

The user is dead, long live the platform? Problematizing the user-centric focus of (digital) memory studies

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Memory Studies
2023, Vol. 16(6) 1500–1512

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DOI: 10.1177/17506980231202849

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Abstract

The rise of digital technologies has caused a major shift in memory studies. The unprecedented possibilities for storing and retrieving information enabled by platforms not only expand capacities for preserving memory-related content for individuals and collectives but also challenge existing memory power structures. An integral constituent of the scholarly assessment of these transformations is the increased focus on the memory actors' agency and connectivity. Despite the importance of such a user-centric focus, the article argues that it can be limiting for the field of (digital) memory studies conceptually and methodologically. Under the condition when platforms and their algorithms turn into (hegemonic) memory actors themselves and determine what data memory scholars and the general public can (not) access, there is a pressing need for critically revisiting the key assumptions about memory in the digital age. To address this need, the article discusses the fundamental premises of a more infrastructure-centric approach to memory studies together with the conceptual and methodological implications of its adoption for studying individual and collective remembrance.

Keywords

artificial intelligence, digital memory, infrastructure, methodology, platform

Introduction

The rise of digital technologies has major implications for how the past is remembered and interacted with and how individual and collective memory practices are studied. In contrast to the focus on the institution- or group-oriented forms of remembrance, which underlined many classic concepts in memory studies, such as the collective (Halbwachs, 1992), social (Olick and Robbins, 1998) or cultural memory (Assmann, 2011a), the conceptualisations of the digital (Liebermann, 2021) – or connective (Hoskins, 2011a) – memory turn increasingly acknowledged the role of individual agency in the context of remembrance. The availability of new possibilities for producing,

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storing and sharing content online has direct implications for the capacities of individuals to preserve information about their lives and make it visible to others (Barratt, 2009; Garde-Hansen et al., 2009; Van Dijck, 2007) but also to engage in the discussions of the collective past to contest or support its specific interpretations (Liu, 2018; Makhortykh et al., 2022a; Rutten et al., 2013).

The agency of individual memory actors is further amplified by the unprecedented connectivity between consumers and producers of memories (Hoskins, 2011b), which is enabled by the digitisation of memory practices. This connectivity blurs the line between collective and individual memory and prompts the need for introducing new conceptualisations of memory processes (e.g. 'the memory of the multitude'; Hoskins, 2017) required for capturing the more dynamic and complex nature of digital remembrance. Under these circumstances, the focus of the scholarly debate concerning the nuanced relationship between technology and remembrance is increasingly shifting towards how the conceptions of multilayeredness and connectivity can be integrated into memory studies and what the implications of digitally amplified individual agency for remembering historical and recent past are (e.g. Davidjants and Tiidenberg, 2022; Ebbrecht-Hartmann, 2021; Ekelund, 2022). An integral part of this discussion relates to the long-term impacts of online platforms on human remembrance, as platforms can not only empower individuals by allowing them to challenge the memory power structures and democratise commemorative practices (Knudsen and Stage, 2013) but also limit individuals' agency by making it difficult to control over what information about their past is shared and preserved online (Mayer-Schönberger, 2011).

Such a user-centric approach, which currently prevails in the field of memory studies, has many benefits. However, the focus on individual actors and the way they employ digital platform affordances to remember the past also leads to the limited acknowledgement of the disruptive changes in the field of remembrance due to the growing autonomy of platform-based memory infrastructures and the transformation of their elements (e.g. AI-driven systems) into memory actors. This lacking recognition of the infrastructure-related changes results in scarce attention towards 'mundanity and ordinarieness' (Hesmondhalgh, 2022: 132) of infrastructures underlying digital memory ecosystems and driven by obscure processes and values. Furthermore, it causes an often simplified understanding of human agency in the context of memory-making despite it undergoing profound changes due to humans increasingly interacting with and being affected by non-human actors (for examples of such agency transformations in other contexts, see Hepp, 2022; Hintze and Dunn, 2022). Thus, achieving an in-depth understanding of the role of memory infrastructures is crucial for developing more critical perspectives on the relationship between digital technology and remembrance, for instance, informed by postcolonial (Keightley, 2022) and political economy studies (Reading, 2014), in particular considering the growing concerns about the differentiated – and often discriminatory – treatment of certain individuals and groups by the online platforms in the context other than remembrance (e.g. Cahn et al., 2019; Noble, 2018; Urman and Makhortykh, 2022).

These reasons prompt a pressing need to problematise the user-centric approach prevalent currently in the field of memory studies and discuss the perspectives of complementing it with an infrastructure-centric approach. Informed by critical data studies and computer science, the disciplines which until now have been scarcely engaged with by memory studies, an infrastructure-centric approach can allow going beyond the present discussions of how individual memory practices rely on platform affordances. Specifically, it can advance the recent critical inquiries about the possibility of these affordances to fundamentally transform the interactions with the past, thus implying the need to revisit not only conceptual assumptions about how memory works in the digital age but also the methodological approaches used to study it.

The rest of the article is organised as follows: first, it briefly reviews the state of research on the pre-digital and early digital forms of memory infrastructures. Then, it scrutinises the distinct

features of the current digital memory infrastructures, considering the recent developments related to the increasing integration of AI-driven systems of information retrieval and information generation into these infrastructures. The article then examines the conceptual and methodological implications of an infrastructure-centric approach to memory studies. Finally, the article concludes with a discussion of the relevance of the infrastructure-centric approach and the concrete ways required for its adoption.

Evolution of memory infrastructures: a short overview

The concept of the memory infrastructure, which can be viewed as an assemblage of social practices and technological affordances used for the production, storage, and transmission of information about the past, is not completely new for memory studies. The reliance on certain technical means (e.g. writing systems) for ensuring that the past is remembered can be traced back as early as Ancient Egypt and Ancient Greece (Assman, 2011b). However, the fundamental shift towards the use of technological infrastructures instead of rhetorics-based forms of memory transmission (e.g. the classic arts of memory; Yates, 1966) is related to the invention of the printing press (Connerton, 2009: 4). The rise of printing facilitated the codification and preservation of the past by making the transmission of memories more accessible to the general public but, at the same time, accelerated the processes of forgetting by diminishing the need for the constant re-communication of information about the past (Esposito, 2008).

Another example of the memory infrastructure is analogue mass media, which has become particularly prominent in the twentieth century. By generating narratives about recent and historical events and by projecting these narratives to the broad public, mass media enabled the industrialisation of memory, defined by Stiegler (2010: 106) as ‘the generalization of the production of industrial temporal objects’. This mediated industrialisation played an integral role in the memory boom in the 1970s and 1980s (Hoskins, 2014), defining academic and broader societal fascination with memory and commemoration. The acknowledgement of the importance of mass media as an infrastructure for (collective) memory construction and transmission is reflected in a number of conceptualisations of media’s mnemonic functionalities, including prosthetic (Landsberg, 2004) or mediated memory (Garde-Hansen, 2011), and the increasing recognition of the importance of new groups of memory actors (e.g. journalists and other mass media practitioners; Zelizer and Tenenboim-Weinblatt, 2014).

In addition to the general types of memory infrastructures, such as the ones enabled by printing or mass media, there are also forms of infrastructure that are specifically related to the heritage sector. Two common examples are archives and museums, which are complex assemblages that define how information about the past is stored and accessed via a combination of affordances and practices (Featherstone, 2006). Specifically, technological affordances determine what can be found within these assemblages – e.g. how the memory-related content is catalogued, how reliably it is stored, and how individual items can be retrieved – and, by doing so, structure (and are structured by) social practices (e.g. the ones determining what information about the past is preserved and who can interact with such information) which reflect power relations in relation to how memories can be accessed.

The processes of digitisation result in multiple changes in the heritage-specific forms of memory infrastructure. These processes enable new ways of interacting with the museum and archival collections due to the intense processes of digitising material artefacts (Newell, 2012; Ogilvie, 2016) and establishing collections of digital-born materials (Bultmann et al., 2022; Fondren and McCune, 2018). The increased accessibility of materials stored by heritage institutions, in particular, due to new forms of integrated research infrastructures (Anderson and Blanke, 2015), expands

the capacities of both researchers interested in studying the past and of the general public engaging with the institutional representations of the past.

Both general and heritage-specific forms of memory infrastructure are profoundly affected by the rise of online platforms, which not only enhance the functionality of existing infrastructures (e.g. by increasing their outreach) but also become memory infrastructures themselves. Platforms such as Facebook (Prey and Smit, 2018) or TikTok (Makhortykh, 2021a) facilitate the production of memory-related content and, importantly, its storage and sharing. By doing so, these infrastructures enable multimodal memory practices, which are shaped by platform affordances (e.g. Bareither, 2021; Kaun and Stiernstedt, 2014) and contribute to the formation of platform-based memory communities characterised by higher connectivity between actors involved in the processes of remembrance (Burkey, 2020).

What is special about current (digital) memory infrastructures?

While memory infrastructures have been around for a long time, several features make the impact of their digital forms – that is, platforms used by commercial companies and heritage institutions – particularly distinct and stimulate the need for an infrastructure-centric approach for memory studies. The first of these features relates to the unprecedented volume of memory-related content – described by Hoskins (2011a: 269) as a ‘post-scarcity’ memory ecosystem – which has to be stored and organised by the contemporary memory infrastructures. By making this content available and accessible, platform-based infrastructures transform how the past is preserved and perceived by individuals. On the one hand, the encounters with memories become more pervasive due to individuals’ increased capacities for storing and retrieving recollections, but on the other hand, it also results in higher dependency of individuals on infrastructures for passively preserving information about the past instead of actively remembering it (Hoskins and Halstead, 2021).

The second feature concerns the transformation of memory infrastructures into crucial gatekeepers of memory. While the gate-keeping function of infrastructure is not novel per se, in the post-scarcity memory ecosystem, it changes in three important aspects. First, unlike the pre-digital era, memory infrastructures become integral for helping users navigate information not only about the collective but also the individual past due to the rapid increase in the volume of content associated with it (e.g. Mayer-Schönberger, 2011; Van Dijck, 2007). Second, due to the volume of the content that makes the involvement of human actors in the functionality of memory infrastructures partially obsolete (Makhortykh, 2021b), infrastructures themselves have to decide how to organise memory-related content and connect human actors, thus enabling memory connectivity (Hoskins, 2011b). Third, unlike earlier forms of infrastructure, platforms are increasingly capable of producing memory-related content themselves using functionalities of generative AI models (e.g. chatGPT or DALL-E; Kansteiner, 2022; Makhortykh et al., 2023) and not simply re-distribute content made by humans. These generative capacities make infrastructure amplify the volume of content which they have to organise and enable the self-reinforcing loop of the post-scarcity memory ecosystem.

To account for the above-mentioned aspects, the contemporary memory infrastructures must have a high degree of autonomy. This autonomy is another feature that fundamentally differentiates today’s memory infrastructures from the earlier ones, which were characterised by humans being the only type of memory actors involved in these infrastructures’ functionalities. Under the present conditions, memory infrastructures increasingly rely on non-human memory actors such as AI-driven systems (e.g. search engines or conversational agents), which react to human requests to retrieve or generate information about the past, often by using additional techniques to personalise the content retrieval for individual users (Prey and Smit, 2018) or integrating serendipity for keeping users surprised (Verhoeven, 2016). Furthermore, as the number of non-human actors involved in the

generation and transmission of memory-related content increases, these actors also start interacting with each other, resulting in the rise of machine-to-machine memory interactions.

The increased autonomy results in the profound change of memory-related power relations, which is the fourth distinct feature of contemporary memory infrastructures. With the storage and curation of memories being increasingly outsourced to platforms, these platforms start shaping how the past is represented and understood, whereas individual and collective human actors experience less control over their memories. Such lack of control is amplified by the notorious lack of transparency (e.g. Pasquale, 2015) that characterised the digital infrastructures, including the ones related to memory (Makhortykh, 2021b). Another factor that influences the role of memory infrastructure in the context of power relations relates to AI-driven systems being non-neutral and primed by the logic behind the system design that guides the decisions which the systems are making (Birhane, 2021). In the case of many commercial systems, including the ones that influence the processes of remembrance (e.g. recommender systems used by social media platforms for suggesting content to their users), such logic is often focused on stimulating user behaviour, which can maximise the profits of the company using the system (e.g. by increasing the amount of time the user spends within the platform or prioritising content which might sell better). While this logic can be applicable to other contexts, in the case of remembrance, it might conflict with ethical and moral obligations related to the proper representation of the past (e.g. in the case of remembrance of mass atrocities; Makhortykh et al., 2023) and individual priorities about what individuals may or may not want to remember.

Conceptual implications

Integrating the concept of retrievability in the dynamics of remembering and forgetting

One of the key assumptions about contemporary memory infrastructures relates to them limiting capabilities for forgetting on the individual and collective levels (e.g. Hoskins and Halstead, 2021; Mayer-Schönberger, 2011). Platforms are argued to enable ‘perfect remembering’ (Mayer-Schönberger, 2011: 5) by capturing and storing information about the past in a way that restricts the ability of individuals to alter or delete it. While in many cases it might be advantageous, the constancy of digital memory traces can also severely limit human agency by diminishing the possibilities to make platforms forget (unless such possibilities are enabled legally; Esposito, 2017), even if, in some cases, information available via these platforms is factually incorrect.

While from the user-centric perspective, the perfect remembering argument might be justified, the adoption of the infrastructure-centric approach can make it more nuanced by critically questioning the mechanisms of platform-based remembrance. If we assume that the process of remembrance involves the active engagement with a specific form of memory-related content (e.g. Hoskins, 2017), then the possibility of such content being stored somewhere within the platform does not automatically mean that it will become part of individual or collective memory practices. Even if specific content items are provisionally accessible, the sheer volume of information available online makes engagement with them rather unlikely, in particular, if the platform users are not certain what exactly they are looking for. Consequently, for the content to become part of memory practices, it has to be accessible to individuals or groups, thus stressing the importance of the distribution aspect of digital infrastructures, which increasingly attracts scholarly attention in other academic disciplines (e.g. Hesmondhalgh, 2022; McDonald et al., 2021).

One of the key arguments of the research on (media) distribution is the importance of challenging the prevalent focus on the content and reception of messages and acknowledging the essential role

of infrastructure enabling content dissemination (Starosielski, 2015: 6). When applied to memory studies, this paradigm stresses that what exactly is remembered and forgotten through the platforms is intrinsically dependent on what is retrievable and also how the priorities for content retrieval by the platform-specific systems are defined. Unsurprisingly, the recent legal mechanisms aiming to realise the right for (digital) forgetting, such as the right to be forgotten (Esposito, 2017) and the right to erasure (Ausloos, 2020), focus specifically on limiting the retrievability of the content via platform algorithms, but not necessarily the actual content erasure (in particular, considering the challenges of realising such erasure requests; Esposito, 2017; Makhortykh et al., 2022b).

Conceptualising the role of non-human actors in human and non-human remembrance

An important feature of the current digital memory assemblages is their increasing reliance on non-human actors. Constituted by the diverse forms of AI-driven systems, such as search engines (Makhortykh et al., 2021b), recommender systems (Prey and Smit, 2018), holograms (Shur-Ofry and Pessach, 2019) or text-based conversational agents (Kansteiner, 2022), these non-human actors are programmed to perform a broad range of memory-related tasks. Initially, these tasks focussed on retrieving information in response to explicit human requests (e.g. queries entered in the search system of the archive or the commercial platform), but currently, they increasingly shift towards content generation in response to human queries (e.g. via chatGPT) as well as memory exchanges between non-human actors (e.g. search engines and conversational agents; Wiggers, 2023).

Until now, the field of memory studies primarily treated these non-human actors as mere tools used by humans to facilitate retrieval of memory-related information. However, the expansion of tasks involving the non-human actors prompts the need to urgently re-conceptualise their role in the context of remembrance. Considering that non-human actors are directly responsible for deciding what information about the past is retrievable and in which formats it is delivered to human users, these actors become crucial constituents of human memory practices by shaping what and how is remembered by individuals and societies. At the same time, the lack of transparency of the non-human actors' functionality makes it difficult for human users to assess how AI-driven systems make specific choices when dealing with memory-related information and how they might influence the way humans perceive the past.

Besides the fundamental changes in human remembrance, the rise of non-human memory actors also raises questions about the new forms of non-human memory. To perform their functions, AI-driven systems have not only to memorise information about the past (Chang et al., 2023) but also exchange this information with each other, thus enabling memory interactions that do not directly involve human actors. While these interactions quickly grow in number, for instance, in the case of Wikipedia bots challenging each others' points of view (Tsvetkova et al., 2017) or smart devices sharing historical information with each other (Li et al., 2018), the current scholarly discussions focus primarily on the technical aspects of these processes (e.g. Prince and Prince, 2018). However, there is a pressing need for the conceptual and normative assessment of these rising forms of machine-to-machine memory communication and the implications it may have for human remembrance.

Acknowledging the role of infrastructure designers and their subjective choices in determining the functionality of memory infrastructures

Despite the impressive volume of scholarship on the use of platforms in the context of individual and remembrance, the questions of how memory infrastructures are designed, who their designers are and what implications the design choices made by these people have for memory practices

remain understudied. However, addressing these questions is essential, considering that technological infrastructures are shaped by organised social practices and arrangements (Star, 1999) and the demographic characteristics of communities involved in these infrastructures' development (D'ignazio and Klein, 2020: 27–28). While a few recent studies (e.g. Burkey, 2022; Prey and Smit, 2018) note the importance of considering the gate-keeping role of infrastructure designers both in the context of commercial platforms and heritage institutions, the acknowledgement of the important role of this group of memory actors (together with biases attributed to the privilege hazard that these actors are often subjected to; D'ignazio and Klein, 2020: 29) is yet to be achieved. Such acknowledgement, together with an in-depth investigation of the processes of designing memory infrastructures, is essential for understanding how the current functionalities (and malperformances) of memory infrastructures are shaped by the individual and collective choices of their developers (e.g. what data is used for training a specific model or why a specific interface is constructed in a particular way) and how infrastructure designs can be improved and made more memory-sensitive.

Recognising the possibility of infrastructures reinforcing neo-colonial memory practices

Similar to other data-driven technologies (Couldry and Mejias, 2019; D'ignazio and Klein, 2020), memory infrastructures are embedded into the relations of power and can not only challenge but also reinforce these relations (Keightley, 2022). A number of contributions to the field of critical data studies highlight how technical infrastructures can reiterate structural injustices by amplifying discrimination towards marginalised communities (e.g. Birhane, 2021; Kalluri, 2020) and reinforcing neo-colonial practices (Couldry and Mejias, 2019). In the case of individual and collective remembrance, these relations of power determine what and how is remembered. While there is a known tendency for standardisation – often synonymous with Westernisation – of memory practices (e.g. Butler, 2016; David, 2017), the rise of new memory infrastructures, particularly those relying on AI-driven systems, raises new concerns in this context. AI-driven systems are by default amoral and follow a set of values coded into them by their developers, who often represent privileged communities and, thus, are not necessarily sensitive to the risks these systems can pose to underprivileged and marginalised groups (Birhane, 2021). Under these circumstances, memory infrastructures can reiterate a small set of hegemonic (and often Western-centric) narratives and practices, thus amplifying memory-related power inequalities arising from colonial legacies. Acknowledging these risks and finding possible solutions (e.g. putting the discriminated communities that are directly impacted by the infrastructures in the centre of the research; Kalluri, 2020) is, thus, one of the important tasks for memory studies.

Methodological implications

Integrating algorithm audits in the methodological toolbox of memory studies

Despite the impressive methodological diversity of memory studies, the field until now has had little engagement with the academic disciplines that are particularly relevant for designing and investigating digital infrastructures (e.g. computer science and critical data studies). In addition to the important theoretical insights that these disciplines can bring, they also contributed to the development of novel methodological approaches, which can be a crucial asset for investigating how memory infrastructures influence processes of individual and collective remembrance in the digital age.

One of these approaches is algorithm auditing, which is a research methodology for examining the functionality and impact of decision-making algorithms (Mittelstadt, 2016). Over the last decade, a number of algorithm audit approaches have been developed (see Bandy, 2021) for investigating the performance of AI-driven systems, such as search engines and recommender systems. The exact implementation of algorithm audits can vary from investigating the code underlying the system to simulating human behaviour for generating system outputs, which then can be examined for potential bias. The major advantage of algorithm audits is that they allow an understanding of how AI-driven systems function under the condition of non-transparency, which is essential for determining the systems' impact on societal processes (including individual and collective forms of engagement with the past). Until now, only a few studies (e.g. Makhortykh et al., 2021b; Zavadski and Toepfl, 2019) employ algorithm audits in the context of remembrance despite the potential of combining the methodological capacities of audits with the in-depth theoretical understanding of the memory-related phenomena coming from memory studies. The importance of such a combination increases in light of the increasing presence of non-human memory actors and the need to rely on algorithm audits for understanding what and how they remember.

Recognising the importance of big data research in the context of memory studies

In addition to the algorithm audits, the methodological approaches related to big data are important for realising the potential of an infrastructure-centric approach for memory studies. The growing complexity of memory infrastructures, which increasingly enable personalisation of their outputs for individual users and often randomise outputs to find the most optimal selection of content for satisfying user information needs, stresses the importance of adopting more robust strategies of analysing how infrastructures influence memory practices. Under the conditions of personalisation and randomisation of system outputs, the reliance on a small number of data points (e.g. a dozen queries for chatGPT collected by a single researcher) may result in the incorrect assessment of the infrastructure performance and its possible implications for individual and collective remembrance. Big data approaches for data collection and analysis (e.g. Sumikawa and Jatowt, 2021) can counter this limitation. Similarly, when applied to data on user online behaviour (e.g. concerning news consumption, see Merten et al., 2022; Stier et al., 2020), the big data approaches can be integral for understanding whether the conceptual assumptions about the presumed uses of memory infrastructures actually hold true. At the same time, it is important to take into consideration potential biases embedded in the design of big data projects (e.g. the so-called 'Big Dick Data' bias sacrificing contextualisation for the sake of size; D'Ignazio and Klein, 2020: 151) and the tools which these projects rely on (e.g. gender bias in image recognition platforms; Schwemmer et al., 2020). To counter these biases, it is integral to take into consideration both the ethical aspects of using big data for research purposes (Richterich, 2018) and principles of human-centric (Somandepalli et al., 2021) and value-oriented (Pereira and Baranauskas, 2015) design, which can inform the adoption of big data for studying individual and collective engagement with the past.

Addressing the question of the authenticity of memory-related content

One more methodological challenge that is important to address for an infrastructure-centric approach relates to the differentiation between human- and non-human-made memory content. The ability of new constituents of memory infrastructures (e.g. generative AI models such as chatGPT) to generate content that is difficult to differentiate from the one made by the human raises concerns about authenticity of memory-related content and potential (ab)uses of memory infrastructures for misleading the public or distorting the historical facts. Under these conditions, it may be integral for memory studies scholars to look for the ways to differentiate between authentic and

non-authentic memory-related content (as well as defining what authenticity means in this context). While the research on the topic is already ongoing, for example, considering digital watermarking for enabling the integrity of heritage content (Mehraj et al., 2022), it still has to be comprehensively and critically explored in the context of memory studies.

Conclusion

This article discusses the increasing significance of online platforms for the processes of individual and collective remembrance and argues that it is crucial to supplement the current user-centric focus of memory studies with more research on the present and future forms of memory infrastructures. It suggests that existing platform-based memory infrastructures, which are distinguished by the integration of AI-driven systems in platforms' architectures for curating and creating memory-related content, can be viewed as socio-technical assemblages bringing together human and non-human memory actors. These assemblages enable unprecedented connectivity between human actors but also make the processes of engaging with memory less predictable and transparent (e.g. Makhortykh et al., 2023). This lack of transparency is worrisome, considering the obscure functionalities of systems powering the activities of non-human actors and their increased agency in distributing and creating memory-related content that affects both human and non-human remembrance.

The adoption of the infrastructure-centric approach is essential for addressing many conceptual and methodological challenges faced by memory studies. These challenges relate to the unprecedented reliance of humans on memory infrastructures, which can result in the 'greying' of active remembrance (Hoskins and Halstead, 2021), together with the growing role of non-human actors in how the past is preserved and engaged with. Addressing these challenges is essential for advancing the current state of memory-related research and for solving fundamental questions concerning the future of individual and collective remembrance. Among other issues, these questions deal with the long-term effects of technological infrastructures on human remembrance and forgetting (and how these infrastructures can be affected by future technological shifts which can potentially make the present infrastructures obsolete), the complex interplay between the human and non-human rights and obligations to remember (and to forget), and the nuanced relationships between memory infrastructures and different power structures together with the inequalities and discrimination such relationships might cause, especially for marginalised memory communities.

Besides addressing the above-mentioned challenges, adopting the infrastructure-centric approach is important for facilitating the dialogue between memory studies and the related fields, where the critical discussion of the technological infrastructures has been rapidly advancing in recent decades. Ranging from anthropology (Larkin, 2013) and science and technology studies (Star, 1999; Starosielski, 2015) to critical data studies (Birhane, 2021; D'Ignazio and Klein, 2020) and media studies (Hepp, 2022; Hesmondhalgh, 2022), these fields demonstrate how infrastructures shape – and are shaped – by societal power relations and highlight the risks of these infrastructures reiterating structural injustices and damaging discriminated groups. The infrastructure-centric approach will facilitate the process of engaging with critical insights from these disciplines and will put forward the unique perspective of memory studies on how power relations shape the representation of the past on the individual and collective levels and, through it, ground historical inequalities in the present (e.g. Brown and Au, 2014). Such a perspective opens new possibilities for understanding how historical injustices and (lack of) their remembrance can shape different forms of prejudice affecting the design of technological infrastructures (e.g. the privilege hazard; D'Ignazio and Klein, 2020: 29) and how these prejudices can be countered to prevent technology from further damaging the marginalised communities.

The practical implementation of the infrastructure-centric approach requires a number of steps. One of them, as argued by Walden and Marrison (2023a), relates to the intensification of cross-sector

collaboration between practitioners and academics to align different views on technological infrastructures and their implications for individual and collective remembrance. Such collaboration is particularly important for bridging perspectives on the societal and technological aspects of memory infrastructures between memory studies and more technical or critical disciplines (e.g. computer science or critical data studies). The exact formats of such collaboration can vary from participatory workshops (Bultmann et al., 2022; Walden and Marrison, 2023a, 2023b) to establishing hubs for exchanging good practices and expertise (Walden and Marrison, 2023a).

Another step relates to the expansion of methodological approaches used in memory studies. While recently there has been an increase in the application of computational approaches for studying (digital) memory practices, for instance, to analyse large volumes of available data (e.g. Barna and Knap, 2022; Makhortykh et al., 2021a; Sumikawa and Jatowt, 2021) or to understand the functionality of AI-driven system used for distributing memory-related content (e.g. Makhortykh et al., 2021b; Zavadski and Toeplf, 2019), the field of memory studies still primarily relies on qualitative approaches for examining how digital platforms impact the processes of remembrance. However, the wider adoption of computational approaches and critical evaluation of their limitations and possibilities is essential for studying the functionality of memory infrastructures and assessing their long-term implications for individual and collective remembrance.

Finally, it is crucial to enable more critical engagement with technology for memory scholars and heritage practitioners. The exact ways in which such engagement can happen vary depending on the amount of resources and time that can be invested. In some cases, it can be achieved through individual effort (e.g. by familiarising oneself with ethical guidelines on using technology in the context of remembrance; Walden and Marrison, 2023a), whereas for other forms of critical engagement (e.g. the development of digital literacies; Säljö, 2012), dedicated learning programmes with the sufficient amount of funding are required. It is, however, important to acknowledge that under the condition of the rapid development of memory infrastructures, which rely on new and often non-transparent forms of technology (e.g. generative AIs; Makhortykh et al., 2023), creating possibilities for scholars and practitioners to critically interrogate these developments is necessary for achieving a sustainable memory ecosystem.

Funding

The author disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The research has been supported by the Alfred Landecker Foundation, which provided financial support for the research time of Mykola Makhortykh, who contributed to the article as part of his project titled “Algorithmic turn in Holocaust memory transmission.

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