 6). The four examples presented above constitute practices that reflect the theoretical discussion established in previous chapters and contribute to a creative vision of AI resources that exists outside of a commercial and capitalist bias. These projects offer solutions that deviate from the original functions of their respective tools, adapting instead to the specific technical and poetic requirements of the artist.

While the pieces realized by the *Intelligent Instruments Lab* explore the development of tools with a deeper technical focus in an inventive manner, *Esboços* and *Inconsciente Artificial* prioritize a more poetic and practical application of existing

resources. *Sonifying the Arctic* utilizes tools that were not originally developed for artistic ends, whereas *Stacco* deepens a technological resource specifically created for the artistic domain, adapting it to the requirements of a unique musical instrument.

The pieces *Esboços* and *Inconsciente Artificial* were produced within a context of exploring AI tools with an emphasis on inventive and creative possibilities in artistic creation, rather than the development of entirely new technologies for the field. In this sense, we observe an approach that is more accessible to artists who may not possess deep knowledge in the area of computing. This demonstrates that it is indeed possible to subvert the perspective of a ready-made tool by adopting a critical and conscious posture of technological appropriation, resulting in projects that expand the horizons of artistic practice.

Conclusions and future work

In this paper, we presented a critical and practical perspective on the use of AI in musical creation. In light of the vast number of commercial tools available on the market, we problematize the ethical and commercial biases inherent in generative tools, critiquing the reductive "human versus machine" dualism that dominates contemporary discourse. To address these complexities, we conducted a theoretical review centered on the concept of *artistic technodiversity*, synthesizing Latour's *quasi-objects*, Tsing's *polyphonic assemblages*, and Hui's *technodiversity*.

By deconstructing the metaphors of the tech industry, we advocate for a decentralized and *technodiverse* practice using currently available digital tools and resources, even those not specifically developed for artistic practice. Through four presented case studies, we exemplify creative practices that reflect unconventional use and a perspective of technological appropriation by artists, without the need for deep technical specialization. Beyond theoretical concepts, these examples articulated a technodiverse perspective through artistic practice and creation. Such an approach proposes a non-hegemonic use of technology, in which art enables alternative technological futures.

Finally, it is worth noting that this article is part of an ongoing doctoral research project. The issues raised here point to the need for continuous investigation into how

the critical appropriation of AI technologies can foster an *artistic technodiversity* that escapes capitalist interests and represents a new resource for the arts in general.

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Declaration of AI Use

During the preparation of this work, the author(s) used Gemini Pro and Google's NotebookLM to assist with literature review, data systematization, and manuscript revision. After using these tools, the author(s) reviewed and edited the text as needed and take(s) full responsibility for the final content of the publication.

References

ACIL, Tufan. Re-Thinking Boundaries: The Evolution and Impact of AI in Music and Soundscapes. **Avant**, [S. l.], 2024. DOI: 10.26913/ava2202401. Disponível em: <https://journal.avant.edu.pl/index.php/en/article/view/70>. Acesso em: 21 mar. 2025.

AIDE, T. Mitchell; CORRADA-BRAVO, Carlos; CAMPOS-CERQUEIRA, Marconi; MILAN, Carlos; VEGA, Giovany; ALVAREZ, Rafael. Real-time bioacoustics monitoring and automated species identification. *Em*: PEERJ 2024, Macau. **Anais [...]**. . *Em*: INTERDISCIPLINARY CONFERENCE AT THE CROSSROADS OF MUSIC, COMPUTER SCIENCE, EDUCATION, CREATIVITY STUDIES, HUMAN SCIENCES AND ENGINEERING - UBIMUS. Macau p. e103. DOI: 10.7717/peerj.103. Disponível em: <https://peerj.com/articles/103>. Acesso em: 22 out. 2025.

BAALMAN, Marije. **Composing interactions: an artist's guide to building expressive interactive systems**. Rotterdam: V2_Publishing, 2022.

BATESON, Gregory. **Steps to an Ecology of Mind**. [s.l.] : The University of Chicago Press, 1999. v. 26 Disponível em: <https://www.jstor.org/stable/446833?origin=crossref>. Acesso em: 4 dez. 2025.

BENJAMIN, Walter. The Work of Art in the Age of Mechanical Reproduction. *Em*: **Classics in Media Theory**. 1. ed. London: Routledge, 1936. p. 9–23. DOI: 10.4324/9781003432272-2. Disponível em: <https://www.taylorfrancis.com/books/9781003432272/chapters/10.4324/9781003432272-2>. Acesso em: 8 jan. 2026.

BODEN, Margaret A. Computer Models of Creativity. **AI Magazine**, [S. l.], v. 30, n. 3, p. 23–34, 2009. DOI: 10.1609/aimag.v30i3.2254.

BODEN, Margaret A. **Inteligência artificial: uma brevíssima introdução**. São Paulo, SP: Editora UNESP, 2021.

BOWN, Oliver; GRACE, Kazjon; BRAY, Liam; VENTURA, Dan. A Speculative Exploration of the Role of Dialogue in Human-Computer Co-creation. **Proceedings of the 11th International Conference on Computational Creativity**, [S. l.], p. 25–32, 2020.

CAILLON, Antoine; ESLING, Philippe. **RAVE: A variational autoencoder for fast and high-quality neural audio synthesis**. , 2021. DOI: 10.48550/arXiv.2111.05011. Disponível em: <http://arxiv.org/abs/2111.05011>. Acesso em: 29 maio. 2025.

CASTRO, Eduardo Viveiros De. **A inconstância da alma selvagem**. [s.l.] : Cosac Naify, 2013.

COECKELBERGH, Mark. **AI ethics**. Cambridge, MA: The MIT Press, 2020.

DAVIS, Nicholas. Human-Computer Co-Creativity: Blending Human and Computational Creativity. **Proceedings of the AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment**, [S. l.], v. 9, n. 6, p. 9–12, 2021. DOI: 10.1609/aiide.v9i6.12603.

DE OLIVEIRA, Vinícius Cesar; PADOVANI, José Henrique. Map, Trigger, Score, Procedure: machine-listening paradigms in live-electronics. **Revista Vórtex**, [S. l.], v. 10, n. 1, 2022. DOI: 10.33871/23179937.2022.10.1.3. Disponível em: <https://periodicos.unespar.edu.br/index.php/vortex/article/view/4691>. Acesso em: 11 maio. 2025.

DE OLIVEIRA, Vinícius Cesar; PADOVANI, Jose Henrique. conTorchionist: A flexible nomadic library for exploring machine listening/learning in multiple platforms, languages, and time-contexts. [S. l.], 2025.

FAUSTINO, Deivison. **Colonialismo digital: Por uma crítica hacker-fanoniana**. São Paulo, SP: Boitempo, 2023.

FIORINI, Marco; BROCHEC, Nicolas. Guiding Co-Creative Musical Agents through Real-Time Flute Instrumental Playing Technique Recognition. **Hal open science**, [S. l.], 2024.

FIORINI, Marco; MALT, Mikhail. Somax2 – A Distributed Co-Creative System for Human-Machine Co-Improvisation. *Em*: LUKOWICZ, Paul; MAYER, Sven; KOCH, Janin; SHAW-TAYLOR, John; TIDDI, Ilaria (org.). **Frontiers in Artificial Intelligence and Applications**. [s.l.] : IOS Press, 2023. DOI: 10.3233/FAIA230106. Disponível em: <https://ebooks.iospress.nl/doi/10.3233/FAIA230106>. Acesso em: 28 out. 2024.

FOUCAULT, Michel. **Problematização do Sujeito : Psicologia, Psiquiatria e Psicanálise**. [s.l.] : Forense Universitária, 2002. v. I

GEBRU, Timnit; JIANG, Harry H.; BROWN, Lauren; CHENG, Jessica; KHAN, Mehtab; GUPTA, Abhishek; WORKMAN, Deja; HANNA, Alex; FLOWERS, Johnathan. AI Art and its Impact on Artists. *Em: PROCEEDINGS OF THE 2023 AAAI/ACM CONFERENCE ON AI, ETHICS, AND SOCIETY 2023*, Montréal QC Canada. **Anais [...]**. . *Em: AIES '23: AAAI/ACM CONFERENCE ON AI, ETHICS, AND SOCIETY*. Montréal QC Canada: ACM, 2023. p. 363–374. DOI: 10.1145/3600211.3604681. Disponível em: <https://dl.acm.org/doi/10.1145/3600211.3604681>. Acesso em: 25 abr. 2025.

GEBRU, Timnit; TORRES, Émile P. The TESCREAL bundle: Eugenics and the promise of utopia through artificial general intelligence. **First Monday**, [S. l.], 2024. DOI: 10.5210/fm.v29i4.13636. Disponível em: <https://firstmonday.org/ojs/index.php/fm/article/view/13636>. Acesso em: 27 maio. 2025.

HUI, Yuk. **Tecnodiversidade**. [s.l.] : Ubu Editora, 2020.

HUI, Yuk. **The question concerning technology in China: an essay in cosmotechnics**. Third corrected edition ed. Falmouth: Urbanomic, 2022.

HUI, Yuk. ChatGPT, or the Eschatology of Machines. **e-flux Journal: Brooklyn, NY - USA**, [S. l.], n. 137, 2023.

LATOUR, Bruno. **We have never been modern**. 3. print. ed. Cambridge, Mass: Harvard Univ. Press, 1994.

LATOUR, Bruno. **Reagregando o social**. [s.l.] : Edusc - Editora Universidade Do Sagrado Coração, 2011.

LATOUR, Bruno. **Onde estou?: Lições do confinamento para uso dos terrestres**. Rio de Janeiro, RJ: Bazar do Tempo, 2021.

MACIAS, Edwar; SERRANO, Javier; VICARIO, Jose Lopez; MORELL, Antoni. Novel Imputation Method Using Average Code from Autoencoders in Clinical Data. *Em: 2020 28TH EUROPEAN SIGNAL PROCESSING CONFERENCE (EUSIPCO) 2021*, Amsterdam, Netherlands. **Anais [...]**. . *Em: 2020 28TH EUROPEAN SIGNAL PROCESSING CONFERENCE (EUSIPCO)*. Amsterdam, Netherlands: IEEE, 2021. p. 1576–1579. DOI: 10.23919/Eusipco47968.2020.9287343. Disponível em: <https://ieeexplore.ieee.org/document/9287343/>. Acesso em: 22 out. 2025.

MORE, Max; VITA-MORE, Natasha. **The transhumanist reader: classical and contemporary essays on the science, technology, and philosophy of the human future**. Malden: Wiley-Blackwell, 2013.

PADOVANI. The solfège of technical objects: notes on the potential contribution of Gilbert Simondon to sound studies and arts. **Interference Journal**, [S. l.], v. February, n. 6- Out of Phase, p. 31–45, 2018.

PRIVATO, Nicola; SHEPARDSON, Victor. Stacco: Exploring the Embodied Perception of Latent Representations in Neural Synthesis. *Em: NIME24 2024, Utrecht. Anais [...]. Em: NEW INTERFACES FOR MUSIC EXPRESSIONS - NIME. Utrecht*

RIBEIRO, Sidarta. **O oráculo da noite: a história e a ciência do sonho**. São Paulo, SP: Companhia das Letras, 2020.

ROMAGNA, Afonso Felipe; PADOVANI, José Henrique. Inconsciente artificial: estratégias tecno-poéticas na criação e improvisação musical com IA. *Em: ANAIS DO XXXV CONGRESSO DA ANPPOM 2025, Campo Grande - MS. Anais [...]. Campo Grande - MS: ANPPOM, 2025. Disponível em: <https://anppom.org.br/congressos/anais/>.*

ROUVROY, Antoinette; BERNS, Thomas. Governamentalidade algorítmica e perspectivas de emancipação: o díspar como condição de individuação pela relação? **Revista Eco Pós**, Tecnopolíticas e Vigilância. [S. l.], v. 18, n. 2, Tecnopolíticas e Vigilância, p. 36–56, 2015.

SALGADO, Sebastião; SALGADO, Lélia Wanick. **Gold: Serra Pelada gold mine**. Cologne [Paris]: Taschen, 2019.

SANTAELLA, Lucia. **A inteligência artificial é inteligente?** São Paulo, SP: Edições 70, 2022.

SIMONDON, Gilbert. **Do modo de existência dos objetos técnicos**. [s.l.] : Contraponto, 2020.

STIEGLER, Bernard. **For a New Critique of Political Economy**. Cambridge, UK: Polity press, 2010.

TREMBLAY, Pierre Alexandre; GREEN, Owen; ROMA, Gerard; HARKER, Alex. From Collections to Corpora: Exploring Sounds through Fluid Decomposition. [S. l.], 2019.

TSING, Anna Lowenhaupt. **The mushroom at the end of the world: on the possibility of life in capitalist ruins**. Princeton: Princeton University press, 2015.

VOROPAI, Lioudmila. **Future(s) of Art in the Age of Algorithmic Governance: Speculative Policies, Desirable Institutions, Disruptive Scenarios – Umbau**. 2023. Disponível em: <https://umbau.hfg-karlsruhe.de/posts/future-s-of-art-in-the-age-of-algorithmic-governance-speculative-policies-desirable-institutions-disruptive-scenarios>. Acesso em: 4 abr. 2026.

ZYLINSKA, Joanna. **AI art: machine visions and warped dreams**. First edition ed. London: Open Humanities Press, 2020.

ZYLINSKA, Joanna. Diffused Seeing: The Epistemological Challenge of Generative AI. **Media Theory**, [S. l.], v. 8, n. 1, p. 229–258, 2024. DOI: 10.70064/mt.v8i1.1075.

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