ABSTRACT

Title of Thesis:	OUTLAST: INTERACTIVE ART INSTALLATION ON DIGITAL PRESENCE EXPLORING INTERACTIVE ART AS REFLECTIVE PRACTICE
	Kriti Singh, Master of Science, 2025
Thesis Directed By:	Alex Leitch, INFO

This thesis explores the creation of an interactive art installation designed to engage viewers with the accumulation of digital artifacts, digital decay, and the act of revisiting one's digital possessions. The primary research question that this thesis aims to answer is: "How can user responses to the art installation object improve the object itself, which was designed to represent processes of digital accumulation, digital decay, and prompts for revisitation?" The methodology involved an iterative design process through experience prototyping and was guided by reflection-in-action. The author conducted a qualitative user study involving 19 interviews with individuals who had experience with archives, and observed their interactions with the installation. Thematic analysis was used to analyze the collected data.

OUTLAST: INTERACTIVE ART INSTALLATION ON DIGITAL PRESENCE
EXPLORING INTERACTIVE ART AS REFLECTIVE PRACTICE

by

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Dedication

To Maa and my 5th grade self.

Acknowledgements

Thank you to my advisor, Professor Alex Leitch, for giving me your time and pushing me to start this project. I am grateful for the many discussions we've had about art and science coalescing. Thank you to my committee members, Dr. Victoria Van Hyning, for your patience and introducing me to many important aspects about archives, and Dr. Irene Pasquetto for your feedback throughout the development of this thesis.

Zayneb, I lucked out with you as my best friend. Thank you for the countless times you talked to me about my work, for patiently (often, scoldingly) sitting by me as I wrote this thesis, and for all the laughs. You're the best gift Maryland gave me. I'm happy to share the sky with you. Thank you to my friends back home−Shriya, Nishka, Shrijita, Kruti, Kashvi, Kritika, Anindita and Pranay for believing in my work and me, and showing up for me. Thank you, Mimmi, for your unwavering faith in me. You've moved worlds for me. Thank you, Jummy and Shruti, for your confidence in my abilities. Yooeun and Donovan, thank you for helping me test and document my work, and for being a joy to be around through an objectively difficult process. I value that lightness. Thank you to my partner, C.J., for taking care of me unconditionally to push this work over the finish line. You're my strength.

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Thank you, Professor Jason Aston, for the many post-class conversations about weird art and the joy in creating weird things. Thank you for pushing me to be me.

Thank you, Urna and Anisha, for your most delightful account, @hues_day on Instagram, where I encountered the excerpt from In Memory of Memory by Maria Stepanova, which set me off on this path to create this installation: *"For these images, the future is just one more cemetery, a huge archive of human bodies we know nothing about for the most part, except that they existed. This immortality is imposed on you. It is fixed and preserved without effort. In the past, immortality was a matter of choice. We have accepted the impossibility of simply disappearing. Whether you want it or not, you are facing the strange extension of your existence, your outward form preserved for all time. Since we began recording and archiving, the unreproducible has disappeared from life. When an artist performs on stage and someone describes it to us − it demanded time and passion of the curious. You had to imagine, flesh it out, recreate something in your head. Now there is nothing between you and what has been. The more we keep recording, the more people will fall into the zone of the undead. Their physical form keeps on walking and talking, their earthly voice resounds whenever you want it to. They still have it within their power to charm, to arouse desire, or to disgust (the body and the name separate, like film credits). The culmination of this pornography from the distant past, nameless dead bodies performing their mechanical duties long after their owners are ash and dust."*

Thank you to the many strangers who helped me with lugging my boxes from one end of campus to the other. Lastly, thank you to my research participants who trusted me with their stories and provided me with the best feedback. Their experiences, I carry with me, as part of the art I created.

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List of Abbreviations

HCI: Human-Computer Interaction

PSD: PhotoShop Document

DWG: Drawing CAD file

Chapter 1: Introduction

We live in a world where we are constantly producing and acquiring digital artifacts—selfies, screenshots, texts, videos, bookmarks of digital media, research papers and more. Hobbs (2001) defines a personal archive as "the documentation of individual lives and human personality" and notes that such archives "represent a departure from the collective formality and systemic organization found in other types of records" (p. 126). Unlike formal physical archives such as administrative or government records, which are impersonal and organized, personal archives often lack this regimentation, simply because "people in their private lives are not programmatic or entirely planned or rule-driven or procedure-bound as they make their documents" (Hobbs, 2001, p. 130). McKemmish (1996) argued that individuals' records are extensions of themselves and a representation of their identity. Hobbs (2001) further notes that these records allow people to situate themselves in the world and serve as a form of personal memorializing. Physical artifacts have long been utilized by people as external memory and reference tools. These include journals, scrapbooks, photographs, handwritten letters, annotated books, recipe cards, personal libraries of books, newspaper clippings, ticket stubs, postcards, personal collections of artwork and ephemera. We are shifting from analog formats to hybrid and increasingly digital formats (Beagrie, 2005). Digital possessions have been defined as providing evidence of the individual, representing the individual's identity, perceived as having value, and providing a sense of bounded control (Cushing, 2013). Personal digital collections are "composites drawing material from the individual's private life, work, and education, as well as from external communities and content sources" (Beagrie, 2005, Defining Personal Digital Collections section). Personal digital archiving consists of "personal photograph digitization,

web archiving, social media archiving, personal digital file management and tools, converting old file formats, lifelogging, and even saving voicemails and SMS texts" (Condron, 2019, p. 29). Predicting future worth is one of the most challenging issues that consumers and archivists face (Marshall et al., 2007). Marshall et al. (2007) identify "benign neglect" as a common approach to personal digital archiving, where individuals accumulate digital materials without systematic organization. The study also talks about archives that are fragmented and difficult to manage, increasing the risk of data loss and making retrieval challenging. Moreover, low-cost abundant storage makes it possible to do this "record-keeping" with much ease where we can store most life experiences through photographs, audio, video, and other types of data. Accumulation of digital artifacts, therefore, becomes an easy process because it is easy to record, create, receive and save (Czerwinski et al., 2006). Digital artifacts accumulate with little friction and are often devoid of the material signs of aging that would provoke human attentiveness toward curation. Marshall et al. (2007) define this rapid accumulation of digital belongings as "formidable" (p. 4). The vastness of digital belongings can intimidate people away from curation. Lord and Macdonald (2003) describe digital curation as "the activity of managing and promoting the use of data from its point of creation, to ensure it is fit for contemporary purpose, and available for discovery and re-use" (p. 12). According to Marshall et al. (2007), a major driving force behind long-term curation techniques in personal digital archives is the possibility that an over accumulation of digital artifacts could obfuscate artifacts with long term value.

People associate their digital artifacts with notions of safety and security (Gulotta et al., 2013; Marshall et al., 2007). However, there is no guaranteed strategy for the long-term preservation of digital information that is foolproof and digital artifacts are prone to obsolescence (Houghton, 2016). This digital decay can occur due to hardware and software

obsolescence, obsolete formats, legal issues such as copyright and more (Houghton, 2016). Digital artifacts are not only corrupted and lost due to the processes mentioned, but also intentionally compressed for the sake of storage space (Sayood, 2017).

Digital decay has also been explored as an aesthetic. Several artists have investigated decay–video compression, feedback, and glitches–to generate art works. Artists have long used decay as an aesthetic in a variety of mediums such as sound, visual art, cinema (Grimaldi, 2024), net art and more. Rosa Menkman, a visualist specialising in Glitch Art, published *The Glitch Moment(um)* (Menkman, 2011) which used information theory to posit "glitch art" as a particular genre of contemporary art. Visual digital decay has also been used as a mode of inquiry. Gulotta et al. (2013) designed three interactive systems that served as speculative, provocative artifacts to explore people's feelings about digital legacy. Digital decay was chosen as a visual treatment to disrupt associations of safety and stability people have with digital data. However, this paper explicitly asked participants not to critique the system in terms of its usability and visual effects.

With the vast accumulation of our digital possessions it gets harder to retrieve data. Overwhelming volume of digital photos, rudimentary organization, lack of maintenance, and an overestimation of ability to find older pictures are some of the many reasons for retrieval failure (Whittaker et al., 2010). According to the Society of American Archivists, "memory" can refer to "An individual's knowledge of the past." and "A specific recollection of something in the past." (Society of American Archivists, n.d.). Researchers have argued that memory should be conceptualized as an activity integrated into people's lives, and digital "memory triggers" should be woven into everyday life (Peesapati et al., 2010). Effective curation of personal digital archives hinges significantly on the ability to draw attention to and maintain engagement with archived materials, highlighting that the act of curation is fundamentally about managing

attention: sentimental objects must be periodically seen or interacted with to maintain their mnemonic value (Jones & Ackerman, 2016). Researchers have started looking into ways to allow users to re-experience digital media from their past through a variety of mediums such as images, sound, and social media (Chen et al., 2023). Research has aimed to create interactive designs that can be used as memory cues to support remembering (van den Hoven, 2014). Social media platforms like Facebook, with features such as "Lookback" or "Year in Review," play a role in the process of stimulating reminiscence (Thomas & Briggs, 2016).

This thesis examines how we might design interactive systems that make this accumulation tangible, introduce digital decay immediately and viscerally, and prompt revisitation into our personal archives. It is about the creation of a real-time interactive art installation, *Outlast.* This multimodal interactive installation explored the accumulation of digital artifacts, digital decay, and prompting of revisitation of one's digital possessions. The installation considered decay as a design material—not as a failure, but as a way to provoke reflection on the fragility of digital artifacts. The multimodal installation combined various input mechanisms such as live input from cameras, depth information from depth sensing cameras and had elements of temporality baked into it. The installation demanded the active participation of an individual. It only activated if there were people in its proximity. The viewers themselves were the most important actors in the installation, allowing them to become part of the performance and explore interactive art as a form of reflective practice.

The final structure of the installation was reached via iterative prototyping. I explored this creation through various user experience (UX) methodologies such as rapid prototyping and reflection-in-action. At each step of the way, I sought user feedback to improve one prototype to the next. The installation was shown and tested at a variety of settings, both in an exhibition

setting, where I had no control over who saw the installation and a laboratory setting, where I had full control over participants accessing the installation.

I developed a study to answer the primary research question: "How can user responses to the art installation object improve the object itself, which was designed to represent processes of digital accumulation, digital decay, and prompts for revisitation?"

To answer this question, I designed the user study centering embodiment of the self and the participant's archive into the installation. This allowed the installation to be uniquely personalized to the participant. I conducted 19 interviews with individuals who maintained extensive digital collections. I collected qualitative data through these interviews as well as observed participants' interactions with the installation. I used thematic analysis to analyze participants' unique experiences. The findings from this study are contextualized through relevant scholarly work.

Chapter 2 reviews the literature on digital archives, glitch aesthetics, and embodied interaction in HCI.

Chapter 3 details the methodological framework of *Outlast*, outlining the iterative design and development of the interactive installation. It describes the prototyping phases, artistic considerations for visualizing digital accumulation, decay, and revisitation, and documents the exhibition of the installation across multiple contexts. The chapter also outlines the study design, participant recruitment methods, and qualitative analysis techniques used to interpret participant interactions and feedback.

Chapter 4 presents the findings from participant engagements with *Outlast*. Drawing from interviews and observations, this chapter outlines key themes that emerged across the three acts—Digital Accumulation, Digital Decay, and Revisitation.

Chapter 5 discusses the broader implications of the findings, connecting participants' responses to existing literature on digital accumulation, decay, embodied interaction, and audience engagement in art installation. It reflects on how digital decay can serve as a design material and offers insights into how meaning is constructed through engagement rather than static representation.

Chapter 6 outlines the limitations of the study, addressing constraints in participant diversity, technical implementation due to lack of equipment, and reflects on the challenges of studying emotional responses in installations in a laboratory setting. It considers how these limitations might inform future iterations of both the installation and the research methodology.

Chapter 7 outlines directions for future work, proposing new avenues for exploring digital decay, through interactive systems. It suggests expanding the participant pool, experimenting with user-driven control over decay, and exploring cultural and emotional variations in how digital decay is perceived. The chapter also considers how future installations might incorporate long-term engagement, paired participation, and alternative metaphors for digital decay.

Chapter 2: Literature Review

Digital Accumulation

Physical artifacts have long been utilized by people as external memory and reference tools. These include journals, scrapbooks, photographs, handwritten letters, annotated books, recipe cards, personal libraries of books, newspaper clippings, ticket stubs, postcards, personal collections of artwork and ephemera. We are shifting from analog formats to hybrid and increasingly digital formats (Beagrie, 2005). Digital possessions have been defined as providing evidence of the individual, representing the individual's identity, perceived as having value, and providing a sense of bounded control (Cushing, 2013). Personal digital collections are "composites drawing material from the individual's private life, work, and education, as well as from external communities and content sources" (Beagrie, 2005, Defining Personal Digital Collections section). Personal digital archiving consists of "personal photograph digitization, web archiving, social media archiving, personal digital file management and tools, converting old file formats, lifelogging, and even saving voicemails and SMS texts" (Condron, 2019, p. 29). Digital artifacts are becoming more and more integrated into our personal and professional life (Gulotta et al., 2013).

Hobbs (2001) defines a personal archive as "the documentation of individual lives and human personality" and notes that such archives "represent a departure from the collective formality and systemic organization found in other types of records" (p. 126). Unlike formal physical archives such as administrative or government records, which are impersonal and organized, personal archives often lack this regimentation, simply because "people in their private lives are not programmatic or entirely planned or rule-driven or procedure-bound as they

make their documents" (Hobbs, 2001, p. 130). Archival scholars have researched the individual-artifact relationship. McKemmish (1996) argued that individuals' records are extensions of themselves and a representation of their identity. It's how they situate themselves in the world. "Record keeping is a kind of witnessing. On a personal level it is a way of evidencing and memorializing our lives; our existence, our activities and experiences, our relationships with others, our identity, our 'place' in the world" (McKemmish, 1996, p. 175).

In our increasingly digital age, people may develop strong attachments to certain digital artifacts as they share more information online. People believe their "self" extends to their digital possessions, and they grow more "attached" to them (Cushing, 2011, 2013). From a work perspective, people do not delete digital data in case they need them for evidence in the future. Predicting future worth is one of the most challenging issues that consumers and archivists face (Marshall et al., 2007). This builds on archival terms of "primary value" and "secondary value." Pearce-Moses (2005) defined "primary value" as "the value of records derived from the original use that caused them to be created" (p. 309). "Secondary value" is defined as "values that some records have because of the uses, often unforeseen, to which they can be put by individuals other than those for whom the records were originally created," which "may justify continuing retention after the expiration of primary values" (Pearce-Moses, 2005, pp. 355, 399).

Marshall et al. (2007) argue that when archives become fragmented and difficult to manage, the risk of data loss increases and retrieval becomes challenging. At the same time, low-cost abundant storage makes it possible to do this "record-keeping" with much ease where we can store most life experiences through photographs, audio, video, and other types of data. Marshall et al. (2007) identify "benign neglect" as a common approach to personal digital archiving, where individuals accumulate digital materials without systematic organization.

Accumulation of digital artifacts, therefore, becomes an easy process because it is easy to record, create, receive and save (Czerwinski et al., 2006). This can result in hoarding of data. The term "Digital Hoarding" was introduced as a subtype of hoarding behaviour (van Bennekom et al., 2015). van Bennekom et al. (2015) described digital hoarding as, "…the accumulation of digital files to the point of loss of perspective, which eventually results in stress and disorganisation" (p. 1).

Digital Curation Concerns

We are creating at a staggering rate each day. This rate is far greater than our capacity to absorb (Tungare, 2007). On Instagram, people upload over 95 million photos each day (Jacimovic, 2023). Marshall et al. (2007) define this rapid accumulation of digital belongings as "formidable" (p. 4). The vastness of digital belongings can intimidate people away from curation. Lord and Macdonald (2003) describe digital curation as "the activity of managing and promoting the use of data from its point of creation, to ensure it is fit for contemporary purpose, and available for discovery and re-use" (p. 12). According to Marshall et al. (2007), a major driving force behind long-term curation techniques in personal digital archives is the possibility that an over accumulation of digital artifacts could obfuscate artifacts with long term value. Time is not devoted to pruning and maintaining digital artifacts (Boardman & Sasse, 2004).

The lack of curation can be attributed to many reasons, such as laziness towards deleting both personal and work artifacts (Sweeten et al., 2018). Due to the significant rise in digital storage capacity in recent years, participants are no longer constrained by space limits and do not feel compelled to remove material in order to conserve or free up space. The perception of infinite space serves as a deterrent to any data deletion. (Sweeten et al., 2018) However, the very media on which our 'infinite' storage depends remains bound by physics. The illusion of

immateriality lends digital information the advantage of being immune to decay (Blanchette, 2011). Blanchette argues that this is problematic and that bits are "material objects" that "cannot escape the material constraints of the physical devices that manipulate, store, and exchange them" (p. 1).

Digital Decay and Media Degradation

People associate digital data with notions of safety and security (Gulotta et al., 2013; Marshall, 2007). They often equate backup practices such as the 3-2-1 rule (three copies of your data, stored on two different types of media, with one copy kept offsite) with longevity yet no strategy can fully forestall failure (Boyda, 2008). There is no guaranteed strategy for the long term preservation of digital information that is foolproof and digital artifacts are prone to obsolescence (Houghton, 2016). Moreover, this degradation rarely occurs in a dramatic fashion, but seeps in slowly, more subtly, eroding an artifact's fidelity and accessibility (Boyda, 2008).

Data preservation challenges: Data Corruption, File Format Obsolescence

Digital decay happens in a variety of ways. Archival scholars have recognised the various ways digital data is lost. In the paper, *A Digital Dark Ages? Challenges in the Preservation of Electronic Information*, Kuny (1997) argues that we are living in a time where much of what is coded electronically will be lost forever, akin to a digital dark age. Similarly, Houghton (2016), in her article *Preservation Challenges in the Digital Age*, outlines the major threats to the long-term survival of digital information.

Data Corruption and Fragility

Digital materials are inherently fragile. Houghton notes that some file types (especially lossy or compressed formats) can suffer "total loss if even a single bit is lost," making them

extremely vulnerable to bit rot and corruption. Unlike analog media with lifespans of centuries, digital storage media often last only 3–50 years, so content can decay or become unreadable if not refreshed or monitored regularly (Houghton, 2016).

Deprecation of software and hardware

Rapid advancements in operating systems and application software present challenges since files might not display properly as platforms change. New versions aren't guaranteed to read old files, and backward compatibility is limited. Similarly, physical hardware and storage media age and fail. They are prone to obsolescence and even mechanical failure, risking data loss. Preserving digital objects, therefore, often requires preserving or emulating the original hardware/software environment which is a complex task in itself (Houghton, 2016).

Obsolete File Formats

Proprietary formats still pose challenges for preservation, even though open, well-documented formats have lessened certain risks. If a format's software or specifications are locked up by vendors, archivists may need permission from patent holders to migrate or emulate the content. This complicates long-term access, as data in obsolete or closed formats might become inaccessible when the original software is unavailable or no longer runs on modern systems (Houghton, 2016).

Changes in the Designated Community's Knowledge Base

Changes in the knowledge base of the designated community can make data difficult or impossible for users to understand or use over time because the necessary context, such as tacit knowledge, specific terminology, languages, or analysis paradigms, is lost over time. Addressing this would require community involvement (Giaretta, 2011).

Restrictive Licensing, Intellectual Property, and Privatisation

Increasingly restrictive intellectual property and licensing regimes may prevent many materials from entering library collections for preservation. The archiving and preservation functions are becoming increasingly privatized, with companies retaining valuable information without a long-term public commitment (Kuny, 1997). Houghton (2016) highlights how relying on third-party cloud services for storage introduces additional copyright and licensing issues that may restrict copying or migration.

Decay as a Need

Data is not only corrupted and lost due to the processes listed above, but data is also intentionally compressed for the sake of storage space. Data compression is defined as "the art or science of representing data in a compact form" (Sayood, 2017, p. 1). The primary goal of data compression is to reduce redundancy in stored or communicated data, thereby increasing effective data density (Sayood, 2017). With the ever-increasing volumes of data, especially in areas like digital images, data compression is crucial for efficient file storage. It also minimizes the amount of data to be transmitted, thereby reducing communication costs. Compression also reduces the load on the input/output channels of the computer system which in turn improves the processing efficiency of a system. Sayood (2017) gives the example of Huffman coding, where the reduced file size led to a reduction in the number of disk operations required to load the database.

Decay as an Aesthetic

Several artists have investigated decay—video compression, feedback loops, and glitches—to generate art works. Artists have long used decay as an aesthetic in a variety of

mediums such as sound, visual art, cinema (Grimaldi, 2024), net art and more. Bill Morrison's Decasia explores the concept of decay and mortality through found footage and a score composed of several detuned pianos. The film uses deteriorated archival film stock to create a visual representation of time's passage and the inevitable breakdown of both physical and cultural artifacts (Betancourt, 2015).

> In the case study of Bill Morrison's Decasia, such works not only produce new, more inclusive understandings of the past, but also reflect a cognizance of those materials' physicality within the cycle of actual creative practices. In short, they embrace decay not only as an aesthetic, but as a necessary element to perpetuating new meaning that actually builds on the materials of the past (Eng-Wilmot, 2008, p. 123).

Rosa Menkman, a visualist specialising in Glitch Art, published *The Glitch Moment(um)* (Menkman, 2011) which draws on information theory to posit "glitch art" as a particular genre of contemporary art. In the book, she argues that the glitch shifts between existing as an artifact and as a process. The focus shifts from decay's perception as a defect or imperfection and moves into the space of transformation.

However, transformation through decay can also unsettle. Sigmund Freud's essay, *Unheimlich* examines the German word 'unheimlich,' which is the opposite of 'heimlich,' i.e., familiar, native, or belonging to the home. The German word 'unheimlich' is conventionally translated into English as 'uncanny.' The essay investigates the subject of the 'uncanny', which arises when something long known is estranged by repression or context and suddenly feels foreign. He notes that sensitivity to the uncanny varies greatly among people. Freud argues that not everything new or unfamiliar is frightening; something must be added to make it uncanny. While fiction is an area fertile for invoking the 'uncanny', Freud mentions that one can invoke it

in reality by creating events that almost never occur in real life. He says a core driver of the "uncanny" is a feeling of disorientation or not knowing one's bearings; the better one's orientation, the less uncanny things seem. While this can effectively achieve an uncanny impact, the success of evoking the uncanny may come at the cost of the receiver feeling deceived or dissatisfied (Freud, 1919).

The potential of mediated decay ties back to broader questions about authenticity and aura in reproduction. In *The Work of Art in the Age of Biocybernetic Reproduction*, Mitchell (2003) writes, "the copy has, if anything, even more aura than the original. The copy is no longer an inferior or decayed relic of the original, but is in principle an improvement on the original" (p. 487).

Datamoshing

Datamoshing is a practice whereby audiovisual artists actively downgrade the quality of digital images in order to render a more "raw" aesthetic on screen. In *Datamoshing and the emergence of digital complexity from digital chaos,* Brown and Kutty (2012) explored the aesthetic possibilities that are opened up by datamoshing. They conclude that datamoshing represents a new type of "time-image" deliberately embracing a loss of aura to paradoxically gain "even more" aura, and can be seen as an image of the future in the present (p. 174).

Databending

Databending uses software to intentionally disrupt the information contained within a file which causes glitches as a result (Geere, 2010).

Visual digital decay has also been used as a mode of inquiry. Gulotta et al. (2013) designed three interactive systems that served as speculative, provocative artifacts to explore people's feelings about digital legacy. Digital decay was chosen as a visual treatment to disrupt

associations of safety and stability people have with digital data. The prototypes were a digital appropriation of physical processes of decay such as environmental exposure, handling wear, and chemical aging. They showed digital data as decaying over time, with portions fading out or being literally replaced by their constituent raw bits. Participants in the study, who were all parents, consistently questioned the very legitimacy of applying physical decay metaphors to digital media, mentioning that digital data should remain "pristine" and felt that these prototypes were thought experiments (Gulotta et al., 2013, p. 1818). Participants also found it difficult to subject a photo of their loved ones to decay.

However, this paper explicitly asked participants not to critique the system in terms of its usability and visual effects (Gulotta et al., 2013).

Revisitation

As discussed earlier, with the vast accumulation of our digital possessions, it gets harder to retrieve data. Overwhelming volume of digital photos, rudimentary organization, lack of maintenance, and an overestimation of ability to find older pictures are some of the many reasons for retrieval failure (Whittaker et al., 2010). According to the Society of American Archivists, "memory" can refer to "An individual's knowledge of the past." and "A specific recollection of something in the past" (Society of American Archivists, n.d.). While the absence of digital or physical artifacts does not preclude reminiscence, they can be used to aid memory. Reminiscence has been described as,

> ...the volitional or non-volitional act or process of recollecting memories of one's self in the past. It may involve the recall of particular or generic episodes that may or may not have been previously forgotten, and that are accompanied by the sense that the

> remembered episodes are veridical accounts of the original experiences. This recollection from autobiographical memory may be private or shared with others. (Bluck & Levine, 1998, p. 188)

Researchers have argued that memory should be conceptualized as an activity integrated into people's lives, and digital "memory triggers" should be woven into everyday life (Peesapati et al., 2010, p. 2027). Effective curation of personal digital archives hinges significantly on the ability to draw attention to and maintain engagement with archived materials (Jones & Ackerman, 2016). Participants in Jones and Ackerman's (2016) study expressed a distinct concern about losing the relevance of artifacts that remain unseen or unused. They highlighted that the act of curation is fundamentally about managing attention: sentimental objects must be periodically seen or interacted with to maintain their mnemonic value. One participant notably remarked, "Sentimental objects have to be in sight and touched every once in a while. They must be thought about so they don't lose their relevance" (Jones & Ackerman, 2016, p. 89).

Researchers have started looking into ways to allow users to re-experience digital media from their past through a variety of mediums such as images, sound and social media (Chen et al., 2023). Research has aimed to create interactive designs that can be used as memory cues to support remembering (van den Hoven, 2014). Social media platforms like Facebook, with features such as "Lookback" or "Year in Review," play a role in the process of stimulating reminiscence (Thomas & Briggs, 2016). Triptychs (sets of three photographs) drawn from Facebook accounts to encourage reflection have also been researched (Thomas et al., 2018). Physical artifacts have also been created as a means of technology mediated reminiscence. *Reflexive Printer*, a physical artifact that prints one photo a day from a user's smartphone album as a low-resolution halftone image on thermal paper and then deletes it from the phone is an

example. This facilitated a serendipitous encounter with past memories through recontextualisation of digital data (Tsai et al., 2014).

Interactive Art

Embodiment and Interactivity

Ishii and Ulmer (1997) describe interactive surfaces as "the transformation of each surface within architectural space (e.g., walls, desktops, ceilings, doors, windows) into an active interface between the physical and virtual worlds" (p. 235).

Dourish critiques traditional HCI approaches that separate cognition from action, arguing that meaning arises through interaction, not before it (Dourish, 2001). Interaction is then seen as a means of creating meaning rather than just processing information, where the item and its context on all levels define each other and are open to various interpretations. Embodied phenomena are those that occur in real time and place and that we experience first hand rather than abstractly.

There are several design challenges when interactive technologies are used in public settings. In *Designing the Spectator Experience,* Reeves et al. (2005) provide a framework for classifying public interfaces based on the extent to which a performer's manipulations (actions carried out by the user) and their resulting effects (the outcomes of these manipulations) are hidden, partially revealed, fully revealed, or even amplified for spectators. Manipulations are defined broadly to include physical controls, gestures, movements, and speech, even those not directly sensed by the interface. Effects encompass the main content, visible system responses,

and even the performer's reactions. Based on this classification, the authors propose a taxonomy of public interfaces and identify four broad design strategies for the spectator experience:

- **Secretive**: Both manipulations and effects are largely hidden from spectators.
- **Expressive**: Both manipulations and effects are revealed, sometimes even amplified, allowing spectators to appreciate the performer's interaction and learn by watching.
- **Magical**: Effects are revealed, but the manipulations that caused them are hidden, aiming to create a sense of wonder or mystery.
- **Suspenseful**: Manipulations are apparent, but effects are only revealed when the spectator becomes the performer.

Activation of a Space

Ciolfi and Bannon (2005) draw a distinction between 'space' as an abstract physical environment, and 'place' as a space that gains meaning through experience and use, arguing that while space is often seen as a mere physical setting, place involves human investment with understandings, meanings, and memories. These social, emotional, and contextual factors therefore become relevant to the design of technologically-enhanced physical environments. They write:

> Technologically-enhanced physical environments in the design of technology are no longer concerned solely with people's interaction with the standard desktop computer – the 'box' that sits on people's desktops. Design must now concern itself rather with the physical environments that people will experience through their daily lives. People will encounter technologically enhanced spaces and artefacts as they move through a variety of environments. These systems will change the way in which physical spaces are used

and shaped by people. The systems will be able to respond and react to their presence and actions (Ciolfi & Bannon, 2005, p. 217).

Audience Participation in Art Installations

The paper *Enticing People to Interact with Large Public Displays in Public Spaces*, Brignull and Rogers (2003) focus on how groups of people socialize around large displays in public places, how they move towards them and interact with them, and how one can design displays to encourage participation. They investigate the resistance of the public to interact with large displays in public places and offer recommendations to encourage participation. The authors identify social embarrassment as a major barrier to participation. They talk about the feeling of "public shame" when participating in a real-time display of contributions, called the Opinionizer. Because contributions to the Opinionizer were broadcast in real-time on the large display, any "human foibles, like making and deleting mistakes, and being hesitant or shaky with the cursor, were highly visible and very public" (Brignull & Rogers, 2001, p. 21). This visibility required a considerable amount of confidence from participants to cope with the pressure of performing in front of an audience.

The Honey Pot Effect

Brignull and Rogers (2003) also highlight the importance of vicarious learning through observing others. They coined the term "Honey Pot effect" which suggested that a sociable buzz was created when the number of people in the immediate vicinity of the display increased, signaling openness to discussion. Participants seemed to learn how to use the system by observing others through this honey pot effect. Research has found that individuals need constant

encouragement and demonstration to interact with an interactive public display (Churchill, 2004).

The authors provided the following recommendations for enticing people to participate:

- Designing the display and surrounding activities to be attractive and easy to understand from a distance.
- Considering bodily occlusion by placing the display at least partially above head height.
- Recognizing that a large empty space around the display can deter participation.
- Using a helper initially to build confidence.
- Positioning the display near traffic flow.
- Making the interaction very lightweight and visible.
- Ensuring participants can learn vicariously by observing others.
- Making the interface clear and reassuring that interaction is low commitment, quick, and enjoyable.

While this paper talks about the audience as one whole entity, individuals in an interactive space can assume a variety of roles. In *From Interaction to Trajectories: Designing Coherent Journeys Through User Experiences*, Benford et al. (2009) discuss several performance roles involved in interactive experiences. They list:

- **Participant**: A member of the public who is the main target of the experience.
- **Spectator**: A member of the public who witnesses the actions of participants. The authors further distinguish this role into the audience, who are part of the performance frame, and bystanders, who are unwitting observers (e.g., people just passing through the locality).
- **Actor**: Professionals who perform to members of the public.

- **Operator/Orchestrator**: Professionals who manage the technologies and shape the experience from behind the scenes.

Benford et al. (2009) highlight that an individual may follow a trajectory through several different roles as part of their overall experience. An individual may move from bystander to spectator to participant and back again. People may initially be unaware of an experience (bystanding), then become familiar with it while observing (spectating), and finally take part (participating). Therefore interactive experiences must be designed with these trajectories in mind.

Heterogenous Interpretations

HCI has largely operated under the assumption that there should be a single, correct way to interpret a computer system, whether that is how it works or the emotions it should evoke. The goal of designers was to accurately convey this intended interpretation to users, and disagreements in interpretation were seen as problems to be solved by identifying the correct interpretation and designing systems to ensure its adoption. As Norman (1986) explains:

> The designer should want the User's Model to be compatible with the underlying Conceptual Model, the Design Model. And this can only happen through interacting with the System Image…. If one hopes for the user to understand a system, to use it properly, and to enjoy using it, then it is up to the designer to make the System Image explicit, intelligible, consistent. (p. 47)

In contrast, Sengers and Gaver (2006) argue to reconsider the necessity and desirability of a single preferred interpretation. They argue that interpretation occurs at various levels, from understanding basic interface elements to grasping the system's role in users' lives and its

social/cultural meaning. They advocate for explicitly designing for multiple, heterogeneous interpretations and suggest design strategies for supporting multiple interpretations such as by clearly specifying usability, while leaving interpretation of use open:

> …design systems as a blank canvas which can be interpreted by users in many possible ways. The goal of this design strategy, in contrast, is to have clear usability – what the system does and how it can be controlled is obvious – but the ultimate purpose, meaning, and usefulness of the device is left open for users to decide. (Sengers & Gaver, 2006, p. 102)

The paper also discusses evaluation strategies for systems designed with multiple interpretations in mind. They suggest incorporating user interpretation into evaluation by systematically gathering and analyzing users' own accounts. They also suggest gathering multiple, potentially inconsistent assessments and interpretations from various sources, including users, designers, and external experts (e.g., filmmakers, participants from different fields such as journalists and art critics, traditionally thought to be unrelated to HCI), to create a rich and layered understanding. This may lead to a more radical reformulation of what it means to assess the success of new systems.

Given the above, I chose to pursue the methods employed in making my installation which acted as a "blank canvas" for users to pour their own meanings and interpretations into. The methods also describe how recruitment was done to get a variety of interpretations from various sources with an attempt at including participants from other disciplines. For purposes of this study, I will focus on personal archives and the accumulation that occurs in personal digital collections.

Chapter 3: Methods

To explore how people engage with digital accumulation, decay, and revisitation, I built an interactive installation titled *Outlast* and conducted a user study to refine it through participant feedback. The study involved iterative design and prototyping methods, experience prototyping, and reflection-in-action. Following the final prototype, I carried out 19 semi-structured interviews with participants who interacted with the installation and used thematic analysis to interpret their experiences. The following sections describe the design process, artistic decisions, study design, and methods of data analysis.

Installation Design

Outlast is an interactive art installation exploring themes of digital accumulation, digital decay and revisitation of our archives. The installation only activates if there are people in its proximity. The viewers themselves were the most important actor in the installation, allowing them to become part of the performance and explore interactive art as a form of reflective practice. The following subsections present a discussion of design methodology in the context of installation design, projection mapping, interactivity and temporal installation. The final structure of the installation was reached via iterative prototyping (Camburn, 2017).

Design and Implementation (Structure)

A. Explorative Low-fidelity Prototyping

a. Prototype 1: “Screen Look”



Fig 1: Boxes stuck on a sheet of cardboard (low-fidelity prototype)

The first prototype was a bunch of boxes stuck on a large sheet of cardboard. This was made as an early prototype to explore the look and feel of using boxes as an evocative metaphor for data centers. It only took a day to source boxes across campus and stick them to the sheet through rapid prototyping. Rapid prototyping is a design methodology that is used in a variety of sectors to reach a minimum-viable product (MVP) which is a nascent stage of a product that includes the most basic features ripe for iterations and optimizations. “It is a version of a new product, which allows a team to collect the maximum amount of validated learning about customers with the least effort” (Lenarduzzi & Taibi, 2016, p. 112). It also enables users or focus groups to participate in the design process by interacting with each prototype.

I liked the look of the boxes as a metaphor but simply sticking the boxes to a sheet flattened the metaphor rather than making it evocative. There was a lack of depth and

dimensionality. Data centers are dynamic, spatial structures with layers of black box processes to them. By sticking boxes to a flat sheet, the prototype looked too static. I also noticed that there was a lack of embodiment when I saw people simply standing in front of the cardboard sheet. The structure did not invite spatial exploration or engagement and I wanted something more immersive.

I shifted from this "screen" look to a more sculptural approach by using staggered, stacked boxes that people could walk around moving in my next prototype.

b. Prototype 2: "Sculptural staggered boxes"

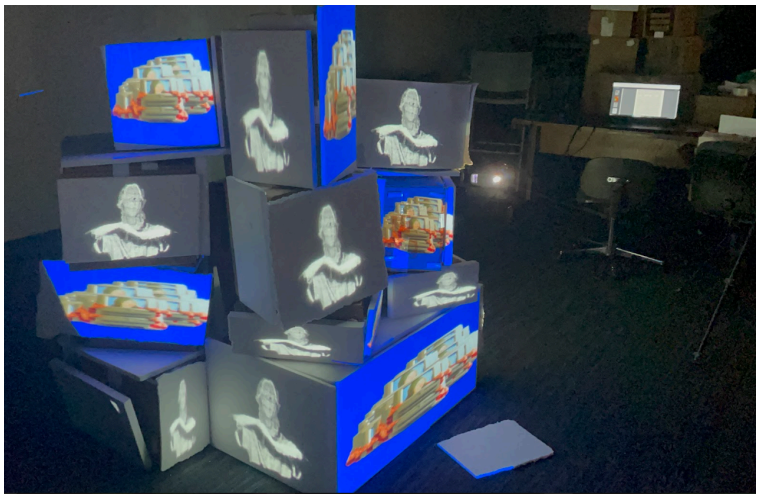


Fig 2: Side view of the prototype (left)

The second prototype was made of several cardboard boxes of various sizes, styrofoam and Ethafoam sheets. The goal was to explore whether using boxes as an evocative metaphor for storage and data centres was visually and structurally sound. Cardboard boxes of various sizes were placed on top of each other with an emphasis to make it seem like it was about to topple over. This was done to suggest that data centres that we place our trust into are not as reliable as they seem. I projected a test projection screen onto these boxes and it was evident that the projection would not show up vividly on the brown cardboard box. Some of them also had

address labels and other company labelling on them which made plain cardboard boxes a wrong decision.



Fig 3: Test projection onto boxes

To make the surface better for projection, I chose to stick pebbled styrofoam to obscure the cardboard. However, pebbled styrofoam is difficult to cut smoothly without beading and hot-wire cutters release hazardous fumes. Fabricating custom styrofoam panels for around 30 differently sized boxes quickly became impractical for a long-term installation.

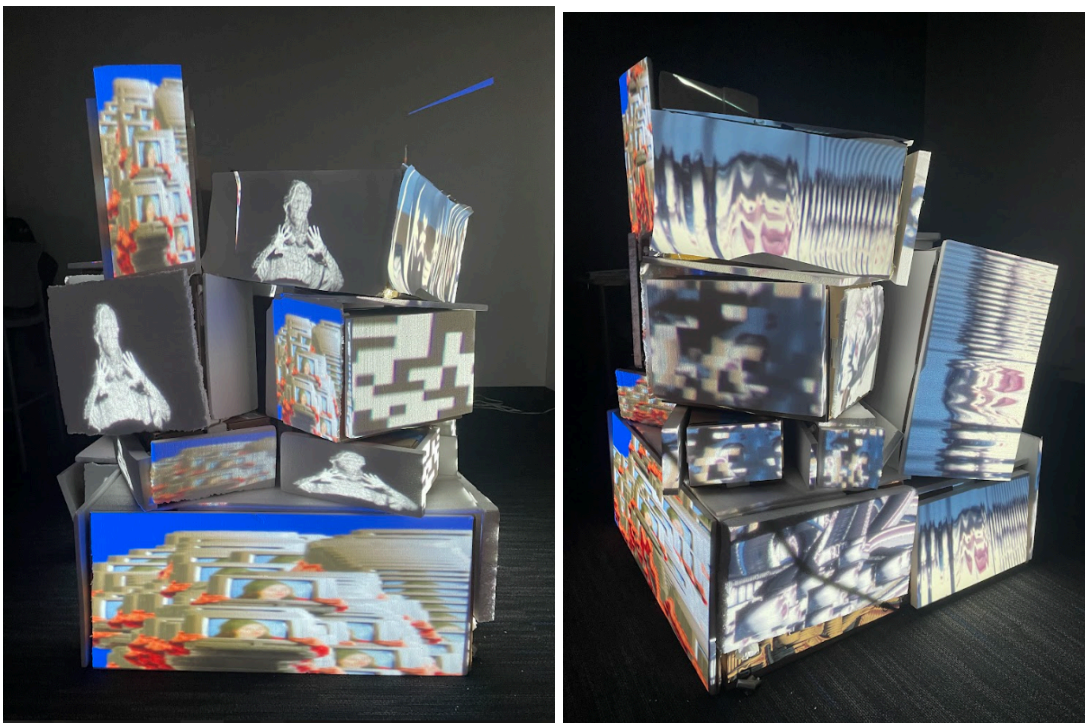


Fig 4: Front (L) and side (R) view of the prototype

Ethafoam® sheets are Sealed Air's brand name for their archival quality, polyethylene foam product in plank form. These tough, flexible thermoplastic resins are widely used in protective packing of fine art and artifacts for both transportation and storage. However, in the final prototype, I decided against this product as a veneer over the cardboard because it is low density, perforated and therefore, not opaque. Projection mapping onto Ethafoam® makes a blurry image. For the first viewing of the prototype, I went ahead with projecting onto the cardboard with Styrofoam and Ethafoam® stuck on it. This was good enough to test whether the boxes were a good metaphor for the message of the installation. This was shown to the incubator program I was a part of and people enjoyed the messaging and the installation.



Fig 5: Incubatee member in front of camera testing the prototype under spotlights conditions



Fig 6: Incubatee member in front of camera testing the prototype under well lit conditions

However, the structure which consisted of around 30 boxes was very unstable and I had no way to recreate it exactly for future shows. The number of boxes also made it hard to be portable. For my final prototype, I decided to go with a structure consisting of 7 boxes of the same size.

B. Final Prototype

The final prototype consisted of 7 boxes each of the same size. The resulting structure was around 7 feet tall.



Fig 7: Front view of the installation with projections

I considered placing vinyl contact paper on top of the boxes to make it white but they had a slightly reflective surface. Projection mapping on top of vinyl contact paper resulted in a slight reflection opposite to the boxes on the walls of the room.

I settled on white foam board core of 3/16’’ thickness. These were light yet sturdy and provided me with a smooth white surface to project onto with no reflection. I used nine 32 x 40” foam board cores and cut them according to the size of the box.

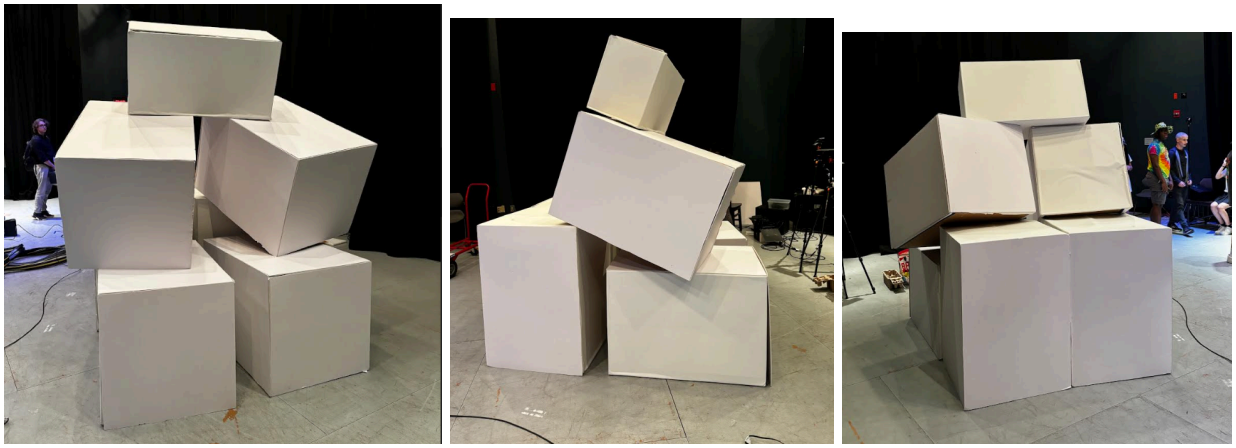


Fig 8: Front (left), side (center), and back view (right) of the installation

I decided this was going to be my final sculpted piece because these boxes gave me an expansive surface for projection. The larger boxes meant I could project sections of the installation's messaging meaningfully onto different faces. Limiting the set to seven boxes kept documentation and setup manageable for repeated and consistent installations. This was an important consideration because I needed to transport these boxes across campus multiple times for exhibition.



Fig 9: Holding boxes to show its lightweight nature as well as portability benefits

Experience Prototyping

"Experience prototyping" is a methodology put forth by designers Marion Buchenau and Jane Fulton Suri at IDEO (Buchenau and Suri, 2000). They define an Experience Prototype as, "…any kind of representation, in any medium, that is designed to understand, explore or communicate what it might be like to engage with the product, space or system we are designing (p. 425). It is valuable in understanding existing user experiences and context, exploring and evaluating design ideas, and communicating ideas to an audience.

Experience prototyping offers a practical framework for creating a tested prototype for various projects and utilizing it to predict and model how an experience will turn out. The focus is on active participation that allows designers, clients or users to "experience it themselves" rather than witnessing a demonstration or someone else's experience.

Buchenau and Suri suggest embracing a low-fidelity mindset, especially in the early phases, to focus on the design question rather than the prop. This framework served as the guiding principle for the design, testing, and iterative refinement of every prototype in this installation.

Reflection-in-action

Reflection-in-action is also an overarching methodology in this practice-based research. It is a methodology by Donald Schön (Schön, 1983) provided in his book The Reflective Practitioner. Schön states that the designer improves each project through iterations based on the insights gained from reflection-in-action practice, and then applies what they have learned to the next project. It is an immediate, on-the-spot reflection where one adjusts their approach in real

time based on their experiences. It is valuable in unpredictable situations where all variables cannot be predicted.

I used this methodology because my installation was shown to a variety of audiences in a variety of settings, where it was hard to predict the multitude of needs of the audience. This method allowed me to think on my feet. As an example, I changed the height of a tripod once I noticed most participants were not at eye level with the camera. Schön asserts that reflection-in-action is a desire to learn from experience rather than a requirement for further action.

Artistic Decisions

The installation was divided into three acts. The first act was to show the accumulation of our digital artifacts. The second act was to show a lack of perceived decay in our archives. The last act was to show "revisitation" to prompt people to revisit their personal collections. I aimed to present Outlast by combining generative methodologies with practices from photography, film, video art and more, investigating new aesthetics that explore the fleeting visual imagery, undergoing decay, dissolution, and accumulation over time.

TouchDesigner

This work used TouchDesigner (TouchDesigner, Derivative, 2023) to create the projections as well as map them to the boxes. TouchDesigner is a visual programming platform developed by Derivative Canada. It is a node-based visual programming software in the field of new media interaction, for real time interactive multimedia content, through external screen controls, MIDI (Musical Instrument Digital Interface) data and other input devices, so that they

act as modular components in the project to perform operations on images, with features such as interoperability, high integration, real-time, and data visualization.

Considerations for Digital Accumulation

A. Slit-scan

To show the accumulation of images, I looked into visual treatments that would show repetition. I looked into slit-scan photography (Stratski, 2014), known for capturing sequential slices of a subject over time. A slit scan camera does not have a shutter, rather it only has a small slit that lets in the light continuously. Rather than capturing an entire scene in a single instant, the camera repeatedly records a thin vertical (or horizontal) slice of reality. The image is built over time by taking a thin vertical or horizontal slice from a continuously updating source. This results in a distortion effect where the past and present coexist in a single image.

To activate the slit-scan effect, I required live-input from audience members and participants. I wanted to capture a thin slice of an incoming video frame. This process involves multiple layers of feedback systems and compositing to track these pixel movements, integrating blur effects. Drawing inspiration from the slit-scan technique, the pixel displacement in motion, coupled with a feedback system, traces the pixel shift movements.

All parts of this installation required people to stand in front of cameras. Only then the white boxes had something projected onto it. A Logitech 4K Pro Webcam was connected to my laptop to get a live feed of the camera. This feed was imported into TouchDesigner. To extract a thin slice of the video, I used a Transform component. I, then, used a Feedback loop to accumulate previous frames and composited it to blend new slices with old ones. I used a Transform operator to move the stored image to the left before adding the new sliced image and connected it to the feedback loop to continuously shift the accumulated frames. This let me

create a dynamic slit-scan effect where motion is stretched across time. The resulting treatment continuously smeared the face of the audience into slices.



Fig 10: Repeated images projected live onto boxes using a slit-scan technique.

B. Kinect Hand Tracking Visuals

To portray the overwhelming experience of trawling an ocean of digital artifacts, I looked into other visual treatments. I took inspiration from accumulation and overwhelm in computers. I recreated the effect of cards shuffling in a game of Solitaire.

The Kinect is a motion sensor input device from Microsoft (Kinect, Derivative). I connected a Kinect Sensor to my machine. The device includes an infrared depth sensing camera, a RGB color camera, and a microphone array for audio capture. The Microsoft Kinect

SDK enables features such as skeleton tracking, hand interactions, and voice recognition. For this section, I used Kinect's skeleton tracking abilities to track the hand of a person. TouchDesigner has built-in support for Kinect using Microsoft's official Kinect for Windows SDK. I used the Kinect component in TouchDesigner to set up the hand tracking inside TouchDesigner. The Kinect operator outputs joint positions in terms of coordinates. I selected the right and left hand channels, i.e., 'righthandx', 'righthandy.'

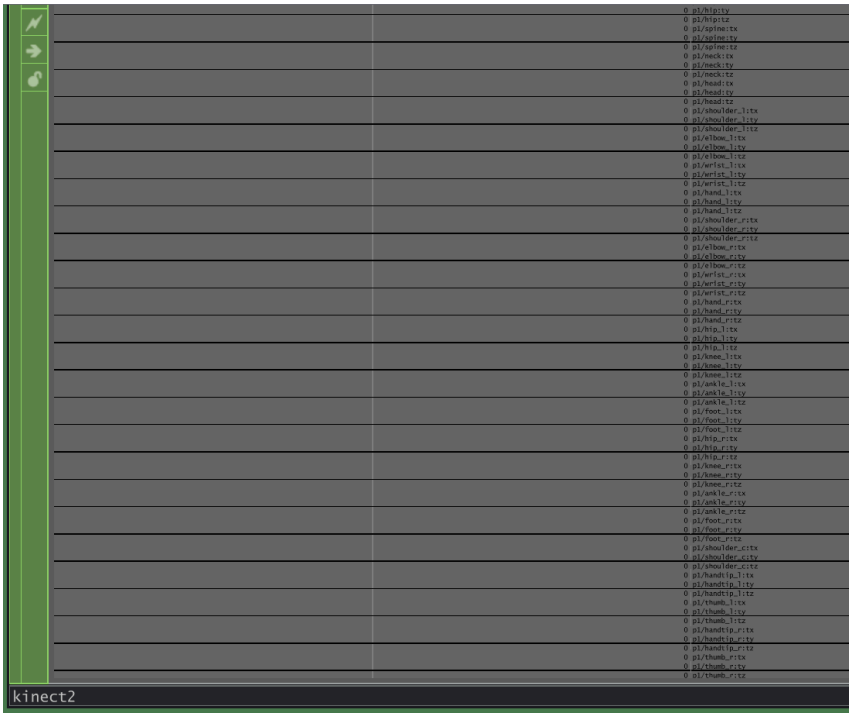


Fig 11: All channels of a Kinect Camera

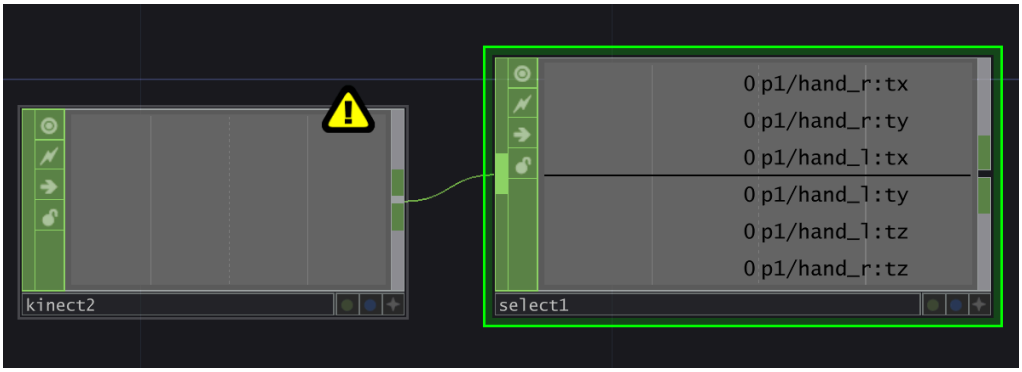


Fig 12: Only taking left and right joint positions from Kinect to track a hand

Next, I imported an image into TouchDesigner and used a Transform operator to move the image. I wanted to use the hand coordinates to control the image's position. I linked the tx and ty parameters of the Transform operator to the hand's x and y channels from the Kinect operator. To use this image and have the same visual treatment as the Solitaire example shown above, I wanted to retain the frames of the image moving so that it would work as a paintbrush. I created a feedback loop to allow continuous drawing and composited the images to layer new brush strokes over old ones. I added a Level operator to control opacity which created fading trails.

Considerations for Decay

Datamoshing and Compression Artifacts

To show decay, I looked into lossy media and compression artifacts. A compression artifact is a noticeable distortion of media (including images, audio, and video) caused by the application of lossy compression. Compression artifacts may intentionally be used as a visual style, sometimes known as "glitch art." Compression artifacts are distortions or imperfections in digital media (images, videos, audio) that occur after data is compressed, especially using lossy compression, which sacrifices some data for efficiency. These artifacts can range from subtle to

noticeable and include blockiness, blurring, color bleeding, and jagged edges. In video art, one technique used is data moshing. Datamoshing is a glitch effect where video frames are manipulated to create surreal, distorted visuals. It typically involves frame manipulation by removing or delaying I-frames (keyframes) while allowing P-frames (predictive frames) to persist. It can also involve pixel smearing where we reuse motion vectors from previous frames to create trippy artifacts. I created a live datamoshing effect. When people stood in front of cameras, they had their live picture decayed and glitched.



Fig 13: Example of datamoshing effect on live camera input of self

I used TouchDesigner to create this effect. I input the second camera's live feed into my machine and imported it into TouchDesigner. Next, I used a Displacement operator with a noise texture to warp frames based on movement and to randomly trigger delays.



Fig 14: Datamoshing effect on an archived image

At my first viewing of this installation at a festival, I asked audience members to stand in front of cameras to have themselves projected onto the boxes and decayed. However, this made me realise that the focus had turned to the self, whereas I wanted the focus to be on people's archives. In the final installation viewing, where I conducted my research study, I asked participants to share a valuable picture with me which I then fed into TouchDesigner as an imported image and distorted under the same glitch effect. This turned the focus from the self to the archive.

Manipulation of Photographs

I also took inspiration from artists who work with distortion. Kensuke Koike [b.1980, Japan] creates unique artwork by manipulating found, vintage, photographic material (Kensuke Koike Archives, Open Doors Gallery). Using images sourced from antique shops, the artist folds,

tears and transforms photographs to create surrealist collages. Cutting, tearing, disassembling before gathering up the pieces of photographs. Kensuke Koike's artistic process always begins with a deconstruction phase and ends with a final surrealist collage. His images are formed through tearing.

I took inspiration from his work and recreated the collage look in TouchDesigner using techniques such as image slicing, feedback loops, and procedural transformations. After taking in the live input from the cameras into TouchDesigner. I used a Ramp operator as a mask for slicing effects.

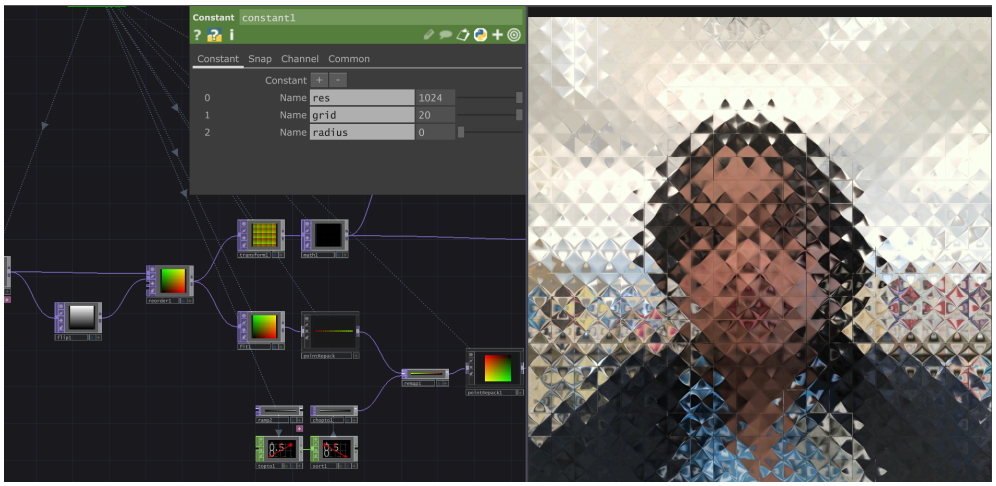


Fig 15: Setup in TouchDesigner

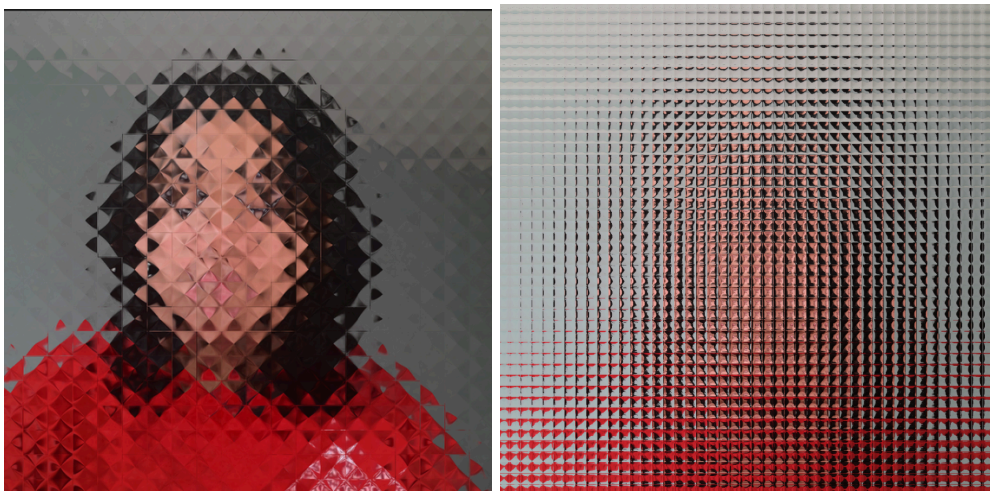


Fig 16: Decay of self

Kinect Depth Mapped Decay

Another way I portrayed decay was using a Kinect depth sensor camera (Kinect, Derivative). For this effect, the participant would have to stand in front of the camera and move closer. As they moved closer, their projected image would disappear. I used a Particle System using PointClouds in Touch Designer to make a 3D rendering of the person. When the person was at a distance from the depth sensor, it would show themself in 3D space, but if they moved closer to the camera, the particles of the particle system would scatter leaving only a black projection.



Fig 17: Projection when away from Kinect camera



Fig 18: Projection as you move closer to Kinect camera (points dissipating)

Considerations for Revisitation

The final act of Revisitation, I wanted to prompt people to reflect on revisiting their digital artifacts and think about its afterlife. What is the afterlife of our data? How can we be prompted to revisit our data often? Could revisitation be a means to curation? I was heavily inspired by American visual artist Dan Graham's installation *Present, Continuous, Past(s)* (1974). *Present Continuous Past(s)* (1974) was a room with mirrored walls, a video camera and a screen below the camera. The mirrors reflect present time, and the video camera tapes what is immediately in front of it and the entire reflection on the opposite mirrored wall. The screen plays the recordings 8 seconds later, and a person viewing the monitor sees both the image of himself or herself of 8 seconds earlier, and what was reflected on the mirror from the monitor eight seconds prior to that, 16 seconds in the past (Dan Graham, 1974). I calculated the average time it took for a person to interact with the first two acts, Digital Accumulation and Digital Decay, which was around two minutes. Participants turned around the corner and saw themselves two minutes into the past, projected on the boxes.



Fig 19: Revisitation act while someone is interacting with the front two acts



Fig 20: Revisitation act after interaction with the front two acts shown at a delay of 2 minutes

In TouchDesigner, I used a Cache operator to cache frames of participants interacting with the first two acts, Digital Accumulation and Digital Decay, and showed them at a delay of two minutes. No participant was recorded. Cached frames were simply shown at a delay.

Interactivity and Exhibition Design

Outlast was presented as an interactive art installation in three locations in 2024 as three different prototypes: NewWorks Incubator Program showing (August 2024), NextNow Festival at College Park, Maryland (September 2024) and as a research study in an Art Laboratory at the University of Maryland (October 2024). Each showing had different components from the previous one according to what I learned in each iteration. Interactivity was at the core of this installation. The boxes are blank, i.e., have no projections on them, if there are no people in front of the cameras. The installation is only activated in the presence of people. Each section had a dedicated webcam for it.

Comparative Table of Venue Contexts and Installation Features

Venue	Footfall	Digital Accumulation	Digital Decay	Revisitation	Additions/Removals
NewWorks Incubator Program	Small gathering (~20 people) in a room	Slit-scan, Kinect hand-tracking	Kinect Decay	Not shown	N/A
NextNow Festival	Festival setting, footfall of around 500 people	Slit-scan	Kinect Decay, Kensuke Koike inspired decay on the self, Datamoshing	Not shown due to technical difficulties	Kinect-hand tracking to create a more embodied installation. Also made it more computationally intensive to use Kinect components in both Digital

Venue	Footfall	Digital Accumulation	Digital Decay	Revisitation	Additions/Removals
					Accumulation and Decay
Art Laboratory	Laboratory setting (an environment in which the researchers can control who is participating and how) (Duarte et al., 2022)	Slit-scan	Kinect Decay, Datamoshing on participants' image	Dan Graham inspired Present, Continuous, Past(s) setup	N/A

Table 1: Comparative Table of Venue Contexts and Installation Features

Installation Breakdown for Initial Prototype at the NewWorks Incubator Exhibition

Venue	Footfall	Digital Accumulation	Digital Decay	Revisitation
NewWorks Incubator Program	Small gathering (~20 people) in a room	Slit-scan, Kinect hand-tracking	Kinect Decay	Not shown

Table 2: Installation Breakdown at the New Works Incubator Exhibition



Fig 21: Prototype shown at NewWorks Incubator

The first prototype and the second were made as a part of the NewWorks Incubator Program at the Immersive Media Design department at the University of Maryland, College Park. I had a webcam and a Kinect XBox depth sensing camera for Digital Accumulation. The Digital Decay section likewise employed the same Kinect camera.

Amongst the artistic techniques explored above, slit-scan and Kinect hand-tracked paintbrush was chosen for Digital Accumulation. For decay, I showed a Kinect depth-camera mapped decay. This prototype was shown to fellow incubatees who had interest and expertise in immersive media applications. While testing with fellow incubatees, I realised that it was too computationally intensive to have two Kinect components inputting into a machine at the same time, i.e., the Kinect hand tracking and Kinect decay. The hand tracking of an image as a paintbrush was also seen as more of a playful component than actually showing digital accumulation meaningfully. I substituted the image with the camera feed of the person experiencing the installation but the image quality was not good under the lighting conditions

which made the “paint brushed” self look grey and muddy over time. I decided to do away with the Kinect hand-tracked image to portray Digital Accumulation for my next prototype and exhibition.

The Kinect decay was well received by the other incubatees who enjoyed the disappearance effect of the decay. It suggested that decay was not just the corruption of an image visually but also forgetting a memory.

Revisitation was not shown to the incubatees at the time because there was not enough time to develop it.

Installation Breakdown for Initial Prototype at the NextNow Festival

Venue	Footfall	Digital Accumulation	Digital Decay	Revisitation
NextNow Festival	Festival setting, footfall of around 500 people	Slit-scan	Kinect Decay Kensuke Koike inspired decay on the self Datamoshing	Not shown due to technical difficulties

Table 3: Installation Breakdown at the NextNow festival



Fig 22: Prototype shown at festival

For this exhibition, I had a dedicated webcam on a tripod and a projector for Digital Accumulation. Next, people walked over to the right hand side of the installation which

portrayed Digital Decay. This side also had its own dedicated projector and webcam on a tripod to get the live feed of the audience. I also included a Kinect XBox camera on a tripod next to the camera for the Kinect decayed self effect.

For revisitation, I had another webcam on a tripod right next to the camera taking in the live input for Digital Accumulation. This was wired to a computer at the back of the installation where Revisitation was meant to be projected. This camera was just to take in the live feed of people interacting with the first two acts, Digital Accumulation and Digital Decay and show themselves interacting with the installation with a delay of two minutes.

Having gotten feedback from the first showing, I did not include the Kinect hand tracked "self paintbrush" and instead, kept just the slit-scan to portray Digital Accumulation.

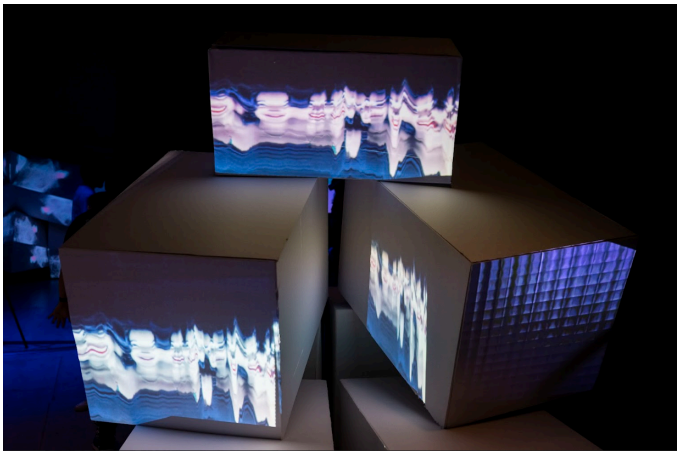


Fig 23: Accumulation of images shown via slit-scan effect

For Decay, I wanted a more obvious look for decay and chose Datamoshing and Kensuke Koike inspired decay. I also included the Kinect depth mapped decay.

I was unable to show Revisitation due to technical difficulties. The caching system went out of memory and new frames were not getting added to the cache. For my final exhibition where I conducted my user study, I created a mechanism to remove cached frames after a certain period of time.

Audience members mentioned that the slit scan looked like “decay” as well. Instead of going for something that would not suggest decay, I decided to keep the slit-scan technique because I wanted each section of the installation to flow into each other.

Installation Breakdown for Final Prototype at Art Laboratory

Venue	Footfall	Digital Accumulation	Digital Decay	Revisitation
Art Laboratory	Laboratory setting (an environment in which the researchers can control who is participating and how) (Duarte et al., 2022)	Slit-scan	Kinect Decay Datamoshing on the archive	Dan Graham inspired Present, Continuous, Past(s) setup

Table 4: Installation Breakdown at the Art Laboratory

I conducted my thesis’ user study at the final showing of this installation at the Art Laboratory.



Fig 24: Installation setup with cameras (front view)



Fig 25: Slit-scan (Left, top and bottom boxes)

Datamoshing (Right, top and bottom boxes)

Kinect Decay (Top box)

For Digital Accumulation, I kept the slit-scan technique. I had one camera for capturing the live feed of each participant.

For Digital Decay, I asked people to send a picture they considered valuable to them. To gauge people's feelings about digital decay, it was important to center the user study around the participant's own personal digital collection and not just the visual effect of decay on the self in the earlier prototype. Hence, the change in protocol to request a valuable picture from their own photo gallery. It was communicated that this did not have to be a picture of themself or anyone else that has faces. It can be any picture that they like. If one had concerns regarding the appropriateness of the picture, I asked them to discuss it with me before sending it to me. This picture was projected onto faces of the boxes with a Datamoshed effect over the duration of the user study. The picture decayed more and more as time passed and became mostly unrecognizable after some time.

Unlike the previous showing, I only had one projector to show both Digital Accumulation and Digital Decay, therefore some faces of the boxes were left un-projected. I also had a Kinect to show the Kinect depth mapped decay on one of the boxes.

For revisitation, I kept a webcam stuck on one of the boxes and it was wired within the box. This camera was inconspicuous since it was a part of the structure. As people turned around the corner they saw themselves two minutes into the past. I had a dedicated projector for this section and it covered the back of the structure.

In total, the final installation used two web cameras, two tripods, two projectors and a Kinect Xbox camera.

Study Design

Recruitment

The recruitment was done via convenience sampling, with an emphasis on individuals who maintained extensive digital collections. I reached out to people who had their own archives and had a large number of digital possessions. For example, this included a documentary filmmaker, a database scientist, artists, film photographers, library worker, art historian and more. Participants' varied experiences with collecting and organizing digital material allowed them to offer rich perspectives on the installation. Compared to the random sample at the festival showing, this study aimed to engage individuals who were likely to have deeper personal investments in digital artifacts. Their familiarity with archives meant they could provide nuanced insights into my installation. People working with databases, libraries, family albums, art, film understand accumulation from various disciplinary lenses. They could offer feedback on how intuitive or disorienting the installation feels and help refine the interactive elements of the

experience. Given their exposure to archives in a variety of ways, participants may highlight elements that are missing or could be better shown in the installation. For example, should the piece include more unpredictable distortions? Should the decayed images decay gradually or abruptly? Names have been replaced with pseudonyms in the Findings section and any proper names used do not refer to real people.

Data Analysis

All interview sessions with participants (N=19) were audio recorded producing around 23 hours of content. These recordings were captured over Zoom which has an automatic transcription service. I listened to all interviews, compared the transcripts and manually cleaned up any discrepancies myself. These interviews were coded using an inductive thematic analysis approach (Braun & Clarke, 2006) to identify emergent themes. This allowed for an organic understanding of participant perspectives without imposing preconceived categories and allowed for the discovery of unexpected insights.

To analyze responses, I independently went through the responses for each question. Each element of the codebook was a "unit of thought" mentioned by the participant. A "unit of thought" represents a distinct, coherent idea or concept expressed by a participant. I carefully examined each response to identify discrete, meaningful statements and broke down participants' narratives into individual, conceptually complete ideas. After extracting these units I conducted several rounds of qualitative coding to identify themes across the corpus. Multiple codes could be applied to a single response.

I approached the data from a "contextual constructivist" position (King, 2004) recognizing that individual perceptions and interpretations are shaped by their social and cultural contexts. This approach was important to me because it also aligns with how individual

backgrounds influence participants' views on the installation and how my own positionality is reflected in the design of the installation and in the interpretation of the findings.

Recruitment Demographics & Interview Questions

Please refer to the Appendix A for recruitment demographics and Appendix B for a list of questions asked to participants.

Chapter 4: Findings

Structure & Spatial Experience

First Impressions & Initial Reactions

When asked to describe the experience/sensation in a few words, participants used terms such as “bold,” “intriguing,” and “intimidating” when describing their first encounter with the installation. Several also described the arrangement of boxes and the projections as “mysterious.” “Kurt” (documentary filmmaker) expressed intrigue about how the projections worked and how different surfaces were activated.

> I think initially, it’s like, a little intimidating with the cameras, right? Like, you know, something’s up, because you see the stuff on the thing, and you see the cameras set up as you enter, but you’re not really sure how it all comes together. I only see two projectors, so how are we hitting like, five or six different surfaces? So it’s a little mysterious.

Navigation & Movement

Participants had to move through the space, making the installation feel immersive. This altered the sense of scale, and Kurt explained feeling “a little bit small in this space, like you’re moving around the art, rather than the art being something that you come to, right?”

The shape and arrangement of the boxes immediately drew the attention of “Tiffany” (library worker), who described that her first encounter with the installation made her curious about what was to come.

> I was very intrigued, just as a first impression walking in, because of this unique shape, the unique way that the box is positioned. It makes me really want to just, like, walk around and like, yeah, it makes me really curious. Like, Oh, I really want to see, like, what could be projected on here, and what this could look like…because it's just like a blank slate, literally.

Projection of Participant & Interactivity

In this section I will talk about the participants themselves being projected onto the installation. Further sections will explore participants' provided digital image being projected onto the installation.

The Viewer as The Subject

The installation required active participation; it did not function without people. When participants were asked how they judge their own role in this, "Claire" (former librarian) explained that the "interactive portions are the experience. Otherwise, I don't think there's an installation. Otherwise it's just boxes." Another participant, Gillian (art historian/independent curator) recognized that interacting with images of herself made the installation feel more personal.

> You can see that it doesn't really work without people. So, like, it really does not—oh, like, my face is what appeared here. And like, there really isn't another face aside from that. So it feels very much like you need to have someone in the room to see it. And it also feels like a very personal experience, because it's like you're seeing yourself in it.

Personal connections to the installation also lead participants like "Solange" (graduate student) to compare themselves to different concepts or objects related to storage and archives, saying, "I

am the source medium, and these are the outlets. So I put it like the dummy way—I'm the file. This might be the hard drive or social media that you're putting me on."

Participants remarked that the installation embodying themself transformed the work into an experience that was unique to them, rather than a fixed narrative or loop. When asked how the interactive elements of the installation influence their experience, Kurt commented that the interactive approach made the installation feel like a more targeted and personal experience.

> I think if it wasn't interactive in some way, I kind of wouldn't really get what was going on. Like, if it was just a pre-made loop and it was a different photo, it would seem like, kind of like an autobiographical thing, rather than it being about anyone.

Gillian reflected on how the installation differed from traditional visual art by explicitly requiring participation which made them more aware of themselves as a spectator.

> I think that interactivity…I always feel like it makes you more aware of yourself as a spectator. Because I'm an art historian, like, oh, like, paintings also have little meaning if there's not somebody to look at it, you know? But this is just like, a lot more obvious, and it incorporates that a little bit more. I just think it makes you reflect a little bit more on your own experience.

Solange noted how the installation invited reflection on how she relates to her digital artifacts by centering her:

> In a short span of time, you've shown the relationship between the medium and the output, because you make us the medium, and then you make this [the installation] the output, the different ways that it can decay. Our relationship to the picture, and then our relationship to how things decay in the back, when it's like beyond our control.

Playfulness

Seeing oneself projected created excitement for some participants. “Jacqueline” (digital artist) found joy in how the installation centered her in its presentation.

> I feel like it’s [my role] somewhat significant. It’s like a part of me, or something like, dear to me was projected onto every single screen. So, like, for a moment, or even now, it was all about me, which is like, kind of nice.

Participants described that being placed at the center of the installation made the interactive elements feel playful. “Zoe” (researcher), found this self oriented play exciting, because “Who doesn’t love themselves?” Zoe also commented on the embodiment aspect of the installation by saying that “I was behind the camera, and it was fun. It’s still very cool to see the physical aspect of me on a camera. It was fun to play around.”

Self-Consciousness

Some participants expressed discomfort or self-consciousness when viewing themselves in the installation. For example, when asked what connections between their body movement and visuals they find interesting, “Axl” (Linux administrator) noted:

> It doesn’t have to be me. It could be anyone else. I didn’t like looking at myself, but the rest I feel neutral about. It made me think that I don’t want to look at myself. My posture was bad, so when I saw the footage of me two minutes before that point, I felt kind of ashamed.

Many participants felt a heightened self-awareness, akin to being observed. “Sloane” (writer, journalist) observed that “it’s interesting thinking about how I am moving, and thinking about

that, having that more at the forefront of my mind when I know that I have been or am being recorded."

Some participants noted that even if they were in the moment enjoying the experience, the possibility of being recorded made them uneasy. Kurt expressed the duality of being wary about video recording but also found the experience playful, "I think people are a little wary of themselves, like I said, we're hyper aware of video and how it works and where it appears, but it's a fun experience. Like, it's nice to interact with art."

Projection of The Archive

In this section, I will talk about the act of providing an image to the installation. In further sections, I will discuss the look and feel of the provided decayed image and its effect on the participant.

Participant responses suggested that the process of selecting and submitting an image for the installation played a crucial role in shaping their engagement with the piece as well as how the meaning of the installation changed based on the image they submitted. Their reflections reveal key themes around personal investment and attachment, the shift from passive observer to active participant, and the reconsideration of an image's significance.

Scaling the Personal: From Phone to Installation

Participants compared moving their images from personal devices to the installation with handling physical photographs. When asked to describe the experience, "Zaya" (user experience designer) connected the process akin to hanging a picture digitally, "this is still digital, but it kind of feels the same way as hanging up a picture." Similarly, Zoe talked about how the image became spatial, "I printed this image out, but I've never seen it blown up on like, a big, like,

actual solid structure. So that was really interesting to see." Kurt talked about how the act of scaling up a digital image gave it a new physicality:

> It's making the digital physical in a couple different ways. It's taking video and putting it onto an object and having it take up a lot of physical space, and then it's also kind of giving it a different physical characteristic of the decay aspect, or the distortion aspects, because that's what happens to physical objects, right? So I think it's just trying to get people to think about digital objects the same way they experience physical ones.

Zaya reflected on moving the image from the digital realm to the physical realm and how that was a curatorial act:

> The picture–I haven't thought much of it since I took it. The act of picking the picture and then using it for this installation kind of made it more special. I have like 10 different variations of the picture, but this is the one I like the most, and I didn't know that at that time. By curating this experience, it felt like I was creating memory.
>
> It felt cool, it felt special. It felt real, and it felt fancy. Seeing my image projected in the art installation kind of gave more meaning to it, or like, more importance. It's the mix of digital memory in the physical realm, it felt more tangible.
>
> It's not just lost, like in cyberspace, like, again, this is still digital, but I guess seeing it in a digital object in the physical realm, through, projecting through boxes, it's a unique experience. It created a memory. I was able to remember it more.

Participant Responses to Image Manipulation

In this section, I will outline participant responses to each section of the installation.

Slit-scan for Digital Accumulation

The slit-scan effect, which captures a narrow slice of video over time and accumulates it, was used to show the vastness of our archives. This elicited varied responses from participants regarding the experience of distortion, presence, and interactivity. The feedback reveals a complex relationship between digital accumulation, movement, and the perception of time.

Engagement with the Slit-Scan Effect

Participants described their initial engagement with the slit-scan effect as playful and exploratory. Many expressed an instinctive desire to test the effect by moving around in front of the camera, leading to surprising and sometimes humorous results. When asked, "what connections between your body movement and visuals did you find the most interesting?" "Troy" (installation artist) shared, "The slit scan was the most interesting. I could spend all day drawing a little picture and letting it disappear," highlighting the playful, ephemeral quality of the effect. Kurt added, "your face getting smeared is, I think it's almost like a fun introduction to the experience. It's like, you know, we're doing something with video, and you are the subject." "Scarlet" (user experience designer) described it as "a really cool effect for interaction because you can make your own patterns," emphasizing the creative potential it unlocked. When asked, "how would you describe the effects used in each section of the insulation?" Zoe reflected on the mechanics of the interaction, "I had a lot of fun playing around with it, like, I could move. And it was kind of taking, I think it's like a, what is it, like a frame by frame?"

Some participants had an instinctual reaction to the slit scan effect where their first response was to move in front of the camera. Kurt said:

> My instinct went in front of a camera to just kind of like, bob around and test to see what it does, versus standing still and getting smeared. And then once I did, you kind of got more of the full effect. But yeah, I think my first response with it was just to kind of play with it.

Ulana and Noor appreciated how movement was reflected in real time where the slit-scan captured the slightest movement. Noor noted, "I like that every minute little movement that I made was also kind of getting recorded," emphasizing the responsiveness of the visual output. Ulana elaborated:

> I like that I can move and it shows in real time, and I can do weird stuff. The result is even weirder. It makes you look at yourself in a weird way, which is a little uncomfortable, because your eyes have, like, matched, and…you move. So it picks up one part of your eye, but you've moved, and there's, like your eye right next to it. And that was like, "Oh, God. like, it's a little unsettling. But it's also so cool."

Slit Scan as a Visual Metaphor

The slit scan effect was interpreted by participants as a representation of presence. Participants drew comparisons to photography, video and medical visualizations. Jasper described it as "a visual kind of metaphor for this preservation or this mark that you make," positioning it as a symbolic trace of existence. Claire expressed emotional neutrality, saying, "I don't think I had really any feelings about that. It's just like you're there right then you're not." Troy offered a more elaborate interpretation, reflecting:

> The short term memory of, like, it's taking a bit and extrapolating and then dying. And I think there is something to it, and why I've always been drawn to it as, like, a perversion

> of photography, like in the most fun way, like it lives between both video and photography. It also has that MRI, EKG, as we graph, other data, just like it's tracking movement. It's very interesting.

Perceiving as Decay

As noted previously, many participants focused on the decayed appearance of the slit-scan effect. Zaya compared the effect to a memory that never had the chance to be properly stored, stating, "It's like something that gets uploaded incorrectly… like the memory never had a chance to even be preserved properly. It kind of reminds you of me forgetting to document something, or me not documenting it how I want to remember it."

Frustrations with the Slit-scan

Participants expressed confusion about attempting to get a clear, recognizable version of themselves using the slit-scan. Solange struggled to find her face in the slit scan. Gillian described it as a game of finding one's own face:

> The part where you're looking into the camera and you're seeing yourself, it is kind of like this game, it feels kind of like, oh, like, can I find the place where I recognize myself? it's fun for a second. But then I think if you told me, like, sit here and really try to get your perfect like [self], it would be frustrating but in a good way.

Claire described initial confusion when, with no one in front of the camera, the projection showed only the hallway door: "It took me a minute to figure out what was going on here, because the door background was very like…is it working? But I realized that, "Oh, that's me." Tiffany elaborated:

> If there were no cinder block walls, or maybe that is part of it, but I think because it's reflecting on the door, it feels like [it's] in a space—nothing here, but there was stuff here because of the change in surroundings. [referring to the occasional passers-by in the hallway.] When it's in stasis, I feel like there could be more happening. I think it's because of the surroundings. It's just very industrial. So then, what is in stasis here, is kind of abstract.

However, Jasper commented on the doorway as an intentional element: "The doorway is really interesting to have for the slit scan. It's another visual metaphor for, like, my presence, being there and then being removed. So I think it's a good connection between those two." Axl suggested including a facial recognition square when participants came into the frame of the slit-scan, to act as a guide.

Digital Decay & Emotional Responses

Participant-Driven Content in the Installation

Participants emphasized that providing an image made the experience feel uniquely personal. When asked to reflect on their role in the meaning-making of the installation, Kurt described how submitting a personal photo altered his engagement:

> I think my instinct from thinking about video is to be like, well, the actor is the subject, right? Like, but it's not necessarily you that is a subject. It's your digital self, almost. It's the viewer's role to think of themselves in the context of digital decay, and without them being a part of it, then they would probably be like, Oh, that's a neat demo, versus thinking about, "Oh, there goes my photo," right? It's a way to kind of force the

participant to think about the questions you want them to think about, rather than just being an observer. It takes it from conceptual to almost like an example or a test.

Tiffany mentioned how she felt more connected to the installation because she submitted a personal photo:

> The fact that you asked for something from me in the very beginning and put it up made it… a lot more personal, it's really unique… I had a lot more of a connection to the exhibit because something of mine is on there.

When asked, "How do you judge your role in the installation?" Jasper described his agency in shaping the work, noting, "The role that I have is I can change my experience with this piece based on what I'm submitting to it."

Claire, who submitted a picture of her cat, pointed out how her particular submission did not invite vulnerability:

> My cat, this doesn't require the vulnerability that it would require of someone else. So if somebody was like, "Oh, I'm going to share you a picture of my dear whatever, who has died. This is very dear to me," and you stick this on here all of a sudden, you force that person to be vulnerable and perhaps have feelings about their photo going away. So you kind of like, crack open the human. But in my case, it's my cat. So I'm like, yeah, look at my cat on a box. So there's, like, a different emotional response to it that I don't necessarily have, but I can see someone having.

Contrary to Claire's assumption, some participants did not report emotional reactions even when their submitted image held personal significance to them. Solange submitted a photo of her late brother. I asked them how they felt about that particular picture getting distorted and they expressed detachment, "*I didn't feel anything. No, I didn't feel anything at all* [emphasis

added].” “Priscilla” (former database administrator) commented on this personal individual-artifact relationship, “I think that every witness and participant in the installation is likely to have a different experience, a personal experience, which ultimately, for the most part, our digital artifacts are.”

Emotional Responses: Upsetting, Disconcerting, Loss

Several participants reported that they found the effect of digital decay unsettling. When asked, “What aspect of the installation surprised you the most?” Jacqueline immediately remarked on her discomfort when the image she was familiar with was rendered strange, “[I’m surprised by] how upset it made me. The distortion was like when you play your favorite CD and it starts skipping, It’s a very, like, upsetting, frustrating sort of feeling.” Gillian shared this feeling:

> Seeing an image you’re so familiar with distorted is just very surprising. I don’t know if daunting is the right word, but I think the effect of just being like, “Oh, it’s a familiar image and it’s not familiar anymore is disconcerting.

Participants’ Expectations Disrupt Emotional Impact

Several participants indicated that the digital decay lacked emotional weight to them because they understood their original image was not actually at risk. When asked to talk about their interpretation of the installation, Troy remarked that the transformation felt inconsequential:

> It’s a simulation of the simulation failing. You’re taking a thing and, like, trying to show its destruction and hint at that, this thing (photograph) could get destroyed at any moment. It’s that thing where, like, we know, there’s a guardrail, you know, as opposed

to, like, the magician who takes your $100 bill and starts cutting it up. *There's an attempt at a threat to the thing that isn't there* [emphasis added].

Participants also expressed discomfort when digital images were distorted in ways that violated expectations of how digital technology typically works. Tiffany said that this discomfort was not necessarily emotional, but rather the degradation disrupted expectations of how digital technology should function:

> I think it's not a pleasant feeling to see pictures distorted like that. I know it's being distorted, so that is something very abstract and…sometimes it can be a little bit off-putting, totally not in an emotional way, but kind of weird, *this is not how it's supposed to be technologically, right?[emphasis added]*.

Temporal Expectations of Decay

Participants had expectations that digital decay would stick to a timeline where recent digital artifacts would not decay as much as old ones. Jasper noted that older photos already seem to carry the weight of time and gradual decay, which was unlike his submission—a recently captured image:

> Like the past archiving and the present archiving feels connected, but a little bit different. If it was a past image, it's already a memory. It's already decaying in some form. But this [image] is so recent that it's like–it's not there yet. It's still at the forefront of my mind.

Jacqueline expressed discomfort at the visual corruption of a recent photo, describing it as feeling "different, a little weird. Seeing something I care about a lot sort of—not tarnished, that's kind of harsh—but sort of fall apart, especially because that photo is so recent. To see that

happen to it was kind of sad." When asked to describe the effects used in each section, Solange noted the unexpected immediacy of digital decay, saying:

> I guess this one made me feel–-how is it distorted? I just took it recently. You don't expect things to decay as soon as you take it, right? It was instantly smushed up. *You don't expect things to instantly be smushed up* [emphasis added]. Over time they are expected to get smushed up.

Kurt observed that decay unfolding gradually rather than instantly aligns more closely with natural expectations of deterioration:

> I think I didn't initially get that the decaying photo was like decaying to nothing forever, like, I asked, "Is this a loop?" *I think maybe that indicates something interesting about decay is that you, like, don't initially see its effects, right? It's something that's slow and happens over time* [emphasis added]. Every other object in the exhibit is pretty immediate… But that one, I think, because of the nature of decay and the effect, took a second for me to get.

When asked, "how did the interactive elements of the installation influence your experience?" Sloane described the decay as occurring in real time rather than only as a retrospective reflection:

> I think it adds a greater depth to the whole experience and makes it more tactile and real. Because in real time, you are the content for a minute, and then you can play it back. It makes you feel more immediate. *So we're not just thinking retrospectively about what just happened [digital decay] now* [emphasis added].

The installation accelerated the decay process that is usually imperceptible, allowing Priscilla to "see" time unfold, saying:

> It actually helped me to see time. It actually helped me see how that [digital decay] might take place, because they wouldn't decay in the same way that that physical images did, which tends to be much smoother and cleaner. So, yeah, it helped me to see time.

Aesthetic and Conceptual Appreciation

For some participants, the datamoshing effect was just a creative reinterpretation of their images. When asked to describe the effects used in each section, Ulana mentioned:

> I like the idea of the distortion bit of my pictures. That was cool. I feel like the part where you put pictures, I just found it interesting. Like, it was your take on something I did, like your take on my art.

Others simply saw the effect as visually interesting rather than meaningful. Zoe described it as "not like a negative thing. It's mostly just like, oh, it's cool. It's different." Claire echoed a similar detachment, saying, "Like, I'm not impacted by much, yeah, as not a reflection of this study. I'm a wanderer of things. Oh, that's neat. And then go on my way."

The Irreversibility of Certain Forms of Decay

When asked to describe the effects used in the Decay section, some participants compared different ways an image could degrade. Kurt remarked how tinting and coloration can be undone, but full-on datamoshing creates something you can't restore:

> If a digital tape had a coloration, right? If you were to take that digital thing that had been given some type of tint and then pulled it into Lightroom and clicked AutoCorrect, wouldn't that have fixed your decay, right? We have the software to undo any color distortion, right? So that doesn't really necessarily work as a decay device, but then this

> one with the smearing, it kind of loses totally what it is, right? It's not an aged version of itself. *It's like a rock becoming dust. You can't really undo that the same way you get to undo tinting something* [emphasis added].

Solange agreed that this decay was unsalvageable: "I don't want to say that the picture has less worth, but like, the point of the picture is gone almost, right? And in this one, it's not even recognizable. It's not even salvageable."

Noor brought up how photography aids her in preserving moments beyond the limitations of human recall. She pointed out how the decay effect contrasted photography's role as a memory aid and portrayed a failure at that which was discomforting:

> Which is why you have, like a digital memory version of it, which is a photo or a video, if that also decays, then it feels like storage to me again, right? Like when the moment is gone, you have no absolute memory of it at all. So, yeah it did make me a little bit uncomfortable, the decay part is a little bit disturbing.

Generative decay: Unpredictability and Reconstruction

Participants noted that the datamoshing effect was generative, producing random distortions across different parts of their images. Gillian reflected on how the randomness of the glitch affected her interpretation of the image:

> That's me and my brother, and then my dad's up there. And I was like, this is weird in like, meaning of the image, in the sense of like, my brother and I are, like, totally messed up. But then my dad's static up there in some ways. So like, in that sense, I was almost looking at the individual people and what was happening to their faces, and sort of questioning, thinking about what that means.

Participants reported that despite severe distortion they could still discern familiar details. They were seeing ways to reconstruct the photograph. Priscilla was still able to recognize elements through visual approximation, referencing artistic techniques like pointillism:

> The degradation in the bottom right corner, I find interesting because it reminds me of pointillism in painting… knowing what the image is, I can still see the original image in that, and it's a little bit like pointillism, that if you step back far enough, the digital points, pixels start merging back together, and you can see what the image is.

Another participant likened the decay process to LEGO, where an image was broken down into smaller, discrete components that still retained some recognizable structure, where the photograph could theoretically be pieced back together. Noor explained that "you can't comprehend, but you can still make some sense with this. It was the same thing–me over there but in LEGO."

Digital Decay: Beyond Visual Deterioration

Participants described the projection of the distorted effect on their image submissions as "distorted," "pixelated," and "fragmented." However, Tiffany, a library worker, highlighted a separation between surface level decay and underlying content, noting, "In archives, everything is literally in a box. So I was just thinking about that—the things on the outside that are being displayed are deteriorating and decaying, but maybe *the stuff inside is just fine"* [emphasis added].

Findings from the Kinect 3D Decay Experience

Experiencing the Self in 3D Representation

Most participants were struck by the novelty of seeing themselves in a three-dimensional, point-cloud representation. The effect was described as "surprising", "weird", and "novel." Kurt described:

> I really like the 3d mapping thing. That's like an experience that I haven't had before. [I haven't] seen myself like that before. That's an interesting distortion. To see something on a flat surface, but on a 3D object that renders yourself in 3D…there's something weird happening… like, I don't know if this is flat or not. Am I inside the box? Like, it's a weird like, look at myself in the TV type experience.

Gillian echoed this sense of unfamiliarity, saying there was "a novelty of seeing yourself in a weird aesthetic. And you're like, "Oh that's me, but it's not." Ulana also appreciated the uniqueness of the texture-based distortion: "you just look at yourself in a different texture, which is something I haven't seen a lot before... with texture, I feel like it's a little different."

Participants noted how the abstracted effect made this effect look in-human. "Molly" (photographer) said, "I really like the top one because it completely detaches the image you see. It's so detached from how you would actually look, because it looks so grainy and stony, and it doesn't look human."

Axl liked that this effect was not a form of self-encounter. They appreciated the unrecognizability, saying, "That was the best part. I think it's creative. You can't really tell it's my face." Sloane echoed this, adding, "I like that. I knew it was me, but then, you expect yourself to look [a certain way] when you see a video of yourself."

The Interaction of Proximity-Based Point-Cloud Dispersal and Decay

The core interaction was to move closer to the camera which led to the dispersal of the points of the 3D rendering. Claire remarked on this interaction, saying, “It’s a little weird to see my own head explode, but not a bad weird. That was interesting. It’s not unsettling.” Scarlet found beauty in the moment of disappearance, stating, “I think my favorite was the one in which I came close to the camera and disappeared. Not exactly sure what that makes me feel, but it’s really, really cool. I really love it.” Tiffany appreciated both the aesthetic and personal dimensions of this interaction:

> I also really, like the artistic effect of that, we move closer, because it’s like dynamic. You can kind of see it’s not like repeating the same thing. The way that you can interact with that, that’s really cool. And, I feel like it also adds, like, an element of a person . It’s very personal, because it’s like, whoever actually walks in.

Material Associations with Digital Decay

Participants made strong connections between the visual distortions in Outlast and physical forms of decay. Gillian described the imagery as “a ghosted image.” Solange noted how the interaction where the image flattens, compresses, and then takes on a 3D quality and the points disperse based on the proximity of the participants resembled shifting textures of sand. Ulana drew a direct link to material decay, comparing the visuals to weathered sandstone and basalt engravings highlighting how the installation’s aesthetic choices resonate with material processes of decay, saying:

> Have you seen sandstone and basalt engraved buildings? “So, like, when you’re carving on stone and it’s aged, and then it kind of has that like texture of chalk on paper, it kind of

> takes that vibe, which means some kind of decay, because there is physical decay... something has come out of it, been actually physically lost forever. That gives me decay. That's sick.

Digital Metaphors and Meaning-Making

Participants used digital metaphors to interpret the experience of distortion and decay linking it to resolution loss, memory, and digital absorption. Priscilla compared the distortion to zooming in too closely on a digital image, where resolution is lost:

> Reminds me of what happens when we get too close. If you zoom in on digital images too much, what you're left with is a couple of fuzzy pixels and no idea of what the image is, or what the information is.

Zaya related it to how proximity in the installation mirrored different states of memory and experience. She felt that stepping back from the camera, where she could see her full form within the installation, meant that she had let an experience marinate and take form in her mind. In contrast, stepping forward placed her fully in the moment, where the memory had not yet taken shape, hence the dispersal of the point-cloud self. She said:

> If I took a step back and looked at it, it seems like I'm more introspective, but when I'm really close, it feels more "interactive with them in the moment." Moving forward reminds me of being active and in the moment. When I'm in the moment, I'm not really thinking about the memory itself. It's like the act of documenting, and that alone isn't enough for it to preserve the memory. What actually preserves it is if I take a step back and think about it. Be introspective about it.

Priscilla and Noor associated the disappearance of the self in the installation with a sense of finality. The disappearance of an image signified total loss to the participants. Priscilla remarked, “I would say, the one at the top is perhaps the end point of the degradation when there’s nothing left.” Similarly, Noor observed, “That one is like, gone, like it just disappeared. So the top one [Kinect decay], is the most decay.” Scarlet described the interactive distortion as a metaphor for digital erasure, the closer you get to the screen, like you’re being absorbed by technology. Your personality is disappearing.”

Respite from Digital Decay

Jacqueline expressed confusion about the textured visual effect applied to herself. Both her and Ulana described how the visual effect of the Kinect decay version of themselves served as a distraction from the discomfort they experienced with the datamoshed image they provided. This shifted their emotional state from distress to curiosity. Jacqueline described how the Kinect decay visuals served as a buffer against the discomfort she felt from the datamoshed images:

> The top part, it was a bit weird to see myself textured. I don’t know how to describe that. I don’t know how I feel about the top part. I feel like it was a good distraction from whatever was happening on the bottom [Datamoshing]. It shifted me, my thinking, a bit, from a semi distressed state to, like, ooh, that’s kind of cool.

Ulana echoed this shift, saying, “I feel like it [Kinect decay] made me less uneasy and more interested, whereas this one made me a little uneasy [Datamoshing].”

Findings from the Revisitation Experience

The final act of Outlast evoked strong reactions, ranging from fascination to discomfort. Participants were struck by the novel experience of seeing themselves two minutes into the past, sometimes perceiving it as an opportunity for reflection. Several participants noted that this was a good way to conclude the installation. The Revisitation section was placed at the back, so participants had to walk behind the installation to see it. This spatial movement played a crucial role in their engagement. Unlike a front-facing display, which would immediately signal to participants that they were seeing themselves in a delayed loop, this setup introduced an element of discovery. Participants had to physically move to a different position to encounter their past selves, and in doing so, they stumbled upon the realization that they were witnessing a record of themselves two minutes in the past. The following themes emerged:

The Experience of Seeing Oneself in the Past: Uncanny, Reflective and Grounding

Participants were looking at temporarily cached frames of themselves interacting with the first two acts. In this way their past self from two minutes ago was reintroduced into the present. For Kurt, this was a meta feeling:

> The back was interesting because it made me think about how long I spent looking at the front. You don't really get the chance to reflect on your experience interacting with the art piece while still interacting with the art piece. It's like a weird twist or something.

Scarlet noted how this was an "out of body experience" reflecting on the novelty of seeing one's reaction to their own photos. Their self encounter was fresh and thought-provoking:

> Seeing my reaction became a part of my memory. It's definitely something to take away from this installation. That is one aspect of seeing your photos. But then how do you react

to your photos when you see them? Like, you never get to see that, which is, it's kind of cool because you're having an out of body experience.

Jasper likened it to a third-person view in a video game, where suddenly, you're no longer fully inside your own experience but watching yourself from an external perspective. He shared the sentiment of novelty, describing the effect as a "time-machine."

> It's that third person view where you see yourself again, you're like, "Oh, that's me," and you're seeing your actions before. So as far as my role, I do feel that I'm an active participant in this, and it becomes like a player, and the other is like I'm a third person viewing it again even though it's me. And then this interaction of the game, seeing me on the other side, I think that was a new experience that I didn't have before, where it's like a time machine…

Priscilla highlighted how this experience broke from the usual way we perceive ourselves. They commented on how we rarely see ourselves as others do, in motion, from the outside.

> That was interesting, because it was a way of me seeing what I was experiencing, which, as humans, we very rarely get to see. We have an image of ourselves which is usually not at all what other people see. So it allowed me to see myself and my experience with this from someone else's perspective.

Tiffany was struck by the time lag and when asked, "what connections between your body movement and visuals did you find the most interesting?" said:

> The time lag was what really stood out to me, because there's a kind of like space-time relationship–seeing yourself there, but not being there, seeing that memory of yourself–-that really stood out to me. I think out of like all four of the things [sections of the installation], I think this made the biggest impression on me because of its offset. It's

> like an out of body sort of thing. And it was surprising being in the back, like physically in the back, so it's not like front and center. That surprise element was also a big part of it. The fact the revisiting is in the back, and then you don't notice, you don't realize that you're seeing a memory until you walk around to it, whereas, sometimes they have a the security cam, you can kind of feel like, "oh, okay, that's really right there, like two seconds ago," but realizing. "Oh, this is a memory" when you walk by what you are seeing without realizing what it is.

Respite from Digital Decay

For some participants this act provided them respite from the Decay portions of the installation. Jacqueline talked about the duality of self-perception—how seeing oneself from an external perspective can feel both unsettling and grounding:

> I also liked the back a lot too, because it's like, there's always something about watching yourself on film, or like, you know, when you hear your own voice, it's always, like, kind of jarring, but also, like very rooted. It's a strange juxtaposition.

Noor echoed this sentiment, emphasizing the recentness of the captured moment: "It lets you look at the past again. I'm not sure why, but it's nice to see. It's like revisiting a moment which hasn't decayed, like it's more of a very recent memory."

Consent, Surveillance, and Loss of Control

Participants related this section to the sense of surveillance where they wondered how traces of themselves are left behind in places they did not consent to, highlighting the discomfort

of losing control over one's digital representation and the idea of being recorded without consent. Gillian deliberated:

> I think seeing yourself, it made me think a lot about how my image exists in the world and like, in places where I don't expect it to be, and in ways that I do or don't expect it to be, like, I think, like the idea of watching yourself in the past, like, it is like a very like, you're like, "Oh, this is it feels very strange than seeing yourself in real time." Because you're having to face the fact that there's like kind of a recording of you somewhere. It's kind of a strange feeling when it's not of your own, like my selfies are my selfies. But you know, to think that I'm on a security camera somewhere and, like, don't have control of what I look like is very strange.

Ulana contrasted it to George Orwell's "Big Brother" from 1984 where the ubiquitous slogan is "Big Brother is watching you" serving as a constant reminder that all citizens are subject to constant surveillance, saying, "...And the two minutes ago-thing [Revisitation], I was just like, Oh God no. Just terrifying. It was very Big Brother. If I knew I was being watched, I would not have been that much at ease." This also brought up feelings of anxiety about the installation where participants questioned how one could see themselves in the past without a recording being made. For this reason, participants probed the mechanics of how this part of the installation worked. Ulana asked, "Where is it looking at me from?"

Several participants mentioned that an introduction or curator guidance was helpful in understanding the installation. When I mentioned, "you were an active part of the installation and have therefore contributed to its meaning," and asked "how do you judge your role in this?" Scarlet shared that this question helped them recognize their role in the first place:

> I think your explanation being a part of it would be perfect, you know, like explaining that, "Oh, you're also part of the installation," because it can be a little jarring for people to see themselves. So you might be like, "Hey, why am I here? Like, why did you record?

Participants wished to know the mechanism of the Revisitation section beforehand to understand that it was not a recording but a delayed playback. This caused some participants anxiety that their video was being recorded and stored without them knowing. Sloane mentioned:

> I think maybe there was a little subconscious anxiety or anger at not knowing the extent of where images of myself or video of myself was going when it would be recorded. Not like actual anger, but like, like irritation, a little peek of anxiety. Because if you can see you two minutes ago, yeah, then it's being recorded, It's weird. I don't know how you did that. A playback or something, I didn't know how this is possible. *Maybe the mechanics of it people would want to know more about* [emphasis added]**.**

Getting the Timing Right

The installation's design to playback a person's live camera feed two minutes later was an approximation of how long participants would spend interacting with the first two acts of Digital Accumulation and Digital Decay. Some participants did not take as long and went to the back of the installation before two minutes, which meant that for a short amount of time they saw nothing. This led to feelings of anticipation and panic for some. For Solange, this meant that she looked at the live input of an empty hallway for some time before she saw herself:

> Puzzled [describing Revisitation] Where is it? Kind of like that first thought where you think you know where something is, and then you realize, 5 minutes in, that you really

> can't find it. Whatever that feeling is called, not quite panic, but you're on your way there.

Jasper and Claire talked about how if they wanted to interact with the Revisitation side more they would have to spend more time interacting with the first two acts. Jasper realized the experience relied heavily on precise timing, saying,

> If I want to interact with that side [Revisitation] more, I have to spend some time over here [Digital Accumulation and Digital Decay] so it's recorded, and, like, run back and see so that feels like less playful and more just like I'm interested in.

Claire imagined how interacting with the front two acts longer could have enhanced the experience, turning the installation into something akin to a haunted house or mystery:

> The one in the back is interesting because it's like, if it had been timed so that I had been here two minutes and then walked over, it would have been very interesting. Like a, like a Scooby Doo effect, like a haunted house, almost, you're there and then you're getting followed around.

For Troy, the timing was perfect and it landed like a haunted house, "The turn [surprised me] It's a little horror showy, or haunted house ish. It's like, "Ooh you were there the whole time."

Self-encounter and Discomfort

Participants described heightened self-consciousness and embarrassment when viewing their immediate past actions. Ulana's response expressed discomfort about the evidence of an embarrassing moment. She had an immediate rejection—an instinctive resistance to engaging with her past self in this manner, saying:

> If I'm doing weird ****, I don't want documentation of it. I just wanted to be in the moment and gone. I had fun, and it's done. I don't want it to be preserved as such. I was like, Oh, God, what? I don't want to look at myself. No, thanks.

Gillian mentioned they were self-judgmental and were unsettled by their self-encounter:

> In the last part, I think that that part is probably the most unsettling of it all right? I'm seeing myself, and it's in the past, and, "Oh, I'm moving that way." You're more judgmental of what you have put out there.

Final Act

Revisitation was the final act in the installation. Several participants felt that this act tied everything together. Ulana described how it transformed her impression of the piece from playful to reflective:

> If I looked at just the front, I would say, like a seven on 10, but after you do the back, I would say, like a good 10, like, I feel like the back makes you be like, "Oh, God. What!" In the front, it's just joy. Like, you're like, "Oh, this is so cool." This is fun. It's cute. You know, I'm doing weird ****. It's doing weird **** back. But then when you go and you see and reflect, and you're like, "Oh God, this is just strange to me." So I think, yeah, with that, it really rounds off the whole thing.

Scarlet echoed this sense of cohesion, saying, "I really like it, especially the fact that the second part just kind of ties it all together."

Tiffany, who found the digital decay effect unsettling, appreciated how Revisitation brought clarity helping her contextualize the earlier acts:

> I think it's not a pleasant feeling to see pictures distorted like that. So that is something very abstract and I don't know maybe, just for me personally, sometimes it can be a little

bit off putting, whereas, when I saw the other side, where it's like, very clearly the image, I feel like it was easier for me to put some sense into it kind of the retrospective, or I remember, the revisiting side.

Participant Suggestions for Installation

From participant feedback, a theme emerged around manipulation and interactivity, highlighting how the installation could further engage audiences by allowing them to actively distort, interact with, and contribute to the evolving imagery. In this way, the audience would have more agency.

User-Controlled Distortion and Decay

Participants expressed a desire to actively manipulate the digital imagery, rather than passively observing it. Scarlet envisioned a version of the Digital Decay act where users could drive the distortion themselves, saying, "You can have people actually interact with that photo and like, just, like, dismantle it, you know, distort it. Distort the photo in their own way. I think that would be really cool." Troy imagined how the Kinect could be used not just for capturing, but for actively destabilizing the image, suggesting, "I'm curious if … Kinect was the thing breaking the image more. Instead of the Kinect showing me now, the Kinect is taking me now, and kind of like using that to tear apart the memory. That would be the feedback." Jasper also wanted to test the limits of the decay process, saying he was interested in seeing how far it could be "pushed."

Live Image Submission & Collective Archive Model

Priscilla suggested enabling visitors to upload an image in real-time, so they could directly witness transformations without needing the artist or curator to intervene.

Kasper suggested that, rather than each person seeing only their own contribution, the installation could cycle through all visitors' submissions, creating a collective archive of images:

> I like the idea that you're trying to invite us to input something to this piece. I could see that existing as another archive, in the sense that maybe these images rotate through from all the submissions. Right now it's one to one. So it's like, I have a chance to be really personal with this piece and add to it.

Further Immersion by Including Other Senses

Several participants wanted more immersion from the installation by including other senses beyond sight. Ulana brought a wonderful insight into the ocular centrism of design suggesting she wanted sounds and other immersion techniques beyond just sight:

> Maybe if you had some wind blowing, or sounds, or just like other senses, and not just visual. I feel like, especially when it comes to like, when you're there and you're not just looking at a flat painting on a wall, when you're looking at something that's a little more interactive, I feel like I want the whole package, you know? I want everything to be a part of it. Have you read The Eyes of The Skin by Juhani Palassmaa? It talks a lot about ocular centricism of design and how we forget that there's other senses that affect the experience you have in a space or a product or anything.

Kurt suggested recording sounds from people visiting the installation and playing that back to them:

> It would be interesting, but also probably pretty off putting to have recorded sound of people that didn't know they were being recorded, and play it back, maybe backwards, or, like, really distorted over there. Kind of like a moody play, kind of like a haunted house thing.

Priscilla suggested that in a museum context, a video component or additional explanatory materials could help make the installation more understandable without the intervention of a curator. This would allow visitors to engage with it in a more structured way. She provided the example of Smithsonian museums where there are often short interviews of other people experiencing an object. She also suggested that I explore adding tactility to my installation, where people could press buttons to get a description of the installation or interact with the installation.

> If you didn't have a curator here, I think a description of the purpose, I think a secondary exhibit that might provide short interviews of other people who have experienced it, might help bridge what is sometimes a digital divide for some people, and give them hints. Not necessarily tell them how to experience it, but give them hints about what they're looking at. Different people in society, based on their experiences and their interests, etc, have a different relationship with digital and it's not uncommon for individuals or whole groups and communities to see information that is digital, information that is displayed and not understand what they see. So having a secondary display that can help arrange that would be helpful. and I think incorporating that into a secondary exhibit, or into the introduction of this for individuals who walk up to the exhibit to experience it would be incredibly helpful.

> The Smithsonian is particularly good at it. If you walk up to a display in the Smithsonian, not all but for many there's a panel and you can press a button and you can get a short description of what you're looking at, and sometimes there are buttons that help you interact with that kind of interaction, I think would be good.

Design Feedback on Structure and Scale

Participants had a variety of suggestions for the sculpture of the installation. Gillian suggested the boxes be fabricated to be heavier and sturdier to see how that would unfold over time. Tiffany suggested returning to the earlier prototype of having boxes of various sizes. Additionally, she suggested applying various treatments to the box where they are still a blank canvas but of different textures.

Other participants focused on increasing the overall magnitude of the piece to better reflect themes of digital excess and accumulation. Ulana suggested using bigger boxes so that visitors could walk through them. Jacqueline noted that the scale itself could embody how people treat digital storage as infinite and digital accumulation as inconsequential, thereby justifying the retention of ever-growing digital artifacts:

> It just comes down to size, I feel like people tend to hold on to these things because we genuinely don't think they're going anywhere. So like, if you could sort of bring that out physically, I think it would really push it. If we could show accumulation in a way, I think that would be interesting.

She also suggested leaning into the laboratory setting of the installation and isolating the participant further by draping the entire room in "digital decay." She asked, "How big can we

go? If you could isolate someone in your room and just project a plethora of images on various walls in different states of decay, and see what occurs. I wonder what they would feel like."

Guidance

Navigability: Confusion vs. Discovery

Participants expressed various perspectives on how much guidance should be given within the installation. Some participants enjoyed the element of discovery, feeling that figuring out the interaction was part of the experience. Kurt reflected on the value of discovery:

> I would say maybe put a mark on the floor where the camera's looking, but that might *lower the experience of discovering it a little bit and navigating its mystery* [emphasis added]. Because when you look at it, *it's kind of a confounding object* [emphasis added], right? And you're like, what's going on here, right? And that's kind of the fun of it. I kind of like that. I had to kind of just figure out how it worked, as I did, and made it part of like play or an experience.

Zoe emphasized the freedom of playful, unstructured interaction: "I think the beauty and the interactivity is like that people are being silly and using it however they feel." Sloane struck a balance between guidance and exploration, stating, "Some assistance would be good, but a lot of it, if you just look for an extra minute or so, you can figure out what's going on."

Participants acknowledged the challenge of balancing boundless exploration versus guided interaction. Troy, an installation artist, spoke to the inherent challenge of interactive art and the need to subtly guide viewers:

> The hard problem with interactive art is that, when you're making it, you have to give it over to the viewer. You end up having to draw a line on the floor. Like, this is the is the interaction zone.

Others, however, found certain aspects unclear without instruction, particularly regarding where to stand or how to engage with specific elements. They suggested adding visual cues such as floor markings to indicate where one should stand and foot outlines to depict the direction in which the installation was to be explored.

Participants noted that they needed assistance in understanding how to trigger the point-cloud dispersal interaction of the Kinect Decay section. Some were unaware of the Kinect camera being a camera or the effects of proximity on their appearance in the installation. Ulana noted that the spatial constraints and camera design led to uncertainty:

> I didn't know that was a camera [Kinect Camera]. The big one, it didn't look like [a camera]. I saw this [webcams], and I was like, Yeah, okay, that's a camera. And if you hadn't told me to move that close, I probably wouldn't have, because there's this pole in the middle. I think that's just a constraint of the space you've been given. I think that was the only thing. Everything else, I think, is pretty straightforward and understandable.

Thematic Coherence and Clarity

Troy felt that the different acts of the installation felt somewhat separate rather than fully integrated. He expressed a desire for the different acts of the installation to feel more connected. He also mentioned wanting more obvious depictions of the themes I was exploring and adding more natural bridges between each act.

> I liked it. I want it to be more meshed. Right now you're kind of operating like a triptych. And I think in some ways, I want all of them to string together a little bit more. *Because memories get meshed* [emphasis added]. You gotta mesh more.

> It feels like all the things are very separate right now. I think making it a little more explicit. …I think I could see what you're getting at. And I wanted it to be a little bit more obvious.

Research Study Procedure

Several participants wanted to have at least one other participant in the laboratory to see how another person might interact with the installation. Gillian remarked, "I would be interested to see if there were multiple people in the room, like, what that would feel like, to see someone else do it."

People were also interested in having a longitudinal study with the installation. Participants questioned how the installation might evolve if it was made with sturdier boxes Gillian noted, "...boxes fabricated that are heavier and more sturdy. So if somebody were to bump into them, it wouldn't fall. It would be interesting to see how it would unfold over a long period of time." Zaya was also interested in seeing whether the chosen image grew in importance. They also questioned whether there would be a difference in the emotional response if it is an image that is taken recently versus older images.

> ..a year from now, if I remember what image I did, if this actually affected the importance of that image. It'll be interesting doing a study of doing this with images you just took, versus older images, and then comparing those groups together to see if it affects the feeling or, like the memory or whatever.

Chapter 5: Discussion

Installation as an experiential inquiry into digital decay's perceptions

In my study, the requirement was that participants submit a photo they personally valued for the Digital Decay section. Participants had two kinds of reactions to their photos getting decayed. Many treated the decayed images as an intriguing aesthetic effect, remaining emotionally detached from what was happening to their photographs. On the other hand, for some participants, the effect of digital decay was disconcerting and off-putting. While there could be many possible interpretations of these behaviors, two main factors could have influenced their reactions.

Artifact Valuation Shapes Emotional Responses to Decay

First, the emotional weight of the experience was largely shaped by the specific images each individual chose to submit and their personal relationship with their artifact, which dictated the kind of response a participant would have. This observation aligns with Cushing et al.'s (2013) finding about individual-digital possession relationships, where a characteristic of a digital possession is that it is recognized by the individual as having value. Cushing's study suggests that sentimental value can be described in emotional terms, such as music that "speaks to" a person, or in relation to hypothetical loss, like losing photos of a deceased pet. In my study, Claire also articulated the value of digital artifacts through discussions of potential loss. Many participants recognized that their engagement with the installation depended on their relationship to their image submission. Claire mentioned that her image submission of a cat did not invite vulnerability, but she could easily imagine someone submitting a photo of a deceased loved one being forced to be vulnerable and reacting with greater emotional intensity. This

individual-digital possession value participants ascribed to their photos shaped the kind of emotional reaction they would have to digital decay. This emotional variability was further emphasized by participants like Solange, who submitted a deeply personal photo of a late brother but reported complete emotional detachment, stating, “I didn't feel anything. No, I didn't feel anything at all.” This was noteworthy and somewhat unexpected that even deeply significant images did not necessarily evoke an emotional response.

On the other hand, for some participants, the installation provoked an uncanny response by taking their familiar digital images, and distorting them through a datamoshing effect. Participants were unsettled not by something wholly alien, but by the estrangement of the familiar: “Seeing an image you're so familiar with distorted is just very surprising…it’s a familiar image and it’s not familiar anymore is disconcerting.” This aligns with Freud’s idea that the uncanny emerges when repressed or long-familiar content re-emerges in an altered form (Freud, 1919). In the context of the installation, digital artifacts reappear in a corrupted, decaying state, which made some participants upset and disconcerted, unlike personal digital collections often thought of as private, safe spaces (akin to the ‘heimlich’, or homely). I had not predicted participants to be this viscerally upset in the experience. This discomfort mirrors Gulotta et al.’s (2013) finding amongst their research participants. When choosing images to upload, Gulotta et al.’s participants hesitated to subject “precious memories” to any decay process, describing it as “a little heartbreaking to see this deteriorate over time” (Gulotta et al., 2013, p. 1818). Likewise, in my study, Jacqueline remarked that the distortion “[made me] upset…it’s a very, like, upsetting, frustrating sort of feeling,” The intensity of these reactions exceeded my expectations, underscoring the emotional stakes tied to losing personal digital artifacts. These responses also

align with Cushing et al.'s (2013) characterization of emotional value in digital possessions, which arises from imagining the pain of losing them.

Technological Expectations as Emotional Guardrails

While the intensity of participants' emotional reactions depended on how much they personally valued their submitted artifact, my findings reflect that perceptions of digital decay were also shaped by their ingrained expectations of digital technology such as permanence, stability, and reversibility. As I had anticipated, many participants treated the simulated decay as a creative reinterpretation of their images rather than a genuine threat echoing Gulotta et al.'s (2013) finding that provocative decay systems may be valued as art or thought experiments rather than practical tools. However, when a disruption in expectations from technology was made visible through digital decay, it evoked a strong reaction from some participants. For example, Tiffany's comment that digital decay "...can be a little bit off-putting…it's not how it's supposed to be technologically" points to how tightly expectations around digital reliability are bound to participants' perception of digital decay. This specific reaction overlaps with Gulotta et al.'s (2013) finding that participants saw value in the promise of digital reliability. In their interviews, parents emphasized the importance of keeping photos "as pristine as possible" (p. 1818).

Despite the careful mapping of physical phenomena to digital decay, participants in Gulotta's study pushed back. Parents questioned not just how a digital photograph might decay, but whether it ever should. In my study, even when images were visually deteriorating, some participants remained emotionally distant, protected by their understanding that no real loss was occurring. When asked to talk about their interpretation of the installation, Troy remarked that the transformation felt inconsequential. Knowing that their original image could always be

restored acted as a psychological "guardrail," and kept Digital Decay as a harmless visual experiment rather than evoking feelings of genuine loss. Both Troy's and Tiffany's remarks spring from a shared belief in digital media's invulnerability. This aligns with the broader research on digital preservation, where digital artifacts are often seen as infinitely reproducible and recoverable (Marshall et al., 2007). Noor's reflection extended this by highlighting what happens when that guardrail snaps: she noted that photography exists to preserve memories beyond human recall, so watching her image decay made her feel uncomfortable. In other words, when decay challenges photography's role as a memory aid, the same expectation of permanence that diffused emotional impact instead generated discomfort.

Temporal Misalignment in Decay Perception

Finally, this research also reveals some preliminary findings about temporal expectations from decay. Participants viewed digital decay through a temporal lens, perceiving recently captured photos as incongruent with the decay applied by the installation. They had expectations that digital decay would stick to a timeline where recently captured photos would not decay as much as old ones. This was a surprising finding, that participants had expectations of organic decay to digital decay.

Participants' accounts also highlighted how the installation functioned as more than just a visual demonstration of digital decay, but acted as an immersive device that allowed people to feel the weight of loss in real-time by stripping away the comfort of gradual change. By providing an immediate and visceral experience of digital decay, the installation allowed participants to confront a concept they typically wouldn't experience. Priscilla's remark about "seeing time" reveals how manipulating temporality can surface the fragility of digital artifacts, making the impermanence of digital data tangible. Unlike Gulotta et al. (2013), whose gradual

decay probes did not foreground the age of the images or tempo, my findings show that the speed of degradation and the artifact's age itself become a critical driver of emotional engagement. In Gulotta et al.'s study, participants' skepticism focused on the concept, not on whether decay was "too fast" or "too slow." In my study, people placed strong analog expectations about when decay should occur: recent photos "shouldn't" tarnish instantly, older images "should" carry more wear. This acceleration of digital decay was helpful for some participants to think about what might happen to their digital archives.

From a design perspective, this suggests that emotional resonance with digital decay is coupled with perceived risk to one's possessions and is not a function of just aesthetics. This opens an opportunity for future work to design more convincing illusions of loss.

Future Study Design: Evaluating Emotional Responses to Artifact Value and Decay Dynamics

Future research will focus on understanding which artifact-decay tempo pairings work best. Understanding these temporal expectations opens up possibilities for designing more effective "illusions of loss" that could help people understand digital fragility and motivate better digital archiving behaviours. I am interested in researching interface design and creating museum-style exhibitions that foreground digital ephemerality and decay to reveal the material qualities of digital artifacts, instead of reducing them to technical glitches. I propose a study design that systematically varies both artifact significance and decay parameters. Participants could first rank a pool of their own images on a standardized sentimental-value scale (e.g., 1 = purely aesthetic, 5 = deeply personal/family memory which they might be upset about if it got lost). I could then stratify the images into "low value," "medium value," and "high value" groups for each participant. Each participant would then view images from each category under different

decay treatments such as gradual pixelation, abrupt glitching, participant driven decay, along with a baseline no decay image. Emotional responses could then be captured via self-reported Likert scales. This could be followed up by a semi-structured interview asking participants to compare their experiences across low vs. high value images and abrupt vs. gradual decay. Recruiting enough participants could provide the average discomfort (or lack thereof) for high value and low value images undergoing abrupt and gradual decay.

Future research will also focus on mapping emotional responses against artifact-related variables to develop a more precise predictor of participant engagement with digital decay instead of the one-size-fits-all approach of asking participants to submit a single most valuable image. When was the artifact created or acquired (recent vs. old image)? Does the artifact depict close relationships, acquaintances or non-human subjects? Is this the only copy or is it easily reproducible? Asking participants about their attachment to their digital artifacts, technological comfort level, and previous digital loss experiences such as corrupted files or hard-drives could also be a factor to consider. Specific combinations of these variables could help me understand why certain individuals experience discomfort while others remain emotionally detached and also inform the design and testing of decay-based interfaces.

Embodied Encounters and the Construction of Meaning

Findings also underscore the value of real-time interaction in prompting reflection. Some participants interpreted the visual output of the slit-scan not as a marker of digital accumulation, but as a failed attempt at preservation. The image was marked by corruption, where something was attempted, but not fully captured. Also, rather than abstractly contemplating digital decay, participants were prompted to inhabit it—seeing themselves become the content, then watching

that content unravel. This transformation in real time and real space and not just in theory, lends itself to an embodied way of knowing.

People typically interact with their digital photos in a contained, individual way—scrolling through a phone screen, swiping between images, and storing them in their personal devices. The installation disrupted this by magnifying their personal selections, making them large, visible, and central to an artistic experience. Participants described the very act of choosing and submitting a photo as a curatorial process, one that elevated their chosen images from something easily overlooked to something more meaningful and situated in a specific place and time. The installation, then, did not just display images but actively created a new relationship between participants and their digital collections. This suggests that the installation functioned as an exercise in digital curation on top of a representation of digital decay—forcing participants to assign significance to an image in a way they may not have previously. A surprising finding was that rather than reinforcing the ephemerality of digital images, the process of submission paradoxically made them feel more real and intentional, even before the decay process began. Therefore, future iterations could formalize this process, perhaps through submission rituals that acknowledge this as a meaningful moment of transfer.

These findings align with Dourish's argument that meaning arises through interaction, not before it (Dourish, 2001). In this sense, the installation doesn't simply communicate ideas about digital decay; it enables participants to construct meaning through their interaction with it. The installation serves as a catalyst for reflection when working with abstract concepts such as digital decay.

Embarrassment as a Deterrent to Interact

In conjunction with previous research, my study also reveals that the feeling of "public shame" when participating in a real-time display of contributions is a major deterrent (Brignull and Rogers, 2003). My findings suggest that when a person themself is projected onto an object, the embarrassment can become manifold. For some participants, seeing themselves projected onto a large, confounding object was jarring. They also did not want to see themselves as the Revisitation act showed them. Axl's comment illustrated how self-consciousness and the potential for public self-evaluation can be a hindrance to engagement: "I didn't like looking at myself…it made me think that I don't want to look at myself. My posture was bad, so when I saw the footage of me two minutes before that point, I felt kind of ashamed." They mentioned that the best part of the installation was their abstracted self instead, in the Kinect Decay section, because no one could tell it was their face. This was the only section in the installation that did not project participants' literal self image and they appreciated being spared this self-encounter.

One potential strategy to mitigate the potential for embarrassment is to incorporate an explanatory component into the installation such as a brief message that says "you're also part of the installation" to normalize the experience and invite consent. As the findings suggested, explaining this process could help participants reframe the interaction from being a source of potential embarrassment to being a collective, shared experience where one feels like a critical actor. I could also create a gradual "onboarding" experience that would prepare participants for seeing themselves projected on a large display. I could also experiment with various levels of abstraction in self-representation incorporating filters or transformations that make self-images less literal and potentially less embarrassing. Since the installation centered so much on

participants' own video feed, I could design opt-out mechanisms that would allow participants to experience the installation without being visually captured.

Thus, while the installation's use of embodiment and delayed self-reflection can offer powerful insights into digital decay, experience designers must balance these benefits with the risk of eliciting feelings of shame or discomfort that can act as barriers to full participation.

Multi-Role Experience: The Participant as Actor, Viewer, and Operator

Participants varied in how they perceived their involvement: some readily recognized their role in activating the installation and shaping its meaning, while others hesitated to claim their role as key agents. For example, Gillian (art historian) pointed out that the interactivity in the installation provoked her to be more aware of herself as a spectator. Axl, on the other hand, remarked, "...it doesn't have to be me. It could be anyone else" underscoring a desire to not recognize oneself as a critical actor and highlighting a protective detachment from vulnerability. As mentioned in the literature review, Benford et al. (2009) researched how individuals in an interactive space can assume a variety of roles namely Actor, Participant, Spectator and Orchestrator over the course of the experience. However, it does not explicitly discuss a single participant simultaneously undertaking multiple performance roles. In the first act, I intended participants to be the Actors, after I, as the Orchestrator, showed them where to stand in front of the cameras. Next, they were the Participant, the main target of the experience, during the Digital Decay section. In the Revisitation section, they were spectators to themselves being Actor *and* Participant in the first two acts. I did not expect this to be overwhelming for participants.

This role traversal produced contrasting experiences. For some, the trajectory from Actor and Participant in the first two acts to Spectator in the Revisitation act served as a unifying finale, offering respite from the unsettling experience of having just experienced their images

decay. However, others described discomfort in embodying these multiple roles at the same time–being forced into spectatorship while also trying to make sense of the operations driving the interaction.

The literature also proposes a taxonomy where there is a "magical" element when effects are revealed, but the manipulations that caused them are hidden, creating a sense of wonder or mystery (Reeves et al., 2005). Participants encountered this very "magic" when they were surprised at the turn revealed in the Revisitation act, where they saw themselves two minutes into the past, being spectators to themselves being actors and participants. They described their emotional responses using magical concepts such as "out of body experience," "haunted house," and likening this act to a "time machine." Several participants mentioned that this was a rare thing to experience—the novelty of seeing one's reaction to their own photos and seeing ourselves as others do, in motion, from the outside. This unsettling real world uncanny encounter with oneself aligns with Freud's (1919) argument that the uncanny can be invoked by "bringing about events which never or very rarely happen in fact," and parallels his analysis of the "double" who "...are to be considered identical by reason of looking alike" which "confounds the self, or the foreign self is substituted for his own" (p. 19). Many participants immediately probed how the mechanics of this act worked. This probing reveals that even when playing the part of Actor, Participant, and Spectator, there was a desire to also become Orchestrator—professionals who manage the technologies and know how the backend is working (Benford et al., 2009). Findings reveal that when the participant is the one enacting the magic and also experiencing it, there can be a sense of loss of control during the interactive experience when one does not understand their role clearly. This was indicated when participants described the last act of Revisitation feeling like surveillance to them. One participant mentioned

feeling “irritation, a little peek of anxiety.” This is in line with Freud mentioning that the success of being uncanny comes with vexation from the receiver’s end saying they “retain a feeling of dissatisfaction, a kind of grudge against the attempted deceit” (Freud, 1919, p. 19).

At this point, participants may want to shed some roles and/or take up new ones, such as just being a Spectator or being Actor and Orchestrator at the same time. This is supported by participants’ feedback desiring a more active role in shaping the installation’s behavior and output. Several participants expressed wanting more agency—to move beyond simply being the source of the input to actively influencing the process of decay and transformation. This, again, suggests a latent wish to adopt the Orchestrator role: to “break the image” (Troy), “distort the image” in new ways (Scarlet), or “push the decay” further (Jasper), rather than remaining passive subjects. Their wish to discard roles or take up new ones is further supported by participants asking for more than one person in the laboratory setting to experience the installation with. Some wished to be just spectators while another person activated the installation—both to share the experience and to witness others’ digital data undergoing decay.

Earlier, when I set up this installation in an exhibition setting and had no control over who participated and how, I observed the honey-pot effect (Brignull and Rogers, 2003), as mentioned in the literature review section. People were willing to participate more after seeing other audience members interact with the installation. This provided more opportunities for new audience members to simply observe how the system worked and understand how to contribute. In this way, they knew how to interact with the installation without my intervention urging them to participate.

To balance the flux between Actor, Participant, and Spectator, adding another participant could be a simple scaffold: it would let people shed roles or take up new ones, process the

installation's intent, and then re-enter as co-creators or purely as observers. Future research studies may still test such objects in a laboratory setting but conduct it in pairs instead of an individual. Future iterations of such installations should carefully calibrate the number and sequence of role transitions in each act to avoid overwhelming participants and maintain coherence. As Troy noted: the installation's acts felt somewhat disjointed, lacking a sense of seamless integration. These transitions should also be purposefully designed, potentially supported by brief orienting prompts that reinforce informed consent without diluting the surprise of the final reveal. Future work will explore how to invite and sustain consent without giving away the installation's magical impact.

Multiple Interpretations as a Lens for Understanding User Responses

Sengers and Gaver argue that HCI should embrace multiple, potentially competing interpretations of systems rather than striving for a single, authoritative one (Sengers & Gavers, 2006). The findings reveal the diverse user responses to *Outlast*. The various reactions to the slit-scan effect, the emotional impact (or lack thereof) of digital decay, and the differing senses of surveillance during the Revisitation act all exemplify the heterogeneous interpretations that Sengers and Gaver discuss. The findings demonstrate that participants brought their own backgrounds and perspectives to the installation, resulting in a multitude of meanings and experiences. The initial "blank slate" of the white boxes awaiting projection and meaning-making is an example of "clearly specifying usability, while leaving interpretation of use open" (Sengers & Gaver, 2006, p. 102).

The installation acted as a conduit for personal meaning rather than imposing a singular interpretation. Based on what the participant gives to the installation (e.g.: the picture to be

decayed and their own embodied self) and brings to the installation based on their positionality, the installation's impact can vary. The installation's key function is to reflect back what is given to it by the participant. As Jasper noted earlier, "The role that I have is I can change my experience with this piece based on what I'm submitting to it" it highlighted how the installation did not generate meaning on its own but instead transformed familiar digital images in ways that provoke introspection. Accounting for Senger's and Gaver's suggestion to incorporate user interpretation into evaluation, I moved beyond simply assessing whether participants understood the themes of digital accumulation and decay as I intended.

As a library worker, Tiffany challenged that visual degradation of a photograph may not necessarily equate to the complete loss of the memory or data it represents which made me think about metadata—other information embedded in the photograph such as the time and date it was taken, the camera settings used, location data, and even tags or descriptions function as a critical layer of memory that is separate from the visual image itself. While the visible content of a photo might decay, this metadata could remain intact. This contextual information would allow the photograph to retain some of its significance and meaning, even in the absence of its original visual clarity. This response offered a more complex and nuanced view of digital decay. This also aligns with the literature which suggests, "...an exploration of digital archival data is needed as it opens to a form of loss—digital decay—that happens not spectacularly but more insidiously over time" (Boyda, 2013, p.8). Tiffany also suggested applying various textures to the boxes itself instead of letting them be a pristine white. Many participants also associated the Kinect Decay section with material decay such as "weathered sandstone." I had decided to use plain white foam boards to mirror the uniform look of data centers. However, future iterations of the installation will consider applying physical decay treatments to the boxes itself, taking

inspiration from Bill Morrison's film, Decasia, entirely composed of decaying nitrous film, which depicts film as inextricably material. This visual treatment of decay applied to the boxes may shed light on the fact that digital information is also inextricably material (Blanchette, 2011).

I had not considered showing digital decay beyond just projections of visual deterioration applied to the image. Some participants also had a tendency to piece together elements of their decayed image through visual approximation even as they lost clarity. This finding made me consider how reconciliation can occur through what information is left behind within an image. Future renditions of this installation will therefore go beyond just visual deterioration and explore a more insidious approach to digital decay, such as metadata corruption, that cannot be reconstructed visually.

Chapter 6: Limitations

Equipment

Having only two projectors meant that the front of the installation could be projection mapped but not the sides. Many participants found the Digital Accumulation section, which used a slit-scan technique, fun to play with, but wanted the interaction to last longer and actually have time to accumulate. At a previous showing of this installation where I had three projectors, one dedicated to each section of the installation, the slit-scan effect was warped around the faces of the installation to show the lasting accumulation of archives. Not having enough projectors detracted from the sculptural look of the installation and also reduced the effectiveness of the "Digital Accumulation" section. Furthermore, it was not possible to keep the projectors at a considerable distance to project onto all sides of the sculpture.

Simulated Setting

Having invited participants to the laboratory meant that I could not observe them in a natural setting like that of an exhibition. Having exhibited this installation in the past at a festival where people were free to "discover" the work and I could observe them with a "fly-in-the-wall" approach, here, participants knew they had to interact with the installation for purposes of a user study. I also recorded their interaction which may have influenced their reactions.

Venue

The laboratory had natural light filtering in from above so it could not be turned darker for the projections to be very prominent. Also, due to the nature of the study requiring cameras, a baseline amount of light quality was required to capture the participant. Several participants

commented on the lighting in the environment which affected the atmosphere and emotional engagement with the piece. They expressed their desire for a darker room, while recognising that the lights needed to be turned on for the camera to capture the person.

However, when the installation was shown at a festival, technicians required a certain amount of light in the space for it to not be a OSHA (Occupational Safety and Health Administration) hazard and remain accessible. Balancing accessibility and visual impact for such a piece is an interesting design challenge that will be explored in future work.

Participants also surfaced how the absence of dynamic elements or changes in the surroundings made the slit-scan unintuitive. The physical context of the installation—its environment—had a significant impact on how the digital projections are experienced. Because of the laboratory's location in a quaint area of the Art Department, the slit-scan did not pick up on movement because there wasn't any. This was unlike the festival setting of the installation's viewing. A more dynamic space might make the Digital Accumulation section feel more alive and interactive.

Accessibility

The laboratory was also too small to have a wheelchair accessible path to move around the installation. The installation was also purely visual with no sound, and is therefore inaccessible in its current format to blind or low vision (BLV) people.

Recruitment

Recruitment emphasized subjects known to maintain digital data archives, and therefore results may not be generalizable.

Size Limitations of Sent Photograph

A participant expressed wanting to send a video that was more than 3 gigabytes. I had not accounted for files of this size to be input into the system. The technical capabilities of the machine would not have supported a file of this size. This meant that participants could possibly be hindered in sending the media they wish to be projected onto the installation the most.

Chapter 7: Some further considerations about future work

While the Discussion section provides a proposal for a future research study based on participants' interviews, the installation and its testing will also benefit from including sound, tactile feedback, and participants interacting with the decay of several images. The testing also revealed that the curator or the researcher must also have the foresight to gauge which images may overstep boundaries. I will detail these observations in this section.

Sound

Installations such as this one benefit from sound, such as a glitching sound, to add to its atmosphere and immersiveness. Adding not just musical sound but also voiceovers describing each section of the experience would also allow low vision and blind people to experience the installation and address some accessibility concerns (Bertrand, 2022).

More interactive touchpoints

Including more interaction inputs such as a button or a lever that people can push to generate the "decay" in the image would provide participants more agency and something to do beyond just standing in front of the cameras.

Laboratory vs. Exhibition Setting and Generative Repository

The installation could next be set up in an exhibition setting where participants could plug and play their image without intervention from a curator. Participants would be informed of this storage. Next, this installation could be tested in a laboratory setting where participants interact with the generated repository instead of just interacting with their personal images. This

might provoke new emotional responses—seeing an actual collection of valuable pictures getting decayed instead of a singular image.

Mitigating Emotional Risk Through Co-authorship of Decay

While some participants like Solange, expressed detachment when viewing images of deceased loved ones, others exhibited a general discomfort with the aesthetics of digital decay. Given the subjective nature of meaning-making and the varying degrees of participants' personal attachment to digital artifacts, such visual transformations may, in some cases, evoke more existential fears such as the fear of death. Currently, the digital decay section was algorithmically determined: the machine decides when, how, and how much an image deteriorates. This can be provocative from an aesthetic or conceptual standpoint, but it also risks overriding the participant's emotional boundaries. Depending on cultural beliefs, people might interpret the distorted image as an omen or symbol of their own or others' eventual decay.

From a design perspective, this highlights the need for foresight and further reflection-in-action. Designers working with personal digital archives and decay aesthetics should consider implementing opt-in consent mechanisms, content warnings, or the ability to preview and adjust the level of distortion before committing to a final interaction. This may be tested by adding more interactive touch points such as buttons which participants can press to drive the decay, giving them something to do beyond just standing in front of the cameras. Here, the locus of control over the decay process is given to the participant. By giving users agency to specify a decay "threshold", modulate the extent, speed, or type of decay, they are comfortable with, the interaction becomes one of co-authorship rather than passive reception, thus possibly improving trust and emotional safety in the interactive system. These interventions can help

mitigate potential for extreme distress while preserving the integrity of the artistic or experiential intent.

Future research exploring whether participants associate the decay of digital possessions with concepts of death or spiritual decay would be an interesting avenue.

Conclusion

This thesis documents the lifecycle of the creation of an interactive art installation beginning with an iterative design process, guided by reflection-in-action and incorporating user feedback, leading to a final prototype that successfully elicited a range of responses from participants. Key findings from the user study (N=19) reveal participants' expectations of visual approximation of digital decay. By projecting participants' live images and their submitted personal photographs onto the sculptural installation, the installation transformed into a personalized experience for all participants. The thesis explored various artistic techniques to represent digital accumulation (slit-scan), digital decay (datamoshing, Kinect depth-mapped decay), and revisitation (delayed self-encounter). The study also revealed the diverse interpretations of the installation, supporting the notion that HCI should embrace multiple meanings rather than adjudicating a single, correct interpretation. The installation positioned participants in multiple roles concurrently, and their feedback indicates a strong yearning to sometimes take on even more active roles, such as that of an orchestrator or drop roles such as that of a spectator.

This extends the literature where research has looked into audience members assuming various roles but not concurrently. This also extends the literature by providing insight into how participants may desire to shift into other performance roles. This desire to be more than a participant, to have a hand in the system's operation and evolution, highlights a potential area for further exploration in the field of interactive art.

While the literature may discuss participants as active contributors and spectators of their own interactions, the explicit yearning for a more direct orchestrational role, as evidenced in the study, suggests a deeper level of engagement that future installations and research could consider. Participants expressed a desire for more agency and control within the installation,

suggesting avenues for future work such as user-controlled distortion and real-time image uploads. Feedback on the installation's design, including the sculptural elements, projection mapping, and the environment, also provided valuable insights for future iterations. The thesis acknowledges limitations in its study, including the recruitment pool, equipment constraints, and the simulated laboratory setting. Future work aims to address these by recruiting pairs of participants, adding more interactive touchpoints, and exploring larger scales.

Appendices

Appendix A: Recruitment Demographics

Overview of participant demographics, occupations, types of digital possessions, and storage and organization practices.

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
Gillian	33	Art Historian, Independent Curator	Bookmarks for dissertation research and curatorial practice, photos on Facebook, Instagram, Google Cloud, PDFs of things she has written.	She describes these digital artifacts as somewhat disorganized and temporary, with the primary purpose of preserving memories and potential research material for her future dissertation.
Solange	33	Graduate Student	Voicemails from grandmother, messages from her late brother on Snapchat, from late brother, video recordings of class lectures, family related documents, photographs from various periods of her life on Facebook and Twitter, personal documents such as college application essays.	She has two hard drives of two terabytes each where she stores important files. She emails important files to herself. Voicemails from grandmother are downloaded, emailed to herself, then transferred to the hard drive. Class recordings are also in hard drives, ‘‘just in case’’ she might need them someday. Phone gallery is loosely organized by month and year. She keeps physical copies of important images. She keeps Snapchat solely to preserve messages from her late brother.

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
Ulana	25	UX Designer, Film photographer, Architect	Film and digital photos from trips, Spotify playlists, architecture school files–scans of all sketches across all semesters (PSD, DWG, Revit models), thesis iterations.	Meticulously organizes photographs by location and year. Film camera photos are in a dedicated folder called ‘‘film’’ Uses social media as additional organization. She has multiple hard drives. One 5-terabyte hard drive she calls the ‘‘mother lode’’, which has two passwords to get through. She keeps one hard drive at home, and another with her. She updates backups every 2 months, and goes home every 4-6 months to update the additional hard drive. She ensures multiple copies – one local storage and one cloud based storage.
Tiffany	25	UX Designer, Library worker	Photos and videos, Instagram stories and Instagram archives, shared photo albums on Google Photos	Describes her photo gallery as a ‘‘mess.’’ Her approach is casual and pragmatic – digital possessions are collected without much deliberate organization, with Instagram serving as the most curated personal archive, which is more intentional than her regular photo gallery. She shares photos and videos that are

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
				‘‘notable,’’ ‘‘worth sharing,’’ and creates a narrative around them. She appreciates Instagram’s feature of saving stories after 24 hours and uses this archive to revisit memories with timestamps. She finds it easier to look back on memories through Instagram than photo apps.
Jasper	28	Digital artist	Family home videotapes that he digitized, digital artwork files, family photos from various time periods, screenshots and personal documentation, 3d photogrammetry scans for his art practice.	Storage is on multiple devices and storage methods (iCloud, hard drives, phones) He digitized around 30 family home videotapes each around 2 hours. The total digitization process took around 60 hours. He split the videos into individual clips and dated the videos to make them searchable. He described the process as tedious but was important to him to preserve family history. He uses portable scanners like his phones for photogrammetry scans and acknowledges that the current quality is already ‘‘obsolete.’’
Zoe	22	Graduate	Photos from different life	She mentioned having storage

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
		Student, researcher	stages, angel number logs (she records every angel number she sees daily), notes on loved one's likes, Myers-Briggs personality types, gift ideas, etc. Scanned important documents, and class-related PDFs and slides.	challenges, often running out of space and having to delete files. She keeps multiple copies of important files and creates multiple backups of sentimental photos.
Priscilla	64	Lecturer, former database architect, database administrator	Photos, family history documents, financial records, videos (mentioned some are now inaccessible due to outdated technology), ebooks and audiobooks.	Stored on various devices like flash drives and keeps some in a Firebox safe. She periodically tries to clean out and organize these digital files but acknowledges that her current, digital collection is not well-organized.
Troy	41	Installation artist	Artwork files and documentation, raw project files and code from past work, photos, home movies, and ripped CDs.	He backs up his digital files in triplicate: two cloud-based backups, Google Photos and Backblaze, and one local storage on his computer.
Jacqueline	25	Graduate Student, Digital artist	Art files (raw files), photographs (concert photos and personal photos), videos, music,	Keeps these files organized in carefully structured folders, often sorted by year, event, or category, and maintains multiple

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
			ripped CDs, e-books (sorted by author), notes and ideas for stories, coursework and academic files from undergraduate years	backups across iCloud, hard drives, and other storage methods.
Kurt	27	Documentary filmmaker	Video archives of childhood camcorder footage converted to digital, photographs, documentary and personal video, family event recordings, links and bookmarks in Google Keep organized into different categories such as ‘articles’, ‘painters’, ‘movies.’ He also has a large Letterboxd watchlist (around 1600 movies).	He calls himself a ‘‘media pack rat’’ who collects digital artifacts but is not necessarily precious about organizing everything meticulously. He uses Google Drive and pays $10/month and keeps multiple backups across devices.
Molly	25	UX Designer, Photographer	Large collection of personal and friend photos, eBooks, educational materials, movie downloads.	She stores digital content on hard drives, Google Photos and uses Instagram as a preservation and organizational tool to curate photographs. She labels hard drives by life phases (every 5 years) and has separate hard drives for photos with friends and personal

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
				photos.
Claire	28	Graduate student, Former librarian	Steam video games (dozens of games accumulated since she was 14), photos of her cat, Snapchat Memories, digital documents such as scanned diplomas, tax records, and work and school documents.	Claire is not sentimental about her digital artifacts and tends to delete things frequently. She describes her approach as ‘‘Marie Kondo in my photos.’’
Spencer	24	UX designer, graduate Student	A digital ‘‘pun journal’’, lists of quotes and motivational sayings, Notion pages of journal entries, Nebo app for digital notes, photos, various digital notebooks and collections across various apps.	He rarely opens Google Photos and primarily uses WhatsApp to organize photos and mentioned getting overwhelmed by too many digital options.
Soraya	29	UX Designer, Graduate student, architect	Photos, architecture files, group chat messages with her sisters	She uses Instagram as an archive. She specifically likes the ‘‘archive’’ feature because it allows her to remove posts from public view while still retaining access to her own content. She gets to keep her memories without permanently deleting them. She pays for iCloud

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
				storage.
Noor	31	UX Researcher, Graduate Student	She digitally stores family photos and videos, holiday pictures organized in folders, childhood and personal memories, Instagram Saves like recipes and hacks, appreciation emails, and study materials and documents.	She stores her digital files in multiple places. She has one hard drive with her at home and one with her sister. Noor and her sister have a specific yearly backup ritual when they visit home: They spend about two days just doing backups, where they collect all photos and videos from their parents' phones and transfer these files to three hard drives and two laptops. They ensure that everything is backed up systematically. They use a method where new folders are transferred and existing data is not duplicated. Noor describes this as a family ritual, saying ‘‘we spend like two days just doing this backup business’’ and emphasizes that her family is ‘‘very particular about it.’’ This tradition stems from a previous data loss experience and reflects their family's deep commitment to preserving memories.

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
				The motivation behind this ritual is their belief that photos and videos are of ‘‘extremely high emotional value’’ and represent memories they want to preserve and revisit over time.
Axl	25	Linux Systems Administrator	Digital artifacts related to Japanese pop culture and theater, live stream footage, variety show recordings, bookmarks in Firefox, eBooks, photos scans of books, pictures from various sources (such as celebrity photo books), content from exclusive sources such as private LiveJournal communities. They mention downloading and ‘‘hoarding’’ photos from an old photo uploading service, ‘Photobucket.’ They mention that sometimes pictures uploaded to Photobucket a long time ago (around 15 years) can disappear and only remain in small,	They use the 3-2-1 backup principle: 3 copies of your data. 2 different types of media/storage. 1 copy stored offline. They have a Network Attached Storage (NAS) at home where they primarily back up videos which they then sync to Backblaze for cloud storage and also stores files on phone and laptop. They also use a private Discord server just for themself for private links.

Participant Pseudonym	Age	Occupation/ hobbies	Digital possessions	Further details about storage and organization methods
			low-resolution versions. They wish to preserve potentially disappearing content. Axl uses a "digital berry picking metaphor" saying, "It's like picking berries…but like digital files feel like berries that I have to hoard."	
Scarlet	25	Graduate Student	Photos, videos, Pinterest boards, wallpapers, old family videos converted from VCR to MP4, Whatsapp chats	Primarily uses Google Photos and admits she is not very organized about managing her digital possessions. She keeps the family videos on all the laptops she has ever used.
Zaya	26	Undergraduate Student	Photos, Pinterest boards	She uses Google Drive to store photos but admits to not organizing them.
Sloane	22	Journalist, writer, songwriter	Journalism articles, voice memos	Google Docs for writing, and phone storage for voice memos. She mentioned having very little organization.

Table 5: Overview of participant demographics, occupations, types of digital possessions, and storage and organization practices.

Appendix B: List of questions asked

1. Can you describe the experience/sensation in a few words?

2. What, in your opinion, is the meaning of the installation?

3. How would you describe the effects used in each section of the installation? What did it make you think about?

4. You were an active part of the installation and have therefore contributed to its meaning. How do you judge your role in this?

5. What connections between your body movement and visuals did you find the most interesting?

6. What aspect of the installation surprised you the most?

7. What aspect of the installation confused/frustrated you the most?

8. What three words would you use to describe your experience with the installation?

9. What did you think about seeing your images projected onto boxes?

10. What do you think the installation was trying to communicate about digital decay? How effectively did it do this?

11. How did the interactive elements of the installation influence your experience?

12. Do you have any other suggestions for how this work might be developed in the future?/ Is there anything that you could add to the installation that would help further drive the point of it?

13. Did the installation effectively portray digital accumulation, decay, and revisitation?

14. Do you feel confident in your ability to explore the work, or do you require some assistance in understanding the mechanics?

15. Are there any other questions I should have asked? Do you have any additional comments?

Appendix C: Institution Review Board Approval Letter

UNIVERSITY OF MARYLAND
INSTITUTIONAL REVIEW BOARD

1204 Marie Mount Hall
College Park, MD 20742-5125
TEL 301.405.4212
FAX 301.314.1475
irb@umd.edu
www.umresearch.umd.edu/IRB

DATE:	February 13, 2025
TO:	Kriti Singh, Human Computer Interaction
FROM:	University of Maryland College Park (UMCP) IRB
PROJECT TITLE:	[2230786-2] Outlast: Interactive Art Installation on Digital Presence exploring Interactive Art as Reflective Practice
SUBMISSION TYPE:	Amendment/Modification
ACTION:	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	February 13, 2025
REVIEW CATEGORY:	Exemption category #45CFR46.104(d)(2)(ii).

Thank you for your submission of Amendment/Modification materials for this project. The University of Maryland College Park (UMCP) IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the IRB Office at 301-405-4212 or irb@umd.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Maryland College Park (UMCP) IRB's records.

Generated on IRBNet

Appendix D: Consent Form

CONSENT TO PARTICIPATE

Project Title	*Outlast: Interactive Art Installation on Digital Presence exploring Interactive Art as Reflective Practice*
Purpose of the Study	*This research is being conducted by **Kriti Singh** at the University of Maryland, College Park. We are inviting you to participate in this thesis research project because you are a qualified participant at the age of 18 or older. The purpose of this research project is to gauge your experience and understanding of digital presence through the implementation of an interactive art installation. You will be the most important actor in the installation allowing you to become part of the performance and explore interactive art as a form of reflective practice. By visualizing digital presence, digital decay, and revisitation, the study seeks to examine how such artistic representations impact participants' awareness of their digital footprint and prompt consideration of their accumulated digital possessions.*
Procedures	*There are two ways to participate in this research study:* *1. **Full Participation**: You can choose to engage in all aspects of the study – **survey**, being **video recorded** during your interaction with the installation, and a post interaction **interview**.* *2. **Partial Participation**: You have the option to decline video recording while still participating in other aspects of the study. In this case, you will complete the **survey** and participate in the **interview** without being recorded during your installation interaction. Your consent to record audio is compulsory for the interview.* *You are invited to complete a survey form focusing on your digital hoarding habits. This will take 3-4 minutes. You may skip any question you do not wish to answer. Promptly after you are invited to interact with the art installation. The interaction is non-invasive in any way, shape, or form. It is purely observational/experiential. If you chose, Full Participation, permission to record your interaction is required to analyze your engagement patterns, measure time spent at different sections of the installation and observe any unique or interesting interactions. You are welcome to interact with the installation for as long as you'd like. Post interacting with the installation, your videotape of your interactions with the installation will be shown to you and you will be asked to reflect on your experience via interview questions. You may refuse to answer any interview question for any reason. The interview will take 60*

	minutes. Your consent to record audio is compulsory for the interview. *If you choose Partial Participation, no video recording will be made and you will only be asked to fill out the survey and do a post interaction interview. Permission to be audio recorded is compulsory for the interview. You can choose to drop out of the study at any point during or after the data collection for any reason.*
Potential Risks and Discomforts	*The research activities involve no more than minimal risk. You may skip any question you do not wish to answer. You can choose to drop out of the study at any point during or after the data collection for any reason. Data collected will be completely removed from all relevant online storage space and local devices.* *While we have implemented rigorous measures to protect your personal information and responses, there is a minimal risk in any study that data could be accessed by unauthorized individuals or inadvertently disclosed. We want to ensure you are aware of this risk, however slight, so you can make an informed decision about their participation.*
Potential Benefits	*Engaging in this study offers you a unique opportunity to engage with an art installation portraying themes of digital presence, digital decay and revisitation. You will be engaged to reflect on your own digital possessions and activities.*
Confidentiality	*All information collected in this research is confidential, and you will not be identified by your name or other identifiable indicators. Collected data will be stored in password-protected devices and UMD internal platforms (UMD Box for video/text recordings and all signed consent forms) which use high-level encryption for all transmitted and stored data. The original copies of all written consent will be shredded once they are scanned and uploaded to the aforementioned password protected devices/platforms. For digital consents, you will sign the digital consent form PDF and send to us though emails. The digital consent will be downloaded and stored to the aforementioned password protected devices/platform and the original email will be deleted. In future reports or research articles generated from this project, your identity will be protected to the maximum extent possible.* *Your identifiable data (e.g., contact email) will be destroyed once the data collection is done. There will be a key linking personally identifiable information to your study ID. This key will be stored securely and separately from other project data to ensure the privacy and data protection for our participants. Specifically, the key will be kept in a separate, password-protected folder, accessible only to research team. Once data collection with you is completed, the key linking your personal information to their study ID will be promptly destroyed to further safeguard your privacy.* *Audio recordings will be transcribed into text format. All personally identifiable information (PII) within these transcriptions will be masked with pseudonym to ensure your privacy. The transcription*

	process will be undertaken by the PI. Following the completion and verification of the transcriptions, the original audio recordings will be destroyed and in line with best practices. *Video recordings will be stored securely on password-protected devices and UMD Box, similar to other data. These recordings will be used solely for analysis purposes by the research team. To protect participant privacy, video files will be coded with participant IDs rather than names. Any screenshots or still images used from these videos in publications or presentations will have identifying features blurred or obscured. Video recordings will be transferred from the recording device (PI's phone) to secure storage as soon as possible after each session, typically within 24 hours. Once the transfer is confirmed, the original recording will be deleted from the phone.* *In our efforts to protect your confidentiality when publishing results, you will be represented by anonymous alphanumeric codes instead of your name or any other personally identifiable information. Furthermore, if direct quotations from you are included in the published results, they will be reviewed to ensure they contain no identifiable information. Any necessary minor modifications will be made to these quotations to guarantee anonymity without altering their core meaning.* *All data will be accessible only by the research team, but if you or someone else is in danger or if the research team is required to do so by law, participants' information may be shared with representatives of the University of Maryland, College Park or governmental authorities. The collected data will be held for a period of no longer than seven years of the study completion in the principal investigator's password-protected computer and on the above listed secure online systems, after which the data will be deleted.* *If we write a report or article about this research project, your identity will be protected to the maximum extent possible. Your information may be shared with representatives of the University of Maryland, College Park or governmental authorities if you or someone else is in danger or if we are required to do so by law.*
Right to Withdraw and Questions	*Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.* *If you decide to stop taking part in the study, if you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the investigator:*

	[Kriti Singh] ***[4316 Van Buren St, University Park, 20782]*** ***[kritisgh@umd.edu]*** ***[3018061968]***
Participant Rights	*If you have questions about your rights as a research participant or wish to report a research-related injury, please contact:* University of Maryland College Park Institutional Review Board Office 1204 Marie Mount Hall College Park, Maryland, 20742 E-mail: irb@umd.edu Telephone: 301-405-0678 *For more information regarding participant rights, please visit:* *https://research.umd.edu/research-resources/research-compliance/institutional-review-board-irb/research-participants* *This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.*
Permission to Audio Record	*We would like your permission to audio record you during the interview session. We will only use this information to ensure we record the information accurately. The audio recording will be destroyed at the end of the study.* ☐***NO, I do not give my permission*** *for me to be audio recorded during any interview.* ☐***YES, I give my permission*** *for me to be audio recorded during any interview.*
Permission to Video Record	*We would like your permission to video record as you interact with the installation. These recordings will be used solely for analysis purposes by the research team. To protect your privacy, video files will be coded with a participant ID instead of any personally identifiable information. Any screenshots or still images used from these videos in publications or presentations will have identifying features blurred or obscured. The recording will be destroyed at the end of the study.* ☐***NO, I do not give my permission*** *for me to be video recorded during the installation.* ☐***YES, I give my permission*** *for me to be video recorded during any installation.*
Permission to store picture for duration of the study	*You will be required to upload a picture you consider valuable to UMD Box which is encrypted. This need not be a picture of yourself or anyone else that has faces. It can be any picture that you like. If you have concerns regarding the appropriateness of the picture, please discuss it with me before sending it to me. This picture will be downloaded on a password protected device and projected onto a box. It will just be you (participant) and PI in a secure room.The*

	picture will be deleted promptly after the user study. We would like your permission to receive a picture to project onto the installation. This picture will be used solely for analysis purposes by the research team. To protect your privacy, files will be coded with a participant ID instead of any personally identifiable information. Any screenshots or still images used from video recordings of the installation in publications or presentations will have identifying features blurred or obscured. ☐ ***NO, I do <u>not</u> give my permission*** *for my picture to be stored during the installation.* ☐ ***YES, I do give my permission*** *for my picture to be stored during the installation.*	
Statement of Consent	*Your signature indicates that you are at least 18 years of age; you have read this consent form or have had it read to you; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study. You will receive a copy of this signed consent form.* *If you agree to participate, please sign your name below.*	
Signature and Date	**NAME OF PARTICIPANT** **[Please Print]**	
	SIGNATURE OF PARTICIPANT	
	DATE	

Appendix E: Installation pictures



Fig 26: Audience members standing in front of camera and projected onto Digital Accumulation section of installation

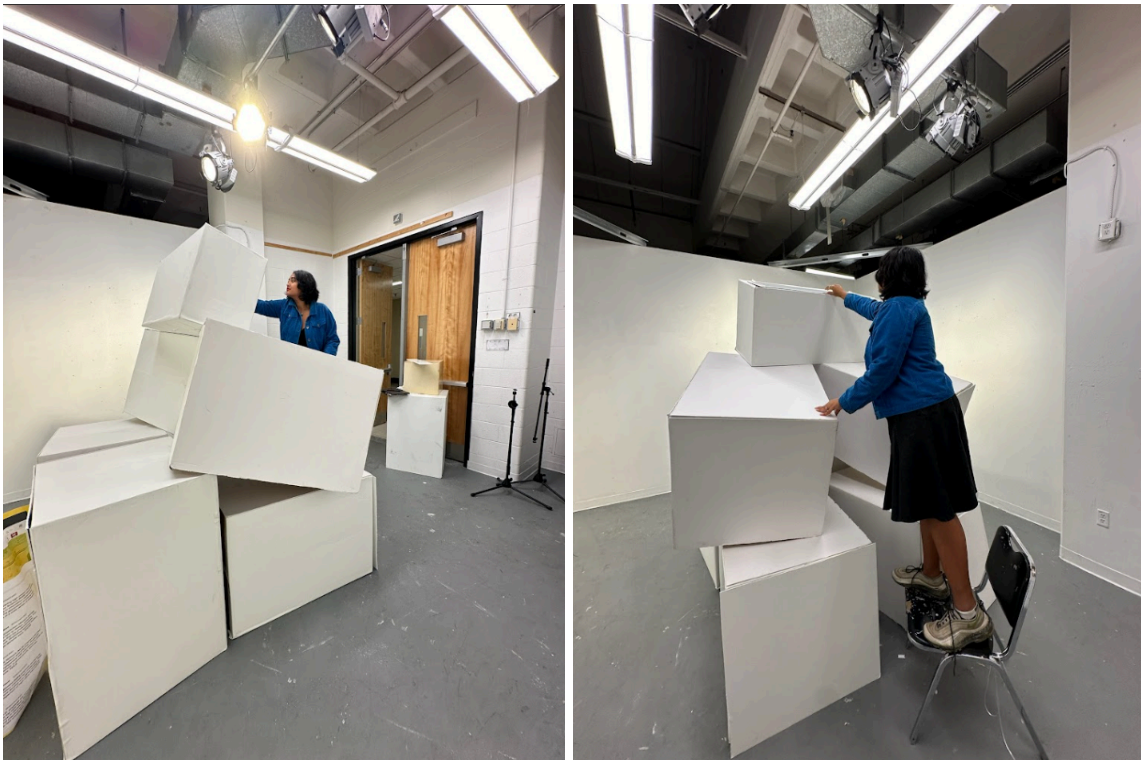


Fig 27: Author pictured standing on a chair to set up the installation's boxes.

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