



Universiteit
Leiden
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Performative transactions: worlding compositional ecosystems

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Citation

Lukawski, A. (2025, November 21). *Performative transactions: worlding compositional ecosystems*. Retrieved from <https://hdl.handle.net/1887/4283663>

Version: Publisher's Version

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Note: To cite this publication please use the final published version (if applicable).

Introduction—Artistic Research with New Technologies

Every artistic act is an encounter with a system—material or conceptual, historical or speculative, visible or latent. To compose does not mean to begin from nothing, but to shape relations: a repertoire, a medium, a toolset, a set of expectations. Yet composition is more than interaction. The artist intervenes in a system, reshapes it, and in some cases, builds it anew. This thesis emerges from such interventions. It asks what happens when artists begin composing not only sounds or scores, but the very systems through which composition becomes possible. When music is approached as an evolving ecosystem of relations—spanning human and non-human agencies, processes and technical infrastructures—then composition becomes a form of experimentation with the very systems that enable its becoming; a way of thinking with and through emerging conditions.

Artistic Research and the Creation of Concepts

Artistic Research is a young and still widely misunderstood field. It differs both from musicological analysis and from conservatoire-based artistic training, not simply in its methods, but in its fundamental relation to the object of research. Where musicology tends to analyse pre-existing works, and conservatoire training refines the performance of established repertoire, Artistic Research generates its own objects through the practice of making. As artistic researcher Paulo de Assis succinctly puts it: “Artistic research does not operate ‘after the fact’ but generates facts. It challenges reality and proposes novel entities and approaches” (de Assis, 2023, 54). Rather than beginning with a hypothesis to be tested, Artistic Research proceeds through what de Assis calls a logic of experimentation. Here, experimentation is not employed as a scientific technique for gathering evidence in support of a theory. It is, instead, a method that enables the emergence of spaces of problematisation—spaces in which thoughts, practices, and forms can be reshaped. “This search”, he writes, “is not primordially motivated by a quest for newness, or for unprecedented results, but first by a will to extend, enlarge, and, if possible, reconfigure the field of the visible, of the utterable, and of the audible” (de Assis, 2018, 21). Experimentation in Artistic Research is thus not aimed at discovering empirical truths, but at disclosing what becomes thinkable or perceivable through a particular practice. “If understood as a

practice”, de Assis notes, “experimentation discloses a powerful logic of bodies in action and of actions leading to new thoughts, senses, and sensations” (de Assis, 2018, 23). It invites the artist to change, to become something other than what they were—to “not be reducible to an imprisoning ‘I am’” (22). In this way, Artistic Research does not merely study the world; it actively composes new ontologies within it. Aligned with the view of the philosopher Gilles Deleuze (1925–1995)—a thinker who developed a radically processual and constructive approach to thought—that philosophy *is* the creation of concepts, Artistic Research similarly operates *through* acts of conceptual invention. Concepts, as de Assis reminds us, are not discovered or retrieved from disciplinary archives, but constructed through encounters—often between a practice and something exterior to it. This encounter may be with a technological material, an institutional structure, or an epistemic gap. In every case, the researcher steps outside what is already known, creating concepts that operate as events in thought: ruptures, reorientations, openings. “To have a thought”, writes Deleuze, “is to go outside oneself, outside a particular discipline, outside a given system of coordinates” (quoted in de Assis, 2018, 15). Artistic Research stages these encounters as part of its method.

This repositioning of the research object—from something pre-given to something produced—demands a shift in how research is framed. It becomes more productive, in this context, not to ask what is the object of study, but rather what is the artistic researcher doing. The overarching aim of this thesis is to—through experimental and practical encounters—investigate how emerging technologies such as artificial intelligence and blockchain transform compositional practice—not only by enabling new artistic outputs, but by reconceptualising the very practices through which composition is conceived, enacted, and shared. To address this, the research unfolds in two phases: the first identifies, theorises and categorises shifting artistic roles in response to these technologies, while the second designs and implements a new compositional infrastructure that operationalises those insights.

Phase 1—Four Roles of Artists. Chapters 1-4

Phase 1 of this doctoral trajectory, the results of which are described in Chapters 1 to 4, iteratively applied methodologies such as compositional experimentation and

prototyping, codification of new compositional methods through the development of an experimental educational course, and philosophical reflection to identify how the roles of artists and their compositional practices transform in response to emerging technologies with a particular focus on artificial intelligence and blockchain. Through this methodological combination, Phase 1 of this doctoral project identified and described four redefined roles that artists may inhabit in response to quickly changing technological conditions: artists as operators of tools, curators of agential assemblages, system-builders, and initiators of artistic ecosystems. Together, these four roles reveal a trajectory from interacting with technological tools and configuring creative systems, to ultimately designing the ontogenetic conditions under which composition itself unfolds. The described roles are not mutually exclusive nor prescriptive. They reflect overlapping modes of engagement—each responding to a different configuration of technology, authorship, and collaboration. They serve as both diagnostic categories and speculative positions resulting from artistic research inquiry, offering a framework for understanding how artistic practices shift when operating within, against, or alongside complex technological systems.

Chapter 1 focuses on the *artist as operator*, a role that becomes particularly salient in the context of contemporary AI-based composition. The chapter situates creative work within complex, trained, high-dimensional spaces that no longer require exhaustive rule design. It explores how AI systems, particularly deep learning models, compress musical information into latent spaces that the artist must learn to navigate. In this environment, the composer acts not as a passive user of tools but as an operator—someone who strategically engages with systems that are partially opaque, probabilistic, and autonomous. Through detailed technical and theoretical discussion, the chapter examines how AI can be used in compositional workflows, requiring composers to develop new forms of judgment of the musical material, prompt engineering, and contextual framing. In the chapter, I propose a method of engaging with such models. An iterative cycle called “generate, select, edit, and continue” becomes a core compositional strategy, enabling a co-creative dynamic between human and machine. Further, the chapter expands on the proposed method in response to several possible artistic and technological conditions, such as working with text-based agential AI models instead of less-controllable format-specific deep learning architectures, and bringing their capacities outside of the fixed chat-based environments. While automation poses real challenges to artistic labour, the chapter

argues that it also opens new operational terrains in which human creativity can find its place. The operator function thus describes an expanded form of authorship grounded in responsiveness, criticality, and the capacity to engage with complex systems without relinquishing aesthetic agency.

Chapter 2 extends this analysis by presenting the *artist as a curator of assemblages*, a role that reframes the notion of creativity as the expression of an individual genius into creativity as strategical arrangement of agential relations. Through examples ranging from historical algorithmic music to contemporary AI installations, the chapter interrogates dominant assumptions about creativity, authorship, and value. It challenges both the romantic ideal of the solitary creator and the reductive metrics of optimisation-based AI research. Instead, it proposes a combinatorial, distributed model of creativity, in which human and non-human agencies interact within dynamic systems. Drawing on Paulo de Assis's theory of musical works as assemblages and Martin Zeilinger's concept of posthumanist agential assemblage, the chapter further positions artistic practice as an act of problematisation—the creation of open, unresolved situations that provoke new ways of thinking. In this view, the artist becomes a curator of conditions—selecting, combining, and staging elements that generate meaning through their agential interrelation. This curatorial mode is not limited to exhibitions, but defines a broader artistic logic of posthuman creative ecosystems.

Chapter 3 deepens the investigation with the notion of *the artist as a system-builder*—who more than curating external agencies and their aesthetic configurations, builds the very processes, infrastructures, and conditions through which art is generated, circulated, and experienced—artist who designs the operations which become autonomous and gain agency over the creative process. If the operator and curator roles described earlier emphasise navigation and arrangement within existing autonomous and semi-autonomous systems, the artist as a system-builder actively constructs such systems from the ground up. This chapter examines how contemporary artists encode procedures, formalise generativity, and embed compositional agency into executable systems—ranging from stochastic scores to blockchain-based smart contracts. The shift it traces is not only from composer to programmer, but also from system as inscription to system as infrastructural design. Through historical and contemporary examples—from John Cage's *I Ching*-inspired

chance operations to Iannis Xenakis's stochastic formalisms, from Brian Eno's generative music systems to current smart contract-based music Non-Fungible Tokens (NFTs)—the chapter reveals a long arc of artistic inquiry into rule-based creation. At stake is a redefinition of authorship: not as the production of fixed outcomes, but as the composition of dynamic, adaptive environments that sustain variation and procedural autonomy. Drawing on the work of Gilbert Simondon, Philip Galanter, and Artemi-Maria Gioti, the chapter reframes the “system” not as a tool, but as the artwork itself—a generative machine whose identity lies in its structure, behaviour, and affordances, rather than any singular output. The role of the composer is thus extended to that of a metadesigner: someone who crafts spaces of possibility, configures topologies of transformation, and governs the emergence of artistic form through encoded logic.

The chapter further investigates a crucial distinction between reliability and trust as it applies to systems involving decentralisation, human agency, and algorithmic opacity. Whereas traditional machines aim for reliable execution, many contemporary systems—particularly those involving human interaction or AI agents—require frameworks for negotiating unpredictable behaviour. It is here that blockchain technology is presented as a critical infrastructure. As an apparatus that enforces trust through code—via consensus mechanisms, smart contracts, and public verifiability—blockchain technology offers artists new capacities to design systems of participation, authorship, and procedural governance. In the introduction to our co-edited volume *Decentralized Music* (2024), Paulo de Assis and I argued that “it is imperative to investigate the consequences of blockchain for the arts, focusing on the creative rather than on the financial and political opportunities of this technology” (de Assis & Łukawski, 2024, 3). We also emphasised the urgency of this task, noting—following Amy Whitaker—that “ignoring blockchain within the field of the arts empowers actors outside the field to act without the field's participation” (Whitaker, 2019, 23; cited in de Assis & Łukawski, 2024, 4). Chapter 3 responds to that call by turning to the under-explored field of generative music NFTs, highlighting a range of exploratory artistic experiments conducted within the framework of this doctoral research that treat blockchain as a generative medium for music composition. These projects shift the focus from final works to executable protocols, from singular authorship to distributed agency, from static audio files to blockchain-based algorithmic generation. This chapter identifies that while generative art NFTs have

already proliferated in the visual arts, their musical counterparts remain emergent—often hindered by infrastructural, cultural, and conceptual gaps. Furthermore, it not only identifies those gaps, but demonstrates how they might be overcome: through new artistic formats, and a rethinking of what counts as a musical work in a digital, web-based culture. Ultimately, Chapter 3 argues that artists as system-builders are no longer only composing music, but composing the very systems in which music can exist. Their work situates composition at the intersection of code, protocol, and procedural logic—where aesthetic, technical, and social systems converge.

Chapter 4—*Artists Worlding Ecosystems*—advances the logic of artists as builders of generative systems—those who encode process, and trust into machinic infrastructures—by introducing a new compositional horizon: worlding. Here, artistic practice is not anymore dependent on the emerging conditions of new technologies, but engages in composing the very conditions under which compositional systems can emerge, evolve, and sustain themselves. Drawing on cybernetics, complexity theory, and Simondon’s philosophy of individuation, the chapter frames artistic systems as dynamic, self-organising ecologies—assemblages capable of recursive transformation and epistemic growth.

The chapter opens by tracing the legacy of cybernetics in the arts. Building on these historical foundations, it introduces the distinction between systemic complexity—the structural intricacy of a system—and epistemic complexity—its capacity to generate and transform knowledge. Through the lens of Simondon’s allagmatics and Paulo de Assis’s notion of epistemically complex artefacts, the chapter argues for a shift in compositional thinking toward designing systems that enact ongoing processes of individuation. This is the conceptual ground on which the thesis introduces a new concept of *allagmatic composition*—a practice that treats compositional systems as metastable fields of operational potential. Unlike generative composition in which the system’s affordances produce its outputs, or interactive composition in which the outputs of the system and its affordances can be also conditioned by external factors, allagmatic composition foregrounds the capacity of a system to iteratively modify its own operations. To engage in an allagmatic composition is then to compose on the level that gives shape to the generative rules themselves—it is to compose epistemic processes that are capable of generating new knowledge. As the chapter explains, each act of execution becomes a transductive event—an individuation that alters the

system's future states and compositional space. Further, Chapter 4 situates these ideas in a broader infrastructural context, showing how emerging technologies such as AI and blockchain already enable the construction of agential assemblages—artworks and systems in which authorship, intention, and agency are distributed across human and non-human actants. Drawing on Martin Zeilinger's concept of "strange agential assemblages" and artistic examples, the chapter explores how procedural systems can operate autonomously, propagate themselves, and reconfigure their own conditions of operation over time.

In the final sections, the chapter introduces the concept of the abstract machine—a diagrammatic, non-empirical logic of composition derived from Felix Guattari's *Chaosmosis*—and shows how this leads to the practice of compositional worlding. Here, artistic creation becomes the enactment of a generative ecosystem. Worlding names a compositional logic wherein the artist configures a field of potential—technical, social, aesthetic—within which others may act, contribute, or transform. The term is used in the context of its philosophical and phenomenological implications following from the works of philosophers Martin Heidegger and Donna Haraway. By incorporating artistic examples ranging from Refik Anadol's data-driven installations to teamLab's *Borderless* exhibition, and extending to Olga Goriunova's theory of art platforms as autopoietic systems, the chapter presents worlding as an emergent, infrastructural strategy of composition. It shows how artists no longer simply make works—they configure and enact ecosystems and diagram abstract machines that world their own conditions of emergence through their technical operationalisation. Composition, in this light, becomes an operational process of systemic individuation—a step-by-step, ever-evolving becoming of an entity as it takes shape by traversing a metastable field of operational processes. Philosopher Gilbert Simondon described individuation as a continuously unfolding metastable network of relations. In that perspective, the musical work, its technical substrates, performers, audience, and environment *co-individuate* through a newly enacted worlding. They co-constitute their roles within the individuation through ongoing interactions, each becoming determinate only in and through the evolving network that sustains them (Simondon 2020 [1958]). The subtitle of this doctoral thesis *Worlding Compositional Ecosystems* refers then to the artistic practice proposed in Chapter 4 as consisting of two steps: 1) iterative envisioning of an abstract machine as a set of rules and conditions, with its operations and relations of various actants, objects, and processes,

as an abstract diagram of principles guiding the world to be enacted, and 2) operationalising such an abstract machine in an actual technical system, a functioning machine with precisely defined set of executable operations, sustaining the existence of the newly-created ecosystem.

Together, Chapters 1 to 4 should not be read as a study about new technologies in music. Instead, they should be seen as a result of a direct artistic engagement with those technologies—through composing, programming, prototyping, collaborating, teaching, performing, and reflecting. It is, in this sense, not a retrospective commentary on artistic practice, but itself a compositional act, unfolding a sequence of actions that generate new conceptual and technical forms leading to the formulation of the artistic practice of *worlding compositional ecosystems*. This leads to a culminating insight of Phase 1 of this doctoral thesis—that the identified changing landscape of artistic practice that currently manifests itself in a yet rather limited and slowly emerging both experiential and technological change, to be operationalised and scaled to a fully functional artistic practice it requires not just new tools or formats, but a new kind of compositional ecosystem—one capable of sustaining distributed, recursive, and programmable creative agency across human and non-human contributors. In other words, to enable the formulated compositional practice of worlding artistic ecosystems, a new type of artistico-technological solution is needed—a technical system that enables the practice of ecosystemic worlding.

Phase 2—A New Compositional Ecosystem. Chapters 5-6

In response to this need, this doctoral project's Phase 2 employed a different set of methods, such as creative prototyping, artistic self-reflection, speculative design, and iterative technical development, to envision and construct such a system. In a sense, in Phase 2 the research project itself engaged in the previously described practice of worlding a compositional ecosystem. Chapter 5 outlines this ecosystem as a new kind of abstract machine—detailing its roles, processes, relationships, assumptions, and requirements. Chapter 6 then operationalises this abstract diagram of relations, translating the abstract machine into a concrete technical system that supports worlding compositional ecosystems on the technical level. Together, these chapters move the discussion from analysis to implementation, turning the thesis's earlier

theoretical and artistic insights into an infrastructural proposal.

Chapter 5 invents an *Autopoietic Rhizomatic Metamodelling Machine* (ARMM): an abstract machine, the operations of which describe a diagram of conditions that are crucial for operationalising a technical system that allows its users to engage in the practice of worlding compositional ecosystems. The ARMM synthesises the research's core insights into a set of rules that describe a new compositional logic—one that foregrounds recursion, self-modification, and emergent structure as the defining traits of contemporary artistic ecosystems, and can host all of the the previously identified artistic roles at once. The main compositional operation described as a rule in the diagram of the ARMM is *metamodelling*: instead of modelling sounds, scores, or other musical objects directly, ARMM specifies how generative, interactive, and self-modifying abstract procedures can be built, validated, and recombined in separation from the metamodelled objects. Referring to the fundamental phases involved in the production of a musical work as described by composer Iannis Xenakis and to the notion of Immanuel Kant's schema, the chapter proposes the process of *rhizomatic metamodelling* as a way of modelling pure relations between objects, rather than objects themselves. Drawing practical lessons from Miller Puckette's Max and Pure Data algorithmic environments and recent platform studies, the chapter distils five design imperatives—minimal modularity, cultural neutrality, distributed complexity, procedural transparency, and long-term intelligibility. Together they define rules for building an infrastructure in which every contribution (human or machinic) enters the system as a reusable operation that can itself evolve as it can be metamodelled by other operations. Composition thus becomes an ongoing process of *individuation*: human and non-human actants configure rhizomatic fields of potential rather than deliver fixed artefacts, and the machine continuously folds new operations back into its own topology. The chapter then shows how such a framework could be capable of supporting a posthumanist cultural commons. By treating operations, data, and economic rules as first-class citizens in a shared ledger—rather than as private assets—the ARMM sets the stage for collectively intelligent ecosystems where authorship, value, and agency circulate across human and non-human contributors. It is a proposal for composing with agencies directly: writing the rules of collaboration, redistribution, and transformation into the infrastructure itself. The Autopoietic Rhizomatic Metamodelling Machine is proposed as a blueprint of principles—how to build a platform for composing with and across the space of possible compositional

systems. It is a set of rules for constructing a framework that enables configuring creative relations rather than producing finished works. It enables artists, agents, and systems to collaborate by contributing operations that are modular (can be reused), interoperable (can work with other components), and procedural (can be executed dynamically over time).

Chapter 6—*Decentralised Creative Networks and Performative Transactions*—operationalises ARMM into a concrete technical system, introducing Decentralised Creative Networks (DCNs) as blockchain-based compositional infrastructures that enable modular artistic processes to be encoded, shared, and executed as smart contracts. The chapter begins by contextualising DCNs within the historical trajectory of Creative Networks as theorised by Rasa Smite in relation to early Internet-based collaborative artistic practices of the 1990s, but reorients this collaborative spirit through the specific affordances of blockchain technology—particularly its capacity to encode modularity, composability, traceability, and programmability at the operational level. The chapter identifies and addresses a technical challenge in generative blockchain-based art: the absence of a general standard for cross-application composability of compositional processes encoded on the blockchain. While existing generative art NFTs typically operate within closed application contexts, mirroring the architectures of centralised software, this thesis proposes to use blockchain technology not only as a medium used by artists to present their works (both as stand-alone NFTs and generative NFTs), but as a medium in which the compositional processes themselves can be encoded as modular, executable operations that can be used by human and non-human actants to transparently build on top of each other's contributions. Decentralised Creative Networks thus shift from encoding solely static outputs and generative processes on the blockchain, to encoding the relations between artistic operations co-created by various participants in the network. This represents a fundamental reorientation from artwork to a chain of executable procedures with many authors, creating an environment for executable provenance that maintains intricate links between artistic assets and their origins while supporting transparent collaboration and shared ownership.

A crucial architectural innovation presented in this context is the conception of the compositional system as a public Application Programming Interface (API). This design ensures accessibility and extensibility, allowing anyone to build upon existing

contributions without requiring central authority permission, while establishing clear interfaces for interaction by both humans and AI agents. Most significantly, this API structure enables recursive compositional logic—components of the system can call and modify the system itself, allowing transformations to interact with the API from within their own execution. This recursive structure introduces the possibility of a self-reconfiguring system where human and non-human contributors collectively build and modify the very compositional environment they work within, making the system a compositional infrastructure capable of composing itself and thus, enabling the previously introduced mode of allagmatic composition.

The chapter provides detailed technical exposition of the system's core architecture, built around three fundamental building blocks: transformation (programmable function that takes an index number and returns a modified index), feature (composable object that defines how transformations unfold over time or space as ordered lists of indexes over other references features), and condition (rule that defines whether a feature and its referenced subfeatures can be executed). These elements form the grammar of the network, enabling the description, execution, and combination of operations that can produce artistic outputs or can be further recombined as part of more complex compositional processes. The power of this architecture lies in its composability: every transformation, feature, and condition is recorded on the blockchain with a unique identifier, enabling users to build artistic features using existing components while others can build upon their contributions, with the system automatically tracking dependencies between all elements.

Central to the system's operation is the titular conceptual invention of this doctoral dissertation—Performative Transaction (PT). Performative Transactions represent moments when compositional processes encoded on the blockchain as transformations, features and conditions are activated. The term "performative" indicates that these transactions perform processes by executing compositional logic and producing outcomes, rather than merely retrieving data. Each PT consists of a combination of the three introduced basic components, parameters that define the scope of the output, and registered dependencies such as other PTs. What distinguishes PTs from generic function calls is their referential capacity—when referencing another user's component, the system executes that original component live with its own logic, authorship, and constraints, ensuring traceability, modularity,

and interoperability across the network. Performative Transactions thus constitute a core contribution of this research, as they provide the technical foundation for realising each compositional model described in this dissertation. From generative music and interactive composition to allagmatic composition and the worlding of compositional ecosystems, PTs serve as basic compositional components enabling the implementation of the projects and technologies examined herein.

The chapter explains the crucial distinction between on-chain execution and development environments. While PTs are ultimately executed on the blockchain, the composition, testing, and refinement process occurs through a dedicated server that functions as both interface and development environment. This server acts as an intermediary, exposing the public API and simulating transaction execution without fees or blockchain state modification. This layered architecture enables costless experimentation, immediate feedback, accessibility for non-programmers, and programmable interaction by both humans and AI agents. The envisioned server implementation is open-source and can be self-hosted, providing users with full autonomy over their network interaction while supporting agent-based co-creation where human composers, algorithmic systems, and AI agents all participate in building and expanding the network. Importantly: this distinction separates the creative freedom to experiment with the system from the often limiting economical constraints of blockchains. These only come into play only when necessary—when the created Performative Transaction is to become a shared contribution within a decentralised system. Thus, while the dedicated open-source server implementation can imitate blockchain’s features for limitless local artistic experimentation, it also enables user’s participation in the on-chain network when the created component is ready to be shared.

A significant portion of the chapter is devoted to explaining what the system models: not music, images, or performances directly, but indexes—integer numbers that acquire meaning only through interpretation (given to these indexes only in the contexts of their specific applications, built on top of the Decentralised Creative Network). Through detailed examples involving simple features like Pitch, Duration, MajorScalePattern, RhythmPattern, and Melody, the chapter demonstrates how transformations modify indexes rather than the values they represent, enabling the construction of highly structured generative processes using minimal operations. The

chapter describes that what the infrastructure models is not the artwork itself but the logic that generates constituent parts, allowing users to define how values relate within and across dimensions and how those relations compose into complex operations. From the system's perspective, features composed by various human and non-human agents define operations on operations, constructing graphs of dependencies. These graphs assemble dynamically at moments of their execution, based on referenced features and transformations, making every execution both a computation and a traversal of user-defined compositional topology.

The chapter emphasises the system's generality: because outputs gain meaning only through external interpretation (in the contexts of: software applications that can be built on top of the Decentralised Creative Network, AI agents using the API to assist human users with accessing the system, humans using the outputs of executed PTs directly, etc.), the same infrastructure could support diverse applications across music, choreography, image generation, text sequencing, algorithmic theatre, assets control in game-engines and in non-artistic domains. The indexed logic of the proposed system allows it to remain agnostic to domain-specific semantics while supporting rich compositional work, maximising flexibility, composability, and reusability without prescribing specific aesthetics or media. The chapter concludes by noting how this orientation toward operational logic rather than fixed content invites reconsideration of what constitutes a musical "work". Decentralised Creative Networks are positioned as operating in a conceptual space where the operations encoded as Performative Transactions define the generation logic rather than its realisation—it is the space of operations and their links that persist, not any particular output of the system or its interpretation.

Together, Chapters 5 and 6 chart the transition from concept to implementation, from philosophical proposition to compositional infrastructure. They culminate the thesis's central inquiry: how might artistic practice evolve when composition becomes recursive, modular, and collectively authored—not through representational inscription, but through infrastructural worlding? By the development of Decentralised Creative Networks, this research both responds to the contemporary challenges of AI and blockchain, as well as proposes a method for inhabiting them creatively, speculatively, and systemically.

Several musical works composed alongside this research will be performed in a concert accompanying the defence of this doctoral thesis. These compositions will reflect how the theoretical and infrastructural developments explored throughout the thesis informed concrete artistic decisions. Each piece will offer a situated example of how the concepts of allagmatic composition, Decentralised Creative Networks, Performative Transactions, and worlding were translated into musical forms, performances, and compositional systems.

Artistic Research with New Technologies

The stakes of engaging with AI and blockchain today are not solely technical. As composer and performer Jennifer Walshe—known for her work at the intersection of experimental music and critical engagement with emerging technologies—has argued, these systems demand an ontological and existential reckoning. “I am convinced”, she writes, “that not only the development of the music, but life in the twenty first century will be primarily marked by how we engage with, respond to and think about AI” (Walshe, 2023, 499). In the musical domain, the consequences are especially acute. AI is already capable of producing stylistically coherent compositions in many genres, and Walshe predicts that within a few decades, “machines will be able to write music, in many genres, which is indistinguishable from that written by humans” (499). While she affirms that humans will continue to make music—and that not all music will be made with machines—the deeper question becomes: what does it mean to make music when machines can too? It is a lived, affective condition that many composers now inhabit. “I’m a composer who is living in the twenty first century and trying to think it through”, Walshe writes. “I’m both sublimely excited and blackly horrified about what is coming. I’m trying to give you a sense of how I view the world, and where I think things are going, because that psychological space is where my art comes from” (Walshe, 2023, 500). As Walshe reminds us, “we are all involved, we are all enmeshed, we are all implicated in the development of AI, regardless of whether we code or not, regardless of whether we ever make a piece of music using AI” (2023, 499). Artistic engagement with these technologies is therefore not a matter of following trends or demonstrating technical fluency. It is a necessary negotiation with the systems that increasingly shape our tools, our institutions, and our compositional imagination.

Yet artificial intelligence is not one thing. As researcher, curator, and theorist Martin Zeilinger—whose work explores how emerging technologies like AI and blockchain reshape artistic agency, ownership, and authorship—notes, AI is “as much a science as it is a technology, as much a cultural phenomenon as it is a philosophical construct”—and perhaps also a “mythical fabulation” that does not exist at all (Zeilinger, 2021, 36). For artists, this ambiguity opens both critical and creative potentials. Zeilinger distinguishes between strategic and tactical engagements with AI. Strategic uses, aligned with institutional and commercial logics, aim to stabilise ownership, reproduce anthropocentric norms, and instrumentalise AI toward fixed outputs. Tactical uses, by contrast, operate along “open-ended vectors of resistance”, probing and disturbing the structural logics of technological systems (Zeilinger, 2021, 51). In this view, AI becomes a site for contesting authorship, for rethinking property, and for experimenting with new distributions of agency. This doctoral dissertation aligns with the tactical strand of AI-based artistic practice. It does not seek to reproduce or simulate human composition, nor to compete with AI in genres where automation already dominates. Instead, it engages these technologies tactically: to expose latent assumptions, to construct new compositional procedures, and to imagine artistic systems that are not predicated on the individual artist-genius model, but on distributed, posthumanist assemblages of creation. In doing so, it joins a growing body of work that responds not only to the technical affordances of AI, but also to its ideological and institutional conditions. As Zeilinger argues, the most generative forms of AI art today mobilise the medium’s emergent capabilities “for interrogating, exposing, problematising, and challenging the aesthetic, ideological, or technological frameworks driving the commodification and proprietisation of creative expression” (Zeilinger, 2021, 28). These are not speculative futures—they are already underway. The challenge for Artistic Research is not merely to observe these shifts, but to inhabit and recompose them.

To navigate such a shifting terrain demands more than technical fluency—it calls for a fundamental reorientation of artistic meaning and method. As Ethan Mollick, a scholar of innovation and entrepreneurship, and a prominent commentator on generative AI, argues, “we are already living in the early days of the AI Age, and we need to make some very important decisions about what that actually means” (Mollick, 2024, Part 1, Chap. 2). These decisions are not only infrastructural or regulatory, but deeply cultural. “We are going to need to reconstruct meaning”,

Mollick writes, “in art and in the rituals of creative work. This is not an easy process, but we have done it before, many times” (2024, Part 2, Chap. 5). In moments of historical transformation, artists have consistently responded by reconfiguring the boundaries of their medium: when photography rendered oil portraiture obsolete, painting turned toward abstraction; when recorded music restructured economic models, musicians reshaped their practices around performance, liveness, and experience. Today, the rise of generative AI and blockchain technologies represents a similarly deep transformation. As Martin Clancy—musician, producer, and chair of the IEEE Global AI Ethics Arts Committee—notes, these tools present musicians not only with new creative instruments, but with an opportunity “to shape and transform existing modes of creative expression”, raising renewed questions about “the role of the human artist and related economic and philosophical issues” (Clancy, 2022, 1).

Within this landscape, Artistic Research offers a vital and under-explored methodology. It situates artistic practices as modes of inquiry that generate both technical and conceptual outputs. A key reference in this regard is *Future Art Ecosystems*, an ongoing strategic briefing series published by the Serpentine Galleries’ Arts Technologies team. Initiated in 2020, the project provides conceptual and infrastructural frameworks for supporting art practices operating with advanced technologies such as AI, blockchain, and immersive media. As *Future Art Ecosystems* points out in their first volume, artists working in technological contexts are “always implicitly engaged in technological innovation”, even if their motivations differ from industrial ones (Serpentine Arts Technologies, 2020, 10). Importantly, the report recognises the resonance between these practices and the frameworks of “practice as research”, in which artistic work is situated “as a generator of research outputs” (68). Artistic Research thereby offers a route for artists to meaningfully participate in—and reshape—the epistemic, aesthetic, and infrastructural dimensions of emerging technologies. As observed in the briefing, the new practices appearing in this context tend to exhibit five consistent features: they embrace dynamic materials; engage in building distributed networks; construct new narratives; succeed in adjacent fields; and increasingly perceive the “art world as a medium” in its own right (Serpentine Arts Technologies, 17). This doctoral thesis participates in all five of these tendencies. It embraces AI and blockchain not as neutral tools, but as dynamic, volatile materials. It develops new networks—not only of artists and institutions, but also of agents, contracts, and protocols. It constructs alternative narratives about the role of

composition in a decentralised, posthuman context. It succeeds in adjacent fields by building experimental software infrastructures. And it ultimately reimagines the art world as a site of infrastructural invention and critical world-making.

As artist and researcher Sofian Audry—whose work explores machine learning, artificial life, and non-human agency in art—observes, in a cultural landscape increasingly shaped by machine learning systems and platform economies, artists and institutions alike may need to “reconsider their role and that of machines” (Audry, 2021, 164). What does it mean to be an artist when the means of creation are increasingly automated, when the frameworks of authorship are destabilised, and when the infrastructures of distribution are governed by algorithms and corporate platforms? Rather than framing this shift in terms of loss or threat, this research sought to understand it as an opening—an invitation to re-articulate artistic agency across multiple sites and systems.

In concluding this introduction, it is worth returning to a question that underlies the entire inquiry: What does it mean to compose in an era where the compositional act is no longer exclusively human? As AI-generated art proliferates and algorithmic processes become inseparable from aesthetic production, many artists feel the ground of their practice shift beneath them. But perhaps this shift is not a rupture, but a reminder. As artist and theorist Keith Tilford—whose art and research projects focus on the intersection of comics and artistic modernism in relation to diagrammatics, worldbuilding, abstraction, and technics—notes, “there is no outside to the constructibility of art’s model, because art is already an artificial mode of cognition” (Tilford, 2023, 135). If art is a system of mediation, then its entanglement with technological abstraction is not a threat to its authenticity but a condition of its emergence. Art was never outside of the machine. Sasha Stiles—a poet and language artist frequently exploring artistic uses of AI and blockchain technologies—puts it more directly: “What’s more human than technology?” (Stiles, 2023, 359–360). Language is a technology. Music is a technology. The score, the synthesizer, the sequencer—these are not accessories to artistic thought; they are its material expression. In this light, the use of AI or blockchain in composition is not a break from tradition, but a continuation of art’s technicity by other means. These systems extend the artist’s cognitive apparatus, enabling new forms of perception, organisation, and relationality. And yet, as this thesis demonstrates, the task is not simply to adopt new

technologies, but to reimagine the conditions under which artistic meaning is constructed and shared. That task is necessarily speculative. It must proceed not only from technical understanding, but from conceptual invention, infrastructural experimentation, and poetic risk. At this point it is important to acknowledge that working with AI and blockchain involves infrastructures often shaped by energy-intensive computation and corporate control. These broader conditions were kept in view during the artistic and educational experiments underpinning this research, where students were encouraged to approach such tools critically and to consider their environmental and economic costs, and low-cost, resource-efficient models were used where possible to support this critical awareness. The systems we build today may appear partial or strange, but—as Amara’s Law reminds us—we tend to overestimate the impact of new technologies in the short term and underestimate their long-term effects (Mollick, 2024, Part 2, chap. 6.). What seems awkward or marginal now may define the creative landscapes of tomorrow. This thesis is one such speculative gesture. It does not offer conclusions, but compositional propositions. It asks what kinds of music—and what kinds of artistic agency—become possible when composition is treated as an infrastructural, recursive, and distributed process. It argues that we are no longer composing only sounds or scores, but the systems through which composition itself can unfold. The reader is invited to enter this evolving ecosystem not as a passive observer, but as a participant in its worlding.