The Frick Collection and Frick Art Reference Library

SEARCHING THROUGH SEEING: OPTIMIZING COMPUTER VISION TECHNOLOGY FOR THE ARTS

Thursday, April 12, 2018, 2 p.m. to 6:40 p.m.

Attendance is free with online registration

ABSTRACTS

KEYNOTE ADDRESS: SEARCHING THROUGH SEEING: OPTIMIZING COMPUTER VISION TECHNOLOGY FOR THE ARTS

Emily L. Spratt

In the arts, one of the most fundamental questions is *what does it mean to see*? While this philosophical inquiry is embedded in the historical foundation of the field of art history, it is taking on a radically different signification in the age of artificial intelligence. While recent developments in computer vision technology have enabled everything from the identification of persons in photographs in social media to self-driving cars and surgical assistance, the field most connected to the hermeneutic value of sight itself has yet to benefit fully from these innovations. Largely on account of the expanded use of machine learning techniques, a subset of AI, image recognition and retrieval technologies have been increasingly honed and are proving to be essential tools to find, sort, and analyze visual information. It is these technologies combined with others that are silently guiding the visual culture of our digital worlds. Now is the time to recognize that their curatorial effect on the images we navigate has far too great a universal value and worldwide social impact to not require oversight. Art history, a field dedicated to the accurate representation of knowledge through images, is uniquely positioned to advocate for the responsible curation of the visual landscape of the digital world, and could lead by example with the treatment of digital reproductions of art. This symposium address will thus focus on the necessity to harness the existing tools in computer vision science for use in the arts and the need to guide their future development. “Searching Through Seeing” anticipates a significant turn toward image-based search queries across sectors in the near future, and aims to underscore the tremendous research potential of this technology as this change occurs. It also brings renewed attention to the philosophical debates on aesthetic perception and asks what it means to visually behold an image in a technocratic society that is extending our conception of what it means to see.

EMILY L. SPRATT is the Frick Art Reference Library’s first fellow in the newly created Research Department, and one of the organizers of “Searching Through Seeing: Optimizing Computer Vision Technology for The Arts.” Her areas of specialization include Byzantine and Renaissance art, cultural heritage and preservation studies, aesthetic theory, machine learning in the arts, and advisory in the art-tech business sector. Her doctoral thesis at Princeton University is on visual culture and the legacy of Byzantium in the early modern period. With experience at the former Hellenic Ministry of Culture, the Byzantine and Christian Museum of Athens, the Benaki Museum, and the Antivouniotissa

Museum of Corfu, Emily has also been a collaborator on a number of international exhibitions and projects. In relation to her research in computer vision science, she curated the pioneering exhibition “Unhuman: Art in the Age of AI,” which featured the art produced in the Art and AI Laboratory at Rutgers University by the AICAN algorithm, in Los Angeles and Frankfurt in the fall of 2017. Additionally, in the Department of Art History at Rutgers, Emily has taught courses on Byzantine art, the history of the museum, cultural heritage, and art and technology. Emily is delighted to have been the Honorary Guest Editor for a recent special issue on computers and art for the Association of Computing Machinery’s quarterly magazine. Emily also has been the recipient of numerous fellowships and awards, including those from the Onassis Foundation, the Gladys Krieble Delmas Foundation, the Cini Foundation in Venice, the Cyprus American Archaeological Research Institution, the American Research Center in Sofia, Bulgaria, the Hellenic Ministry of Culture, and from Princeton, UCLA, and Cornell, the universities from where she holds degrees. More information about Emily can be found on her website: https://sites.google.com/view/emilylspratt/home.

RIGOROUS TECHNICAL IMAGE ANALYSIS OF FINE ART: TOWARD A COMPUTER CONNOISSEURSHIP

David G. Stork

Connoisseurship fell out of favor in the academy the 1970s but seems poised for a resurgence, motivated in part by a "new formalism" in literary and visual studies, an explosion in immense databases of high-resolution multi-spectral images of artwork, new digital algorithms in image analysis and machine learning, the rise in online art sales, and the scourge of fake art undermining the commercial art market. David G. Stork will present an overview of successes in the application of computer methods to the study of art. Computer vision methods do not replace expert connoisseur judgments, of course, but rather enhance and extend them—much as a microscope empowers a biologist. This talk will be directed primarily to art scholars who will someday use these new methods and will address problems in different languages and methodologies in the different disciplines, all in order to foster interdisciplinary collaboration. The talk presents a vision of new art historical methodology: a rich and powerful merging of traditional methods—close readings and comparisons of works, textual analysis—with new computer vision analysis methods, all employed by experts fully versed in art historical questions and contexts.

DAVID G. STORK is Rambus Fellow at Rambus Labs and leads research in its Computational Sensing and Imaging Group. He is a graduate in Physics from MIT and the University of Maryland and studied Art History at Wellesley College. For nearly 20 years he and his colleagues have pioneered the application of rigorous computer image analysis to problems in the history and interpretation of fine art. He has taught courses on the subject in both the Computer Science and Art and Art History Departments at Stanford University and published over 45 technical papers and the world's first three proceedings volumes in this field. He has lectured in 20 countries including at major museums such as the Louvre, National Gallery Washington, National Gallery London, and the Metropolitan Museum of Art. He is a Fellow of the *International Association for Pattern Recognition* (for "...the application of computer vision to the study of art"), of the *International Academic, Research and Industry Association*, of *SPIE*, of *IEEE* ("For contributions to pattern

recognition and image analysis"), and of the *Optical Society of America*. He has published over 200 technical articles and eight books/proceedings volumes, including *Seeing the Light: Optics in Nature, Photography, Color, Vision and Holography* (Wiley), the leading textbook on optics in the arts, and *Pattern Classification* (2nd ed., Wiley), the world's all-time best-selling textbook in the field. According to Google Scholar, his work has garnered over 67,000 scholarly citations.

LIVE VIDEO PRESENTATION: THE ROLE OF AI AND MACHINE LEARNING IN CREATIVITY

Douglas Eck

This presentation discusses Magenta, a Google Brain project investigating music and art generation using deep learning and reinforcement learning. Douglas Eck will describe the goals of Magenta and how it fits into the general trend of AI moving into our daily lives. One crucial question he will address is: Where do AI and machine learning fit into the creative process? He will argue that the issue is about augmenting and extending the artistic process rather than just creating artifacts (songs, paintings, etc.) with machines. As examples, he will discuss two recent projects. In the first, he will explore the use of recurrent neural networks to extend musical phrases in different ways. In the second, he will look at teaching a neural network to draw with strokes. This will be a high-level overview: audience members will not need a prior knowledge of AI or machine learning.

DOUGLAS ECK is a Research Scientist at Google working in the areas of music, art, and machine learning. Currently he is leading the Magenta Project, a Google Brain effort to generate music, video, images, and text using deep learning and reinforcement learning. One of the primary goals of Magenta is to understand better how machine learning algorithms can learn to produce more compelling media based on feedback from artists, musicians, and consumers. Before focusing on generative models for media, Doug worked in areas such as rhythm and meter perception, aspects of music performance, machine learning for large audio datasets, and music recommendation for Google Play Music. He completed his Ph.D. in Computer Science and Cognitive Science at Indiana University in 2000 and went on to a postdoctoral fellowship with Juergen Schmidhuber at IDSIA in Lugano Switzerland. Before joining Google in 2010, Doug worked in Computer Science at the University of Montreal (MILA machine learning lab) where he became Associate Professor.

Optimizing Computer Vision Technology for Autonomous Learning Investment Strategies (ALIS)

Michael Weinberg

In the last five years, developments in applied machine learning have reached a critical turning point, which is disrupting the financial world. Autonomous Learning Investment Strategies, or ALIS, has emerged as the sector in the financial industry that is mobilizing the unique potential that big data combined with artificial intelligence offers for money management. MOV37, a financial firm affiliated with Protégé Partners, has recognized that the asset management industry will restructure on account of the now undeniable transformation in approaches to data analysis, and is bringing together the leading investment managers in this area to pioneer the change. The exponential growth in data, the breakthroughs in computer science, the manifold applications of machine learning in

business, and the record low processing and storage costs of raw and analyzed data are four convening factors that this presentation addresses in the context of the investment landscape's reshaping. As ALIS managers harness the value provide by alternative, unstructured, non-financial data, including image data, the value of the effective and accurate interpretation of it is becoming more apparent. Now that processing and storage costs for image data are decreasing, its use as an investment information source has much future potential to drive ALIS managers' returns. As more capital, and consequently research and development, are invested in directing the growth of image recognition technology, its return as an investment tool will also be apparent.

MICHAEL WEINBERG has 25 years of experience investing directly at the security level and indirectly as an asset allocator in traditional and alternative assets. He is the Chief Investment Officer, and a Senior Managing Director of MOV37 and Protégé Partners. His portfolio management experience includes Soros Fund Management LLC, Credit Suisse First Boston, and Financial Risk Management (FRM). Michael is a board member of AIMA, on the management advisory council for the Michael Price Student Investment Fund, Chair of Value Investing at CFANY, where he has received multiple awards, and a member of the Economic Club of New York. He is a published author, has been interviewed by top financial newspapers, and is a keynote speaker at conferences and universities. Michael received an M.B.A. from Columbia Business School, where he is now also an Adjunct Professor of Finance and Economics, and a B.S. in Economics from New York University.

PERSONALIZING THE ART WORLD: TASTE FINGERPRINTS AND COMPUTER VISION

Jennifer Deason

Abstract forthcoming.

JENNIFER DEASON is the Executive Vice President of Global Strategy & Corporate Development at Sotheby's. One of her areas of focus is to embrace technology to reduce costs, drive incremental growth, and eventually transform Sotheby's. Prior to Sotheby's she spent nine years at Bain Capital focused on media and consumer investments. During her time at Bain Capital, she was the President, CMO, and CFO of various portfolio companies. While at Bain Capital, she spent several years as the CFO of the Weather Channel where she was part of a leadership team that transformed the Weather Channel from a television business to a data-centric technology company. Prior to Bain Capital, she worked at McKinsey, eBay and Deutsche Bank. Jennifer has an M.B.A. from Stanford University and a B.A. in the History of Art from Yale University, where she focused on 16th-century Italian painting. Jennifer is currently on the Board of Directors at the Massachusetts Museum of Contemporary Art, the American Folk Art Museum, and DHI (NYSE: DHX, Chair of Audit Committee).

Machine Learning: The Reality Behind Artificial Intelligence

Christoph Meinel

In the public there is an ongoing discussion about artificial intelligence (AI). In this discussion, AI stands as a paradigm for the digital transformation of our social and private lives. What do we have to expect in a future world where/when the continuing development of digital technologies produces constant change? This talk surveys recent

research and applications of digital technologies at the Hasso Plattner Institute in Potsdam, the leading German university department of digital engineering. In particular the technique of deep learning will be introduced and discussed, an approach that has transformed artificial intelligence from a fantasy into a daily reality. Deep learning enables machines to capture images, to understand and translate texts, to chat with humans like humans, and much more.

CHRISTOPH MEINEL is CEO and Scientific Director of the Hasso Plattner Institute for Digital Engineering gGmbH (HPI) as well as Dean of the Digital Engineering Faculty at the University of Potsdam, where he also holds the chair of Internet Technologies and Systems. He is engaged in MOOCs on openHPI and is a teacher at the HPI School of Design Thinking. His research currently focuses on security engineering, knowledge engineering, and Web 3.0–Semantic, Social, Service Web. Prof. Dr. Meinel is author or co-author of more than twenty-five books and anthologies as well as numerous conference proceedings. He has had more than 550 peer-reviewed papers published in scientific journals and at international conferences and holds a number of international patents. He is a member of the National Academy of Science and Engineering (acatech), director of the HPI-Stanford Design Thinking Research Program, honorary professor at the TU Beijing, visiting professor at Shanghai University, concurrent professor at the University of Nanjing, and member of numerous scientific committees and supervisory boards.

COMPUTER VISION FOR THE ARTS
Laurens van der Maaten

In this talk, Van der Maaten will give an overview of the research that the Facebook AI Research team is doing in artificial intelligence and, in particular, in computer vision. The talk will give a high-level overview of the state-of-the-art technologies for computer vision tasks such as image classification, object recognition, human pose recognition, and automatic answering of questions about images. The second half of the talk covers how potential applications of these technologies may impact the arts, focusing on the creation of new digital media, new techniques for art history, and potential new experiences for museum visitors.

LAURENS VAN DER MAATEN is a Research Scientist at Facebook AI Research in New York. Prior, he worked as an Assistant Professor at Delft University of Technology (The Netherlands) and as a post-doctoral researcher at University of California, San Diego. He received his Ph.D. from Tilburg University (The Netherlands) in 2009. Laurens is interested in a variety of topics in computer vision and machine learning. Specific research topics include the development of models for data visualization, visual understanding, and art analysis.

Creativity: The Next Horizon for Artificial Intelligence
John R. Smith

It is easy for Artificial Intelligence to discover something novel randomly; it is even harder to discover something that is novel as well as unexpected and useful. John R. Smith, IBM's AI expert, will share how the emergence of AI-driven content science will radically

change the future of creative work, fueling creativity and connecting with audiences in a meaningful way.

JOHN R. SMITH is the Head of AI Tech for IBM Research globally and leads IBM's R&D into Vision, Speech, Language, Knowledge and Interaction. He has driven the creation of audio-visual recognition tools, medical image analysis, and augmented creativity for movie trailers, ad creation, and sports highlight reels. His work aims to show how AI might be used in creative industries and explores whether creativity can be analyzed and if Artificial Intelligence can be creative.

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