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## Digital visual history: historiographic curation using digital technologies

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### ABSTRACT



Digital technologies are revolutionizing the way we study and understand history. Historical sources and material evidence are increasingly being transformed into digital objects and integrated into larger databases, offering new ways of researching history in the digital age. This article reviews dominant practices that deal with new forms of historiography. It does so by offering digital curatorial practices and outlines a new methodological concept of *digital visual history*. For that purpose, the article explores a particularly challenging test case of historical visual sources, which not only had a lasting effect on the collective historical imagination but has also increasingly turned digital: the difficult visual heritage of the Holocaust. Highlighting significant aspects of the afterlife of these visual sources, the article uses as an example the digital infrastructure developed in the framework of the EU Horizon 2020 project ‘Visual History of the Holocaust: Rethinking Curation in the Digital Age’ (VHH) (2019–2023) that aims at (re)contextualizing Allied atrocity records as relational and migrating images. In doing so, the article demonstrates how, through the combination of historiographic practices of curation and digital technologies, the visual heritage of past events is revealed as dynamic and interconnected.

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### Introduction: towards *digital visual history*

Big Data, artificial intelligence, machine learning, algorithmic recommendation and advanced search engines: in the twenty-first century, digital technologies have become essential tools for recovering, exploring and narrating the past. These technologies also affect our understanding of historiography, making it an inherently curatorial practice. Historical sources and material evidence are transformed into digital objects and

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become part of larger networks of databases that offer new ways of researching history in the digital age. This is particularly relevant for historical visual sources that depict the atrocities of the Holocaust, as they are not only disturbing and sensitive but also hold both tangible and intangible historical information that often remains obscured in the digital age.

With the growing temporal distance from the historical event, scholars, curators and educators are faced with the significant challenge of interpreting and mediating their heritage. Public perception of the Holocaust is to a large extent shaped by visual media: historical footage and photographs circulating in films, on television, in YouTube videos or Internet memes. Video games as well became ‘a primary medium through which the public consumes history’ (Denning 2021, 182), with popular examples such as *Wolfenstein: The New Order* (2014) or *Call of Duty: WWII* (2017) explicitly relying on Holocaust-related imagery such as camps, barracks and number tattoos (Pfister 2018; Ebbrecht-Hartmann, Stiasny, and Schmidt 2022). Distributed widely in historical exhibitions, museums and school books, those images in particular stimulated the public imagination of the historical events (Stier 2015; Schönemann 2019).

Changing media environments and digital technologies offer new opportunities for tackling this challenge and managing difficult visual heritage, such as that of the National Socialist atrocities and the liberation of the Nazi concentration camps. Huge collections of digitized images and footage are provided by museums and memorials such as Yad Vashem and the United States Holocaust Memorial Museum, offering access through online archives and search engines. Launched in 2021, the project *#LastSeen – Pictures of Nazi Deportations* collects, explores, digitizes and exhibits photographs from archives and private collections that document the deportation of German Jews 80 years ago (Gruner 2022).

Such digital initiatives have the potential to create spaces for active engagement, negotiation and participation that render past events relevant and accessible to a contemporary audience, reaching well beyond the practices of re-experiencing or re-enactment. Until recently, such practices have dominated ‘classic’ commemorative rituals and ceremonies, consequently also dictating the forms of Holocaust remembrance in conventional visual media such as film and television (Avisar 1988; Insdorf 1990; Baron 2005). However, with the advent of digital and online media environments, interactive and participatory practices of commemoration have begun to gain special attention to less controlled modes of engagement

with history, in the process developing innovative ways of using new technologies to interact with history (Kansteiner 2017; Ebbrecht-Hartmann 2021; Henig and Ebbrecht-Hartmann 2022). According to media and memory scholar Anne Reading (2003, 68), this shift places ‘greater emphasis on agency and the relationship between the user’s identity in relation to learning history and developing socially inherited memories’. This approach constitutes the theoretical as well as the technological foundation on which the field of digital history has emerged.

Against this introduction, we offer to rethink the visual history of the Holocaust in relation to digital historiographic practices of curation. Using the digital infrastructure developed within the context of the EU Horizon 2020 project ‘Visual History of the Holocaust: Rethinking Curation in the Digital Age’ (VHH) (2019–2023) as an example aiming at (re)contextualizing Allied atrocity records captured during and in the aftermath of the Holocaust, the article examines the concept of curation concerning digitized films related to the Holocaust and other visual-media collections that engage with its memory, both directly and indirectly. The article delves into key aspects of this challenging visual heritage and illustrates how, through the combination of historiographic curatorial practices and digital technologies, this heritage can be understood as dynamic and interconnected. In doing so, the article demonstrates how far digital infrastructures for researching and curating historical visual records can go in offering new forms of experience and user participation as an innovative relational approach to engaging with disturbing pasts – and their related images – as part of *digital visual history*.

### **From mass media circulation to image migration**

German-Jewish émigré and cultural theorist Siegfried Kracauer argues that there are astonishing affinities between film and history that can deepen the understanding of our engagement with difficult histories through visual media. In his examination of ‘phenomena overwhelming consciousness’, Kracauer ([1960] 1997) emphasizes the revealing function of the camera as a tool for representing atrocities ‘without distortion’ (57). As an example of a film that renders ‘visible what is commonly drowned in inner agitation’ (58), Kracauer mentions Wanda Jakubowska’s early depiction of Auschwitz in *Ostatni Etap (The Last Stage)* (1948). According to Kracauer, such a cinematic configuration makes it possible to follow certain shocking events from a secure yet present spectator’s position, internalizing the sights of horror without being physically affected by them.

Considered images that ‘shock insofar as they show something novel’ (Sontag [1977] 2008, 14), the Allied films and photographs from the liberated camps serve as a key example of Kracauer’s ([1960] 1997) understanding of the mediation of such horrors. He claims that by ‘experiencing the rows of calves’ heads or the litter of tortured human bodies in the films made of Nazi concentration camps, we redeem horror from its invisibility behind the veils of panic and imagination’ (306). Some of the many images captured by Allied cameramen include footage taken by the Red Army after the liberation of Majdanek (July 1944) and Auschwitz (January 1945), which depict former inmates in striped uniforms standing behind barbed wire fences. American cameramen also filmed in Dachau, Flossenbürg, Buchenwald, Mauthausen and at other atrocity sites, including General Dwight D. Eisenhower’s visit to Ohrdruf in April 1945. Following his visit, Eisenhower wrote to General George Marshall that ‘the visual evidence and the verbal testimony of starvation, cruelty, and bestiality were so overpowering as to leave me a bit sick’ (Michalczyk 2014, 24).

Kracauer posits that the film screen and the chemical imprint on photographic paper enable the post-war spectator to confront such shocking images. He explains that the mechanical reflection allows for the viewer ‘to take them in and thus incorporate into his memory the real face of things too dreadful to be beheld in reality’ (Kracauer [1960] 1997, 306). Kracauer notes that the translation of historical atrocities into memory through visual representation transforms ‘the agitated witness into a conscious observer’ (58). In other words, the analog media of film and photography offer the opportunity to study the shocking conditions in the liberated camps as evidence and turn them into visual memories. This, however, is an effect of the passive spectatorship resulting from the cinematic configuration and/or photographic objectivity, which is further enforced through the ongoing process of image circulation.

The mass media circulation of images from the liberated concentration camps has been critically examined by film scholar Anton Kaes (1992), who views it as ‘an eternal cycle, an endless loop, in a Möbius-strip of cliché images’ (39). He argues that ‘the pictures of concentration camps are well-known ones; no one would fail to recognize them. Seeing these images again as part of a television series produces a *déjà vu* effect’ (312). Due to their iconic status, the ongoing circulation of images from the liberated camps in popular culture has helped to ‘produce, organize, and to a large degree, homogenize public memory’ (Kaes 1992, 309). This has led to these images becoming ‘emblems of atrocity’ (Zemel 2003) and,

consequently, an accepted model for re-enacting the horrors of the Nazi concentration camps in the form of ‘migrating images’ (Ebbrecht 2010).

Migrating images, derived from the relics of the camps, provide a multiplicity of visual placeholders for the Holocaust’s ‘missing images’ (i.e. the atrocities committed inside the closed camps), but they also serve as a ‘generic resource’ for imagining atrocities (Haggith 2006, 112; Ebbrecht 2010). These images ‘not only became new symbols for something hitherto unknown and unimaginable: they also structure our view of contemporary atrocities’ (Brink 2000, 136); as migrating images, the Allies’ visual records no longer only represent the history of the Holocaust but can also intersect with other memories and experiences of genocide, terror and acts of violence. Therefore, these images constitute a visual model for other post-1945 representations of genocidal terror, inciting new movement within recollections of liberation imagery. Consequently, those images ‘have created a technological memory bank that is shared by everyone and offers little escape’ (Kaes 1992, 310).

In this context, while Kaes’s observation accurately notes the role of these migrating images in the construction of a shared technological memory, it nevertheless overlooks the much more complex dynamic of image relations. As images migrate through popular culture, they leave a trace and create new connections with each iteration. These connections establish a complex network of image relations that, on the one hand, demonstrates the impact of the visual heritage of migrating images on the memory of the Holocaust and, on the other hand, provides new access points for engaging with its visual heritage in critical and reflexive ways. Referring to Hannah Arendt’s thoughts on critical judgment, film and media scholar Tobias Ebbrecht-Hartmann observed the reflexive potential of migrating images already in his initial critical conceptualization of the term (Ebbrecht 2010, 98):

Turning towards media representation of the Holocaust and migrating images drawn from the event but placed in a different context, the crucial question is if and how popular media enables us to realize this epistemological potential of the spectator’s position or whether it transforms representation into a mimetic aesthetic avoiding imagination and reflexive memory.

Reviewing this concept a decade later, it becomes obvious that the sole focus on media representations is too narrow to fully understand the effects of migrating images. The assumption that these images and the memories associated with them travel by themselves (Erll 2011) implies a certain form of agency similar to what art historian Horst Bredekamp

(2017) characterizes as ‘image acts’, which position the migrating image at a speaking position that enables it to play an active role in the interaction with the spectator. As such, migrating images must be understood as highly relational.

### Historiographic curation in the digital age

Today, digital technologies offer a variety of new options for researching, reviewing and re-editing migrating images as relational entities. They transfer Kaes’s ‘memory bank’ created by mass media circulation in the age of electronic dissemination into mobile and dynamic online collections. Based on digital repositories, such online collections have the potential to establish transtemporal and trans-spatial connections, inter-relating the afterlife of migrating images with their historical context (Ebbrecht-Hartmann 2016). This suggests another transformation within the mediation of phenomena overwhelming consciousness: If, as Kracauer argues, film and photography transformed the agitated and paralyzed observer of atrocities into a conscious-though-passive spectator, then digital technologies turn the latter into an active participant in the process of writing and exhibiting history.

An innovative pre-digital model for this approach is Aby Warburg’s famous *Mnemosyne Atlas* (Ohrt and Heil 2020), which demonstrates specific configurations of images through the practice of curation (Grundtmann 2020, 4). Through this practice, Warburg not only sought to recontextualize images within their historical context but also to identify connections between them based on visual similarities that reveal unexpected relations (Grundtmann 2020, 12); as art historian Georges Didi-Huberman (2011, 2) describes it: ‘To sample chaos, to make sections to retrieve from it [. . . –] packets of images, and to make all of this visible on planes or on *plates of visual consistency*’. Didi-Huberman emphasizes the networked character of these ‘packets of images’ and proposes the metaphor of archaeological exhumation of what he calls ‘surviving images’ (see also Didi-Huberman 2002). This highlights the synchronic as well as diachronic dimensions of both the migration of images and Warburg’s curatorial practice of sampling ‘by means of interposed images’ (Didi-Huberman 2011, 1) as a method of visual analysis, which, to a large extent, has had a significant impact on the development of the field of visual history. Historian Gerhard Paul (2011) explains that visual history is:

more than an additive expansion of the canon of history studies or the history of visual media. It addresses the whole field of visual practice as well as the visuality of experience and history. Methodologically, the research design of visual history is transdisciplinary and has an open structure. Depending on the object of study, it uses [sic] in particular methods of art history, media and communication science.

In Paul's view, images should not only be evaluated based on their pictorial quality but also their capacity to act and, thus, their ability to intertwine with, even create, reality (see also Bredekamp 2017). However, considering images in the broader sense, that is, 'both as sources as well as independent artifacts of historiographic research' (Paul 2011), the research field of visual history initially focused primarily on the medium of photography (Jagschitz 1991). With the globalization of Holocaust memory and its gradual entry into the digital era, new concerns have emerged regarding the ways in which images participate in shaping that past in relation to other media as well. Thus, while 'all histories are potentially visual histories' (Grant and Jordanova 2020, 1), research on the visual history of the Holocaust must essentially investigate images as 'generating powers and especially understand image and event or image and act as a unit and not as separate entities' (Paul 2011).

It is also worth mentioning the emerging field of *digital history*, which uses digital technologies to analyze and interpret historical data and sources. Digital history is interested in the investigation of digital materials, in establishing connections between various sources, and in the development of interpretative associations (Cohen et al. 2008, 454). Building on this, historian Joshua Sternfeld (2011, 550) introduces the methodology of *digital historiography*, which he defines as '*the interdisciplinary study of the interaction of digital technology with historical practice*' (emphasis in the original). The combination of digital technology and historical information, according to Sternfeld (2011, 548), enables new forms of relational engagement with the past:

each relationship or potential relationship between units of historical information – brought together by a selection process, a search inquiry, and archival provenance – reflects an act of historical interpretation.

Intersecting various historiographic approaches – especially those concerning the critical analysis and contextualization of historical sources – with the relational logics of computation (i.e. databases), digital history can therefore be described as 'an approach to examining and representing the past that works with new communication technologies' (Cohen et al.



2008, 454; Cohen and Rosenzweig 2006). Accordingly, an important aspect of digital history is its practical dimension: it aims to identify new methods and ways of working with historical materials in versatile digital infrastructures.

Such a multi-layered approach illustrates how fundamentally inclined the digitization of difficult visual heritage is towards relationality, in the sense that it aims to (re)contextualize visual images of past events in relation to their production context(s), specific social and historical environments, material history and other images and textual sources through technological means. The difficult visual heritage derived from the liberation of the Nazi concentration camps perfectly exemplifies this notion of relationality. Integrating a variety of intentions (evidence, shock, virtual preservation of the atrocity sites, mediation and mobilization), perspectives (liberators, liberated and surviving prisoners, perpetrators and visitors/bystanders) (Weckel 2019) and migrating images (Ebbrecht 2010), these depictions partly remediate previous culturally significant or iconic compositional patterns (especially from a Christian iconography), which have significantly shaped the visual memory of the camps and genocidal atrocities.

Within this historiographic framework, and in line with Warburg's *Atlas*, curation plays a crucial role in exposing such relations. As a practice that intersects different visual objects and institutional actors in the GLAM (Galleries, Libraries, Archives, Museums) and heritage sectors, the transdisciplinary and relational qualities of curation have the ability to expose the 'visuality of history and the historicity of the visual' (Paul 2011) in regard to the difficult visual heritage of the Holocaust. That said, however, digital curation is often understood in the limited sense of active data management, such as maintaining, preserving and adding value(s) to digital data to promote its reuse. But digital curation can also be viewed as a scope of action and possibility that has the potential to open 'spaces of agency, in which unexpected encounters and discursive interchanges can take place' (Sternfeld 2013, 141–142). By performing a 'paradigm shift from representation to presence' (144), curation, therefore, plays a key role in multimodal media environments such as digital platforms and social networks (Sabharwal 2015, 54).

As online platforms have emerged as new spaces of exhibition, publication and communication, the domains of data curation and cultural curation have faced ongoing challenges to adapt their definitions to be more inclusive, both in general and specifically in regard to the past. This has led to the creation of new digital assets and environments that respond to the

growing interest in cultural curation practices and, thus, contribute to the development of new forms of digital historiographic curation that can address the complex issues of re-presenting difficult visual heritage.

Understanding digital historiographic curation as a productive interplay between digital data analysis, historical research and exhibition practices can therefore enable the transformation of analog collections of historical sources into participatory and collaborative interactive environments that shift agency from a single curator to multiple users. In such an engaging environment, users are actively invited to participate in the curation of the visual heritage of past atrocities. However, such an environment involves a certain precondition: to encourage active and interactive curation, digital environments need to offer digital tools such as searching, assembling, annotating, editing, comparing, clustering and sharing. These tools actively integrate users into the process of conducting *digital visual history* research.

### **Digitally clustering difficult visual heritage as historiographic curatorial practice**

The importance of relationality and searchability within digital historiographic practices of curation demands that online platforms adjust their infrastructures to allow for the (inter)linking of digital and digitized historical sources in such a way that enables users to interact with the material using ‘a variety of electronically reproduced primary source texts, images and artifacts as well as the constructed historical narratives, accounts, or presentations that result from digital historical inquiry’ (Lee 2002, 504).

The EU Horizon 2020 project ‘Visual History of the Holocaust: Rethinking Curation in the Digital Age’ ([www.vhh-project.eu](http://www.vhh-project.eu)) has made a significant contribution to the field of digital visual history in regard to the difficult task of preserving and understanding the visual heritage of Nazi atrocities. This project, which ran from 2019 to 2023, utilizes digital technologies in order to preserve, analyze and communicate historical evidence of the Holocaust and the (audio-)visual records captured by Allied cameramen upon their discovery of atrocity sites in Germany and Nazi-occupied Europe. The project’s online platform, which currently operates as an advanced prototype for internal research purposes only, provides a digital collection of the dispersed filmic and photographic images from the liberation period and offers various new options for exploration, participation and co-creation to both specialists (e.g. researchers, heritage practitioners, educators, artists, filmmakers)

and laypeople interested in learning more about the visual history of the Holocaust and its aftermath within post-war popular culture as part of the phenomenon of image migration. As a media management and search infrastructure, the VHH platform enables users to review historical visual and textual materials from different perspectives and actively curate them. This process provides a better understanding of how these records were produced, where they were shown, and how diverse audiences reacted to them in different periods; the platform links well-known and lesser-known, occasionally even unknown, edited and raw liberation footage and photographs and some of their later re-creations and manifestations in popular culture to their historical origins, utilizing advanced digitization and automated film, image and text analysis, and geo-devices.

The VHH online platform serves as a valuable case study for further exploring the concept of digital visual history as a methodological approach. By analysing, decoding and mapping the afterlife of the Holocaust's difficult visual heritage by means of digital technologies, it is possible to discover how, and to what extent, migrating images from liberation records have engraved themselves in the public imagination, which visual tropes and iconic representations have evolved from them, and how they can become entangled with other, lesser known, footage. This kind of analysis might even disprove Kaes's (1992) assertion that 'new images are hard to imagine' (315), as 'the infinitely replicable and revisable visual artifact now becoming increasingly familiar via computer screens will progressively change the status of the visual in terms of information and epistemology' (Gaskell 2001, 189). As such, the process of making these data accessible not only increases its availability for historiographic research and history education but also transforms it into a subject of use and reuse, as well as of practices of annotation, transformation and (re)creation. These processes are highly relevant to the field of digital visual history, especially in the context of the digital visual history of the Holocaust that derived from the liberation records.

The VHH platform, by providing both manual and automated options to access the visual heritage of the liberation, advances the possibility of realizing complex image relations reminiscent of what Warburg did manually in his time (Grundtmann 2020, 6). By sampling and clustering dispersed visual evidence and related sources through search results and organizing them with the help of annotations and bookmarks, the platform aligns with Warburg's approach of studying the 'movement and impact of images' (Kalkstein 2019, 50) within the context of contemporary digital-visual culture:

The movement and transformation of images, the special technological significance of photographs, and the fecundity of the archive are all key to Warburg's project, as well as to our increasingly networked, image-laden digital culture. (Kalkstein 2019, 52)

The digital tools of the VHH platform enable clustering processes that allow for the identification of visual tropes and compositional patterns in the liberation records from both synchronic and diachronic perspectives. These discoveries provide new insights into the processes through which images were selected, migrated and, as a result – also iconized within post-war culture. The platform's search engine relies on controlled vocabularies and a variety of other historiographic curatorial practices that can be applied to selected segments of films, which are technically defined as frame ranges. The vocabularies include terms to categorize the content of the images. Scenes are considered to be constituted by specific inter-relations of those categories: 'prisoner (unspecified)' (category: person) and 'barbed wire' (category: place) may constitute the scene 'prisoners behind barbed wire' (Figure 1).

The cluster demonstrates a variety of references to this particular scene, which range from original footage recorded by US-American (2, 3, 4a) and British (5) cameramen to early film compilations of atrocity footage (1, 4b) and feature films (6, 7, 8). The latter contain an Italian and two US-American movies: two historical films and one mystery thriller that is not explicitly related to the history of the Holocaust.

A closer investigation of the clustered frame ranges shows that frame range 2 is further contextualized through additional annotations. A location maker establishes a place related to the Mauthausen Infirmary Camp. Furthermore, it contains a relation marker that indicates that this particular shot was later used in the information film *Death Mills* from 1945 by the US War Department, which presented the visual evidence the Allies had gathered in liberated camps to the German and Austrian public. As part of the early post-war compilation, this and other shots began to migrate into other films and thereby shaped the visual memory of the Holocaust. That was definitely the case for frame range 1, which is part of the early Soviet film *Auschwitz (Osventsim)* from 1945. The VHH platform relates this frame range to films as different as the German documentary film *Die Befreiung von Auschwitz (The Liberation of Auschwitz, 1986)* and Martin Scorsese's mystery thriller *Shutter Island (2010)*. Noteworthy, those shots of people standing behind barbed wire constitute a specific *Pathosformel*, to use Warburg's words. This is further underlined when taking into consideration other visual depictions of the



**Figure 1.** Cluster with frame ranges from a variety of films containing the scene ‘prisoners behind barbed wire’ composed of screenshots: 1: *Auschwitz (Osventsim)*, 1945; 2: Mauthausen, NARA LID 111-ADC-4326; 3: Mauthausen, NARA LID 111-ADC-4319; 4a: Ebensee, NCJF 402; 4b: *Nazi Concentration Camps*, 1945; 5: Belsen, IWM A70 304–3; 6: *Kapo*, 1960; 7: *Schindler’s List*, 1993; 8: *Shutter Island*, 2010.

same theme, such as American photojournalist Margaret Bourke-White's depiction of former prisoners at a barbed wire fence in Buchenwald. The visual analysis of this digitally generated cluster reveals the significance of this particular 'formula', which, through constant variation and repetition, has been transformed into a representative visualization of *the* concentration camp.

Clustering as an analytic tool for digital visual history relies heavily on interrelating data by means of automated computation (Bönisch 2021). Based on a dataset of 10,593 annotated shots from 98 documentary films, in the VHH project, computational tools were trained that enable the 'automated detection and classification of cinematographic settings' (Helm, Jogl, and Kampel 2022, 2087), so-called automatic relation detection. The basic elements of computational-assisted film and image analysis on the VHH platform are shot boundary detection and shot type classification (Helm and Kampel 2019). The first identifies in and out points that mark the beginning and the end of a shot (with abrupt or gradual transitions between consecutive frames). The second identifies four different shot types: close-up shot, medium shot, long shot and extreme long shot in relation to the most representative center frame of a shot (Helm, Kleber, and Kampel 2022, 637). Both shot boundary detection and shot type classification serve as tools for preparing moving-image data for detailed computational-assisted annotation, including camera movement annotations. It also allows the application of the aforementioned controlled vocabularies to each shot as well as to other digital objects (such as images, documents or quotes), thereby tagging particular places, persons, things or scenes. Those tags interconnect different sources and enable the users to connect different digital items through content components or other aspects they share.

Several shots in the 'prisoners behind barbed wire' cluster originate from the Italian-French movie *Kapo* (1960) by Gillo Pontecorvo, which tells the story of the 14-year-old Edith who survives the selection to the gas chamber by hiding her Jewish identity and later becomes a prisoner functionary (Kapo). After falling in love with a Soviet prisoner of war, she decides to assist in an attempt of mass escape, during which she dies. The film was one of the first dramatic depictions of the concentration camps in cinema. Next to the East German drama *Stars* (1959) and the US-American productions *The Diary of Anne Frank* (1959) and *Judgement at Nuremberg* (1961), it is part of a series of movies depicting this topic during the late 1950s and early 1960s.

A look at the barbed wire scenes in *Kapò* reveals that this trope plays an important narrative role in this film and is the most significant detail used for visualizing concentration and extermination camps (Figure 2).

The automatically generated cluster thereby confirms the strong cinematic affection for the trope of the barbed wire fence, especially in films about the Holocaust:

The magnetic deadly attraction of the fence has been indeed one of the real experiences of turning the world upside down, often reported in diaries and other personal accounts, in the ghettos and camps. But given the spatial experience of cinema connected to the expression of wish and its power to manipulate from a distance, the reciprocal negative attraction the fence offers to us, the attraction of death, felt as a magnetic, electrical field, has a strong cinematic effect. And it is reinterpreted again and again in films like Pontecorvo's *Kapo* (Loewy 2004, 196)

If we now compare the 'barbed wire' cluster and the 'prisoners behind barbed wire' cluster, we see that within *Kapò*, three sub-clusters contain most of the shots depicting the people standing behind barbed wire. Those are frames 101,412 to 101,873 showing Terese dying in the electrified fence with three shots, frames 106,840 to 116,107 depicting the punishment of the Soviet POW Sascha with 16 shots, and frames 160,136 to 160,938 showing the main character Edith as Kapo shortly before the mass escape with six shots. Those frame ranges emphasize the symbolic notion of the combination between prisoners and barbed wire. Each of them gains specific narrative and symbolic meaning in relation to the repeated use of the barbed wire trope. The first frame range symbolizes distress and the second resilience. The third illustrates Edith's decision. She has to choose between the two previously symbolized options. Hence, all three frame ranges are narratively connected and relate to the specific development of the film's main protagonist.

This observation made by analyzing the automatically generated cluster is particularly interesting because it relates to a controversial shot that became 'a critical topos and shorthand for the ethical risks at stake in reconstructing the Nazis' crimes or other historical atrocities' (Saxton 2008, 17). This debate goes back to a review of *Kapò* published by the French critic and director Jacques Rivette in 1961, in which he denounced the depiction of Terese's death in the electric barbed wire fence as ethically contemptible. Rivette particularly denounces the use of the forward tracking shot that approaches Terese's dead body from beneath and positions her hand in the corner of the sequence's final frame (Rivette 1961; see: Quintana 2001). Based on Rivette's description and mentioning that he had



Figure 2. Cluster of annotated frame ranges from the Italian-French movie *Kapò* (1960) that contain barbed wire.



never seen *Kapò*, art and film critic Serge Daney in 1992 repeated the fundamental rejection of the film, and specifically emphasized the lack of distance in Pontecorvo's shot of actress Emmanuelle Riva as Terese (Lindeperg 2010, 311–314). This dispensable and embellishing traveling shot, Daney (2000), 36) complained, had replaced him by force from the position of a witness and enclosed him into the image, a place where the spectators did not belong. In contrast, he votes for a cinema in which either the spectator or the film halts the continuous flow of images. Such disruption of the image would emphasize gaps and absences as well as those images that are missing (Daney 2000, 26).

Although film scholar Libby Saxton (2008, 17) in the introduction to her seminal book *Haunted Images* about film, ethics and testimony correctly points to the fact that Rivette 'slightly misremembers the framing in question, and it is on his misrepresentation that Daney finds his own argument', she nevertheless agrees with the broader criticism of Pontecorvo's aesthetic decision. The last visible image of Riva indeed does not place her in the corner of the frame but in the center of the shot, framed by the fence and the barbed wire, with her hand pointing not towards the corner but upwards towards the frame's off-screen-space. Relying solely on Daney, film scholars nevertheless continued to evoke a 'close-up image' (Silverman 2013, 84) for finishing the tracking shot, which actually ends in a medium shot of Terese's dead body.

Astonishingly, the computational analysis of 'the travelling in *Kapo*' (Daney 2000, 16) reveals that it is effectively composed of three distinctive shots (Figure 3). The first (frames 101,412–10,1516) depicts Terese running towards the electrified fence in a long shot, with the camera placed behind the barbed wire. Disrupting the visual composition, the barbed wire situates the shot within the context of the film's main recurring trope. This shot is followed by an abrupt transition to a close-up shot, which constitutes the impression of a sudden jump-cut that emphasizes the distress and shock embedded in the scene. In conjunction with the distressing sound, the abrupt transition to a tracking shot, which results in a medium shot of the dead body, continues with the sequence's disruptive montage. Its order reverses the classical montage structure, which traditionally would move on from a long shot through a medium shot to the final close-up shot of Terese's face. The tracking shot towards the dead body in the fence thereby constitutes a counterintuitive movement and establishes a precarious and insecure viewing position. It abruptly halts in the position of a medium shot and thereby keeps its distance to the fence.



**Figure 3.** Screenshot depicting the three distinctive shots related to *Kapò's* controversial travelling shot on Terese's dead body in the fence.

The shot-based analysis of the sequence with the help of computational annotations showed that Rivette did not only misremember the traveling shot in *Kapò* but most likely re-structured the disruptive montage in his memory and turned it into a more bearable and less distressing sequence. Despite the indeed problematic, excessive and theatrical acting in this sequence, the cinematography and montage of *Kapò* strive for an aesthetic that actually translates the experience of witnessing into disturbing and disruptive aesthetics. By basing his own criticism on Rivette's denunciation, Daney does not realize that 'the travelling in *Kapò*' is actually marked by disruption and imposes an interruption of the continuous flow of images. This is particularly indicated by the last frames of the third shot, which actually does not end with the image of Terese in the barbed wire – as Rivette had recalled it – but fades into black: a metaphoric response to the stop demanded by Daney.

### Relational history

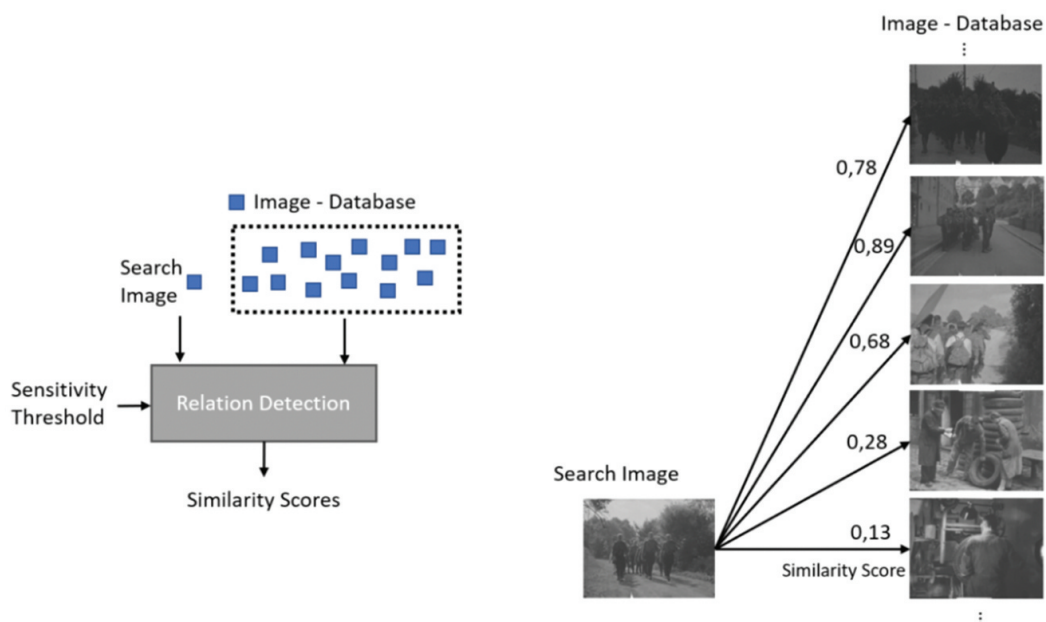
*Kapò*'s visualization of concentration and extermination camps heavily relied on existing depictions of the camps, though these images were taken after liberation. In doing so, it also contributed to the process of typification within the visual memory of the Holocaust (Loewy 2004, 190), even despite the fact that it did not become a canonical part of film history (Daney 2000, 17).

A computationally assisted analysis of Holocaust-related films and other visual media allows us to rediscover those relations established by the explicit or implicit use of previous depictions, such as the footage filmed after the liberation and their afterlife in popular culture. Correspondingly, the uniqueness of the VHH platform lies in its ability to point to a variety of references that connect those post-war representations with historical images that might have served as models for later depictions. Analytically speaking, additional relations were and can be added to an ongoing network of visual ties, which reveal the various meanings and symbols attributed to the difficult visual heritage of the Holocaust in popular culture contexts.

Automated relation detection assists in this ongoing effort by offering complex interrelations between different visual materials (Helm and Kampel 2019, 26). Trained on a predefined visual dataset, such relation detection aims towards automatically identifying compositional similarities that connect a specific image to other images.

Relation detection can assist in finding identical frames and frame ranges that are used in different films, as well as the appearance of similar frames frame ranges, for instance, original footage that was cropped or manipulated visually. This also includes frames and frame ranges that include analog compositions (Figure 4). Such analog compositions could be reenactments of historical depictions as well as allusive references, and interconnect the respective shots in a variety of films or other visual sources. It measures a score that indicates the degree of similarity, which allows for scaling different grades of automatically detected visual relations. While the use of a specific shot in another film would get a high score, which indicates a direct use of existing footage, a lower similarity score would indicate a more indirect, allusive reference to a specific visual trope.

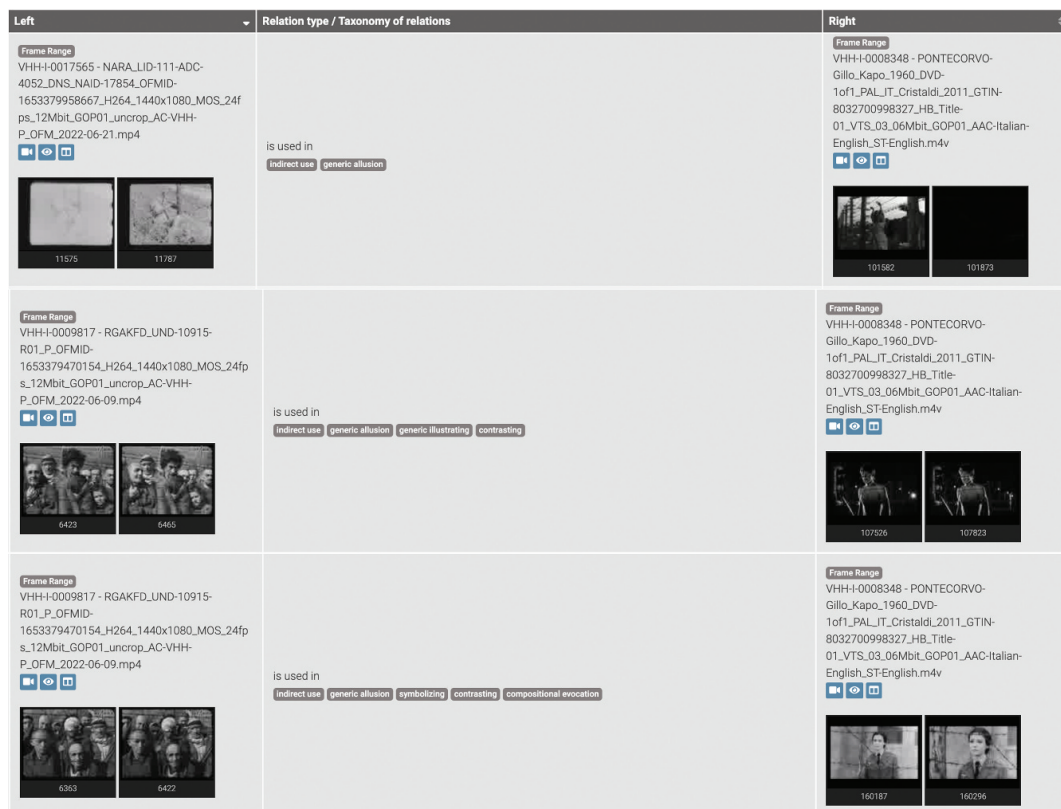
Based on such automated detected relations and on manual annotations, the VHH platform makes it possible to identify and qualify relations between film shots as well as photographs, which enables a digitally assisted detection of image migration and thereby allows writing visual history with the help of digital means. In the case of *Kapò*, the frame ranges depicting ‘prisoners behind barbed wire’ refer to others from liberation footage filmed at different locations (Figure 5).



**Figure 4.** Daniel Helm and Martin Kampel, Relation Detection. Online: <https://cvl.tuwien.ac.at/teaching/diplomarbeiten/relation-detection-image-similarity-measurement-in-large-historical-archives/>.

The implicit relations to archival footage indicate a generic relationship between the dramatizations in *Kapò* and the films taken by allied cameramen at different sites of atrocity. The frame range depicting the dead body of Terese in the electrified barbed wire contains a use annotation, which connects it to footage taken by American camera teams in April 1945 at the Leipzig-Thekla concentration camp. This was a sub-camp of the Buchenwald concentration camp, which primarily hosted political prisoners from Russia, Poland and France. Shortly before liberation, SS troops burned down buildings filled with prisoners. Those who managed to escape had to climb over an electrified barbed wire fence. Many were shot by machine gun fire and died in the fence. The frame range related to the shots in *Kapò* documents those victims.

The VHH platform interconnects this shot with frame ranges in several films that later used this specific footage, among them the compilation films and newsreel report *Death Mills* (1945), *Nazi Concentration Camps* (1945), *Welt im Film* No. 5 (1945), *Deutschland erwache* (1945) and *Staff Film Report #53*, a secret staff briefing film produced by the Signal Corps for the War Department with scenes from different



The screenshot displays the VHH platform interface, showing relations between frame ranges from *Kapò* and liberation footage. The interface is divided into three rows, each representing a different relation type. The 'Left' column shows the source frame range, and the 'Right' column shows the target frame range. The 'Relation type / Taxonomy of relations' column indicates the nature of the connection.

Left	Relation type / Taxonomy of relations	Right
<p>Frame Range</p> <p>VHH-I-0017565 - NARA_LID-111-ADC-4052_DNS_NAID-17854_OFMID-1653379958667_H264_1440x1080_MOS_24fps_12Mbit_GOP01_uncrop_AC-VHH-P_OFM_2022-06-21.mp4</p> <p>11575 11787</p>	<p>is used in</p> <p>indirect use generic allusion</p>	<p>Frame Range</p> <p>VHH-I-0008348 - PONTECORVO-Gillo_Kapo_1960_DVD-1of1_PAL_IT_Cristaldi_2011_GTIN-8032700998327_HB_Title-01_VTS_03_06Mbit_GOP01_AAC-Italian-English_ST-English.m4v</p> <p>101582 101873</p>
<p>Frame Range</p> <p>VHH-I-0009817 - RGAKFD_UND-10915-R01_P_OFMID-1653379470154_H264_1440x1080_MOS_24fps_12Mbit_GOP01_uncrop_AC-VHH-P_OFM_2022-06-09.mp4</p> <p>6423 6465</p>	<p>is used in</p> <p>indirect use generic allusion generic illustrating contrasting</p>	<p>Frame Range</p> <p>VHH-I-0008348 - PONTECORVO-Gillo_Kapo_1960_DVD-1of1_PAL_IT_Cristaldi_2011_GTIN-8032700998327_HB_Title-01_VTS_03_06Mbit_GOP01_AAC-Italian-English_ST-English.m4v</p> <p>107526 107823</p>
<p>Frame Range</p> <p>VHH-I-0009817 - RGAKFD_UND-10915-R01_P_OFMID-1653379470154_H264_1440x1080_MOS_24fps_12Mbit_GOP01_uncrop_AC-VHH-P_OFM_2022-06-09.mp4</p> <p>6353 6422</p>	<p>is used in</p> <p>indirect use generic allusion symbolizing contrasting compositional evocation</p>	<p>Frame Range</p> <p>VHH-I-0008348 - PONTECORVO-Gillo_Kapo_1960_DVD-1of1_PAL_IT_Cristaldi_2011_GTIN-8032700998327_HB_Title-01_VTS_03_06Mbit_GOP01_AAC-Italian-English_ST-English.m4v</p> <p>160187 160296</p>

**Figure 5.** Screenshot depicting relations between frame ranges from *Kapò* and frame ranges in liberation footage.

liberated countries. This indicates that, although the shot seems to be less iconic today, it was used quite frequently immediately after the end of the war. Interestingly, *Deutschland erwache* and the *Staff Film Report* edit the shot referenced in *Kapò* together with shots depicting women, most likely Soviet slave laborers, standing behind the barbed wire while mourning the dead, another variation of the ‘prisoners behind barbed wire’ trope (Figure 6). This montage intersects two sub-categories, ‘dead and living prisoners behind barbed wire’, which correspond to the symbolical use of the trope in *Kapò*. The first group, depicting dead prisoners, emphasizes atrocities and death, and the latter that shows surviving prisoners behind barbed wire contain the notion of resilience and survival. Hence, although that the depiction of Terese’s dead body in *Kapò* was much more likely directly inspired by an iconic photograph of a dead body in a barbed wire fence that was already used by Alain Resnais in his seminal film *Nuit et brouillard* (*Night and Fog*, 1955), the use annotations added to the frame ranges from *Kapò* intensify the narrative function of the three sequences that refer to the trope ‘prisoners behind barbed wire’.

The second (resilience) and the third (transformation from distress to resilience) frame range showing prisoners behind barbed wire in *Kapò* display a use annotation that relates them to two consecutive shots from footage filmed by cameramen attached to the Red Army’s First Ukrainian Front in late January and early February in Auschwitz. They were part of the two-reel film *Osventsim* (*Auschwitz*), which the Soviets released in May 1945, and that ‘left a significant trace, its footage recurring frequently in visual representations of the Holocaust, from *Night and Fog* to *The World at War* and beyond’ (Hicks 2012, 174).

The shots show survivors standing behind barbed wire. Most likely, the camera is positioned inside while the liberated prisoners gaze at it from outside the fence. Though *Kapò*’s implicit use of the shots alters the original footage by zooming in on only one prisoner, they rely on the symbolical impact, which the shots gained specifically through *Nuit et brouillard*. As the use annotation illustrates, the shots play an important role in Resnais’s montage. They interconnect the visible evidence of Nazi atrocities and depictions of former perpetrators rejecting any responsibility in the film’s narrative. In this montage, the survivors behind barbed wire are introduced as silent but resilient prosecutors (Lindeperg 2010, 148, FN 72).

Correspondingly, *Kapò* uses the implicit reference to these specific shots in order to emphasize Sascha’s heroic resilience in the face of torture and to mark Edit in her Kapo uniform as a character that finally decides to resist.



**Figure 6.** Screenshot depicting shots of women behind a barbed wire fence that follow the image of a dead body trapped in barbed wire filmed in April 1945 in the Leipzig-Thekla concentration camp in *Deutschland erwache* (1) and *Staff Film Report #53* (2 + 3).

Another use of annotation, however, sheds light on the original context of the making of these shots. In the film *Die Befreiung von Auschwitz*, which exhibits the shots of the former prisoners gazing through barbed wire into the camera as final images of the film, former Soviet cameraman Aleksandr Vorontsov from the First Ukrainian Front recalls his encounter with the liberated prisoners:

Hundreds of people stood by the barbed wire fences and looked at our soldiers. There was fear in their eyes. They did not know that these were Soviet soldiers, that these were liberators. They had expected the worse and expected death. We took pictures of the faces of these human beings. (Quoted in: Kondoyanidi 2010, 457)

Thus, the computational use annotations establish relations between historical liberation footage and its later use that reveal historical context information as well as different layers of implicated and explicit meaning, which they gain while migrating into popular culture.

## Conclusions

The methodological concept of *digital visual history* presented in this article is built on the use of digital platforms that offer enriched metadata and detailed annotations that create new opportunities for exploring difficult visual heritage as a subject for historiographical research. Digital visual history encourages users to critically analyze the use, as well as the mnemonic role, of visual media by tracing their circulation and migration within visual popular culture and related fields, revealing new relations between various digital objects and images and allowing for an interrelation of the visual appearance, production context and afterlife of migrating images. This innovative approach shifts away from the traditional position of the passive observer; it enhances interactivity and transforms the observer into a user as an active participant and co-creator in the process of studying visual history in the digital age.

The article discussed the VHH platform, and, more specifically, the trope of ‘prisoners behind wire’ as a case study, exploring how computational-assisted annotation and visual analysis can create clusters of frame ranges that reveal significant patterns in historical visual records and popular representations of the Holocaust. Annotated shots and automated shot type classification assisted in a close analysis of sequences that enable new readings of canonical representations and



image migration. Using this case study, the article shows how the integration of computational annotation tools and historiographic curatorial strategies in digital analysis can interconnect both images and other objects based on various indicators, providing diverse research perspectives on the visual heritage of historical events, such as the Nazi atrocities and the Holocaust.

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