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Neuralpoiesis: A Posthuman Feminist Framework for Embodied Memory Production Through Algorithmic Technologies

Abstract

This paper introduces neuralpoiesis, a posthuman feminist framework that reimagines memory production as a dynamic, embodied process mediated by algorithmic technologies, specifically through machine learning models such as Neural Radiance Fields (NeRFs). Drawing on Edith Stein's concept of non-actuality and Rosi Braidotti's theory of nomadic subjectivity, this text examines how memory is created and experienced through embodied interaction with the present environment. Displaced individuals, particularly women, can use NeRF visualizations to create personal memory artifacts from scanned images of objects in their current surroundings that spark memories of home. By juxtaposing Fourth Wave Feminism with the Fourth Industrial Revolution, the framework critiques the conventional, efficiency-driven uses of machine learning, offering instead a feminist reapplication that emphasizes coping and empowerment for marginalized groups. The framework addresses some of the emotional and psychological needs of those experiencing displacement by situating algorithmic technologies as active participants in memory production.

Keywords

Neuralpoiesis, displacement, non-actuality, nomadic subjectivity, posthuman feminism, neural radiance fields (NeRFs)

1. Introduction: Memory and Algorithmic Technologies in the Age of AI

As advancements in artificial intelligence (AI) and machine learning have become increasingly prominent during the Fourth Industrial Revolution, new opportunities for rethinking the nature of memory production have emerged. Memory, which is traditionally understood as the static recall of past events, is now being reconsidered in response to new technologies that allow for the production of dynamic, embodied experiences. Feminist theorists have long challenged the Cartesian conception of memory as an internal, isolated process, arguing instead that memory is relational, fluid, and shaped by one's sociocultural environment. (Braedotti, 2022)

This paper introduces the concept of neuralpoiesis, a framework that positions memory as an ongoing interaction between the body, the environment, and algorithmic technologies. Neuralpoiesis embraces the idea that memory is not merely an internal cognitive process but that it is co-constructed through engagement with the world and the tools that mediate our experiences. The framework builds on feminist critiques of technology, particularly those associated with Fourth Wave Feminism, which advocates for inclusive, intersectional, and transformative applications of digital tools. By focusing on how displaced women can engage with memory through machine learning models such as NeRFs, neuralpoiesis offers a feminist reimagining of memory production that focuses on emotional healing and empowerment.

In the age of AI, technologies such as NeRFs (neural radiance fields) have been primarily used for photorealistic scene reconstruction and immersive visualization. These technologies learn how light interacts with objects in a scene and generate 3D visualizations based on 2D images (Müller et.al, 2022). However, in neuralpoiesis, NeRFs are repurposed to create visual representations of memory sensations—emotional, embodied experiences triggered by encounters with the present environment. These algorithmic artifacts, produced by displaced individuals through embodied acts of walking and filming/scanning, reflect both the physical characteristics of the objects that evoke memory, as well as the emotional and sensory significance of these objects. Through this process, neuralpoiesis reframes memory as a fluid, relational experience produced in collaboration with algorithmic technologies.

The development of accessible machine learning tools in the Fourth Industrial Revolution supports new forms of interaction between human memory and technological mediation. While machine learning models such as NeRFs have traditionally been used for technical purposes, neuralpoiesis suggests that these tools can be used to create visual memory artifacts that assist displaced individuals in reorienting themselves emotionally and psychologically. The framework aligns with Fourth Wave Feminism's call for the ethical and humanistic use of digital tools, positioning AI and machine learning as co-creators of memory, rather than being purely technical agents.

2. Embodied Memory and Non-Actuality in Edith Stein's Phenomenology

Edith Stein's phenomenology provides a theoretical foundation for understanding memory as an embodied, sensory experience. In Stein's framework, memory is not merely a mental recollection of past events but an emotional and physical re-living of experiences through the body. Stein's non-actuality challenges the Cartesian separation between mind and body, suggesting instead that memory is always shaped by an individual's interaction with her environment (Stein, 1917).

For displaced individuals, acts of remembering are often fraught with challenges. Memories of home, identity, and belonging are frequently fragmented and difficult to access due to the trauma and dislocation that accompany displacement.

In such contexts, memory is not a simple retrieval of past images but a process of navigating between the present and the past, mediated through the body's interaction with its surroundings.

Neuralpoiesis builds on Stein's theory of non-actuality by exploring how displaced women can engage in embodied memory practices that help them reconnect with their past through their present environment. For this article, nine displaced women took intentional walks through their current surroundings, scanning or filming objects that sparked memories of home. These objects—whether a tree, a building, or a familiar texture—elicited emotional and sensory responses that connect the present moment with a remembered past. The memory experiences created while scanning and walking are not exact reproductions of past events; they are non-actual experiences, shaped by the individual's current emotional state and physical interaction with the present environment.

Stein's phenomenological approach to memory highlights the importance of the body in acts of remembering. Rather than viewing memory as something that exists solely in the mind, Stein suggests that memory is a lived experience that emerges through physical movement and sensory engagement with the external world (Stein, 1917). This embodied nature of memory is particularly relevant to understanding how digital technologies can extend and amplify memory production in neuralpoiesis.

In neuralpoiesis, scanned images and videos captured during participants' walks are processed using NeRF models to generate 3D visualizations of the objects that evoked memory. These visualizations become digital memory artifacts that reflect the participants' emotional landscapes. By integrating Stein's concept of *non-actuality* with algorithmic technologies, *Neuralpoiesis* offers a new way of understanding how memory is produced, experienced, and shared in the context of displacement.

In this context, memory is not treated as a static repository of past experiences but as a dynamic engaging of the senses constantly being shaped by the present. Stein's focus on the embodied, relational nature of memory is crucial for understanding how machine learning technologies can be used to create visual representations of memory that reflect the emotional and sensory dimensions of experience. By emphasizing the role of the body in memory production, Stein's phenomenology provides a theoretical foundation for using NeRFs to create memory artifacts that are not simply technical outputs but deeply personal, embodied sensory experiences.

3. Neuralpoiesis: Memory as an Algorithmic Process

The concept of neuralpoiesis marks a significant shift in how memory is understood and produced. While traditional models of memory have often been rooted in a static, linear view of recall (Kumar, 2021), neuralpoiesis proposes that memory is an ongoing, dynamic process mediated by both the body and technology and refers to the creative production of memory artifacts using machine learning technologies such as NeRFs. These artifacts are not simply representations of past experiences but are dynamic, relational renderings that reflect the individual's ongoing engagement with her environment and her memories.

Neural radiance fields (NeRFs) are a type of machine learning model that generates 3D scenes from 2D images by learning how light interacts with objects in the scene (Müller et.al., 2022). In neuralpoiesis, NeRFs are used to create three-dimensional visualizations of memory sensations based on the videos and images captured by those living in displacement while they take intentional walks in their present environments (see Fig. 1 below).
The visualizations created capture not only the physical characteristics of the objects participants encounter that evoke memory but also emotional and sensory elements associated with these objects.

For example, a participant might film a tree in her current environment that reminds her of her childhood home. The NeRF model processes this video to create a three-dimensional visualization that encapsulates both the tree's physical appearance and a representation of the emotional resonance it holds for the participant. These memory artifacts are not static representations of the past but are dynamic, interactive tools that allow participants to engage with their memories in new ways. By transforming memories into visual, embodied experiences, Neuralpoiesis offers a new approach to memory production that emphasizes the relational, fluid nature of memory described in Braedotti's *Posthuman Feminism* (2022).

Using NeRFs for neuralpoiesis also challenges traditional boundaries between humans and machines, as well as between past and present. Memory is no longer seen as something that can be passively retrieved or represented but is actively produced through the interaction of the individual, their environment, and the machine learning model. In this way, neuralpoiesis represents a distinct way approach memory as an algorithmic/machine learning process that is relational, dynamic, and deeply tied to the body and the environment.

By incorporating machine learning technologies in the process of memory-making, neuralpoiesis repositions AI and machine learning as tools for emotional healing and empowerment. Rather than using AI to optimize data-driven processes or create photorealistic scenes, neuralpoiesis suggests that these technologies can be repurposed to produce algorithmic memory artifacts that assist displaced individuals in reorienting themselves emotionally and psychologically. This approach aligns with Fourth Wave Feminism's emphasis on using digital tools for social change and empowerment, particularly for marginalized groups such as displaced women.

4. Nomadic Subjectivity and Memory Fluidity in Rosi Braidotti

Rosi Braidotti's theory of nomadic subjectivity provides another critical lens for understanding how memory and identity are produced in Neuralpoiesis. For Braidotti, the nomadic subject resists fixed notions of identity and embraces fluidity, multiplicity, and transformation (Braedotti, 2022). This concept is particularly relevant for displaced individuals, whose identities are constantly reshaped by their experiences of migration, loss, and dislocation.
Displaced women practicing Neuralpoiesis engage in what can be described as a nomadic practice of walking through their current environments, encountering objects and spaces that evoke memories of home. These walks are not just physical journeys but emotional and psychological ones as well, as the participants navigate the complex interplay between their past and present identities. The act of scanning or filming objects that trigger memory

Fig. 1 Still of participant video capture (left) and NeRF generated visualization (right)

sensations can be seen as a form of nomadic subjectivity, where the individual is shaped by their interactions with their surroundings and their memories.

Braidotti's theory of nomadic subjectivity emphasizes the importance of relationality in identity production. For Braidotti, identity does not exist in isolation but is always produced through interactions with others, the environment, and non-human agents such as technology (Braedotti, 2022). In the case of neuralpoiesis, memory artifacts produced through NeRF visualizations are not static representations of the participant's past but are relational, dynamic renderings that reflect the her ongoing engagement with her environment and her memories.

The fluidity of these visualizations mirrors the fluidity of identity itself. Just as the nomadic subject is always in limbo, the memory visualizations produced through Neuralpoiesis are not fixed or static. Instead, they are open-ended, evolving representations of memory sensations that shift in response to the participant's ongoing relationship with her environment. This dynamic process of memory-making reflects the complexity of identity in the context of displacement, where individuals must constantly navigate between multiple identities, places, and experiences.

Braidotti's nomadic subjectivity also challenges traditional notions of identity often rooted in fixed geographies or cultural markers. Displaced women experience a fragmented and fluid sense of self as they move between different places and experiences. The act of scanning or filming objects in their present environment, and then seeing these objects transformed into dynamic memory visualizations, allows one to engage with their sense of self in a way that acknowledges the complexity and multiplicity of their identity. Through neuralpoiesis, memories—and, by extension, identity—are not static but are instead continually evolving and becoming.

The fluid, relational nature of memory production in neuralpoiesis speaks directly to Braidotti's concept of becoming, which suggests that identity is never fully formed but is always in the process of being reconstituted through interactions with others, the environment, and technological agents. By integrating Braidotti's theory of nomadic subjectivity with Stein's concept of non-actuality, neuralpoiesis provides a feminist framework for understanding how memory, identity, and technology intersect in the production of dynamic, relational memory artifacts.

5. Reorienting Displaced Women Through NeRF Visualizations

Neuralpoiesis represents the potential to use technology as a coping mechanism for those living in displacement. Whether due to migration, forced relocation, or other factors, displacement often results in a profound disconnection from one's sense of place and identity. In such situations, memory becomes an essential tool for reorientation, helping individuals make sense of their present circumstances by connecting the past with the present. Neuralpoiesis offers a new way of engaging with memory by allowing the displaced to actively participate in the creation of visual memory artifacts. Through the process of walking, scanning, and generating NeRF visualizations, participants engage with their memories in a way that reconnects them to their past through their present environment. This process allows them to reorient themselves emotionally and psychologically, providing a sense of continuity and grounding in their current context.

The practice of walking and scanning, which forms the core of the neuralpoiesis framework, serves as both a physical and emotional journey. As participants walk through their present surroundings, they encounter objects and spaces that evoke memories of home. Once filmed or scanned, these objects and places are processed as NeRFs to create three-dimensional visualizations that capture both

physical appearance and emotional resonance. The resulting visualizations are deeply personal, serving as tools for coping and reorientation.

The feedback loop incorporated in the neuralpoiesis process ensures that the participants remain at the center of the memory-making process. After the NeRF visualizations are generated, the participants are invited to review and critique the visualizations to ensure that they align with their lived experiences of memory. This iterative process of reviewing and refining the visualizations not only ensures that the final outputs are meaningful to the participants but also reinforces their agency in the memory-making process (see Fig. 2 below). In this way, neuralpoiesis offers more than a technological solution for displaced individuals; it provides a framework for emotional and psychological reorientation. The visual memory artifacts produced through this process serve as tools for re-establishing a sense of continuity and connection, helping displaced women navigate the complex emotional terrain of their past and present identities.

6. Feminist Technology in the Fourth Industrial Revolution

By positioning Neuralpoiesis within the broader context of Fourth Wave Feminism and the Fourth Industrial Revolution, this study critiques the traditional uses of AI and machine learning technologies, proposing a feminist reimagining of the tools. The Fourth Industrial Revolution, characterized by the convergence of digital, physical, and biological technologies, has brought with it a wave of new possibilities to engage with memory, identity, and place. However, many of these technologies have been developed with a focus on efficiency, optimization, and profit, often overlooking their emotional and cultural implications.

In contrast, Fourth Wave Feminism, which emphasizes inclusivity, intersectionality, and the use of technology for social change, offers a powerful lens for reimagining how technologies like NeRFs can be repurposed for inclusive pursuits. In the context of neuralpoiesis, NeRFs are not simply employed to generate photorealistic visualizations of environments; they are reimagined as tools for emotional healing and empowerment. By using machine learning algorithms to create personalized visual representations of memory sensations, this research highlights how emerging technologies can be redirected from commercial to social application.

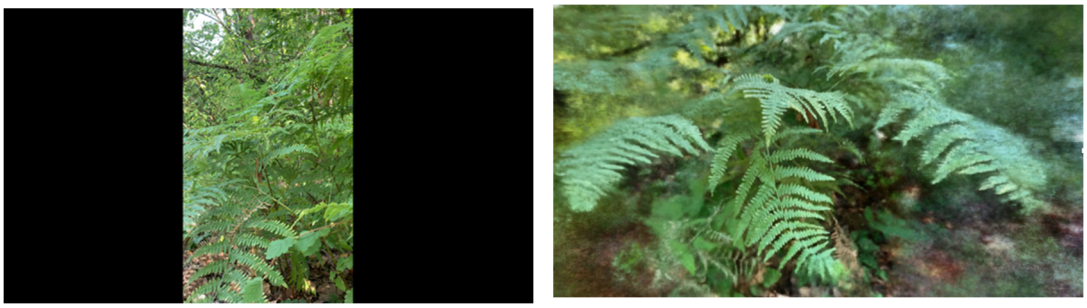

Fig. 1 Still of participant video capture (left) and NeRF generated visualization (right)

The use of NeRFs in this study demonstrates the potential of algorithmic technologies to contribute to memory production, not just as passive tools but as active agents that co-create with human participants. This approach aligns with feminist critiques of technology, which call for a more nuanced understanding of how digital tools might be used to address the emotional and psychological needs of marginalized communities. In the case of neuralpoiesis, NeRF models are used to generate memory visualizations that are deeply personal, reflecting a displacemed person's emotional and sensory experiences of memory.

Furthermore, incorporating user feedback in the NeRF creation process ensures that these technologies do not simply reproduce existing biases or inequalities but are instead shaped by the lived experiences of the displaced. The process of co-creation eployed in neuralpoiesis aligns with the feminist principle of inclusivity, ensuring that the voices of the displaced are central to visualization processes. By allowing users to actively shape the visualizations through personal data, neuralpoiesis offers a new way of engaging with AI and machine learning technologies that prioritizes personal context over technical optimization.

Ultimately, neuralpoiesis critiques traditional uses of AI and machine learning while offering a unique application of emerging algorithmic technologies for memory production and empowerment. The interdisciplinary framework invites further exploration of how algorithmic technologies can be harnessed for inclusive aims, particularly in the context of displacement and migration. By centering the experiences of displaced women and ensuring that their memories are represented in a meaningful and personal way, neuralpoiesis offers a new approach to coping and agency in the digital age.

7. Posthuman Feminism and Expanding Relationality

Rosi Braidotti's posthuman feminist theory further expands the possibilities of neuralpoiesis by challenging traditional boundaries of identity, subjectivity, and empathy. Posthuman feminism, which decouples human experience from the anthropocentric lens that has dominated much of Western thought, proposes that human experience is relational and interconnected with non-human agents like technology, animals, and the environment. This shift from a human-centered to a posthuman understanding of subjectivity allows us to reimagine memory, embodiment, and empathy, particularly in the context of algorithmic technologies like NeRFs.

Through neuralpoiesis, posthuman feminist theory allows us to reconceptualize memory-making as a process that involves both human and non-human agents. The NeRF algorithms used to generate visualizations are not neutral tools; they participate in the production of memory and identity, reshaping how displaced women engage with their pasts. This aligns with Braidotti's theory of nomadic subjectivity, which emphasizes that identity and experience are always in flux, shaped by the relational interaction between humans, technology, and environment.

By integrating Stein's phenomenology of non-actuality, which focuses on the embodied experience of memory, with Braidotti's posthuman feminist theory, neuralpoiesis presents a new approach to exploring how memory can be mediated in the age of AI. Stein's concept of empathy highlights the importance of bodily sensations in the process of memory-making, while Braidotti's posthumanism extends this relational understanding of experience to include non-human actors, such as the NeRF algorithms themselves. Neuralpoiesis represents a framework for the practical application of these concepts.

8. Conclusion: Toward a New Feminist Framework for Algorithmic Memory

This text has introduced neuralpoiesis as a feminist framework that reimagines how memory is produced and experienced through the interaction of embodied experience and algorithmic technologies. Through Edith Stein's non-actuality and Rosi Braidotti's nomadic subjectivity, neuralpoiesis positions memory as a dynamic and relational process. The NeRF visualizations created using this framework offer new ways of engaging with memory and provide the displaced with tools for emotional healing and reorientation. Through the creation of visual memory artifacts, neuralpoiesis offers a means to reorient and engage both past and present.

This approach disrupts traditional notions of memory as static or fixed, proposing instead a model where memory is fluid, relational, and embodied. As a result, neuralpoiesis extends feminist critiques of technology, demonstrating that algorithmic tools like AI can be harnessed for emotional healing. The neuralpoiesis framework aligns with Fourth Wave Feminism by emphasizing the importance of inclusivity and intersectionality, while empowering marginalized voices through technology. By placing displaced women at the center of the algorithmic memory visualization process and allowing them to shape their own memory sensations, neuralpoiesis ensures that representations of an individual's lived experiences are constructed from a personal perspective and prioritizing human agency.

This interdisciplinary framework also engages with the broader discourse on the Fourth Industrial Revolution, which has transformed how we think about identity, memory, and subjectivity in the digital age. As technologies like AI and machine learning become more pervasive, it is critical to examine how these tools can be reimagined to serve humanistic and feminist aims. Neuralpoiesis provides a compelling case for how these technologies can be redirected from their commercial or technical applications toward more meaningful, emotionally resonant uses, particularly in the context of displacement and trauma. Furthermore, neuralpoiesis highlights the potential for posthuman feminist theory to reshape our understanding of memory and identity. By challenging the anthropocentric bias of traditional memory studies, neuralpoiesis opens new possibilities for understanding how memory is produced through the interaction between human and non-human agents.

Neuralpoiesis also presents a new phenomenology of memory that integrates feminist theory, embodied experience, and algorithmic technologies. By drawing on the work of Edith Stein and Rosi Braidotti, this framework reimagines memory as a dynamic, relational process that is produced through both human and non-human interactions. The NeRF visualizations created using neuralpoiesis present new possibilities for engaging with and experiencing memory, ultimately providing those living in displacement with tools for emotional and psychological resilience. Through the lens of Fourth Wave Feminism and the Fourth Industrial Revolution, neuralpoiesis critiques traditional uses of AI and machine learning, offering instead a feminist application of these technologies for memory production and empowerment. This interdisciplinary framework invites further exploration of how algorithmic technologies can be harnessed for inclusive projects, particularly in the context of coping in displacement.

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