Digital Approaches to Art History and Cultural Heritage

Thursday, March 4th, 2021

The Matter of Data. Architecture as Navigational Device

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In this paper we would like to present how we use 3D modelling of buildings as a navigational device for a comprehensive online database (https://documentary-architecture.org). We will present the method of "Documentary Architecture" developed by the Centre for Documentary Architecture in which we explore buildings as documents and built environments as archives in which history is inscribed. For our recent research and exhibition, titled "The Matter of Data", we conducted a comprehensive documentation and archiving project of modernist buildings of the 1920-40s — as they mark the international trajectories of forced exile and migration of architects, inhabitants, owners as well as the migration of ideas and objects. For the architectural historian and theorist, the possibilities of digital connectivity between various locations challenge the conception of narrating architectural history (i.e. with respect to the building's periodisation or their specific geo-political context). Simultaneously the focus on buildings as documentary devices open to another scale and discipline of investigation in which digital historiographies and preservation studies can find new relationships and intersections. Exemplified through a case study in Tel Aviv, the so-called Max Liebling House, we show how a building could be understood as a prism through which different histories are entangled and diffracted. In our analysis, the building brings together the story of its inhabitants with those of the Jewish Bauhaus students who had arrived in Mandatory Palestine. Also, it connects the growth of pre-World War II city of Tel Aviv with the import of building materials from Nazi Germany; moreover it leads beyond the border of British Mandate Palestine to the development of Bauhaus modernism across the Sykes-Picot line. In our presentation we will show a digital platform in which the materiality of the building — recorded and documented through drone photography, photogrammetry, 3D modelling and microscopic analysis of the chemical structure of building materials and paints — is interlinked with a variety of media collected by the CDA, ranging from interviews to archival research. As a tool potentially under constant construction, it is meant both for historians and for the interested public. The archive simultaneously engages with finding new access to the physical materiality of the objects of our analysis — artefacts, buildings, environments — and attempts to chart the web of relations, connections and patterns in which these material objects are nested. Aiming to experiment with new possibilities of intersecting analogue and digital data, we have scripted virtual »promenades« through the house that give users access to various themes of our investigation. The visitor can either follow these or explore the house independently. As such, the building's very (3D) structure is presented as a spatial data archive, unpacking and narrating the building's »deep memory«.

»The Matter of Data.« Architecture as Navigational Device in Digital Archive Design

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The use of three-dimensional virtual documentation and reconstruction models has been understood as a heuristic tool in historical building research since the second digital turn at the latest. In addition to their function as mediators of certain visual ideas, these models make a decisive contribution to clarifying our understanding of construction processes, construction phases, interior design or constructional contexts up to detailed solutions. The context and scientific value of the reconstruction models in particular is closely related to the real object, but the modelling itself is usually detached from it. The paper introduces the technical approach and workflow of an interdisciplinary project, which is funded by the German Research Foundation (DFG) and running since November 2019. With the technical possibilities of Augmented Reality (AR) we directly link precisely the above-mentioned process of reconstruction modelling with the building remains on site. Using Microsoft's AR-Glasses Holo Lens 2. Therefore, a previously recorded three dimensional and georeferenced documentation model overlays the actual building in order to build the virtual reconstruction directly on the object. In this environment, the reconstruction is connected to both, the digital model and the real building. The goal of the first stage of the development of "Augmented Reconstruction" is not to create a final reconstruction model, but rather to implement and visualize working hypotheses, architectural solutions and initial reconstruction approaches on site. An integral part of the project is the connection of all persons involved in the reconstruction process at the object. By streaming directly from the AR-Glasses to different devices, e.g. smartphones, tablets or VR-environments, it is possible to allow a broad, interdisciplinary discussion from any location. Hence, it is possible to add further experts such as conservators, architects, art historians or archaeologists to the person reconstructing the building on site. The results of this collaborative work can immediately be implemented in the reconstruction. The aim of the interdisciplinary project, carried out in cooperation with computer scientists, architects and communication designers, is to develop a digital tool for the methodical application of this new approach. The UNESCO World Heritage Site of the Roman Barbara Baths at Trier/Germany will be used for processing and beta-testing the tool.

«Hospitalis»: a digital art history project for the study and valorization of welfare architecture

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Portugal

The reality of hospital architecture in Portugal, in the transition from the Middle Ages to the Modern Age, is quite heterogeneous and complex. In historical terms this moment is crucial and challenging; the period of the so-called reform and modernization of assistance, initiated by D. João II with the process of reorganization of the care institutions, namely the unification of small units, their assets and incomes, in larger institutions and with greater capacity of the challenges of the beginning of modernity. This institutional change will lead to modifications of buildings, that is, the institutional type will define a new architectural typology. They originated the construction of new hospitals, of larger dimensions, making possible the renovation of the hospital architecture and the application of new architectural models. This process would culminate in the creation of the Misericórdias, which decisively marked the general panorama of assistance in Portugal during the Early Modern Era. In this sense, and with a view to redefine the research problems that establish the analytical framework of Portuguese welfare architecture in the 16Ith century, was conceived the project Hospitalis – Hospital Architecture in Portugal at the dawn of Modernity: identification, characterization and contextualization, recently approved and carry out by the School of Art and Humanities of the University of Lisbon and funded by the Portuguese agency for Science and Technology (FCT).

This project, frame worked in the Art history discipline, have an important digital component to support the virtual reconstruction of some of these buildings. Due to the chosen chronology and the multiple architectural remodelings to which the hospital buildings were submitted, both for aesthetic reasons and the evolution of the practice of medicine, some of them were destroyed or are very altered; in this sense, and based on the assumptions of the crypto history of art (Cf. Vitor Serrão, A Cripto-História da Arte. Análise de Obras de Arte Inexistentes, Lisboa, Livros Horizonte, 2001), we will promote their virtual reconstruction based on documental sources that describe them. These virtual reconstitutions aim the support of research and the buildings' analysis, in order to compose the global framework of the hospital architecture at the dawn of Modernity and the establishment of an instrument for the valorization and diffusion of this specific cultural heritage.

The present communication goal is to validate one of the hypotheses of this project regarding the importance of "tombos" – documental source with the description of properties belonging to the hospitals for the reconstruction of disappeared buildings. For this assessment we will use descriptions existing in "tombos" related to buildings that still exist today and compare the reconstructions carried out with the current building to assess its likelihood and the relevance of this source for this type of reconstruction.

Pedagogy Initiative; Recording Architectural and Cultural Heritage in the United Arab Emirates

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United Arab Emirates

Within the past decade, many scholars and practitioners have utilized digital techniques, such as: laser scanning and photogrammetry, among other technological advancements in the field of 3D&4D surveys and modeling, building information modeling (BIM), and virtual and augmented reality (VR & AR). 'Informative' models have replaced 2D drawings, and digital tools and methodologies have enabled the management of vast amounts of gathered data. This has diversified and arguably altered the modes of architectural representation. The two most widely spread applications are in the field of building industry and cultural heritage. The presented case study takes a very different angle and narrates a pedagogy approach of introducing Intermediate Interior Design students to the realm of technology application. Commencing from a technical class, the authors utilized an applied practice learning approach engaging the students in a research collaboration. The initiative took place at Zayed University, Abu Dhabi campus, UAE. The study was conducted in collaboration with Abu Dhabi Department of Culture and Tourism (DTC); a government authority in charge of managing the archeological sites in Al Ain. DTC also looks after the few surviving modern architectural heritage examples that represent the built environment transformation upon the oil discovery, when modern building material was just started to be imported. Although these structures are often 'appreciated' for their modern architectural heritage importance in the UAE's history, they continue to be perceived by the general public as less desirable when compared to the modern structures. In addition, there is very little documentation publicly available on these buildings. The students worked in groups and as individuals to record and represent many of the tangible and intangible values of Al Qubaisi house (the selected site), looking at it both as an object and as a memory. The research was conducted in two parts; onsite data collection and offsite data analysis and documentation. The final results took two main formats;

1. Technical representations in a form of orthographic drawings, walkthrough video generated from processed point cloud data and a prototype.

2. Ephemeral representations through elevational photographs of past reimagined condition. Despite the limitation presented within the case study, both in its outreach and scope, the authors present two important contributions;

1. Introducing the importance of documenting UAE modern heritage to future Emirati designers through active engagement and practice experience, thus taking a bottom-up approach into possibly affecting the perception of tomorrow's community. The proposed will help increase the awareness of the importance of these buildings' existence and potential uses.

2. Proposing a template for Modern heritage documentation in a form of a book example; currently being edited and reviewed by the authors.

Reconstructing Florentine church interiors: notes from the field

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In a Digital Art History project aiming to visualise spatially historical data that link to specific sites in Florence over time, church interiors can provide a valuable case study. Reconstructing ritual topographies means gathering information on material culture, religious politics, and networks of artistic patronage; analysing how these and other factors interrelate offers a new paradigm for the contextual research of artworks. In this process, using GIS mapping to reconfigure dispersed artworks and link them with their patrons has the potential to offer a step change in our understanding of how artistic ensembles (e.g. church altars) have evolved over time, while integration of reality-based 3D data capture with interpretation-based modelling further enriches the digital visualisation of lost contexts. Specifically, while some church interiors have been preserved over the centuries, only being subject to light refashioning of decorative cycles but leaving the buildings largely intact, others are completely lost, whilst some architectural elements still survive embedded into Florence's built fabric. By addressing the question of why 3D visualizations deserve consideration as stand-alone forms of scholarly communication, this talk will review the process of research-based reconstruction of a church interior by considering how different research questions, and uneven on-site evidence, raise different challenges and call for different methodological responses. It will focus on the case study of the church of Santa Maria degli Innocenti,a building that still exists in its main features, and whose major artworks are today displayed in the nearby local museum.This example provides an opportunity to discuss a workflow for visualizing uncertainty, addressing gaps in the sources, and acknowledging the limits of scholarly interpretation in digital reconstructions. It will finally expand on the benefit of semantically structured metadata for cross-reading and reusability of digital outputs. Ontologies not only highlight the degree of uncertainty due to gaps and inconsistencies in the sources but also provide a framework for interoperability that can answer different research questions while challenging any unproblematic recreation of the past.

From ideal to true form. Digital photogrammetry as a new paradigm of knowledge

Marco Carpiceci & Fabio Colonnese

Architectural heritage preservation requires a deep, layered and interdisciplinary knowledge of the sites. On the edge between natural and artificial, rock-cut architecture presents specific problems concerning the geometrical complexity of the irregular interior and the continuity between the exterior surfaces and landscape. Although studied, measured and drafted several times in the XX century, some of the Cappadocian sites were known and judged only through drawings showing rectified rooms. Those drawings were produced by scholars like Jerphanion, Rodley or Thierry who used abstract models to negotiate the knowledge of the place, to isolate the building from the landscape and to mitigate its irregularities. For example, some of the carved churches and monasteries were often interpreted as a sort of "full-scale models" of sub divo architectures, also according to a part of the decorative patterns. For decades, plans and sections represented only idealized versions of the caves, implicitly intended as the ideas the creator had in their mind but were unable to transfer to stone.

Digital photogrammetry, in particular laser-scanning and photo-modeling, can today reveal the "true" form of the carved spaces of Cappadocian monuments. Today, scholars can rely on the neutral and (almost) foolproof electronic eye of the machine to survey the irregular tuffaceous surfaces. They can take the numeric models as undoubtable results and study them in a comfortable laboratory. They do not need preliminary models to approach the site with any more and, somehow, their way to convert data into information is radically changing. At the same time, some of the irregularities previously neglected or rectified can be today conjectured to be part of original constructive, perceptive or environmental strategies developed by ancient builders.

In this sense, new kinds of conjectural models are to be developed, according to the true form of this ancient, fragile habitat. As the machine is to be addressed to the peculiar quality of rock-cut architecture, so architectural drawing itself is to be oriented to these specific sites and conditions—developed to serve a number of different goals, from knowledge to preservation and dissemination. In the context of a methodology customised on the rock-cut habitat of Cappadocia, especially Göreme and its surroundings, the authors compare an original envisioning model combining contour lines and chromatic codes with the historical surveys, discuss the way the digital photogrammetry is changing the study and knowledge of these sites and evaluate what are we gaining and losing with the transition to digital.

3D Analysis of Cultural Heritage as a tool for architectural, historical, and archeological research – 3D Mapping the Roman Forum, Rome, Italy

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As early as a hundred years before Filippo Brunelleschi, experiments in spatial depth through the play of geometry had already begun. The mathematical principles of linear perspective were established by Brunelleschi in 1415 and articulated in text by Leon Battista Alberti shortly thereafter. Precise mathematical laws behind geometric creation of a one-point perspective became quite in vogue in the Italian renaissance period. Donato Bramante, under the leadership of Pope Julius II, used it for the first time to create three-dimensional complexity and theatrical experience in the conception of the Cortile del Belvedere at the Vatican. In the 1950s, James Ackermann spent three years in Italy researching Bramante's design of the Cortile del Belvedere as part of his dissertation and published it later as part of the Vatican Palace series.[1] For over half a century, Ackermann's research on the Belvedere has been known to scholars as the premier investigation on the topic. Beginning in 2015, my research has led me to 3D scan the site, uncovering new insights into the field. While Ackermann's study has shown the sloping character of the two sides of the Belvedere, new findings have now come to light through the 3D scan data regarding the approach of the design and its execution on site, showing, for the first time in the history of the building, the ingenious plan of Bramante that formed the perspectival layout strategy of the Cortile design. My study involved five specific tools used to capture data observed on the site: 1) 3D Scanning using a state-of-the-art 3D Leica scanner, 2) Gigapan technology which captures extremely high-resolution photography, 3) Hand measure drawings, including plans, elevations, and details, 4) Field notes taken on-site, and 5) Historical references.   My ongoing study through the DHARMA (Digital Historic Architectural Research and Material Analysis) Lab on digitally documenting the Belvedere will bring forward these new findings into the design and execution of the complex layout. It presents observational and analytical studies from the scan data and line drawings produced from the upper courtyard of the Belvedere, which reveal how each bay along the loggia of the cortile was manipulated to create a perspectival view throughout this vast complex. The use of stairs and other architectural elements to enhance the perspectival sense of space, not visible upon first glance, will also be presented.   [1] The original dissertation was published as Ackerman, James S. 1952. The Cortile del Belvedere (1503-1585) and is available only in a few libraries in Germany and Italy, including the Max Planck Institute in Florence. The work was later published in a book form by the Vatican, Ackerman, James S. 1960. The cortile del Belvedere. Città del Vaticano: Biblioteca apostolica vaticana; this more well-known form of his publication is available in many leading libraries in Europe and the United States.

Morellian analysis in a new era. Digitally approaching Transylvanian Renaissance painting in connection with Nuremberg art in the time of Dürer

Ciprian Firea

Documentary sources published in the 19th century indicate that several artists originating in Nuremberg established themselves in Transylvania in the early 1500's. Among them was Johannes, son of the celebrated artist Veit Stoss, who became a master painter in Sighişoara (Germ. Schässburg), a town in central Transylvania. Since the publication of these sources, scholars have attempted, not very convincingly, to attribute surviving artworks to the artist trained (probably) in Nuremberg.

Within the framework of a recent research project (Elaborating Complex Methodologies Regarding the Attribution and Authentication of Medieval and Early Modern Paintings Belonging to the National Cultural Heritage) a new and multi-disciplinary approach to Transylvanian Renaissance painting has been attempted. It consists in the processing of images taken both in the visible and invisible spectra, correlated with the information acquired from the historical, artistic-stylistic and iconographical analysis of the artworks, as well as with the physical-chemical examination of the pigments found in the colour layers, where possible.

The use of advanced tools and instruments such as image processing, powerful lenses and image sensors brought the classical morellian or stylistic analysis to a new era. The question of, for example (and referring to an important momentum of the research from 2016) "what is a Bosch?" should now be answered by using this new kind of approach. This paper aims to establish "what is a Johannes Stoss" by using in depth stylistic analyses of several paintings which display clear artistic connections with the art produced in Nuremberg at the time of Dürer (ca. 1500-1530).

A digital approach to the portrait-sitting as a research object for art historians

Dawn Kanter

This presentation will discuss a digital methodology for using the portrait-sitting in art-historical research, specifically the use of modelling and ontology engineering to construct the portrait-sitting as a research object. It will also discuss the use of a portrait-sitting ontology to model British portraiture 1900-1960 as a network of linked sittings. Therefore, the presentation responds to the theme of digital and computational approaches to the study of visual culture, specifically network analysis.

The portrait-sitting is an interaction between artist, sitter and sometimes patron, from which portraits are typically produced. It entails negotiations of the gaze, subjectivity and agency, and often an exchange of money, therefore it gives insight into portraiture as an interpersonal and interdisciplinary (for instance, social and commercial as well as artistic) practice. Nevertheless, the sitting is an historic event that is irrecoverable and known to us only through fallible evidence. My presentation will focus on the use of modelling and ontology engineering to construct the portrait-sitting as a usable research object for art history, specifically, the socio-historical study of portraiture. This field concerns the interconnectedness of portraiture and other activities that make up societies. Briefly, I am using modelling to analyse information within textual accounts of sittings (data) and about the accounts themselves (metadata), and to distinguish characteristics common to multiple sittings and sitting accounts from characteristics of individual intersubjective encounters; I am using ontology engineering to specify a theory of knowledge about the portrait-sitting, by both uniquely combining existing ontologies, which describe, for example, events, artworks and social relationships, and introducing new terms; I am using linked data to connect information about portrait-sittings to existing knowledge, positioning it as important art-historical data that is nevertheless part of a wider (cultural) network.

Specifically, I argue that sittings for portraits in the National Portrait Gallery (NPG), an institution that prioritises the 'national significance' of the sitter over the merit of the artist, can be used to revise and extend the literature on British portraiture 1900-1960, which is dominated by an approach to portraiture as a primarily artistic practice. To this end, I am developing my portrait-sitting ontology co-dependently with a database of 50-100 sittings for portraits in the NPG. The particularity of the data is more important than the size of the population, as my aim is not to describe a 'universal portrait-sitting' but produce a historically- and culturally-specific model. I expect the database to express a theory of British portraiture 1900-1960 not as a linear progression of individual artists and artistic styles but rather a network of linked interpersonal and interdisciplinary exchanges, which, though they are themselves individual and idiosyncratic, reference shared, if shifting, understandings about individual and collective social identities. The database is, firstly, a contribution to the socio-historical study of portraiture, as it demonstrates interconnectedness with other activities that make up societies. It is also, itself, a social theory of portraiture, where the social is defined as a principle of connections (Latour 2005).

A Genealogy of Forms. From Warburg and Focillon to Computational Analysis

Maria Giulia Dondero

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My talk will examine the research project of a genealogy of forms as it was conceived of in the work of Aby Warburg, in particular in the Atlas Mnemosyne (1924-1929), and in the book The Life of Forms in Art (Vie des formes) by Henri Focillon (1934). These projects were left unfinished because of the difficulty of analyzing patterns in big heterogenous corpora obtained from museums and collections which were both dispersed and disparate (in terms of periods and media). The increasing digitization of works of art, the availability of online databases, and the computer processing of large corpora of images now make such projects technically feasible, notably thanks to convolutional neural networks (CNNs). Computer Visualization approaches using Convolutional Neural Networks (CNN) have demonstrated their efficacy in pattern recognition in very large datasets of images, and the extraction of plastic features to build the signature of images can now be used to detect patterns in heterogeneous corpora.

My talk will consist of two parts:

1. in part one, I will review the research projects of Warburg and Focillon from the standpoint of a genealogy of forms;

2. in the second part, I will focus on current research projects in the USA and Europe that are continuing this ambitious and demanding research project, notably the Media Visualization of Cultural Analytics Lab led by Lev Manovich, the Replica Project by the Digital Humanities Lab of EPFL and finally the Technical Art History Project by Marco Cardinali at the Biblioteca Hertziana in Rome.

There is much benefit to returning to fundamental knowledge developed in art history, particularly in works on the genealogy of forms, in order to try to develop the automatic analysis of large image collections. Returning to the work of Warburg and Focillon on forms (1917, revised in 1942) imposes itself for at least two reasons: First, to respond to the largely justified criticisms that several researchers in media studies (for instance the reflections of Johanna Drucker and the ones of Gary Hall, especially in the paper entitled "Toward a Postdigital Humanities: Cultural Analytics and the Computational Turn to Data-Driven Scholarship" published in American Literature Volume 85, Number 4, December 2013) and in art history (for instance Claire Bishop and in particular the article she wrote for the International Journal for Digital Art History entitled "Against Digital Art History" in 2017) have voiced regarding the current state of research in digital art history and in the digital humanities. These criticisms concern the precedence of methodology over theory, as well as the precedence of mechanical positivism over critical thinking. Secondly, it is necessary to return to the fundamental texts by Focillon and Warburg because they allow to problematize the work devoted to visual similarities in machine learning and to complexify it.

What do Photographs of Artists Circulating on the Internet tell Us?

Pierre-Emmanuel Perrier de La Bâthie

Catholic University of Paris, France

Quantifying the use of materials in objects across the Metropolitan Museum of Art, New York

Sarah Griffin & Florian Klimm

Wincester College Museum & Imperial College London

The functional foundation of every museum is its collection. Encyclopaedic museums, sometimes referred to as 'universal museums', bring together material artefacts from cultures around the world. Thanks to the increasing quality and quantity of collections databases, we can use digital tools to reveal new perspectives on museum collections, which are not dominated by the subjective choices made during their display. In the last decades, network science has been developed as a tool to investigate large data sets. At its core, network science aims to represent and analyse complex, non-linear relationships between entities. One can, for example, compute centralities as a measure of importance of such entities. This study explores different methods for constructing and analysing networks from museum collection data, using a dataset provided by the Metropolitan Museum of Art in New York as a case study. To investigate how the use of different media (i.e., materials and techniques) vary across the collection, networks concerning the media associated with each object are constructed, specifically a bipartite object–medium network and a monopartite network of medium co-occurrence. Within these networks, nodes are ranked by their centralities to identify abundant and important media, which are then considered in relation to museum practices, such as the categorisation of objects into separate departments. In order to identify how the media used in the making of the objects within the collection change over time, a temporal co-occurrence network is investigated as a multilayer network. Investigating multiple centuries individually as separate layers reveals a change in media use over time. By creating new perspectives on the collection made possible with digital tools and that are not dominated by subjective choices concerning the curation and care of the collections, we believe networks of museum datasets can reveal valuable insights into museum collections.

Digital Approaches to Art History and Cultural Heritage

Friday, March 5th 2021

Visualisation as a Research Tool in the Digital Humanities

Dominik Lengyel & Catherine Toulouse

This paper aims to show that visualisation is more than displaying sites. Rather, it is a research tool on its own, acting as a catalyst to critically reflect on questions in the humanities using its particular methods, and to generate further research questions. For this purpose, while data is also recorded, it is translated into objects that correspond to the certainty in knowledge, taking into account the scientific hypotheses. The anastylosis takes place accordingly on the basis of these substitutes, unlike on site when actual finds are re-constructed. Research on the basis of the 3D and 4D models produced in this way, i.e. above all models that extend over more than one point in time, thus makes it possible to concentrate on the hypothesis rather than on the random fragmentation of objects when answering the research questions. In this way, digital tools open up a completely new dimension in addition to the recording and reproduction of scanned geometry, namely the likewise visual representation of the assumed structure on which the findings were based, in other words the architectural design. It is actually reverse engineering, which allows hypotheses to be questioned as if they were real. It is at the same time an opportunity and a challenge, because creating such substitutes for partly abstract concepts has never been part of the humanities. At this point, however, the discipline of architecture comes into play, whose essence is to translate spatial ideas that have not yet been fully formulated into a visually perceptible form. Whereas there it is buildings that are to be built in the future, here, on the other hand, it is architectural compositions that no longer exist or exist only in fragments and will therefore, strictly scientifically, never get beyond a certain degree of certainty. The visualisation thus becomes a snapshot of the current state of science. The modelling, which the authors call the "design of abstraction due to its architectural genesis, can be experienced spatially through what the authors call virtual photography, an approach that photographs the abstract world as if it were real, i.e. according to the usual rules of true architectural photography, unless it is presented through virtual or augmented reality straight away. The presentation aims to demonstrate and illustrate this method by several projects developed by the authors in cooperation with archaeological research institutions:
– Cologne Cathedral and its Predecessors (by order of and exhibited in Cologne Cathedral),
– Bern Minster – its first century (by order of and published by Bern Minster Foundation)
– The Metropolis of Pergamon (within the German Research Fund Excellence Cluster TOPOI, exhibited as part of Sharing Heritage, the European Cultural Heritage Year 2018),
– The Palatine Palaces in Rome (by order of the German Archaeological Institute, both latter exhibited in the Pergamon Museum Berlin),
– The Ideal Church of Julius Echter (by order of the Martin von Wagner Museum in the Würzburg Residence combining physical models, auto-stereoscopy and VR experience).

New Datasets, Old Mindsets: Quantifying and Contextualizing Digital Approaches in Art History

Amanda Wasielewski & Anna Dahlgren

Humanities researchers have increasingly come to embrace the use of computational methods in their work over the past decade, but many art historians continue to resist engaging with such methods. In this paper, we explore the driving factors behind art history's reticence toward the digital turn in the humanities, both from a historiographic and an institutional perspective. Using a mixture of digital and non-digital methods, we argue that there are ideological, technical, and material reasons for this inertia. One of the ways we have approached the methodological questions that arise in this context is through quantitative historiographic analysis of articles published in both mainstream art history journals and the field of "digital art history" between 2010 and 2019. Through a combination of distant historiographic reading and close analysis of the text, we found that the use of computational methods is not something qualitatively new to the discipline. It is, rather, closely tied to a specific set of art historical methods and theories. Additionally, we found that there is a strong focus on the in-house concerns of collecting institutions within digital art history, which also appear to be the primary producers and users of big art historical datasets.

As this study shows, digital art history (DAH) is intertwined with particular pre-digital methods and theories of art history, namely formalist and iconographic methods prevalent during the late nineteenth and early twentieth century, rather than critical theory methods commonly found in more recent art-historical scholarship. This goes some way toward explaining why DAH methods have not gained wider acceptance among art historians, as there are fundamental differences in the theoretical underpinnings of DAH versus the broader field of art history. Moreover, this study shows that the historical concerns of museums with regard to digitization still dominate DAH and that this implicit focus on museums and collecting practices has larger implications for the field as issues on diversity and access are often amplified or perpetuated in scholarship in the wake of digitization projects.

The digital generation of 'cultural heritage': curatorial blind spots in the panorama exhibition at Berlin's Pergamon Museum.

Annette Loeseke

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"The size of the image [...], the new sharpness of detail and the latest lighting and sound technology" make the exhibition PERGAMON. Masterpieces of the Ancient Metropolis and the 360° Panorama in Berlin "a spectacular, even bombastic visual experience," as the brochure suggests. Berlin's Pergamon Museum houses reconstructions of ancient monuments from the (so-called) Near East. Due to the museum's refurbishment, one of its major exhibits, the Pergamon Altar, is currently not on display. However, 80 pieces from the antiquities collection are presented together with digitally based media in a temporary exhibition. The 360° panorama is a pictorial canvas presented in a rotunda of 30 metres in height. Generated through green-screen technique and digital photographs of actors in period costumes, the panorama offers an all-round view of the digitally reconstructed ancient acropolis of Pergamon. The exhibition also presents a large-scale digital projection of a 3D model of the ancient palace district, presented alongside original statues from the museum's collection and a selection of digital reproductions of historical photographs of the historical excavation sites and reconstruction process inside the Pergamon Museum building in the early 20th century. By examining the interplay of digital reproductions of ancient monuments, historical photographs, and original statues and fragments from the ancient monuments in the exhibition, this paper explores how digital tools are integrated into the museum's research and exhibition practice. Drawing on literature about the intersection of digital media and museum practice, and the virtual space as politically constructed space, I explore how the multimedia display generates a cultural heritage, that is framed as both an iconic museum exhibit and immersive exhibition of (assumingly) ancient cultures. What sort of knowledge do the presented digital media produce? How does the interplay of original fragments and digital media enhance the visitor's experience and trigger an emotional response of admiration and awe? To what extent are visitors encouraged to admire both the (assumingly) preserved ancient cultures and the scholarly and curatorial efforts to make use of latest digital technologies? What is the role of digital technologies in generating expertise and framing the museum as a scholarly (as opposed to formerly imperialist) institution? By exploring to what extent the implementation of digital technologies in the museum's scholarly and curatorial practice is technically based (as opposed to culturally and critically centred), I discuss to what extent the exhibition perpetuates, rather than challenges, the museum's historical narrative about the preservation of a pre-given (as opposed to produced) cultural heritage. By uncovering the conceptual, curatorial blind spots in the exhibition, I explore the critical potential of digital technologies to reconsider the presentation of (contested) cultural heritage.

"A Painting of a Murder in the Style of Monet". Applications and Limitations of Large-scale Contrastive Pre-Training in Digital Visual Studies

Fabian Offert

In early 2021, OpenAI released CLIP (Contrastive Language–Image Pre-training), a neural network primarily intended for zero-shot image classification (Radford et. al, 2021). CLIP provides a joint embedding space for text and images based on a Web corpus of 400 million images and their descriptions. This makes it possible to predict descriptions from images and vice-versa, without relying on labeled datasets. CLIP has shown impressive results on several standardized computer vision tasks, like the zero-shot prediction of ImageNet classes. In this paper, we discuss the potential and the limitations of CLIP, and large-scale contrastive pre-training in general, for digital visual studies.

We argue that CLIP and related models like Google's ALIGN (Jia et. al, 2021) are highly likely to play a significant practical role within digital visual studies in the near future. Specifically, we discuss the potential of large-scale contrastive pre-training for both text-based and image-based retrieval, including retrieval for A/V data. Moreover, we discuss the more speculative use and aesthetic aspects of large-scale contrastive pre-training in conjunction with generative models. The combination of CLIP and BigGAN (Brock et. al., 2018), for instance, allows the targeted generation of novel images based on textual prompts, allowing the arbitrary combination of syntactic and semantic aspects ("A Painting of a Murder in the Style of Monet", https://i.redd.it/pndiwc5b4fd61.png).

At the same time, we argue that large-scale contrastive pre-training has several potentially harmful socio-technical implications that need to be taken into account when evaluating its potential. As is the case with large language models like GPT-3 (Brown et. al., 2020), the power of CLIP scales almost linearly with the size of the training corpus. This not only leads to massive compute requirements which are often entirely out of reach within digital visual studies but also to an increased and highly problematic opacity of the training data. This, in turn, facilitates both intentional biases (e.g. censorship of sexual content) and unintentional biases (e.g. reproduction of racial stereotypes) which can severely limit potential applications. It also leads to the problem of "prompt engineering" (which has also been observed in large language models), where certain "styles" of search queries - those not aligned to the specific style of the Web - produce vastly inferior results. It is the scope and mitigation of these socio-technical implications, we argue, that will eventually determine the utility of large-scale contrastive pre-training for digital visual studies.

On the use of Artificial Intelligence in Digital Humanities: an Application in Art History

Elodie Cayuela & Maximilien Servajean

In recent years, the use of digital tools in humanities has increased considerably. They occupy a place that has become, if not central, at least unavoidable. These tools have changed research practices, providing, among other things, useful and intuitive supports, such as databases. Examples in art history include LexArt [ERC AdG n°323761, https://lexart.fr/, accessed 17/03/2020] and the Getty Provenance Index. [http://www.getty.edu/research/tools/provenance/, accessed 17/03/2020]. However, the use of automatic data processing tools, and in particular artificial intelligence (AI), remains limited in this field, even though an obvious increase in its performance and use has been apparent in other disciplines. Thus, questions on the use of these tools in art history arise. Indeed, how can they be integrated into a classical scientific approach? What can AI concretely bring to art history research? What could be the obstacles to the adoption of these methods? We will address these questions through a practical example, for which we have obtained significant results.   Our proposal will begin with a simple introduction of AI. We will show how to include it in an art history experimental approach. We will answer the following question: how to experimentally interrogate an AI model, such as a neural network – a particular algorithm whose basic element is similar to a biological neuron – in order to answer a working hypothesis? This is a fundamental and necessary step in order to facilitate exchanges between humanities researchers and AI experts. Our example concerns the study of the existence and particularity of the English school of painting from the point of view of French theorists, that we confront to a state-of-the-art neural network. During the 18th century, an evolution in the perception of the English school, in the sense of a coherent grouping of artists, did indeed appear among the latter. Marsy first denied its existence [Dictionnaire abrégé de peinture, 1746, t. I, p.199-200]. An anonymous affirmed that England had produced a "small School of painting" ["Lettre XXII [...]", in Gomicourt (ed.), L'observateur français à Londres, vol. 18, 1770, p. 311-312, our translation]. Finally, Levesque certifies that a "new SCHOOL has been formed in Europe today, that of ENGLAND" [Dictionnaire des arts, 1792, t. II, p. 109-110, our translation]. These theorists seem to disagree - which can however be explained by their knowledge or ignorance of the works produced across the Channel. However, their remarks lead one to question the elements defining a school in the sense of a coherent set of painters. We have thus sought to transpose this problem into an AI protocol: is there a statistically significant coherence in 18th century English painting? In our experiments, the AI was able to group works according to the nationality of their author, when this information had been hidden from it, and to predict the nationality of artists it had never seen.

Towards an Alternative Digital Art History

Lev Manovich

City University of New York, United States

Digital art history (as well computational studies of culture in general) is often concerned with discovering "patterns" in large cultural datasets. To discover these patterns, we typically focus on similarities between artifacts.

For example, let's say we study the changes in subjects or formal properties over time in a large body of works. If we discover that the data can be successfully fitted with a line or a curve, showing systematic changes over time, this is considered to be a successful result.

Another frequently used analysis of a cultural dataset is visualizing it in such a way that similar artifacts appear together. (Typically we use dimension reduction methods such as PCA, t-sne, or UMAP.) Here as well, the analysis is focusing on what is similar between many artifacts (as opposed to their differences).

The use of supervised machine learning for classification is also based on similarity. We train the computer to automatically assign new data to the categories. The differences between artifacts within one category are disregarded in favor of what these objects have in common.

Can we imagine an alternative digital art history that would focus on differences between artifacts, rather than their similarities? (If biologists can study millions of different species, why we are satisfied with reducing human "cultural species" to a relatively small number of categories - such as historical periods, genres, motifs, or styles?) Such alternative digital art history will study variability and diversity in human culture - instead of looking for "patterns" of similarity. In my talk, I will discuss these ideas and illustrate them using a number of projects in digital art history, digital humanities, and cultural analytics.

AI and the Digital Archive

Xiaoyan Han & John McQuaid
Frick Art Reference Library, United States

In 1920, Helen Clay Frick (1888–1984) established the Frick Art Reference Library, New York, to commemorate her father, the industrialist and art collector Henry Clay Frick (1849–1919), and to advance research in the fine arts. The Library's founding collection was the Photoarchive, a study collection of reproductions of works of art produced in the Western tradition from the fourth to the mid-twentieth century, which Miss Frick hoped would encourage the study of art history in the United States. The Library is currently digitizing this collection of 1.2 million reproductions and to date, approximately 190,000 images are freely available for consultation and download on the institution's digital archive, The Frick Digital Collections (https://digitalcollections.frick.org). To maximize staff time as well as enhance the discoverability of this collection, the Photoarchive has partnered with Stanford University's Statistics Department on a pilot project that employs Artificial Intelligence (AI) and machine learning to train the computer to apply local classification headings to all digitized images. For this pilot project, the Stanford team focused on a dataset of 20,000 eighteenth and nineteenth-century American portraits and applied VGG—a popular deep neural network architecture—to develop automatic image classifiers. These classifiers have the potential to become powerful tools in metadata creation and image retrieval: preliminary experiments have demonstrated promising results and future projects involve expanding the results of the pilot project to the entirety of the Photoarchive's collection.

The proposed paper will introduce the Photoarchive, its goals for digitizing the collection, and the results of the pilot project. My hope is that the Library's collaboration with Stanford University will inspire other cultural institutions to explore the opportunities afforded by applying AI to art preservation as this technology promises to be a cost-effective means of providing researchers with valuable text cues for searching massive image libraries and organizing their results.

Reconstructing aesthetic encounters using spatial eye-tracking

Eugene Han

While the physical basis of a work of art may be singular and complete, its being-as-perceived is perpetually in metamorphosis, becoming realized with every new visual encounter. No two individuals will engage with an image, sculpture, or work of architecture through precisely the same visual course. Instead, their viewing behaviors and predilections chart out a unique trajectory in which aesthetic perception results from a confrontation between viewer and work. In this regard, seeing is no innocent act, but allows for a co-creative confrontation that gives the work of art its full ontological potential. This idea of visual agency was especially popular towards the early decades of the 20th century, in which a newly established experimental psychology was rebutted by the rise of phenomenology. With a century of hindsight now permitting us to look beyond disciplinary rifts, new research techniques allow us to exploit bridges between the arts and sciences. Though certainly not a recent innovation, eye-tracking technologies provide an auspicious means for relating theories of perception with art, by means of recording an individual's eye movements over the space of an image. However, it is only in recent decades that these techniques have become fully digital, allowing unprecedented precision and at significantly lower cost. While eye-tracking provides the theorist with a tool to trace an individual's perception across the space of a painting or photograph, its use is often restricted to a two-dimensional surface, and commonly relegated to an unnatural setting such as a computer monitor in a darkened laboratory space.

Towards digital reconstruction of lost signs borne by heritage artefacts using chemical imaging: the case of 16th-c. violins and luthiers' tools

Jean-Philippe Échard & Marie Radepont
CRC (CNRS)

Many artefacts from the past may have borne signs (writings, monograms, emblems, etc.), which may be related to their initial appearance, the context of their creation, or later events, owners, etc. A key issue is the loss of readability of these signs, which are of great importance to historians, scholars, conservators, and museum curators, who are contributing to refine the knowledge and heritage values of these artefacts. This loss of readability may be due, among many things to overcoating, material loss by abrasion, or the alteration of the materials themselves, leading to discoloration, fading, etc. Exemplary case studies can be found in the French national collection of the musée de la Musique in Paris. Eg. violins by Andrea Amati (Cremona, second half of the 16th-c.) bear remains of painted royal emblems (Habsburg and Valois families); wooden forms for making instruments from the workshop of Antonio Stradivari (Cremona, 17th-18th-c.) bear traces of ink writing. This paper will present how X-ray fluorescence spectroscopic mapping, a chemical imaging technique allowed was used (i) to digitally reconstruct the emblems designs on the Amati violins, and thus provide information on dating and early context of uses of these instruments; (ii) to improve the readability and attribution of the writings on the Stradivari wooden forms.

Discerning the Painter's Hand Part I: A Machine Learning Approach to Attribution using the 3D Surface Texture of Paintings

Michael McMaster

In recent years, the use of digital tools in humanities has increased considerably. They occupy a place that has become, if not central, at least unavoidable. These tools have changed research practices, providing, among other things, useful and intuitive supports, such as databases. Examples in art history include LexArt [ERC AdG n°323761, https://lexart.fr/, accessed 17/03/2020] and the Getty Provenance Index [http://www.getty.edu/research/tools/provenance/, accessed 17/03/2020]. However, the use of automatic data processing tools, and in particular artificial intelligence (AI), remains limited in this field, even though an obvious increase in its performance and use has been apparent in other disciplines. Thus, questions on the use of these tools in art history arise. Indeed, how can they be integrated into a classical scientific approach? What can AI concretely bring to art history research? What could be the obstacles to the adoption of these methods? We will address these questions through a practical example, for which we have obtained significant results. Our proposal will begin with a simple introduction of AI. We will show how to include it in an art history experimental approach. We will answer the following question: how to experimentally interrogate an AI model, such as a neural network – a particular algorithm whose basic element is similar to a biological neuron – in order to answer a working hypothesis? This is a fundamental and necessary step in order to facilitate exchanges between humanities researchers and AI experts. Our example concerns the study of the existence and particularity of the English school of painting from the point of view of French theorists, that we confront to a state-of-the-art neural network. During the 18th century, an evolution in the perception of the English school, in the sense of a coherent grouping of artists, did indeed appear among the latter. Marsy first denied its existence [Dictionnaire abrégé de peinture, 1746, t. I, p.199-200]. An anonymous affirmed that England had produced a "small School of painting" ["Lettre XXII […]", in Gomicourt (ed.), L'observateur français à Londres, vol. 18, 1770, p. 311-312, our translation]. Finally, Levesque certifies that a "new SCHOOL has been formed in Europe today, that of ENGLAND" [Dictionnaire des arts, 1792, t. II, p. 109-110, our translation]. These theorists seem to disagree - which can however be explained by their knowledge or ignorance of the works produced across the Channel. However, their remarks lead one to question the elements defining a school in the sense of a coherent set of painters. We have thus sought to transpose this problem into an AI protocol: is there a statistically significant coherence in 18th century English painting? In our experiments, the AI was able to group works according to the nationality of their author, when this information had been hidden from it, and to predict the nationality of artists it had never seen.

Discerning the Painter's Hand Part II: Next Steps and Implications of Artificial Intelligence-based Attributions

Lauryn Smith

Part II introduces a novel methodology that applies image processing to surface structure of objects to determine attribution. This method has the potential to attribute small-area surface measurements from relatively small data sets, and could potentially transform the way scholars approach the study and preservation of objects. The method was designed around a question that is at the heart of attribution studies and is of great importance to scholars and institutions that collect, study, and preserve works of art - authorship. The question of "who created" specific objects has plagued scholars and connoisseurs alike for centuries, and has led to an evolution of approaches- ranging from traditional connoisseurship to the more recent integration of cutting-edge technology, to better assess attribution. Parsing out the individual hands on a single painting continues to enthrall scholars, museum curators, and lovers of art as both an intellectual and financial pursuit. However, there still exist countless issues that inhibit our assessment of attribution and the conditions surrounding a painting's creation. One complicating factor is the condition of an object. While conservators aim to preserve original passages, many paintings have severe damage or survived multiple interventions that further obscure the original artist's hand. Our method could prove useful in discerning original artistic contributions from later additions. Another prominent complication, closer to the heart of attribution, is the use of workshops to expand and vary a single artist's output. While the use of workshops dates back to the medieval period, this artistic practice flourished during the early modern period. Early practitioners of connoisseurship rarely considered workshop practices, in part because of the value attached to specific artists, as well as the frequent lack of information on workshop structure and participants. Notable artists that utilized workshops include Rembrandt, Peter Paul Rubens, and El Greco, with many of their pupils going on to gain popularity as independent artists. In the case of El Greco, the growing workshop role of his son, Jorge Manuel Theotocópuli, during the master artist's late life muddles our interpretation of El Greco's late works. This presentation lays out a roadmap for applying our novel methodology to focused challenges associated with the paintings attributed to El Greco and his workshop, and illuminates the obstacles that will be met before deterministic arguments concerning the hand of the artist can be made. Some of the questions to be addressed in this presentation are: How can this approach aid in our understanding of attribution historically and in contemporary society? In what ways can this approach be utilized by scholars to further research on historic artist's practices? How might this technology impact the art market and institutions that collect, study, and preserve works of art?

Geometrical annotations for the analysis of space and material depiction

Maarten Wijntjes, Mitchell van Zuijlen & Francesca Di Cicco

While digitized artworks become increasingly available and computer algorithms increasingly sophisticated to analyze them, the use of human annotations seems hardly investigated. Here, we explore how simple geometric annotations can quantitatively reveal aspects of space and material depictions. In the first experiment, we studied viewpoint analysis of paintings by Hendrick Avercamp, a 17th century Dutch painter of winter landscapes. In a crowdsourced experiment we let participants draw lines over human figures as well as indicate the horizon. The data reveal an intriguing trend of lowering the painter's viewpoint when Hendrick Avercamp became older. This stylistic trend was previously found in paintings by Canaletto and can easily be used to investigate other artists or schools. In the second experiment we studied the relation between the 3D pictorial shape of fabrics with the tonal value of the paint. Matte, satin and velvet fabrics look different because they reflect light differently. This reflection depends on the shape and light source. We annotated local shape by using a so-called attitude probe (the normal vector). Relating the image luminance (the paint value) to the slant of the normal vectors showed markedly different patterns for the three materials. These two examples demonstrate the potential of human annotations in the study of pictorial convention and style. Perspective studies are generally performed on an individual work, while we reveal an interesting trend within a single artist. Furthermore, the study of material depictions is increasing but quantitative tools like perspective reconstructions are lacking, which our paradigm resolves.