The Frick Collection and Frick Art Reference Library

SEARCHING THROUGH SEEING: OPTIMIZING COMPUTER VISION TECHNOLOGY FOR THE ARTS

Friday, April 13, 2018, 9 a.m. to 6:30 p.m.

ABSTRACTS

FACES 2.0: FACES, ART, AND COMPUTERIZED EVALUATION SYSTEMS

Conrad Rudolph, University of California, Riverside

FACES 2.0 is a face recognition application based on a method of machine learning known as a deep neural networking. Funded by the Kress Foundation, it is designed to automatically test the degree of probability of a shared identification between different works of portrait art—that is, non-photographic portraits that are subject to the subjectivity of artistic interpretation. When used correctly with good images, it has the potential to match what is known with a given unknown—something that is unlikely to be accidental—and yields results that may be considered probable. In this, FACES has the potential to provide previously unnoticeable or unconfirmable information by contributing categories of quantifiable data for researchers to factor into their own analyses.

DEEP LEARNING: EXTRACTING SYNTAX AND SEMANTICS FROM IMAGES

Sabine Süsstrunk and Frédéric Kaplan, EPFL, Lausanne

Deep learning methods are a family of algorithms that are profoundly changing the way we process, annotate, cluster, and search for images. It thus opens to larger audiences new forms of exploration of our cultural patrimony that were previously not feasible. Beyond the immediate relevance for the public and private institutions that curate large collections of photographs and artwork, this technology permits documenting ties between artworks at a worldwide scale. Deep learning helps interpret every artwork as the result of a long chain of transmission, invention, and reworking. In this chain, minor artworks, usually overlooked, play a key role to understanding sequences of transformation of visual motifs. Reconstructing the genealogy of this immense scheme of connections is crucial not only for Art History, but also for the history of Archaeology, Architecture, Design, Manuscripts, and for the history of images in general.

ARTPI–THE ART API: ARTIFICIAL INTELLIGENCE FOR ART RECOGNITION

Ahmed Elgammal, Rutgers University

This talk will introduce Artificial Intelligence tools developed for recognition and visual search of art. At the macro level, we will introduce the Art API (ArtPI), the first public API designed and optimized for art. ArtPI uses Artificial Intelligence and deep learning models trained on more than one million images of art. ArtPI provides the ability to recognize and predict the artist, style, and subject as well as assess the formal elements of art. ArtPI allows users to search large collections of artworks in major museums available in the public domain.

Implementing Image Similarity Matching: Comparing Open Source and Commercial Solutions

John Resig, Independent Researcher

Computer Vision research has provided us with image similarity matching technologies for many years now; major companies such as Google and Microsoft have even included image searching as part of their search offerings. However, the use of image similarity technology in the field of art history is still in its infancy. Image similarity matching provides solutions to entire classes of art history problems which are practically unsolvable by humans. During the past seven years, John Resig has explored various ways of solving these problems, using different image similarity technologies, against many different types of art objects. This talk will explore three different technologies that have worked for performing image similarity matching against photographs of artworks: a standalone Open Source solution; a commercial service; and a service written using Open Source libraries. The pros and cons of each solution will be discussed along with recommendations for those who wish to use these technologies in their projects.

Into Iconography: Understanding Images via Pose, Interaction and Composition

Peter Bell, Friedrich-Alexander University Erlangen-Nuremberg

"Into iconography" denotes two aspects of my approach. At first, it describes a second milestone in the collaboration between art history and computer vision. Until now most research tackled stylistic questions, basic comparison, pattern, and object recognition. If semantic issues were regarded, it concerns the first strata of Panofsky's model: the primary or natural subject matter. "Into iconography" now means to concentrate on the secondary subject matter: the iconography, to understand the meaning of scenes and interactions. Iconography that arouses always from a complex relationship between text, image, and cultural context is, of course, far more challenging than the description of objects in the image.

The second aspect, which I will demonstrate by "into iconography," is the variation and progression inside every single iconography. The detection of poses, interactions, and compositions can help to analyze these granular differences and distinctions within the images. The detection of bodies and poses helps to determine a more or less stylistic neutral framework to compare iconography across extended time periods and broad geographical areas. To exemplify this approach, I will present two major iconographies: the Annunciation and the Baptism of Christ.

Blockchain: The Holy Grail? Use of Immutable Records for Provenance and Art Historical Data

Nanne Dekking, CEO and Founder, ARTORY

In its simplest terms, blockchain is a public digital record of recorded transactions held in a verifiable and permanent way. Each record/block in the chain is linked to the previous record, thus creating a blockchain. Content stored in the blockchain is permanent, unalterable, encrypted, and anonymous.

Currently, the art market is faced with better prepared, more skeptical, and more risk-averse art buyers whose wants and needs are changing. Many new buyers find the milieu of the art world alienating, the overload of unreliable information on the web confusing, and believe that modern technologies should be embraced to improve their customer experiences—that's where the blockchain can play an important role.

The nature of the permanent and unalterable data connected to artworks is a clear benefit for provenance and authentication of artworks, providing buyers with a tool to give them confidence in their purchase. This benefit also holds true for the art research community. Including all of the important, correct, and immutably connected information in the blockchain provides scholars a greater sense of security in documenting the history of an artwork. The group that will most obviously benefit from this technology is the living artists. Through vetted galleries and estates, living artists can claim authorship of their works, reducing the incidence of forgery; a record of creation recorded as a block in the chain establishes the provenance of individual works from the moment they leave the studio; and sales are easily tracked, simplifying the payment of royalties under the terms of the Artist's Resale Right. That said, this amazing benefit can also be a threat. The blockchain is only as good as the quality of data that is put into it: that is why it is crucial to vet those who add to a blockchain, making sure to prioritize data integrity along with security and transparency.

ARIES: ARt Image Exploration Space

Samantha Deutch, Frick Art Reference Library
João Lucas Rulff da Costa, Tandon School of Engineering, New York University

Art historians have traditionally used physical light boxes to prepare exhibits or curate collections. On a light box, they can place slides or printed images, move the images around at will, group them as desired, and visually compare them. The transition to digital images has rendered this workflow obsolete. Now, art historians lack well-designed, unified interactive software tools that effectively support the operations they perform with physical light boxes. To address this problem, we designed ARIES (ARt Image Exploration Space), an interactive image manipulation system that enables the exploration and organization of fine digital art. The system allows images to be compared in multiple ways, offering dynamic overlays analogous to a physical light box, and supporting advanced image comparisons and feature-matching functions, available through computational image processing. We will give a demonstration of our system to support art historians' tasks through real use cases.

ARIES is a collaboration between New York University's Visualization, Imaging, and Data Analysis (VIDA) Lab, The Frick Collection, and Universidade Federal Fluminense–UFF (Brazil).

Two Cultures or Two Competitors? Borders, Boundaries and Obstacles to Collaboration in Computational Art History

Park Doing, Cornell University, School of Electrical and Computer Engineering

In the case of the nascent field of Computational Art History, fruitful interactions depend on recognition from all of the groups involved of the different sources of funding,

mechanisms of recognition and reward, dynamics of credibility, and treatment of intellectual property that currently operate in the disparate disciplines coming together to do new kinds of work. These differences can be very real and act with substantial force. But, they can also be mutually navigated by groups who have an awareness of the institutional "machines" that enable and underpin the working worlds of the other disciplines. Surprisingly, even a little awareness in this regard can have quite positive effects, as examples from recent projects involving canvas thread counting, photographic paper characterization, and paper chain line and watermark matching show. This talk is oriented toward providing advice for computational engineers and scientists who are considering beginning, or are already involved in, computational art history projects. The talk summarizes some hard-earned lessons about working amid the institutional arrangements of support and reward that underlie the different "cultures" involved.

UNDERSTANDING ART: DISTANT VIEWING MEETS CLOSE READING

Björn Ommer, University of Heidelberg

Computer vision and art history are concerned with similar questions: What makes images similar? What does their similarity mean and how can we organize data in order to understand it? With their different viewpoints, both fields have taken different directions to establish a theoretical and practical basis for analyzing images. The talk will discuss commonalities and differences.

For roughly a decade, the Computer Vision Group at Heidelberg University with its interdisciplinary composition has sought to combine the strength of both fields. Based on deep learning and our fundamental research on self-supervised similarity learning, we have developed an interactive approach to art historical image analysis. The method can effectively highlight commonalities and deviations to reveal patterns in different images or across time. The approach has proven successful for detecting and analyzing objects and investigating the composition of scenes as well as for a shape-based comparison in reception analysis.

UNDERSTANDING ART: A CRITICAL ASSESSMENT OF POTENTIALS AND CHALLENGES

Sabine Lang, University of Heidelberg

Technical possibilities enabled by computer vision are greatly influencing art history, in particular how we see, access, and understand art. After applying computational tools for some time now to solve various tasks and witness their efficiency, we must halt and assess past projects in order to establish a promising basis: *What potentials are there? And which challenges do we still face?*

This talk considers an interdisciplinary project established in 2009 within the Computer Vision Group of Heidelberg University. An art historian works with computer scientists resulting in the development of computer-based approaches and interactive tools to assist with art historical research. Taking past experiences into account, the talk highlights potentials and challenges when working with computational methods. Among others, it comments on the possibility to re-evaluate traditional methods and terminology used in the respective fields: *How do we observe and evaluate images? And what does similarity mean?* A main potential lies in the ability to practice distant viewing and close reading to

find general patterns or spot unusual trends. Experience also reveals limitations: the talk addresses the issue of why it is insufficient to simply apply existing computer vision methods to art data. Ultimately, I urge for a close collaboration between disciplines to exploit fully the potential of digital tools to explore how we see, access, and understand art.

EXPERIENCES WITH DEEP LEARNING FOR MULTI-LABEL ART CLASSIFICATION

XY Han and Vardan Papyan, Stanford University
Anastasia Levadas, Frick Art Reference Library

Deep neural networks have gained immense popularity in recent years for unprecedented performance in image classification. In this work, we apply deep nets to develop automatic classifiers for the Frick Art Reference Library Photoarchive dataset. Such automatic classifiers can potentially become a powerful tool for art preservation, freeing up much needed time and effort of qualified art curators and providing individuals searching through massive libraries of images with text cues. In our preliminary experiments, we focused on the North American portraits portion of the collection. We adapted VGG—a popular deep neural network architecture—to the multi-class multi-label setting, showing promising empirical results as well as insights that illuminate what drives the classification process. In future work, we aim to expand our current results to the whole Frick Art Reference Library Photoarchive dataset. We provide guidelines on the amount of additional labeled data necessary to achieve this end. Our ultimate goal is to minimize the time and cost of art preservationists both in labeling data and in correcting mislabels.

ARCHIVE-VISION: USING CONTENT BASED IMAGE RECOGNITION TO BUILD A WORLD-WIDE LIBRARY OF EARLY PRINTED MATERIALS

Carl Stahmer, Director of Data and Digital Scholarship at the University of California, Davis, Library

This presentation will demonstrate Arch-Vision, a Content Based Image Recognition platform developed specifically for use with early printed materials and currently implemented at the English Broadside Ballad Archive (http://ebba.english.ucsb.edu), an online archive of more than 8,000 early modern broadside ballads containing over 15,000 woodblock impressions. Arch-V allows users to identify a woodblock impression of interest and search the archive for all occurrences of the same or similar impressions, or to upload an image of their own for searching. The software is also leveraged as a curation tool, allowing catalogers working to describe an image to search for previously cataloged copies or similar images and then import and/or normalize the catalog records for these images. The end-user and cataloging implementations of the software will be demonstrated and a newly launched initiative to build a distributed network of searchable collections across multiple institutions aimed at developing a World Wide Library of Early Printed Materials will be introduced.

HUMAN VISION, COMPUTER TECHNOLOGY AND THE IMAGE INVESTIGATION TOOL

Elizabeth Honig, University of California, Berkeley

The large volume of works produced by Jan Brueghel and his studio, often including approximate and exact repetition of details as well as whole compositions, has offered a fascinating test case for the study of the recognition of similar forms—both by the human eye, and by computers. I will describe the "Image Investigation Tool" that has been devised to aid art historians in visually testing degrees of similarity between imagery, and then briefly compare the questions this tool can answer to those posed by our CS collaborators, who have used our visual data to train machines in detail recognition.

THE DIGITAL ART HISTORY LAB AND RESEARCH DEPARTMENT OF THE FRICK ART REFERENCE LIBRARY WOULD LIKE TO THANK ARTORY LLC AND THE HASSO PLATTNER INSTITUTE FOR THEIR SPONSORSHIP OF THIS EVENT