

## references



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# preface

The title for this thesis comes from an early memory. Without an abundance of organized memories, I still maintain a clear mental image of this corridor. It belongs to a first period of separation from reality, a generator of narratives intended to build sense. Building backwards the parameters for a Markov chain<sup>1</sup> to generate the time sequence that predicts and explains the present.

The title sets up a journey of exploration, with a hidden aspect, and the intention of uncovering it. The story ( if there is any ) revolves around what is behind the door, why it is closed, and what it means as a memory.

The corridor leading to the closed door is a path of self-discovery and confrontation of personal fears. It implies a setting that is limiting and confined, adding to an atmosphere of tension lived in Uruguay until the restoration of democracy in 1985. The closed door is the focal point of such tension. It represents a barrier between protection and isolation, between reality and imagination, history and fiction.

In this context, I explore the themes of curiosity, the fear of the unknown, and a tendency to be constantly drawn toward the off-limits. What is the dark if not a manifestation of the unknown? It's a driving force for widening the senses and understanding the environment.

This thesis is the reflection of my current ongoing introspection, an exploration of the negative space of the memory, and an attempt to confront possible pasts in possible realities. As explored by Roland Barthes in his essay "The death of the author"[Barthes, 1967], meaning in this thesis arises from intertextual relationships between chapters and ideas.

This book is written in ~~TeX~~ (tug.org) and managed as code. The scripts and fragments that compile into this text are available through the following link:

<https://github.com/n2048-creative-technology/thesis>.

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<sup>1</sup>A Markov chain is a mathematical system that moves between different states based only on the current state, not on how it got there. It relies on evaluating the probabilities (or weight) associated with the transition between any two possible states.

# introduction

```
w = 'w = {}{}{}'; print(w.format(chr(39), w, chr(39)))';  
print(w.format(chr(39), w, chr(39)))
```

There is stubbornness in the craft of casting materials through mold making, despite how rewarding it can be. Its whole process makes it hard to allow for later changes. The mold is not the memory of a piece, nor its essence, but it will define its final shape. Is the environment in which we grow and develop ourselves such a kind of mold?

I remember only fragments about my own past, but I've spent the last few years making stronger efforts to understand the ways in which I perceive my own "umwelt", why I react, and what I react to. What shaped this current way of thinking? Without an objective memory of my own history, creating versions of this multidimensional mold in which I've cast my way of perceiving has become an iterative process of re-creation.

*% recursive alterations allow for a progressive reshaping of perception.*

The small snippet of code under the title of this chapter is called a Quine. It is a program that produces its own source code as output, exemplifying a form of computational self-reference.

*% The quine and implies a connection between software, computer models and a human tendency for self-replicating based on our current understanding of reality.*

Gödel's incompleteness theorem proves that any formal system capable of expressing arithmetic contains statements that refer to themselves cannot be proven true or false within the system. It shows that a self-referential system cannot demonstrate its own consistency. This means that any attempt at complete self-referential closure inevitably leads to undecidability or incompleteness, as there are always truths outside the system's ability to demonstrate them.

Yuk Hui's *Recursivity and Contingency* [Hui, 2019] explores the relationship between technical systems, philosophy, and computational logic. He describes recursivity as a form of self-referentiality in technical, biological, and philosophical systems. However, Hui introduces contingency as the space for unexpected possibilities and alternative configurations beyond purely deterministic, recursive closure. His idea of contingency refers to the openness, indeterminacy, and possibility of alternatives beyond deterministic or purely recursive systems. Contingency interrupts recursion, allowing for emergence and transformation.



Gödel's theorem resonates with Hui's argument in that recursion alone does not guarantee self-sufficiency. Systems require contingency to evolve beyond a rigid self-reference. Gödel's results problematize deterministic, computationalist views of reality, aligning with Hui's critique of purely recursive structures in cybernetics.

Hui's philosophical contingency implies that no system can fully determine its own future. There is always the possibility of disruption, reinterpretation, and reconfiguration. Openness, creativity, and evolution require the ability to break out of purely recursive structures.

Perhaps the notion of a quine, or of a self-referential system, relates to the idea of creating our own model of the world, and the difficulty of interpreting the reality as something different than the one that is predefined in our brains.

This thesis unfolds in a way that rejects conventional linearity, mirroring the associative and non-hierarchical characteristics of neurodivergent mental processes. The chapters that follow are not meant to be read as a sequential narrative but as a network of interconnected thoughts. Each one exploring a different facet of my own experience: the fragmented nature of memory, the challenges and strengths of neurodivergence, the tension between determinism and uncertainty, and the role of technology in shaping experience. These themes emerge through theoretical discourse, computational and scientific metaphors, artistic reflections, and lived experience, constructing meaning through their interplay rather than through a singular perspective.

In this way, the thesis resists being a closed system. Instead, it is an open-ended inquiry, an invitation to consider how we construct knowledge, navigate uncertainty, and engage with the world through non-linear processes.

```
text = ""
```

```
This thesis attempts to express a way to relate to the world  
from my own neurodivergent perspective. One that is explained  
and presented from a neuro-normative point of view, and yet,  
it can't prove itself. Hopefully it will allow the reader to  
connect the different topics here contained in an unstructured  
way, following non-linear timelines, as I do.  
""
```

```
s = 'text = "{}"\n\ns = {!r}\nprint(s.format(text, s))'  
print(s.format(text, s))
```

memory

The military dictatorship in Uruguay that started in 1973 finally came to its end in 1985. By that time, I was 5 and carefully kept away from all the struggles and terrors that happened during that period. Even though I have no personal memories of the dictatorship itself, the societal impacts of the regime had a significant influence. I don't know why I remember that corridor, or why that door was closed every evening. What's certain is that it divided the apartment in two separate realities. On mine, there's no sound. I can't avoid creating evolving narratives that reflect the fluidity of memory itself.

Many families of the children born around the 1980s were deeply affected by state repression. Parents who were political dissidents, union activists, or simply suspected of opposing the regime often faced imprisonment, torture, or exile. If not the near family, friends of any close connection to this situations would affect the dynamics of tension and increased anxiety. Political discussions were often avoided for protection, creating an atmosphere of silence and fear. Children of that era absorbed the lingering trauma of parents who had suffered under the dictatorship. This trauma could manifest in overprotectiveness, anxiety, or suppressed anger in family dynamics.

The concept of "speculative remembering", where memories blur and predictions merge with present experiences plays a role in creating an "all-knowing" archive that adapts over time [Sonal Dutt, 2024]. In their 2024 article "The speculative memory: contextualising memory in speculative fiction" the authors emphasize how memory underpins personal identity by shaping narratives of self, as well as the ways in which traumatic memories disrupt perceptions of reality and identity.

Jean-Luc Godard's film "Here and Elsewhere" (Ici et Ailleurs, 1976) touches the themes of representation and history and reflects on the political memory of images and the ways in which a non-linear and fragmented memory can be reassembled in different ways based on the context. The film questions the ethics of remembering through images, questioning the reduced representation of a true past.

This thesis is too an invitation to become more critical about our own processes of remembering, and how memory is shaped by media and context. It's important to note how personal and

collective histories are remembered, forgotten and rewritten over time.

Memory behaves sometimes as an interactive installation, capable of recalling previous viewer interactions, layering them as part of the piece, altering and separating it from its original self.

In *Camera Lucida*, Roland Barthes distinguishes between the studium (the cultural, intellectual response to an image) and the punctum (its personal, emotional impact). He reflects on the role of the viewer in the construction of meaning [Barthes, 1993]. The memory of a closed door, the need for bridging the unknown with rational narratives, the context of my own neurodivergent experience. (Constructing meaning)



curiosity

*commitment to struggle*

As most people, I place some of my earliest memories in my childhood. It was a time where differences were particularly notorious, misunderstood, and punished. The dictatorship heavily controlled education to align with its ideology, promoting nationalism and suppressing critical thinking. As most children born in this period, I received an education shaped by censorship and limited intellectual freedom. Teachers and curricula avoided topics related to human rights, democracy, or the abuse of the regime.

I grew up in a society where trust in the government and institutions was deeply eroded. This mistrust certainly influenced my attitude toward authority and civic participation. In a context where discipline and normativity appeared as main values, I learned to defend my position on the right side of this equations:

curiosity = disobedience  
curiosity = insubordination  
curiosity = commitment to struggle

% Deconstructing the status quo against an institutionalized system of meaning making.

"All men by nature desire to know". This is the opening line of Aristotle's *Metaphysics*, highlighting curiosity as a fundamental aspect of human nature. However, I experienced that curiosity, as a *distracted learning style*, is often rejected as a vicious form, as opposed to a virtuous one. In his book *"Curiosity Studies: A New Ecology of Knowledge"*, Perry Arjun Shankar comments on Aristotle's inclination to recommend being studious about one thing (*monopragmosyne*), as well as on Plato's argument on how curious people suffer from an imbalance in the three parts of their soul: reason, spirit and appetite. [Arjun Shankar, 2020]

It became well established that being curious implies taking risks, failing, making mistakes, "die at least a few times" [Foucault, 1980]. Foucault reflects on the transformative power of curiosity, suggesting that it involves letting go of established ways of thinking and being open to change, which he metaphorically described as a form of \dying."

Curiosity, in this frame, presents an invitation to explore boundaries and question all norms. The digital and other forms of artwork inspired by this can evolve in forms that resist



being fully understood, requiring viewers to engage multiple times or from different perspectives to gain insight, embodying a commitment to struggle.

The exploration of unconventional media as a way to disrupt the status quo is a recurring theme in media theory. Several theories and philosophical perspectives address this phenomenon. McLuhan's "Understanding Media" [McLuhan, 1964], is a good example of this (The medium is the message). Artists using unconventional media are not just creating content, but they are defining new ways to experience and understand such content.

Deleuze and Guattari refer to the idea of deterritorialization, as the process of breaking away from established structures. Their concept of "*rhizome*" emphasizes non-linear, decentralized forms of thought and creation [Gilles Deleuze, 1980].

Curiosity drives us to break away from familiar territories, whether intellectual, cultural, or artistic. It encourages us to explore "*lines of flight*"<sup>2</sup>, creating opportunities for new knowledge and experiences. Non-linear, interconnected ways of thinking and being, as opposed to hierarchical structures, allow for an open-ended exploration, where the process is as valuable as the destination.

A line of flight is not simply an exit but a process of reconfiguration. It resists fixed hierarchies, operating within a rhizomatic structure where connections appear in unexpected ways. Whether in thought, art, or social structures, lines of flight create alternative spaces of existence, rupturing established frameworks and making way for the unanticipated.

In the classical notion of perspective, space converges toward an illusion of depth and stability. In Deleuze and Guattari's conceptual universe, a line of flight suggests an alternative representation of space, one that is fluid and multidimensional.

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<sup>2</sup>Deleuze and Guattari's concept of the "line of flight" (ligne de fuite) is central to their philosophy of becoming. It represents a vector of escape, transformation, and deterritorialization.



# neurodivergent

*The holographic principle suggests that information about a volume of space can be encoded on its boundary, leading to a perspective in which spacetime within that volume, including time, is a projection. Thus, time might not exist as a fundamental property but instead as a result of interactions in this deeper, more fundamental layer of reality.*

The idea of perception as a controlled hallucination suggests that what we see, know, and understand is no more than the most likely prediction made by our trained brains. A neural network in which an internal conflict arises between an error signal, indicating that what's in front of us does not match our expectations, and a massively skewed training dataset of memories, insisting that what we know from past experiences is the correct interpretation.

Neurodivergence is now better known and understood, but as a statistical minority, it is not well represented in the dataset of human interactions. It is only logical that it would be difficult to comprehend from the perspective of a neurotypical brain. The issue of skewed datasets is commonly addressed in the context of AI and machine learning. However, while we can design datasets to balance the represented populations, a real brain learns from real interactions, and the statistics remain the same regardless of awareness.

*"Anything in the territory that resists attempts at modeling thus becomes, in the world of digital models, noise in the system"* [Benasayag, 2019]. Benasayag addresses the issue of algorithmic bias, where neural networks may perpetuate existing social prejudices and inequalities. He underscores the need for critical examination of the data and methodologies used in AI to prevent reinforcing discriminatory practices.

Benasayag's insight raises concerns about the way AI and algorithmic models structure knowledge, representation, and power. This encourages a critical interrogation of locality, which, in digital and algorithmic contexts, is often flattened, abstracted, or omitted in favor of more "universal" models. Problematising locality involves examining how algorithmic systems fail to account for the specificity of place, culture, history, and identity, reinforcing biases embedded in generalized datasets.

The holographic principle challenges the classical idea of locality, suggesting that information can have non-local representations. As a neurodivergent individual, cause-and-effect thinking strategies don't come naturally, favoring lateral connections and holistic insights that reflect non-locality in thought processes. Often a heightened awareness of details, turns into an intuitive grasp of the whole system

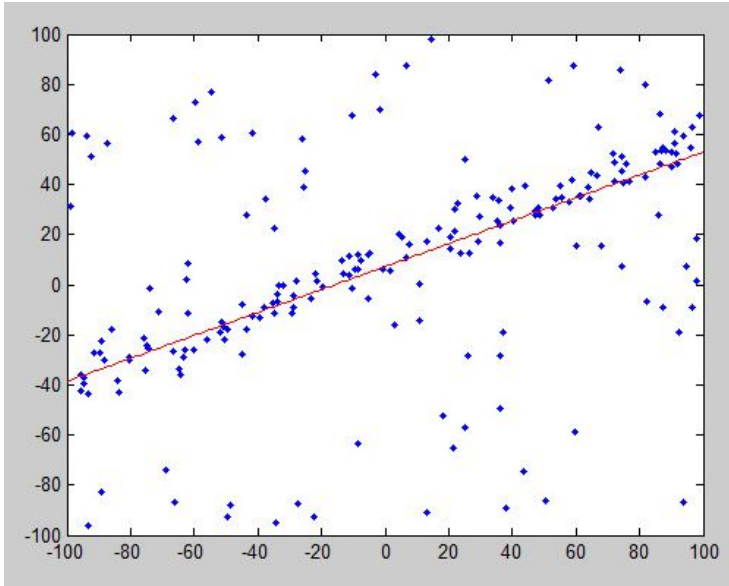


Figure 1: Data points shown in blue, with the line of form  $y = mx + c$  estimated using RANSAC indicated in red. - <https://www.mathworks.com>.

encoded in parts, as a kind of cognitive holography. Most attempts to uncompress this intuition often come across as confusing misunderstandings, since even language is made to reflect linear interpretations of reality through sequential narratives.

*% Exist within the noise*

RANSAC (RANDOM Sample Consensus) is an iterative algorithm used for estimating the parameters of a mathematical model from a dataset that contains both inliers (data points that fit the model) and outliers (data points that do not fit the model). See Figure 1. It is particularly robust and capable of rejecting outliers and is widely used in applications in the presence of noise. We must define new non-probabilistic approaches to social norms and rules that includes outliers, or avoid the models and rules altogether, validating the richness of the full spectrum, avoiding the expectations of coherence to the known set.

Algorithms for pattern recognition, collapse heterogeneous realities into standardized, data-driven abstractions. However, certain local specificities do not easily conform to the logic of machine learning. These "outliers" or "anomalies" are often treated as statistical noise, rather than meaningful divergences that could challenge the system's assumptions. Problematizing locality, then, requires acknowledging that what is excluded from modeling is not neutral but politically significant.

AI models often depend on data extracted from local contexts but are deployed in a non-localized, decontextualized manner. This reinforces structural inequalities, where data from marginalized communities is used to optimize systems that do not serve them, or actively oppress them (e.g., urban surveillance and predictive policing).

% Analytical acceptance, algorithmic forgiveness.

I went through many struggles conforming to neurotypical norms. As a child, I used to write mirrored text and had difficulty reading, so I was quickly diagnosed with dyslexia. I suffered from insomnia for a big portion of my adolescence, as a result of the discomforts of forced social interactions. Later in life, I was prescribed with medication for anxiety disorders due to unbearable panic attack seasons. I was diagnosed quite late in life with ADHD (Attention Deficit Hyperactivity Disorder), followed with a possible co-occurrence of ASD (Autism Spectrum Disorder), a mixed condition that affects a small percentage of the population<sup>3</sup>. I started making sense of the previous 40 years, the anxiety, the insomnia, the lack of personal memories, and the depression caused by simply not fitting-in. I came to realize that a deeper knowledge and understanding of this region of the spectrum became my way of making sense of my interactions with the world, allowing me to forgive myself and others, while also developing the necessary rational arguments to actively reject the structures responsible for perpetuating the generalized norms that shape our societies.

% symbiotic contamination

In the current context of a neurotypical majority, forging the options and leading to a society that values selection

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<sup>3</sup>ADHD has a global prevalence of around 5-7% of children and 2-5% of adults. Around 20-50% of individuals with ADHD also meet criteria for ASD.

over creativity, the creation of our own tools seems to be an appropriate choice to true creativity. Such practices allow to dig into deeper understanding of the final outcomes, and explore the equally rich properties of every step of a process.

## time scales

For some neurodivergent individuals, time feels less sequential and more layered or interconnected, as if different dimensions of experience coexist and interact simultaneously. Moments may feel fragmented, time may be experienced in hyperfocus (expanding infinitely) or in rapid, disjointed flashes. Much like a hologram contains a vast amount of information compressed into a simpler lower-dimensional form, neurodivergent cognition could compress complex timelines and experiences into non-linear formats, creating unique interpretations and associations across time. Neurodivergent cognition might operate by projecting internal mental states or processing vast amounts of sensory data into condensed forms like patterns, metaphors, or unique associations.

Deleuze's concept of the "*irrational cut*" in cinema<sup>4</sup>, introduced in "*Cinema 2: The Time-Image*" [Deleuze, 1985], marks a fundamental disruption of classical continuity and logical progression in film editing. Unlike the "*rational cut*" of classical cinema, which follows a clear cause-and-effect chain, the irrational cut severs this logical flow, creating temporal and spatial disjunctions that do not adhere to conventional narrative logic. Instead, these cuts generate pure time-images, where past, present, and future may coexist in ambiguous and nonlinear ways.

This disruption of linearity in cinema resonates deeply with neurodivergent modes of perception and cognition, particularly in conditions such as ADHD, autism, and certain forms of synesthesia, where experiences of time, memory, and causality often do not conform to neurotypical expectations.

Many neurodivergent individuals experience thought processes that operate in a non-hierarchical, associative, or rhizomatic

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<sup>4</sup>Deleuze frequently references Godard as a master of the "irrational cut"

manner. Rather than following a clear sequence, thoughts, memories, and perceptions may form intricate networks where disparate elements become linked without a clear rational justification. This mirrors how the irrational cut allows film sequences to be connected not through logic, but through affect, intuition, or symbolic resonance.

*% failures with a serial number*

I'm interested in multi-sensory installations, layered audio-visual compositions, or interactive works that allow viewers to experience various *"time slices"* of the piece, where events and emotions compress into a single moment. Experiences of layered and non-linear time are certainly an inspiration to an approach that defies linear storytelling or straightforward interaction.

*% examples*

In his Theater Series, Figure 2, Hiroshi Sugimoto [Sugimoto, 2025] created a series of long-exposure photographs of cinemas where an entire film is projected onto a single frame, collapsing a full-length movie into a single luminous image. Similarly, in Figure 3, a digital work of my own authorship, the equation for incremental mean calculation is implemented to run over video sequences, presenting time not as linear but as an accumulation of all its moments at once.

The generative installation titled *"33 Questions per Minute"*, by Rafael Lozano-Hemmer [Lozano-Hemmer, 2025], Figure 4, shows a rapidly changing sequence of randomly generated questions on LCD screens, exceeding the speed at which they can be read. This creates a layered simultaneity of potential meanings and missed moments in time.





Figure 2: Radio City Music Hall, New York 1978 - Hiroshi Sugimoto, *Theaters*, <https://yoshiigallery.com>.



Figure 3:  $u_{n+1} = u_n + \frac{x_{n+1} - u_n}{n+1}$  - Mauricio van der Maesen de Sombreff, *video frames average*.

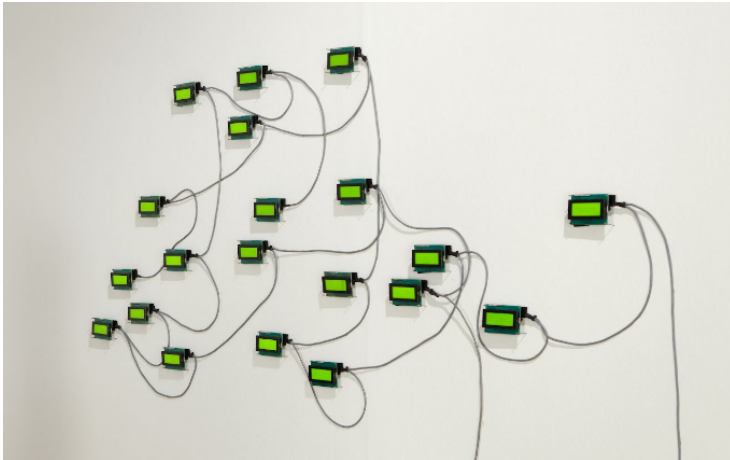


Figure 4: Display version - Rafael Lozano-Hemmer, 33 questions per minute, <https://www.lozano-hemmer.com>.

# perception

*Loud drones, low frequency soothing sounds  
Whispers louder than the loudest screams  
A new detail that changed my day  
The repetitive, unsettling touch  
Tight knots, tight hugs  
Invasive gazes that were not supposed to last  
The faces, the mirrors, the shadows  
Acoustics as the language of every surface  
M.V.*

Self-Organized Criticality describes how certain systems naturally evolve toward a critical, highly sensitive state where small changes can lead to large-scale effects. This state of criticality is "self-organized" because the system doesn't require external tuning to reach this point. It naturally arranges itself into this state through its own dynamics. These models help describe the experience of sensory amplification, where the world can be perceived in vivid detail or with overwhelming intensity. [Adami, 1993]

This idea resonates with my perception of sensory experiences, where seemingly minor stimuli can trigger profound shifts in awareness. My engagement with immersive media and neurophysiological responses to sensory inputs mirrors the principles of self-organized criticality, where perception can oscillate between stability and heightened sensitivity without external modulation. Just as a sandpile reaches a delicate equilibrium where a single grain can trigger a cascade, perception often reaches states where minor inputs lead to significant experiential shifts.

For many, perception unfolds in ways that might differ from conventional understandings. It is often nonlinear and multisensorial, difficult to articulate but deeply felt. The context and balances between anxiety and relaxation shape the sensitivity to sounds and textures. Patterns and structures in an otherwise chaotic environment can be a comforting experience. Time feels non-linear, with moments stretching or compressing, influencing how art and events are experienced.

Immersive or interactive art forms, such as installation art, allow for the direct engagement of multiple senses, mirroring how individuals process the world, translating complex inner experiences into tangible forms. Sensory overload or hyperfocus can transform the relationship between body and world, defining new ways to conceptualize subjectivity.

From a physics standpoint, perception can be understood as a signal processing system, where sensory organs act as transducers, converting energy from one form to another. Interacting photons, wavelengths of a restricted spectrum, pressure variations converted into electrical signals, molecules binding and interacting with receptors, mechanical interactions of skin cells,

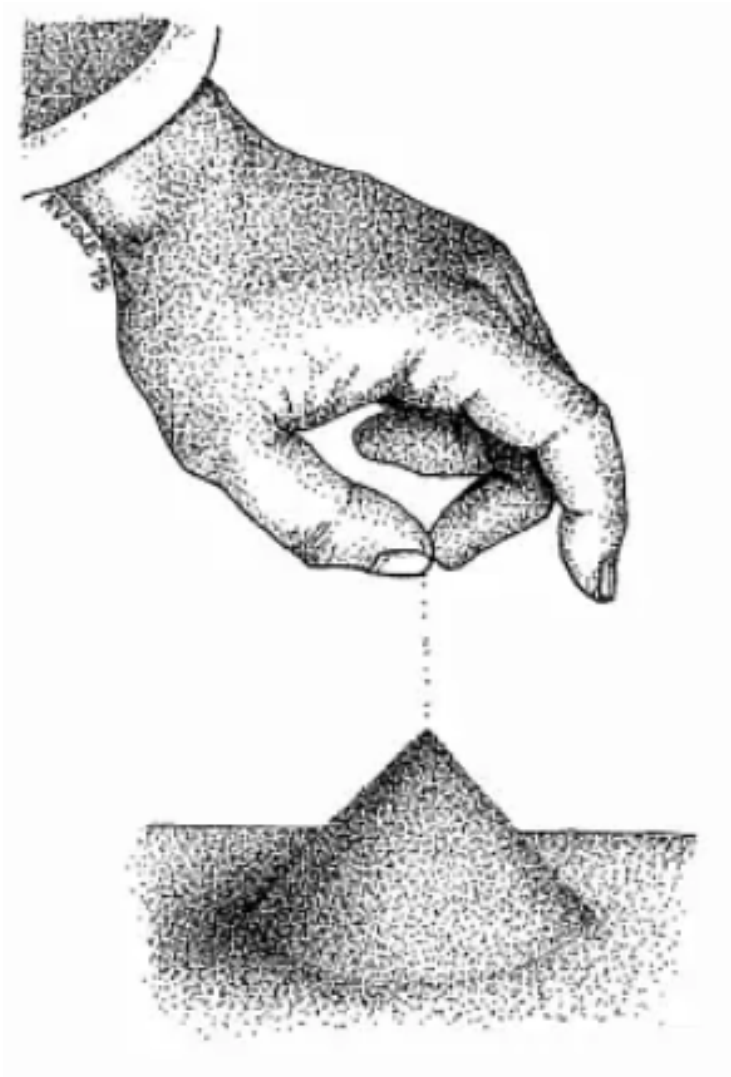


Figure 5: Self organized criticality - *Per Bak's Sand pile model, 1988.*

electromagnetic repulsion, preventing matter from collapsing into itself.

Physics reveals that human perception captures only a small fraction of reality. Neutrinos, dark matter, infrared and ultraviolet light, gravitational waves, and radio signals are imperceptible to us, but part of this reality can be detected with specialized instruments. Can the use of such instruments alter our perception? Is it possible to amplify and alter the ways we relate to the environment by increasing the reach of our perception?

Technology expands our Umwelt by allowing us to access phenomena that are otherwise absent from our perceptual sphere. From infrared imaging to quantum computers, from microscopes to large language models, technology acts as an extension of our perceptual apparatus, expanding our boundaries into previously inaccessible domains.

However, expanding the Umwelt through technological augmentation also transforms the sensorium, the historically contingent ways in which cultures structure perception. Friedrich Kittler and other media theorists have emphasized that new media do not merely extend human perception, but create entirely new perceptual regimes, where what is seen, heard, and felt is structured by technical systems. As Kittler observes in *"Optical Media"* (Berlin Lectures, 1999), *"Media determine our situation. If the optical nerve is replaced by fiber-optic cables, then perception itself is no longer an autonomous act but a function of transmission speeds."* [Kittler, 1999]. This suggests that contemporary digital infrastructures, ranging from algorithmic filtering to surveillance systems and AI-driven vision, do not merely mediate perception but actively reshape what is perceptible and how sensory data is processed.

The field of sensorium studies explores how haptic, auditory, and visual perception are mediated through evolving interfaces, from VR and haptics to biometric sensors. In this context, the question is not just about accessing new perceptual domains but about who controls the mediation of those domains. If perception is increasingly outsourced to technological systems, how does this alter the relationship between self, body, and world?

According to the philosophical approach of post-phenomenology, technology is not neutral. It transforms the nature of perception and experience. Instruments shape what and how we perceive, influencing the object of perception as well as the perceiver.

Our brain is remarkably adaptable and capable of incorporating non-biological sensors into its perceptual framework. This phenomenon is supported by research in neuroscience, cognitive science, and philosophy, particularly in the domains of neuroplasticity, sensory substitution, and embodied cognition. The inclusion of non-biological sensors introduces entirely new dimensions to human perception, effectively expanding the "self".

The *extended mind* hypothesis, proposed by the philosophers Andy Clark and David Chalmers [Andy Clark, 1998], argues that tools and technologies can become integral parts of our cognitive processes. Non-biological sensors present in wearable technologies provide continuous streams of data, which the brain learns to process and integrate. This suggests that perception is not confined to the brain and body but extends into the tools we use, fundamentally altering our experience.

While the extended mind hypothesis positions cognition as distributed beyond the brain, it has been critiqued for an overly functionalist approach that abstracts the role of media, institutions, and historical structures in shaping cognitive processes. N. Katherine Hayles, in *"Unthought: The Power of the Cognitive Nonconscious"* [Hayles, 2017], abandons the assumption that cognition is always rational, conscious, and computationally extendable. Hayles' concept of the "unthought" (the aspects of cognition that exceed conscious awareness) offers a new lens for rethinking perception beyond intentionality. She moves the discussion from what we perceive to how our cognitive frameworks themselves are shaped by technology. In her book, Hayles engages with Bernard Stiegler's theories to discuss how technological mediation affects cognitive processes, particularly in the context of automated perception and algorithmic attention capture.

In this framework, perception is not just a personal or biological act but is conditioned by material and symbolic systems that shape what can be thought or perceived. Digital and

algorithmic systems increasingly mediate our experience, shifting cognitive agency away from the individual toward nonconscious, networked processes. The *unthought* implies that perceptual extension via technology is not merely an augmentation but also a restructuring that operates beyond intentional human control. Hayles critically questions not just what we perceive with technology but who or what determines the structures that govern perception itself.

If perception relies on external tools, the distinction between "human" and "machine" becomes less clear, leading to a hybridized (cyborg) perception that transcends biology. What counts as "real" if our tools mediate all new experiences? Can the brain adapt to perceive entirely artificial data streams, such as simulations or virtual realities, as seamlessly as it does natural environments?

Neural implants such as the Cochlear implant, or existing research in sensory substitution, demonstrate that artificial stimuli can be integrated into perception seamlessly, despite being electrically generated rather than naturally occurring. Experiments in VR adaptation (e.g., the rubber hand illusion, full-body swaps) indicate that the brain can incorporate entirely artificial spatial and sensory information into its embodied schema. AI, predictive algorithms, and immersive XR environments are already generating stimuli that are neurologically indistinguishable from non-mediated experience. Perception is no longer confined to biological limits but is an open system shaped by neural plasticity and technological augmentation. The notion of "reality" becomes an emergent cybernetic construct, not fixed, but fluid, shifting as cognitive architectures evolve. In this sense, the "real" is whatever perception successfully integrates, whether natural or synthetic. It becomes a category of phenomenological stability rather than an intrinsic property of the world.

*"By reenvisioning cognition and crafting a framework in which nonconscious cognition plays a prominent role, my approach enables analyses of cognitive assemblages, and the mediators operating within them, as the means by which power is created, extended, modified, and exercised in technologically developed societies."* [Hayles, 2017]



If technological mediation fundamentally shapes perception, then perception itself becomes a site of power, where control over sensory experience is increasingly delegated to infrastructures beyond individual agency. Stiegler warns that in an era of automated perception and algorithmic attention capture, the process of individuation (the capacity to form unique sensory and cognitive patterns) is under threat. Similarly, Hayles' work on the nonconscious cognitive domain suggests that much of what we assume to be autonomous perception is pre-structured by the digital environments we inhabit.

This calls for a critical approach to perception that does not merely celebrate augmentation but interrogates who or what is shaping perceptual thresholds. Can artistic interventions, speculative design, and critical media practices expose the hidden architectures of technological perception? And if so, how can we reclaim perceptual agency in an era of increasing sensory automation and resist the passive absorption of algorithmically curated experiences? If algorithmic perception operates by optimizing and automating attention, then one form of resistance is to introduce perceptual friction, forcing slow, deep engagement rather than passive consumption. Building alternative, decentralized, open-source tools for AI-assisted art, collective sensory experiences, and participatory XR environments might offer new spaces for perceptual experimentation outside corporate frameworks.

At the same time, the question of how we manage and regulate sensory input becomes increasingly urgent. As perception expands beyond biological limitations through technological augmentation, we are also faced with the challenge of navigating not just the enhancement but the overload of sensory information. If perception is shaped by external tools, what strategies can be developed to mitigate overstimulation while maintaining agency over sensory experience?

An overwhelming visual stimulation can sometimes be managed via a calming sound or a specific type of pressure. Since the world is evolving into larger and larger amounts of information and stimuli, it's interesting to wonder if the inclusion of new types of non-biological sensors in our perception will provoke further overstimulation or present opportunities for relaxation

based on new calming sensations. Perhaps soon, focusing on slow fluctuations of cosmic microwave background radiation will provide a mental shelter from saturated visual and acoustic inputs in our present environment.

# Laplace's demon

$$\frac{d\mathbf{x}}{dt} = f(\mathbf{x}, t)$$

Pierre-Simon de Laplace conceived a thought experiment involving a hypothetical intelligent being with knowledge of the current state of everything and the capacity to process all that information. Under the hypothesis of a deterministic universe, such a being would know both the past and the future, thereby eliminating the perception of time, since everything that exists now would also reveal what was and what will be.

In a much more limited context of both space and time, the constant monitoring of microscopic changes and patterns places me in a position to predict possible futures and assume causality from potential pasts. I live without a normal perception of time, burdened by the overwhelming anxiety of processing all possible realities with the same intensity as the "here and now." Predicting an experience and experiencing the predictions. Presuming a cause for every effect.

% Sense belongs to the realm of Aion, not Chronos.

Modern physics introduces uncertainty. Quantum mechanics poses that states of matter are probabilistic rather than absolute, breaking the strict determinism of Laplace's vision and the classical Newtonian perspective. Yet, even in a probabilistic universe, the human experience of time remains a construction rather than a fundamental entity.

Deleuze, in *"The Logic of Sense"*, contrasts two modes of time: Chronos, the linear, measurable time of physics, and Aion, the time of pure becoming, where past and future exist in a non-hierarchical relationship. [Deleuze, 1969]

In the context of the digital arts, the idea of predictability often manifests itself in a form that simulates control while embedding elements of randomness and chaos, allowing the viewer to experience the tension between determinism and uncertainty. Generative artworks often operate through algorithms to create an aesthetic of deterministic emergence, where each iteration is governed by pre-defined rules yet appears unpredictable to the observer. A perfect example could be the Conway's *"Game of Life"* [wik, 2023].<sup>5</sup>

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<sup>5</sup>The Game of Life is a cellular automaton created by John Horton Conway in 1970. The evolution of the game is determined only by its initial state, requiring no further input.

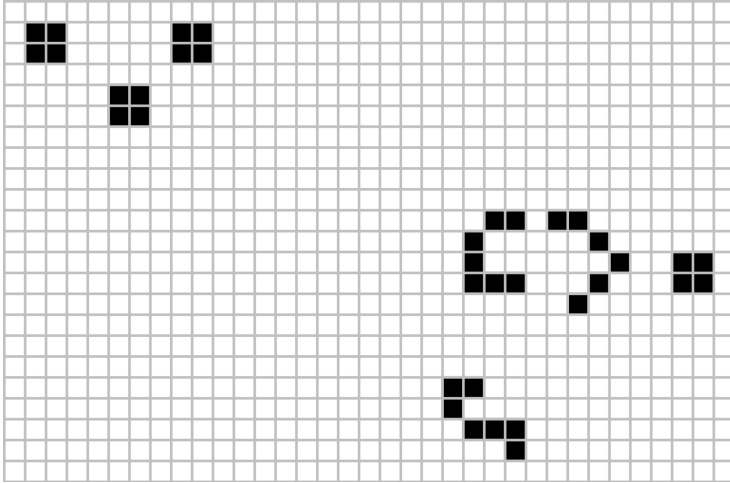


Figure 6: Simkin glider gun - *Conway's Game of Life*.

Machine learning models, trained on vast amounts of data, function as modern-day deterministic oracles, forecasting human behavior, market fluctuations, and even criminal activity. These systems, however, are not infallible, as they rely on probabilistic statistics rather than absolute determinism. Nonetheless, they shape perception, creating a feedback loop where past behavior is used to constrain future choices.

Social media algorithms, for example, predict and curate content based on prior interactions, effectively scripting a deterministic version of personal experience. The more data fed into these systems, the more precise their predictions, reinforcing a perceived loss of agency. In this context, Laplace's Demon is not an abstract philosophical construct but an active, operational force in digital culture.

If absolute determinism were possible, all uncertainty would dissolve into a singular, knowable timeline. But in reality, the human experience remains shaped by probabilities, contingencies, and incomplete information. This paradox between the desire for predictability and the impossibility of absolute foresight can create a psychological state of hypervigilance.

The french philosopher Jean-François Lyotard, in his critique of metanarratives, argues that grand deterministic structures burden individuals by imposing rigid explanations onto an inherently chaotic reality [Lyotard, 1979]. The belief that past data can fully determine future events echoes the totalizing narratives of modernity, which attempt to rationalize history through economic, political, or technological inevitabilities. In the digital age, this deterministic burden manifests through algorithmic governance.

The ubiquitous predictive systems often produce a constructed perception of certainty rather than actual knowledge. The individual caught in this deterministic loop faces a double bind: an overwhelming sense of inevitability (that the future is already decided) paired with the responsibility of optimizing every choice within that rigid structure. This, in turn, reinforces hypervigilance, where every action is analyzed not just in the present but across all its potential future iterations.

The psychological toll of living under predictive determinism can be likened to a mental simulation overload. We are naturally inclined toward predictive processing, constantly modeling future possibilities based on prior experience and current states. In an age dominated by real-time data analytics, this cognitive mechanism is stretched beyond its evolutionary purpose, forcing us to process an exponential number of possibilities at once. This inevitably creates an experiential paradox, since increase knowledge doesn't always result in greater agency. Anticipating all possible futures does not necessarily provide control, only more paths for anxiety.

Time-based media, such as performance art and interactive installations, challenge determinism by requiring live, unrepeatable participation. These works cannot be fully anticipated or reconstructed, embodying contingency and resisting Laplace's hypothetical absolute knowledge. To resist the determinism imposed by both philosophical constructs and algorithmic systems, art and media practice must continue to foreground unpredictability, contingency, and the indeterminacy of human experience.

The artist Ryoji Ikeda famously incorporate randomness in real-time audiovisual installations. Allowing participation and interactivity in the pieces presents a way to discourage determinism. The sound piece titled "*A [for 100 Cars]*" is a good example of it. For this performance, Ikeda invited 100 drivers to follow a score using their cars. Each car was equipped with a sine wave synthesiser producing the note "A" ( frequencies ranging from 376.3 to 506.9 Hz)<sup>6</sup>, connected to the sound system. The score instructed the drivers to set the octave and volume of the sinewave and to use of lights and horns, or open and close the car doors. The only controlled element is a digital timer and the score sheet provided to every driver. The piece is then conditioned by human action, imperfection and error, making it unique and unpredictable.

Our experience depends on the flow of time, on uncertainty, on the interplay between memory and expectation. Media, art, and technology constantly negotiate between determinism and randomness, constructing and deconstructing the perception of temporal order.

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<sup>6</sup>Frequencies ranged from 376.3 to 506.9 Hz represent different historical conventions for the concert pitch, covering a timespan from 1361 to 1936.





# hypervigilance

*Stochastic resonance is a phenomenon in which a signal that is normally too weak to be detected by a sensor can be boosted by adding white noise*

Whenever I take a walk, I don't just stroll from A to B. I'm constantly monitoring every obstacle, every moving object and person around, everything that can be moved by the wind or shifted by the weight of raindrops. I calculate the next position of every object, adjusting my trajectory to account for the space needed for myself and my companion, when there's one by my side. I walk, and I am in the near future as much as I am in the present|more than most people I've discussed this with.

I observe and analyze the changes in other peoples motion, their patterns and micro-expressions, curiously attempting to predict their intentions, possible thoughts, and probable actions. I play out their next moves in my mind like a game of chess. I'm here and now, yet I am also everywhere before and after. I'm everyone in my own form, simultaneously avoiding and seeking connections.

Hypervigilance, characterized by an intensified state of sensory sensitivity and constant scanning for potential threats, often reflects an underlying sense of fear or dread. This heightened alertness is prevalent in individuals with post-traumatic stress disorder (PTSD), where the brain's natural fight-or-flight mechanisms remain overly active long after the traumatic event has passed. Consequently, individuals remain in a chronic state of heightened awareness, perceiving threats even in safe environments.

% The closed door at the end of the corridor comes to mind again.

In contemporary society, the omnipresence of media plays a significant role in amplifying this state of hypervigilance. The concept of *"Mean World Syndrome"*, introduced by George Gerbner [wik, 2025], suggests that extensive exposure to violent or negative media content can lead individuals to perceive the world as more dangerous than it actually is. This perception fosters a culture of fear, where people take unnecessary precautions against minor or unlikely dangers, while paying less attention to more significant risks. In a digital era where doomscrolling<sup>7</sup> is an unconscious habit, this exposure extends beyond isolated traumatic experiences to a collective, systemic form of hypervigilance. The nervous system, already attuned to

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<sup>7</sup>Doomscrolling is the act of spending an excessive amount of time reading large quantities of news, particularly negative news, on the web and social media.

threat detection, is primed by an ongoing flood of distressing images and narratives, reinforcing a sense of constant alertness. This heightened state of awareness is a defining feature of PTSD, where the nervous system remains locked in a state of overdrive long after the initial trauma has passed. But what happens when this hypervigilance extends beyond those directly affected by trauma? Secondary traumatic stress<sup>8</sup> is becoming more common due to the continuous exposure to distressing media. Without experiencing war, disasters, or violence firsthand, constant engagement with mediated suffering is enough to induce similar psychological effects. This suggests that hypervigilance is not just an individual response but a cultural condition.

% How could I share a hyper-experience?

In their article, Wiesenfeld and Moss emphasizes the counterintuitive role of noise in enhancing signal detection and transmission in nonlinear systems [Kurt Wiesenfeld, 1995]. Individuals with ADHD and autism often show heightened response to sensory input which could be seen as a form of "enhanced signal detection". By framing hypervigilance as a system response to noise, this model emphasizes the potential for both challenges and strengths in neurodivergent sensory processing.

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<sup>8</sup>Secondary Traumatic Stress (STS), also known as vicarious trauma or compassion fatigue, refers to the emotional distress and psychological symptoms that result from indirect exposure to traumatic events, particularly through the experiences of others.



# wave function collapse

$$a \propto E$$

Anxiety is proportional to the entropy of a situation.

## Entropy, quantum mechanics and puzzles

The algorithmic approach to solving a Sudoku puzzle involves identifying the cells with minimum entropy (those with the fewest possibilities remaining). When a possible solution is presented, it restricts the degrees of freedom in adjacent cells, reducing entropy and guiding the puzzle toward resolution. This same principle of information resolution echoes in the realm of quantum mechanics, where a wave function, representing a superposition of possible states, collapses upon observation, resolving a multitude of possibilities into a single, defined outcome.

Every unknown in life, every decision still not made, every unanswered question, extends a branching structure of potential realities, a high-entropy state where all possible futures coexist. In this state, anxiety emerges as a direct consequence of the volume of probabilistic outcomes. When a choice is made, or an observation is recorded, all competing possibilities collapse into one, thereby reducing entropy and, in turn, the existential anxiety associated with the unknown. The resolution of uncertainty into a singular actuality offers a peculiar relief, an end to speculation, but also the loss of alternative futures.

### % Observing as a Constructive Act

Observation is never passive. The Copenhagen interpretation of quantum mechanics tells us that the act of measurement does not reveal a pre-existing state but rather enforces one upon an indeterminate system. The world, then, is not a static, pre-formed entity waiting to be observed, but a participatory system where perception shapes reality. When we observe, we frame, filter, and interpret phenomena through the lens of our preconceptions, cultural codes, and technological mediations. McLuhan suggested, in the context of media ecology, that what we observe is shaped by the tools and contexts of observation. [McLuhan, 1964]

The act of looking is an active engagement. The technologies used for observation, such as cameras, screens or algorithms, affect the observed object by framing and introducing layers of abstraction, transforming the observer into both a participant and a subject of the observation. Media plays an important role,

as it pre-selects and amplifies certain aspects of reality and ignores others, conditioning our gaze.

% surveillance

Michel Foucault extends this perspective into the realm of power and surveillance. The panopticon, a structure in which the awareness of being observed transforms behavior, is a metaphor for the self-regulation imposed by knowledge systems. [Foucault, 1975] The wave function collapse can be read similarly: the moment an entity is observed, its state is determined, and its freedom is cropped.

Beyond physics and computation, wave function collapse provides a compelling analogy for decision-making. If each unmade choice represents a superposition of futures, then the moment of commitment enacts a form of collapse, selecting one timeline while discarding all others. Regret, then, can be understood as a longing for collapsed possibilities, an awareness of the alternate selves that could have been.

In contrast, the Many-Worlds interpretation of quantum mechanics suggests that all possible outcomes occur in separate, parallel realities. In this framework, no decision ever truly eliminates an alternative, it merely bifurcates existence into divergent streams.

*Engaging with a moment*

*Observing regardless of consent*

*Collapsing, creating reality*





# emulation

*Human beings are creatures who practice and train,  
creatures who are free to reach beyond themselves in  
the process of becoming.*

Peter Sloterdijk [Sloterdijk, 2014]

I learned about the mask I put on unknowingly to fit in, to attract less attention, to avoid conflicts and misunderstandings. I learned the consequences of wearing this mask.

Living often feels like running an emulation program, replicating behaviors and responses that come naturally to others. On the surface, the emulated environment mimics a typical operating system, seamlessly performing tasks and following expected protocols.

The effort to conform to neurotypical standards can be exhausting, often overwhelming and disconnecting.

The tension between imitation and authenticity mirrors the challenges of emulation. Like an emulator replicating the functionality of another system, masking often relies on recombining observed behaviors to navigate social environments. But emulation, by its nature, exposes the limits of replication, revealing deeper truths through interaction and engagement.

In his essay "*The Work of Art in the Age of Mechanical Reproduction*", Walter Benjamin describes the uniqueness of a piece as its *aura*, and argues that mechanical reproduction diminishes the aura of an original work of art, affecting its authenticity [Benjamin, 1884].

The rise of digital art and AI technologies further complicates the discussion on authenticity. In the digital realm, the ease of replication and distribution encourages a reevaluation of authenticity. The available tools contradict, or at the very least challenge the traditional criteria for what constitutes an original piece, and the notion of what adds value. Such technological developments reveal the ideological function of authenticity, demonstrating how claims to originality often rely on exclusionary and artificial distinctions between "real" and "fake."

Large language models, or *LLMs* offer a powerful example of emulation, imitating human-like language and creativity while simultaneously challenging traditional notions of originality and authenticity.

The discourse of authenticity has long been central to discussions of artistic and cultural production, often serving as a measure of originality and creative legitimacy. However, as Theodor W. Adorno critiques in "*The Jargon of Authenticity*" [W.,

1973], the very notion of authenticity is frequently employed as an ideological construct, one that obscures rather than reveals the underlying conditions of production. This critique is particularly relevant in the context of emulation, where the replication of form and function challenges the perceived dichotomy between originality and imitation. He argues that the insistence on being "true to oneself" or finding an "authentic" mode of being is a way of internalizing and naturalizing systems of control rather than engaging in meaningful critique or transformation.

This critique extends to cultural production, where the valorization of authenticity often serves to exclude certain forms of imitation or replication. The fetishization of originality masks the ways in which all cultural artifacts are socially and historically mediated, constructed through networks of influence, appropriation, and reinterpretation. In this sense, emulation, rather than being a deviation from authenticity, exposes the very contingency of originality itself.

LLMs are trained on gigantic datasets of text. They calculate probabilities of possible words and generate text that mimics human communication, often indistinguishable from content created by real people. LLMs emulate linguistic styles, cultural idioms, and intellectual processes by identifying patterns in existing data.

Through prompt engineering, users collaborate with LLMs to refine outputs, curating their emulation capabilities. This interplay demonstrates how AI tools can enhance human creativity while raising questions about the nature of authenticity. If authenticity lies in human origin, AI lacks it. But if authenticity is somehow measured based on the audience's experience, then LLM-generated texts can feel authentic, even when created by non-human systems.

Deeper connections can be found between AI emulation and human cognition. Both systems recombine existing information to create something new. The distinction lies in intent: human thought is driven by curiosity, emotions, and purpose, which add layers of meaning that is (currently) absent in AI's mechanical processes.

`% biological algorithms`

Masking similarly involves effortful emulation. By adapting to environments shaped by neurotypical norms, masking suppresses natural tendencies to conform to expected patterns. This raises questions about the boundaries between imitation and authenticity in human interactions. Am I authentic if my responses are carefully curated and contextually appropriate but lack an intrinsic connection to the emulated behaviour?

Ultimately, whether in art, technology, or human behavior, the interplay between imitation, emulation, and authenticity challenges us to consider the deeper meanings behind our actions and the layers of intent that define who we are.

By applying Adorno's critique of authenticity to the concept of emulation, we can move beyond simplistic binaries of original versus copy, authentic versus inauthentic. Rather than lamenting the supposed erosion of authenticity in a world increasingly mediated by digital reproduction, we might instead embrace emulation as a mode of critical engagement, one that reveals the complex interplay of influence, repetition, and transformation inherent in all creative acts.

decay

$$n \rightarrow p^+ + e^- + \bar{\nu}_e$$

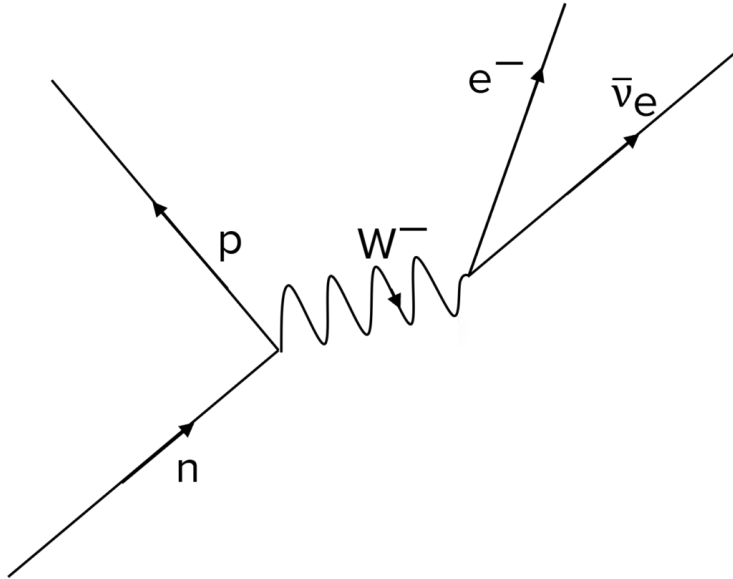


Figure 7: Beta-minus decay.

Decay is a fundamental process of transformation, marking the passage from one state of existence to another. In the realm of particle physics, when an atom has an unstable configuration, such as an excess of neutrons, it undergoes decay to achieve stability. A neutron transforms into a proton, emitting an electron and an antineutrino in the process, in a phenomenon known as beta-minus decay.

Just as the carbon-14 that undergoes radioactive decay over millennia, serving as a measure of time and history, our lives too are governed by the forces of transformation and impermanence. The weight of indecision, uncertainty, and imbalance manifests as forces propelling us toward change. And like the remaining stable nitrogen-14, we seek equilibrium, a resolution to the chaos that defines our existence. Much like the emitted radiation observed in atomic reactions, the disruptions and losses we experience are the byproducts of our transformation.

Everything is transient, every present moment unfolds from the past. Processes of becoming and unbecoming underscore the interconnectedness of all phenomena. The second law of thermodynamics shows a universe driven toward higher entropy, defining the arrow of time. This entropy is not merely a measure of chaos but a sign of the potential for transformation. Decay is a precondition for creation.

In the digital realm, decay mirrors the entropic nature of information and memory. Glitches, data loss, and the degradation of digital media are reminders of the fragility of permanence in a system that relies on energy and maintenance. Artists and technologists alike have explored the concept of digital decay, creating dynamic pieces designed to purposefully degrade and transform over time. These works challenge the idea of art as a static entity, taking advantage of the beauty of impermanence.

Dieter Roth's (1930-1998) artistic practice is deeply linked to the theme of decay, both conceptually and materially. His work explores impermanence, transformation, and the natural processes of deterioration, challenging traditional notions of art as something static or preserved. Roth famously incorporated rotting foodstuffs such as cheese, chocolate, and bread into his sculptures and installations. These materials naturally decomposed over time. His biodegradable artworks were never meant to remain in a fixed state, making decay an essential part of their existence rather than an unintended consequence. Instead of seeing decay as destruction, Roth embraced it as a creative force. Works like "Insel" (1968), or "Small Landscape" (1969, See figure 8) which combined food with other materials, allowed the viewer to witness changes in texture, color, and form over time. This made entropy and organic breakdown an integral part of the viewing experience.

Traditional art forms aim for preservation, but this rigid approach can be altered by creating artworks that could not last. Deteriorating sculptures and digital media meant to be corrupted defies the idea of museums and galleries as places of eternal conservation, forcing audiences to confront the reality of time and change. In many traditions, the impermanence of materials serves as a reminder of our ephemeral nature, that no matter how



Figure 8: Small Landscape - Dieter Roth , 1969,  
<https://www.tate-images.com>.



strong, beautiful, or lasting something appears, it is subject to the forces of time.

Often viewed through the lens of entropy as a gradual decline into disorder, decay also serves as a powerful symbol for mortality and impermanence, reflecting the fundamental nature of existence, both human and material. Transient and ever-changing. Across philosophy, art, and science, these processes of breakdown also represent transformation, renewal, and continuity. They mirror the human experience of aging and illness, a reminder of death, highlighting the inevitable dissolution of the body and mind over time, challenging the idea of fixed identities.

Decay, as the physical consequence of *decadence*, carries an undeniable aesthetic and emotional weight. The textures of rusting metal, peeling paint, or decomposing wood evoke a melancholic beauty, resonating with human emotions of nostalgia and loss. This attraction to decay (*ruin lust*) reveals an innate fascination with the traces of time left on objects, places, and bodies.

The 19th-century Decadent movement in literature and art, for example, was fascinated by fading beauty, decline, and the grotesque. Writers like Joris-Karl Huysmans explored themes of decay, (e.g. "*À rebours*", 1884) intoxication, and exhaustion, seeing ruins, disease, and corruption as sources of strange and melancholic beauty. [Huysmans, 1985]. In "*À rebours*", Huysman depicts Des Esseintes, an aristocrat who retreats from society into an isolated world of extreme aesthetic indulgence, rejecting conventional morality, nature, and human interaction in favor of artificial beauty, refined pleasures, and self-destructive excess.

The idea of replacing reality with artificial experiences, surrounding himself with refined art, literature, and intoxicating sensory stimuli is not foreign to our current technologically oriented era. It mirrors how today's society curates reality through digital technology, consuming endless streams of algorithmically personalized content on social media, entertainment platforms, and virtual spaces. Platforms like Instagram, TikTok, and YouTube create hyper-aestheticized, exaggerated versions of life, much like the way Des Esseintes surrounded himself with extreme beauty. This leads to an

artificial sense of fulfillment but ultimately disconnects users from genuine human experiences, through instant gratification and dopamine loops.

One of the most striking aspects of *Against the Grain* is the character's withdrawal from real-world human interaction in favor of a self-constructed, idealized environment. Similarly, technology has made it easier for people to disconnect from face-to-face interactions, replacing them with digital relationships, parasocial bonds, and algorithmic companionship. Social media and digital avatars allow us to construct idealized versions of ourselves, obsessively controlling our surroundings. Yet this perfectionism leads to anxiety, burnout, and a sense of inauthenticity.

Serving as both an end and a beginning, decay is the dissolution of what was and the emergence of what could be. In embracing decay, we accept the inevitability of change and the transformative power it holds. Whether in the disintegration of memory or the breakdown of stability, decay serves as an excuse to find value and meaning in impermanence.

The closed door at the end of the corridor has always been there, as an object of curiosity, an anchor for fear, a boundary between the known and the speculative. This thesis has explored the structures of cognition, the unpredictability of perception, and the resistance against deterministic narratives. I attempted, through my own lens, to draw parallels between neurodivergence and systems of knowledge, between artistic creation and scientific inquiry, between the physical constraints of space and the abstract dimensions of thought. Based on the fragmented nature of time and memory, the recursivity of perception and an ongoing negotiation of identity, I have attempted to weave together theory and experience. This text is not a closed system; it is an invitation to further exploration.

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