

Head in the Clouds: A Deleuzoguattarian Analysis of the Environmental Impacts of Digital Memory

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ABSTRACT

Digital memory in the twenty-first century is a complex combination of human and nonhuman elements that interact in various combinations. In an era where environmental devastation is inundating the planet, it is vital to address the digital's role in this degradation. This paper explores various facets of the environmental implications of the digital storage of memory objects using Deleuze and Guattari's assemblage theory. I identify the ways in which the digital realm is constructed, or 'territorialised' in Deleuzoguattarian terms. Beyond identifying the most common myths related to digital memory's environmental impact, I expand on the work of information theorists such as Clements, Floridi, and Ess by forwarding three ways in which digital memory practices can be deterritorialised. These approaches include 1) knowledge acquisition, 2) taking response-ability, and 3) anti-redundancy movements. I argue that it is vital for cloud storage users, especially those who self-identify as environmentally conscious, to align their online memory practices with accurate understandings of the environmental impacts of the digital.

KEYWORDS

digital memory, cloud storage, environmental degradation, assemblage theory, informational ontology, response-ability

1. INTRODUCTION

On a rainy Johannesburg afternoon late in 2020 I interviewed a participant for a study on memory and environmental consciousness. Twenty-nine-year-old South African Benjaminⁱ considered himself to be an eco-conscious person who took the environmental consequences of his daily actions seriously. Among other things, he aimed to remain conscious of his water and fuel consumption, his diet, his waste habits, and the objects he surrounded himself with – including those he kept as reminders of the past. In response to questions about which objects he was sentimental about, Benjamin said that “photographs are [his] thing”: “the fact that it’s captured and that somebody that’s in there might not be there at this time next year, I think that holds a lot of weight to me”. He explained that he mostly stored his photos online, because “I don’t wanna be printing on anything”:

[...] there’s no need to really have actual photographs when everyone has access to clouds, digital... access to anything now, really. There’s no real, uh, need for a physical photograph unless you’re displaying it in your house.

When asked to elaborate on the handling of his memory objects before becoming more eco-conscious, he mentioned that he “used to be quite aggressive with the printing”, whereas his environmental awareness has shaped new storage habits. Despite printed photographs carrying more sentimental ‘weight’ for Benjamin, he preferred storing them digitally because he understood cloud storage to be a more environmentally sustainable consumer choice than printing photographs and storing them in his home.

By this stage in the research process, I was unsurprised (but not unalarmed) by this way of thinking. In fact, while conducting interviews between 2019 and 2021 with participants who self-identified as environmentally conscious, a disconcerting number of them expressed the belief that storing memory objects online was more environmentally friendly than storing it ‘physically’ because cloud storage solutions are often marketed as sustainable (Loots 2022). The participants’ views aligned with a body of research that found that consumers (also those who identify as environmentally conscious) commonly “fall into the trap” of identifying greenwashed products and offerings – including the placeless and harmless ‘cloud’ – as more sustainable than they really are (Urbánski and ul Haque 2020; see also Parguel et al., 2015).

A growing culture of recording and storage has emerged marked by a new age of human memory cross-pollinated with the input of technological machines and processes. Recent technological advances offer humans unprecedented opportunities, including how human memories are affected, stored, and recalled. In the twenty-first century, as can be seen from the anecdote above, humans leave numerous online traces of their personal lives in various

multimedia formats. Humans have become “miniarchivists” (Parikka, 2013: 2) in an era where cloud storage and other services that allow for the remote archiving and processing of data, provided by companies such as Google and Facebook, are flourishing.

While such companies often claim to be a ‘greener’ alternative to older forms of media, the information and communication industry has serious environmental implications. Over the last decade, many authors have addressed the extensive environmental damages caused by the industry (see for example Crawford, 2021; Hu, 2015; Iheka, 2021; Maxwell and Miller, 2012; Starosielski and Walker, 2016). The extant body of literature is bringing the materiality of the cloud into critical relation with questions of the environment, data surveillance, and geopolitics. There is no lack of research on the environmental devastation caused by technology, also through a new materialist lens (see for example Cubitt, 2017; Jue and Ruiz, 2021). In particular, many theorists seek to conceptualise digital memory in relation to its environmental impact, human labour, material processes, and other commodity chains involved in the production and consumption of the digital.

Considering the expansive theoretical engagement with this issue, one starts to wonder why this knowledge does not appear to be getting the necessary circulation in the public realm. Or, put otherwise, why do self-identified eco-conscious users, such as Benjamin, believe they are acting in an environmentally conscious way when using cloud storage solutions, when there are clear indications of the contrary? This paper straddles three themes, namely memory, the digital, and the environment. To my knowledge, this paper is the first to apply Deleuzoguattarian assemblage theory to address the question of digital memory’s environmental implications. This is done by drawing human memory, technology, and the environment into the same philosophical frame, and analysing their different relations.

The aim of this article is twofold. First, I consider the ways in which popular worldviews surrounding the environmental effects of cloud computing are territorialised through deliberate strategies carefully employed by dominant capitalist structures. These strategies, in turn, shape users’ digital memory beliefs and consequent practices. Second, I turn to the potentials that the deterritorialisation of naturalised myths can hold if additional materialities are introduced to the digital memory assemblage by providing three solutions. Using assemblage theory, I argue that the ways in which digital memory’s materiality is actively obscured reveals ethically relevant issues about the world. Consequently, I argue that these issues require close consideration to be remade, or deterritorialised, if environmental concerns are to be taken seriously.

I follow Yuk Hui (2017: 1) in defining ‘digital objects’ as objects that “take shape on a screen or hide in the back end of a computer program, composed of data and metadata regulated by structures or schemas”. Digital *memory* objects, in the context of this paper then, are any digital objects stored offline and/or online as a form of remembrance of a past life event, such as documents, videos, sound files, and photographs. A comparison between online and offline storage is a more complex issue than can be presented here. In this article I focus on online digital storage specifically and I discuss *individual* responses to cloud storage as opposed to responses that could be undertaken by industry.

This article consists of four sections. The first provides an overview of its theoretical framework, namely assemblage theory. The second discusses the literature on memory and the digital in the twenty-first century. Thereafter, I turn to the ways in which human beliefs about digital memory practices are territorialised through discourses that deliberately obscure the material components of the digital realm. The final section explores ways in which these myths can be deterritorialised through engaging with the work of theorists such as Estelle Clements (2020, 2022) on digital civics and concepts such as ‘informational ontology’ (Floridi, 2002; 2009); ‘response-ability’ (Haraway, 2016); and ‘anti-redundancy’ (Hogan, 2021; Brennan, 2016). Read together, I highlight the most prominent areas for concern, and forward new approaches in which digital memory practices can be deterritorialised to equip environmentally conscious users in making ethical decisions grounded in knowledge.

2. THEORETICAL FRAMING: ASSEMBLAGE THEORY

Assemblage theory, first theorised by Gilles Deleuze and Félix Guattari, provides ways of framing the material and semiotic relations between humans and nonhumans (DeLanda, 2006; 2016). This shifts the focus for social inquiry from “an approach predicated upon humans and their bodies, examining instead how relational networks or assemblages of animate and inanimate affect and are affected” (Fox and Alldred, 2015: 399). For example, Benjamin’s relation with digital memory is composed of a vast network of materialities such as thoughts, perceptions, physical technologies, and the human body, and the affect that flows between these materialities.

Although this theory dates back to the 1980s, many materialist approaches such as the new materialisms, which arose out of the work of Jane Bennett, Rosi Braidotti, Manuel DeLanda, and Karen Barad (among others), and Bruno Latour’s actor-network theory (ANT), are “prime examples of bodies of work that fit the category of assemblage theory and acknowledge a debt to the work of Deleuze and Guattari” (Buchanan, 2020: 4). Theorists

continue to use assemblage theory to experiment with diverse topics including, for example, research methods (Coleman and Ringrose, 2013; Fox and Alldred, 2017; Law, 2004), habits (Dewsbury, 2011); memory (Hamilakis, 2017); policy (Baker and McGuirk, 2017); sexuality (Feely, 2019); and digital photography (Sun, 2020).

An assemblage can be seen as a process and an arrangement in which heterogenous elements entangle, are not fixed, and do not belong to a larger pre-given group of things (Law, 2004: 42). Assemblages can also be thought of as “temporary co-presences” and articulations of things, beings, enunciations, and memories, “brought together and enacted as such by embodiment, sensoriality and affect” (Hamilakis, 2017: 176). Affects, as “states of being” transferrable between territories (Hemmings, 2005: 551), may either limit materialities within existing capacities or open up new possibilities. For example, Benjamin’s capacity to act in the way that he does – storing memory objects digitally online – is enlivened because of the technologies at his disposal and his beliefs and assumptions (in turn informed by larger micropolitical social and capitalist structures) surrounding the eco-consciousness of this practice.

An assemblage is a tetravalent system that functions along two axes: the components of content and expression on the horizontal axis, and territorialisation and deterritorialisation on the vertical axis (Figure 1). By determining an inside and an outside and using this orientation to explore the world, territories, which are the assemblages that we inhabit, are formed (Thornton, 2018: 193).

[INSERT FIGURE 1 WITH HEADING: Figure 1: The assemblage as tetravalent system that functions on a horizontal and vertical axis. Graphic by the author.]

Territorialisation entails the static end of an assemblage – a person, an idea, a community, an organisation, and so on – by asserting spatial boundaries and defining an identity and function within that assemblage. Alongside a tendency towards stasis, an assemblage also possesses tendencies towards change (Adkins, 2015: 11). Territorialisation (territory made and remade) and deterritorialisation (territory unmade) are poles of a single continuum (Deleuze and Guattari, 1987: 88). Territorialisation stabilises an assemblage while deterritorialisation destabilises it. Thus, one must understand what the territoriality of a specific assemblage is (as will be discussed in section four) and, conversely, what its deterritorialisations are and what abstract machines they effectuate (Deleuze and Guattari, 1987: 88) (which will be the focus of section five). Returning to Benjamin’s case, one might say that his relationship with printed sentimental photographs has been deterritorialised

when his beliefs about environmental consciousness drove him to store such photographs digitally. Deterritorialisation, then, is the way the assembled milieu components of a territory lose their territorial function to meld with other assemblages outside it.

On the horizontal axis of every assemblage, one has content and expression (Deleuze and Guattari, 1987: 504). The former connotes a pragmatic system of actions and passions which presents corporeal modifications of material bodies, actions, and passions. The latter connotes a semiotic system which expresses incorporeal transformations of acts and statements. There exist dynamic relations among the elements of the content, such as the structure of organisations, physical materials, and resources on the one hand and, on the other, the expressive aspect, such as regulations, governing principles, and symbolic expressions. Content is not a signified nor expression a signifier; rather, “both are *variables* of the assemblage” (Deleuze and Guattari, 1987: 66). The material content of assemblages does not preclude the possibility of it becoming signifying, and vice versa: material-semiotic content is expressed as physical matter, organic matter, and linguistic matter (Deleuze and Guattari, 1987: 66-67). Content and expression are thus imbricated in each other in multiple ways.

Taken together, the assemblage’s tetravalence highlights the *ratio* of its tendencies between the material and the expressive and towards stability and change (Deleuze and Guattari, 1987: 88, 504). The more a particular practice tends towards universal axioms, the more it becomes resistant to change. Contrarily, the more uninterested a particular practice is in what constitutes its expression (and instead adapts its method in response to the problems at hand), the more such a practice tends towards change. Any practice will, however, display *both* of these tendencies in a certain *ratio* (Adkins, 2015: 13-14). Only by taking all these dimensions into account can one be said to be working with assemblages (Buchanan, 2020: 121; DeLanda, 2006: 12).

Seeing diverse relations as an assemblage entails that any instance in the world becomes a territorialisation that shapes whatever it produces through affect flowing between its components (Fox and Alldred, 2017: 155). From this perspective, digital memory is not something organised by human actors alone, but an assemblage of things, ideas, social collectives, and institutions. Assemblage theory allows theorists “a way of analysing a thing or situation” (instead of “a way of describing a thing or situation”) (Buchanan, 2020: 132). Rather than dividing the world into discrete components, assemblage theory assembles a set of disparate circumstances: It synthesises a “multiplicity of elements without effacing their heterogeneity or hindering their potential for future rearranging (to the contrary)”

(Massumi, 1987: xi). With this theoretical outline, it is possible to view the environmental effects of digital memory as a territorialised assemblage consisting of diverse materialities, that always has the potential for deterritorialisation, or being remade in a radically different way. The next section turns to a brief overview of digital memory.

3. THE MATERIALITY OF DIGITAL MEMORY

Up until recently, work on memory in terms of the social and technologies tended to emphasise the radical nature of the transition from 'collective' (Halbwachs, 1992) to 'connective memory' (Hoskins, 2011), how social media profits from users' data (Zuboff, 2019), or how the digital offers opportunities for the articulation of marginalised memories (Garde-Hansen, 2009). Moreover, media memories have been characterised as multiple (Rothberg, 2009) and often involving the conflict of power dynamics (Erll, 2011).

Further to this, theorists are researching the role of distributed agency, in particular the use of the technologies that "make possible the storage and transmission of memory", in which memories are increasingly "triggered and shaped by mediating objects such as photographs, home videos, souvenirs, oral stories, and written documents" (Bond, Craps and Vermeulen, 2017: 13). Memory storage is an increasingly non-biological process: the human brain becomes "a porous, permeable container" and through "instant, repeated and shared retrieval processes, memories are increasingly dynamic and protean, but also migratory and distributed across platforms, media and technologies, and other people's minds" (Groes, 2016: 356).

Information technology provide apparently endless storage and retrieval possibilities and thus continuously drive, shape, and organise human memory (Casalegno, 2004: 313; Pister, 2016: 215; Van House and Churchill, 2008). This exploration of memory as a synergy between human and nonhuman (technological) materialities have yielded analyses of digital memory drawing on 'an ecological approach', namely exploring memory as a combination of semiotic and material processes that are made up of ideas, humans, the environment, communication technologies and other components that together create a memory assemblage (Reading, 2014: 752). While online and offline memory storage share similarities, they function in fundamentally different ways. I here focus solely on the former. I am further aware that digital memory storage is a complex issue that requires extensive consideration, and thus approach it carefully.

Of particular interest for this article on digital memory is a body of literature that deals with the environmental impact of the digital more broadly. For example, theorists are analysing

the immense environmental damage caused by digital media (Cubitt, 2017; Iheka, 2021; Maxwell and Miller, 2012; Starosielski and Walker, 2016); discussing how hybrid forms of networks work and how they can be imagined differently (Parks and Starosielski, 2015); unearthing the origins of the cloud as built on older network technologies and politics (Hu, 2015); the role of design in reframing the digital as a fundamentally material process (Pink, Ardèvol and Lanzeni, 2016); analysing the ways in which artificial intelligence technologies entrench inequalities, damage the environment, and fuel undemocratic governance (Crawford, 2021); re-examining media through the ocean that may lead to new understandings of human entanglement with it (Jue, 2020); considering the geology and material conditions of media (Parikka, 2015); and using saturation as a heuristic to analyse phenomena in which the elements involved are difficult to separate (Jue and Ruiz, 2021).

Digital memory requires raw and processed materials and minerals. When tracing digital memory's materiality one finds the often "obfuscated environmental exploitation and friction between capital and labour that go into these newer forms of mediated memory" (Reading, 2014: 749). Material and physical infrastructures are socially constructed in such a way that some benefit and others are marginalised. The materials that make up the 'cloud' are forcibly removed from the earth with machines and human labour and are then processed, graded, and recombined to become micro-chips, computer screens, and mobile devices that power everyday memory (Hogan, 2021: 296; Hu, 2015).

In close relation to this transformation of mineralogy of the earth (such as gold, silver, salt, and copper) one finds the imbrication of human and inhuman materials in relations of extraction: typically, black, marginalised human bodies conduct the role of extracting such materials, exposing them to harsh conditions and reinforcing environmental racism perpetuated throughout history (Yusoff, 2018: 17). These extractions happen at a cost to human lives, and local fauna and flora, and often lead to friction between local communities and large mining companies (Maxwell and Miller, 2012; Reading, 2014: 750).

Digital memory further leads to a stream of waste: from reused trails of data waste to mine people's identities, discarded mining waste, to an endless list of material 'things' such as outmoded computers and fax machines, damaged televisions, monitors and mice, old mobile phones, and broken memory sticks (Gabrys, 2013: vi-vii). Globally, estimates suggest that around 50 million tons of electronic waste is produced annually (Sthiannopkao and Wong, 2012: 463). South Africa, where this paper originated, generated 321 000 tonnes of e-waste in 2016, positioning this as the fastest growing waste stream in the country (Ichikowitz and Hattingh, 2020: 44).

While some portions of electronic waste are crushed and buried as polluting landfill, others are commonly shipped to elsewhere. Many memory gadgets often end up in developing economies where cheap human labour is used to strip it and clean it for its internal metals, minerals, and recyclable elements (Zehle, 2009: 3) (Figure 2). Dismantled to extract these components, the toxins cause cancer in the bodies of labourers and irrevocable toxic environmental changes. On another level, human memories are also visibly fragmented along these spatial and racial lines: living in recycling villages such as Wen'an, Ningbo or Guiyu in China, which are effectively “dead zone[s] with rampant and pervasive negative health effects for the population and local ecology”, would impact one’s memory in ways unimaginable to those not in that position (Davis, 2015: 351).

[INSERT FIGURE 2 WITH HEADING: Figure 2: An e-waste recycling station in Guiyu, China, where discarded computers are dismantled. Photograph entitled, *Ctrl-X-China, a topography of ewaste* by Kai Löffelbein (2018). Used with the photographer’s permission.]

From this it clear that digital memory has very tangible material implications, at all stages of the process. To analyse the ways in which this materiality is obscured, I now analyse digital memory as a territorialised assemblage composed through the entanglement of various ideas, objects, intentions, humans, and systems.

4. CLOUDED VISION: TERRITORIALISED DIGITAL MEMORY

4.1. New materialist analysis

In this section, I turn to some of the main potential reasons for many environmentally conscious humans’ – including Benjamin’s – beliefs that their digital memory practices are environmentally conscious, despite ample evidence of its complex relationship with and detrimental effect on the environment. To illustrate the relations in this assemblage, I use Fox and Alldred’s (2015; 2017) new materialist analysis. Through this method, Fox and Alldred (2017: 29) determine “how assembled relations affect or are affected by each other”. New materialist analysis questions conceptions of bodies as occupying distinct space and roles, which emphasizes the flows produced through the relationship between bodies, things, and ideas (Deleuze and Guattari, 1987: 261). This shifts attention away from the anthropocentric privileging of human agency to ascribing affective capacity to all kinds of matter, including psychological, affective, infrastructural, sociocultural, embodied, and discursive forces working in concert (Feely, 2019: 17).

In determining how the assembled relations affect, and are affected, one can learn what an assemblage *does* and analyze the subsequent consequences. By acknowledging all social, material, and abstract entities in relation to one another, assemblage thinking allows one to address underlying power structures. This process begins by identifying the most pertinent material-semiotic forces affecting an event. Taking Benjamin's narrative as introduced earlier and the various aspects Benjamin mentioned (including himself) into account, an assemblage between him and his practice of storing memory objects online might contain the following materialities:

Benjamin – photographs – memories – sentimental experiences – computer software – digital storage – the cloud as environmentally friendly option – convenience – less printing as environmentally conscious act – changed relationship with memory objects

In this assemblage, many relations with affective implications interact. To analyse this assemblage, it might be useful to look at its history. Previously, Benjamin printed many of his photos. Since then, he shifted his behaviour from printing photographs to storing them online because he believed this to be more environmentally friendly. The assemblage's territory (in other words, printing photographs for sentimental reasons) lost its territorial function by melding with other assemblages outside of it (in other words, storing sentimental photographs online because he wishes to be more environmentally conscious). This shift in habit supposes additional materialities, and adapted beliefs and actions, and suggests the nature of the assemblage as constantly oscillating between stasis and flux.

Across the board I noticed that all the interview participants who touched on cloud storage highlighted its positive effects, without mentioning potential negative environmental implications or the electronic devices used to view online media. Why, if the digital world has a very tangible environmental footprint, is this belief so popular among the public? I now turn to three key factors, namely 1) the problematic myths evoked by the metaphor of the cloud, 2) greenwashing as a capitalist technique to sell products and services; and 3) data saturation as a way by which companies continue to mislead the public.

4.2. The rhetoric of the cloud

I would argue that one of the most prominent reasons for a general public misconception of the impact of the digital, is the metaphors used to describe it. Information technology has been widely understood through conflicting metaphors such as being 'magical' (Lynn Kaarst-Brown and Robey, 1999), 'unexciting', 'simple', or it should 'just work' (Carr, 2014: 180), 'invisible' (Norman, 1998), 'neutral' (Hamilton, 2000), or a 'useful' utility (such as water or electricity) (Johansson, 1997: 22). More specifically, computers' role in augmenting mental

and memory abilities creates a strong link to intelligence-centred or anthropomorphic metaphors such as 'brains', 'memory' or 'intelligence' (Hamilton, 2000, Johansson, 1997).

Most recently, the commercial rhetoric moved beyond the metaphor of the network to the metaphor of memory as a cloud (Figure 3), suggestive of how memory through digital means is accessible from anywhere, and is characterised as “cheap, convenient, ubiquitous and abundant” (Reading, 2014: 753). The misleading marketing concept of the ‘cloud’ suggests something impalpable, fluffy, and light (Holt and Vonderau, 2015: 72; Hu, 2015: xii; Lucivero, 2020: 1019).

[INSERT FIGURE 3 WITH HEADING: Figure 3: An example of how cloud computing is commonly visually communicated as something 'digital', 'intangible', 'secure' and 'harmless'. Image designed by Freepik (www.freepik.com)]

The wider globalised post-industrial rhetoric used by commercial industries evokes the idea that, unlike past industrial processes, these are clean and discrete industries. The cloud metaphor is amplified by branding of data centres as 'server farms' despite the contradictory linguistic mixing of 'server' and 'farm'. This term poses memory is “industrially produced to feed infinite data storage and retrieval needs while also suggesting that this is from a farm – not a factory – suggesting with connotations that this is green and from the countryside not the city” (Reading, 2014: 754).

Such language strategically obscures its geographies, and the materiality and impact of the infrastructure. In reality, cloud computing is a highly tangible assemblage of “material and heavy stuff” composed of cables, servers, IT facilities, shelves in large buildings, and cooling and ventilation systems (Lucivero, 2020: 1019) (Figure 4). In 2017, data centres accounted for over one per cent of the world’s electricity usage (Zhang et al., 2017: 2047). It is predicted that, if left unchecked, the information and communication industry could grow from roughly six percent of the global emissions footprint to exceed 14 per cent of the 2016-level worldwide global greenhouse gas emissions by 2040. This would mean that this industry would be accounting for more than half of the current relative contribution of the whole transportation sector (Belkhir and Elmeligi, 2018: 448).

[INSERT FIGURE 4 WITH HEADING: Figure 4: Visual rendition of what tanks containing coolant for servers at data centers across the globe resemble. The necessity for giant cooling facilities foregrounds the resources such as water and coal used, and air pollution caused by data centers. AI-generated using ImagineArt.]

Storing data in the cloud evokes a sense of security, especially because the data center is positioned as an 'automatic process' that happens separate from human interaction (Taylor 2019). The image of the empty data center "might be seen to feed into and further fuel fantasies of data-based knowledge as objective, and the facilities that store and manage data as pure machines uncontaminated by human bias, error or prying" (Taylor, 2019: 19). Digital technologies are grafted onto older infrastructures that were used to exert power and instil ideologies about society. Yet, the cloud is invested with cultural fantasies about choice, and security to such an extent that they obscure the political and military origins and rhetoric from users (Hogan, 2021; Hu, 2015).

Using language that deliberately conceals data storage's material implications induces false assumptions about the reality of memory storage that not only influence people's understanding thereof but also shape their attitudes towards it (Lucivero, 2020: 1019). Benjamin's belief that online storage is eco-friendly is only one example of how major discourses continuously territorialise certain attitudes. It is vital to upturn current conceptualisations of digital memory by "bringing the commercial rhetoric of 'the cloud' back down to earth to unpack its underlying political economy, including its environmental impact and the political tensions that arise from it" (Reading, 2014: 749). Moving one step beyond this, theorists such as Melody Jue (2020) suggest conceptually displacing metaphors related to 'groundedness' all together to rethink our human relation to our surroundings to nurture more just relations with it. These changes are complicated by practices that deliberately conceal the complexity of the situation, such as greenwashing, to which I next turn.

4.3. Sustainability sells

Since the 1960s, invisibility has been a central mechanism to "express the worldlessness of computerised knowledge" (Cubitt, 2017: 159). As I will discuss now, companies such as Google aim to actively obscure the relationship between the digital and its environmental impact to uphold its reputation as a safe, secure and eco-friendly choice. This is commonly done through greenwashing, a term used against organisations that claim to be more environmentally friendly than they are. The term 'green' (commonly coupled with the colour green) is increasingly used as a marketing strategy to sell products deemed environmentally friendly and simultaneously to suggest progressive politics and sustainability. Such myths are constantly re-established by ideological fixations that compel western societies to assume certain attitudes towards and understandings of the social life they find themselves in (Houze, 2016: 9).

Several attempts by massive corporations to ‘generously’ share the innerworkings of their facilities – on *their* terms – aggravate rather than rectify misconceptions about digital memory’s materiality. One notable example is Google’s 2012 public relations push to promote the visibility, accessibility, and environmental friendliness of their data centers. The colourful, aesthetic images of the sites’ technologies aimed to ‘reveal’ the data centers computers, routers, switches, pipes, and wires (Figure 5). Yet, decontextualising these materials and removing all visual references to human labourers, arguably “render[ed] this infrastructure much *less visible*” (Holt and Vonderau, 2015: 85, my emphasis).

[INSERT FIGURE 5 WITH HEADING: Figure 5: A common example of the aesthetic presentation of data centers by corporates such as Google. The combination of colourful pipes and sleek interior has been likened to abstract art. AI-generated using ImagineArt.]

In fact, by obscuring the relationship between these technological components and their environmental implications brought about by processing, storing, cooling, and distributing trillions of gigabytes (or zettabytes) of data, the series has been likened to abstract art (Holt and Vonderau, 2015: 85) and to wilderness imagery (Taylor, 2019). Similar aesthetic displays of data centers include documentaries (Mendelsohn, 2011) and art books (Alger, 2013; Blum, 2012). As seen in this example, public concerns about the sustainability of the digital world’s infrastructure are thus actively obscured by companies’ dutiful ‘transparency’ with the public.

A Google Cloud report (2022) on global corporates’ green practices found that 58 per cent of executives anonymously surveyed felt that their companies were guilty of greenwashing. Overall, 66 per cent questioned how genuine some of their organisation’s sustainability initiatives were (Google Cloud report, 2022: 5). Moreover, 87 per cent agreed that more meaningful progress could be made if companies were more honest about the issues they face with becoming more environmentally sustainable (Google Cloud report, 2022: 10). Although many carbon emission trackers for users to calculate the environmental impact of their choices and habits have been developed over the past few years, this responsibility cannot be shifted to the consumer alone (Zuboff, 2019: 37). There is a need for legal regulation to curb the irresponsible behaviour of corporate entities attempting to conceal their processes from the public, through practical and measurable metrics (Zuboff, 2019). It seems logical that carbon emissions should be accounted for in the same way that financial operations must be accounted for, as this provides a means of measuring emissions and

developing strategies to achieve mitigation (see for example Hazaea et al., 2023 and He et al., 2021).

4.4. Saturation: a system of surplus

Deep-rooted assumptions about the immateriality of digital memory co-mingle with the increasing use of online services, and expectations of continuous connectivity and endless memory storage space. This raises the demand for data and service availability, which in turn requires data that are stored in servers in multiple sites to be easily accessible (Lucivero, 2020: 1016). 'Data saturation', suggests Mél Hogan (2021: 285), refers to the convergence of neoliberal capitalism with the overproduction of data server farms. In turn, big tech companies use users' reliance on them for "storage space, of battery power, of always-updatable functionality" as an excuse to keep expanding to accommodate these needs (Hogan, 2021: 285; Gabrys, 2013: 38). Ironically, this gives such companies more control due to users' dependency on them. Data saturation, then, "has become an industry tactic to justify not only their ongoing expansions, but also to create a dependency on their services" (Hogan, 2021: 285):

[...] we can acknowledge that the growth of data is significant, but also a force-fabricated project of capitalism and neoliberalism. We create data, but also— and ever more— the conditions that generate more data and that lock us into systems that we no longer fully control or completely understand (Hogan, 2021: 288).

The tech industry is constantly at a saturation point as storage cannot keep up with the fast growth of data. This position is then used to "easily justif[y] the construction of new data centers (because we should not have to imagine the effects of running out of storage space)" (Hogan, 2021: 288). An overabundance of data is required to maintain business growth and this surplus gives rise to a variety of issues, including the environmental challenges I raise here.

From the factors discussed above it is clear that humans' technological habits entangle in assemblages with cultural, social, political, ethical, and very tangible environmental dimensions. An assemblage foregrounding the environmental component of digital memory could reveal:

Digital memory objects – computer software and hardware – online storage – 'cloud' – myths about immateriality – capitalism – data saturation – cooling systems – carbon emissions – mining industry – environmental degradation – e-waste – exportation – exploitation – injustice

The two assemblages presented in this section of 1) Benjamin and his online memory practices and of 2) the oft-observed environmental impact of these practices not only point to

material relation between digital memory and the environment, but also the discrepancy in the public's understanding of this relationship territorialised by dominant discourses. In the same way that digital culture allows for "endless series of new combinations, orderings, and remixes of its basic source materials" (Pister, 2016: 215), the misconstrued relationship between digital infrastructures, content and context should be acknowledged (Pink, Ardèvol and Lanzeni, 2016). I now move beyond potential reasons why the material effects of the digital remain largely unknown to the public. I turn to the ways in which a digital memory assemblage might be deterritorialised if new materialities are plugged into it.

5. CLOUDY WITH A CHANCE OF CHANGE: THE POTENTIALS OF DETERRITORIALISATION

In this section I forward new approaches to address emerging issues associated with online digital storage usage. In offering these strategies I align myself with various theorists and expand on their work by foregrounding practical ways in which to deal with these issues. Most prominently, I consider all four of Clements' (2020) conceptual resources for digital civics, namely philosophy (philosophy of information in particular); virtue ethics in the digital age; civic structures, specifically the physical infrastructure of the informational world and questions related to it; and history (through the lens of memory studies). By grounding my stance in Clements's work and the key theorists she identifies as informing it, substantiates my contribution's comprehensive approach, robustness, and its suitability for the digital era.

Building my own environmental formulation on existing theory, I construct a three-pronged approach for successfully deterritorialising common thinking around the materiality of digital memory. Firstly, I align myself with Luciano Floridi (2002), Charles Ess (2010), and Clements (2020) in arguing that technological problems require philosophical engagement, also by thinking *through* the human body. Secondly, I draw ethics and new materialist thought together by suggesting that those who identify as environmentally conscious have a response-ability (as theorised by Haraway 2016) to make environmental choices grounded in intellectual rigour (Clements 2020, Ess 2010). Thirdly, I offer examples of movements and actions that resist data saturation. Read together, these three strategies deterritorialise the status-quo and serve as viable solutions to the problem of digital memory's environmental impact. I end with a concise new materialist analysis of what these kinds of ethically and intellectually informed environmentally conscious choices might look like.

5.1. Critical thinking

As became clear in the previous section, the myth of the separation of environments and their consequences (such as online/offline) continues to distort users' opinion and

understanding of the digital world. Through his work on the 'philosophy of information', a field concerned with the the "use of computers and the philosophical issues that arise from them" (Clements 2020: 571), this is a primary points Floridi (2002) raises. Digital memory is undoubtedly intertwined with technologies that raise ethical concerns, making the philosophy of information a potentially vital lens with which to address problems arising from this relationship.

Floridi (2009: 151) proposes the concept of informational ontology (rather than digital ontology) to think through the false separation between different spheres of life. Unlike digital ontology, informational ontology argues that the nature of reality is "informational and the digital and analogue are simply differing levels of abstraction" through which one can interpret reality (Clements, 2022: 575). Informational ontology "entails a 'networked morality' directly parallel with contemporary environmental and feminist ethics [...] generally characterised in terms of philosophical naturalism in both Western and Eastern traditions", including thinkers such as Spinoza, Plato, and Buddha (Ess, 2010: 113).ⁱⁱ

In my view, the usefulness of virtue ethics as necessary for realising the self's best possibilities comes very close to the Deleuze and Guattari's (as influenced by materialist philosophers such as Spinoza) ideas around relational ethics. Let us consider Ess's (2010) use of information ethics' focus on the myth of ontological separation of body and mind. Ess (2010: 115) calls for a (re)turn to embodiment as "virtue ethics depends centrally on the body". I argue that this aligns with one of the new materialisms chief projects to take matter "more seriously" (Adkins 2015: 11). Giving due consideration to the significance of the body in the digital age could assist individual users in situating themselves within an assemblage of heterogenous materials.

For example, being aware of one's body in different contexts can "foster the sorts of self-cultivation required to make careful choices regarding the design and use of new media" (Ess 2010: 106), including asking critical questions about the impacts of wearable technologies,ⁱⁱⁱ facial recognition, data privacy, and the physiological and mental health concerns related to technology, such as addiction and digital hoarding.^{iv} If not protested, the instruments employed by surveillance capitalism will turn the body into "a set of coordinates in time and space where sensation and action are translated as data", stripping it of "moral reasoning, politics, social norms, rights, values, relationships, feelings, contexts, and situations" Zuboff (2019: 202-3). Critical engagement deterritorialises the mythical notion of the digital world as separate from the 'physical' and could "sustain the democratic self and

the liberal state" (Ess 2010: 106). Thinking *through* the body would also support policymakers in crafting policies that effectively address pertinent issues.

While it is important to acknowledge that Floridi (2013:164) raises concerns about the over-emphasis of the self in virtue ethics as regards surrounding environments and communities, I use the approaches of Ess and Clements, who both find ways to deploy aspects of virtue ethics together with Floridi's philosophy of information, while also carefully addressing Floridi's concerns. Here, I expanded on their contributions by foregrounding the similarities between assemblage theory and the philosophy of information, which share an ontological shift from dichotomies to more complex understandings of life in terms of multiplicity and flows. Drawing established and emergent theories together in this way provides us with alternative ways of thinking.

5.2. Response-ability

By acknowledging technologies of memory's intrinsic link to philosophy, Clements (2020; 2022) suggests a concept called 'digital civics pedagogy' to encompass the education and actions involved in daily memory practices. Digital civics can be understood as civic citizenship and democratic engagement in the digital realm. It encompasses "various dimensions of ethical and responsible behaviour in digital age contexts" (Clements, 2020: 576). This suggests that for a more robust understanding of and engagement with the digital to emerge, self-identifying as 'environmentally conscious' must be predicated on the environmental implications of not only one's offline actions and habits, but also those that constitute one's online life. As Clements observes:

If teachers cannot make clear to students that the online and offline spheres are part of the same over-arching environment, then we cannot be surprised when students undertake compromising actions in one arena and fail to appreciate they will impact the other (Clements, 2020: 576).

This suggestion is useful not only in the classroom, but also in other spaces that allow opportunities to educate digital citizens. Making citizens more aware of their (un)ethical environmental behaviours through knowledge, assists in deterritorialising their practices. By reminding citizens to reason, their actions can be aligned more with their beliefs (Clements, 2022: 771). Benjamin's assumption that he is acting in an ethical manner, without ensuring that he is intellectually informed to confirm if his behaviour is indeed ethical, outlines this problem. It is vital to make ethical decisions grounded in intellectual rigour, rather than rhetoric or assumption (Clements, 2022: 773). By considering the ethical implications of online life, decisions could be grounded in knowledge rather than widely disseminated myths

conjured by capitalist endeavours (a point also observed by Clements [2022], and Cubitt [2017]).

It is helpful to remember that history can provide pertinent insights into digital age issues, making it a useful source in approaching digital age challenges (Clements, 2022: 769). Taking note of the ecological roots of media could “enlighten our understanding of the media, so that we come to see them as destructive as well as productive forces” (Maxwell and Miller, 2012: 46). It also allows for more complex expressions of the relations between media. Simply comparing printed memory objects to digital memory objects, for example, denies that these are fundamentally different media processes with distinct contexts that require different modes of reasoning and factors to consider: Paperless practices are “not an ultimate solution to environmental issues, but instead create [...] new ones” (Lucivero, 2020: 1019).^v Comparisons are a complex phenomenon that requires not only contextual sensitivity, but also a knowledge of how life is, or could be, assembled.

In particular, simply acting with a sense of ‘response-ability’ (Haraway, 2016; Barad, 2007), might be a useful point of departure. Response-ability can broadly be defined as the capacity or ability to respond: The combinations in which materialities – including humans – assemble make possible (or not) certain responses, in turn augmenting or diminishing one’s ability to act. Someone who views themselves as being environmentally conscious would act in a response-able manner. In my view, this would constitute of practices such as being attentive and inquisitive, actively seeking knowledge, and acting according to one’s found knowledge in an ethical manner. These attributes have much similarity with the concept of ‘Phronesis’ raised by Ess and Clements, that is, the aforementioned attribute of intellectual rigour in ethical practice. This list I present could therefore serve as a means of understanding how this intellectual rigour might be practically deployed in environmental settings. Establishing this critical link between environmental education and ethics education allows researchers and the public at large to formulate new strategies in both domains.

5.3. Anti-redundancy movements

Storing profuse amounts of materials digitally has potentially serious material implications, although the relations between the virtual and the material remain complex (Lucivero, 2020: 1019). To understand this complexity, several authors are exploring the consequences of ‘digital hoarding’, defined as the frequent and excessive acquisition of digital content (Sedera et al., 2022; Uğur and Çalışkan 2022). Due to the benefits, convenience, and assumed security associated with online storage solutions, there is often a “general reluctance amongst users to delete digital content” (Sedera et al., 2022: 1).

It seems possible that the apparently abundant supply of affordable data storage, the convenience of digitisation, and the perceived importance of storing digital content for future use will continue to be important factors affecting users' choices. To make users aware of these choices' environmental impact, I follow Shane Brennan (2016: 58) in suggesting broader usage of the "resource data file". This concept serves as a method of understanding a digital artifact in terms of its carbon footprint.

The conversation around online storage could be shifted, as Brennan (2016: 69) suggests, by user-driven "anti-redundancy" movements and actions such as a 'World Deletion Day' (Brennan, 2016: 69). By repositioning comprehensive and excessive backup as the "digital equivalent of driving an SUV", one might be able to instil a sense of ethical responsibility in users (Brennan, 2016: 69). For the environmentally conscious, positioning the reduction one's digital footprint as an act that would cut emissions, might be the motivation needed to take action. Zuboff (2019: 57) also encourages such collaborative action as one way of actively seeking out and asserting more just futures as it challenges the macropolitical workings of capitalism.

If the suggestions posed in this section were to be implemented as outlined here by a person who sees themselves as environmentally conscious, the assemblages presented in the previous section can be deterritorialised to yield the following:

Self-identified environmentally conscious person – memory objects – digital storage–
knowledge about constructed myths and false dichotomies between online/ offline life
– renewed understanding – intellectual rigour – changed relationship – ethical
response-ability – World Deletion Day – resource data file – conscious online
presence – anti-redundancy movement – action/ activism to advance social and
environmental justice

When practices are reconnected with a new population of ideas, reterritorialisation (whereby deterritorialisations become new territories) might occur (Deleuze and Guattari, 1987: 54). A deterritorialised line might reterritorialise if micro or macropolitical shifts – such as implementing the three strategies above – are brought about. Territorialisation, deterritorialisation, and reterritorialisation are means by which "lives, societies, and history unfold" (Fox and Alldred, 2015: 401). Freeing oneself from restrictions of control and outdated understandings through knowledge, can make way for repositioning oneself in an alternatively assembled assemblage. By emphasising the interconnectedness of materialities and by drawing attention to how life and actions can be constructed differently, deterritorialisation proves invaluable to discussions about digital media ethics and digital civics. In the realm of the digital it allows for a dynamic understanding of ethical

considerations, transcending fixed structures, and accommodating the ever-evolving nature of digital landscapes. This fosters a nuanced approach to civic engagement with the digital that goes beyond conventional understandings.

6. CONCLUSION

Digital memory involves objects, thoughts, human labour, machinery, and many non-renewable energy sources. Analysing digital memory as an assemblage gives one the opportunity to draw human memory, memory storage practices, and mythical beliefs, eco-consciousness, and other factors, into the same frame. By using assemblage theory, this article had two aims, namely, 1) to explore how mythical beliefs about the immateriality of digital memory has been territorialised by corporates' efforts, and 2) to offer suggestions that would deterritorialise such constructed views successfully, in turn reterritorialising digital memory in a more just manner.

Despite narratives told by popular discourses, the digital is a very tangible threat because of its literally heavy environmental footprint brought about by mining of rare earths, massive data centres requiring maintenance and (non-renewable) energy; and the rapid production of (e-)waste. As the public has become acquainted with carefully constructed ideas about the Internet with the use of metaphors such as the 'cloud' and aesthetic abstract images of 'secure' and 'energy-clean' data centers, digital memory has become territorialised.

Drawing on Clements's (2020, 2022) and others' work, I then suggested three practical approaches that would deterritorialise this assemblage. These included critical thinking informed by informational ontology and a (re)turn to the body, assuming response-ability, and joining anti-redundancy movements informed by an understanding of digital content as 'resource files'. I concluded with a new materialist analysis of what an assemblage containing an environmentally conscious person, their digital actions as informed by intellectual rigour, knowledge, and adapted habits of deleting unused files or duplications, might look like.

As human memory and technology increasingly entangle in intimate ways, exploring the injustices of the digital requires urgent attention. While this article focused on micropolitical actions that could be undertaken by individuals, analysing macropolitical interventions on a global scale, such as policy making and governance, might also yield insightful results. Apart from assemblage theory, other theoretical frameworks could be engaged to analyse the relations between digital memory and the environment. Public perceptions regarding the environmental impact of digital media needs further investigation, and more in-depth

empirical studies could yield fruitful results. Delving deeper into the digital memory commodity chain and its relation to cultural memory practices is another potentially useful discussion. Very importantly, digital metaphors must be further interrogated to deterritorialise dominant and harmful power structures.

It is evident that, in the process of envisioning the futures we want to come to life, it is essential to recognise the alarming perceptions about the digital, and its role in memory production. By making visible territorialised beliefs and behaviour – or, by deterritorialising these – may lead us to “discover the knots of becoming tangled in the fabric of being”, which open up vital possibilities, as discussed in this article, for memory (Adkins, 2015: 141). To conceive of a more just and more accurate digital memory, it is necessary to engage with these perceptions, underlying drivers, and societal dynamics. Educating ourselves on the environmental impact of digital memory provides ways of engaging with it more responsibly.

NOTES

ⁱ Pseudonyms were self-selected by the participants.

ⁱⁱ Gilbert Simondon (1924-1989) has made seminal developments in the area of philosophy of information since the 1950s.

ⁱⁱⁱ The implications of this type of technology is manifold. For example, soon after the 2013 launch of Google Glass, an eyewear device, ethical concerns grew about wearers' privacy and the use of the device to undetectably record the wearer's surrounding, including people, without consent (Zuboff 2019: 152). These and other examples highlight that technology and the body are inextricably linked.

^{iv} Digital hoarding is discussed further under the third strategy.

^v Similarly, the environmental impact of cryptocurrencies when compared to traditional monetary processes is now being questioned in light of data missing from earlier comparisons (see for example Neumueller, 2022).

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