IS&T International Symposium on Electronic Imaging (EI 2022)

Computational Imaging XX

Online
17 - 26 January 2022

ISBN: 978-1-7138-9368-4

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

Society for Imaging Science & Technology
7003 Kilworth Lane
Springfield, Virginia 22151
USA

Phone: 703-642-9090
Fax: 703-642-9094

info@imaging.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Computational Imaging XX

MONDAY 17 JANUARY 2022

PLENARY: Quanta Image Sensors: Counting Photons Is the New Game in Town
10:00 – 11:10

Eric R. Fossum, Dartmouth College (United States)

The Quanta Image Sensor (QIS) was conceived as a different image sensor—one that counts photoelectrons one at a time using millions or billions of specialized pixels read out at high frame rate with computation imaging used to create gray scale images. QIS devices have been implemented in a CMOS image sensor (CIS) baseline room-temperature technology without using avalanche multiplication, and also with SPAD arrays. This plenary details the QIS concept, how it has been implemented in CIS and in SPADs, and what the major differences are. Applications that can be disrupted or enabled by this technology are also discussed, including smartphone, where CIS-QIS technology could even be employed in just a few years.

Eric R. Fossum is best known for the invention of the CMOS image sensor "camera-on-a-chip" used in billions of cameras. He is a solid-state image sensor device physicist and engineer, and his career has included academic and government research, and entrepreneurial leadership. At Dartmouth he is a professor of engineering and vice provost for entrepreneurship and technology transfer. Fossum received the 2017 Queen Elizabeth Prize from HRH Prince Charles, considered by many as the Nobel Prize of Engineering "for the creation of digital imaging sensors," along with three others. He was inducted into the National Inventors Hall of Fame, and elected to the National Academy of Engineering among other honors including a recent Emmy Award. He has published more than 300 technical papers and holds more than 175 US patents. He co-founded several startups and co-founded the International Image Sensor Society (IISS), serving as its first president. He is a Fellow of IEEE and OSA.

Topics in Coherent Sensing
Session Chair: Andre Van Rynbach, U.S. Air Force (United States)
11:40 – 12:45

11:40
Conference Introduction

11:45 N/A
Coherent sensing performance using photon-counting arrays (Invited) [Presentation-Only], *Maureen E. Szymanski[1,2], Edward A. Watson[2,3], and David J. Rabb[1,2]; [1]US Air Force Research Laboratory, [2]University of Dayton, and [3]Vista Applied Optics, LLC (United States)*

12:00 N/A
Adaptive deep learning for coherent imaging in scattering media (Invited) [Presentation-Only], *Lei Tian, Boston University (United States)*

12:15 N/A
Quantum limits for coherent-field estimation (Invited) [Presentation-Only], *Timothy J. Schulz[1] and David J. Brady[2]; [1]Michigan Technological University and [2]The University of Arizona (United States)*

12:30 COIMG-105
Compressive single shot synthetic aperture imaging (Invited) [Presentation-Only], *David J. Brady[1], Timothy J. Schulz[2], Chengyu Wang[1], and Minghao Hu[1]; [1]The University of Arizona and [2]Michigan Technological University (United States)*

Topics in Coherent Sensing
Session Chair: Andre Van Rynbach, U.S. Air Force (United States)
13:10 – 14:10

13:10 N/A
3D phase and fluorescence microscopy with scattering samples (Invited) [Presentation-Only], *Laura Waller, University of California, Berkeley (United States)*

13:25 N/A

KEYNOTE: Computational imaging by phase retrieval: From astronomical speckle to x-ray coherent diffractive imaging [Presentation-Only], *James R. Fienup, University of Rochester (United States)*

Researchers used phase retrieval for reconstructing electron density functions of crystalline structures from scattered x-ray data (x-ray crystallography) for many decades. In the 1970's, algorithms were finally developed that worked for non-crystalline (non-periodic), general objects and were applied to astronomical imaging, overcoming the blurring effects of atmospheric turbulence, using data from Labeyrie's stellar speckle interferometry approach. In 1999, the algorithms developed for astronomy began to be used for reconstructing images of non-crystalline objects illuminated with coherent x-rays. As high-brightness, highly coherent x-ray sources were developed, the field of x-ray coherent diffractive imaging grew. The development of alternative data-collection approaches, ptychography in particular, allows for a very robust reconstruction of images of small objects on the nanometer scale. This presentation will describe the development of those phase retrieval algorithms.

James R. Fienup received an AB in physics and mathematics from Holy Cross College (Worcester, MA), and his MS and PhD (1975) in applied physics from Stanford University, where he was a National Science Foundation graduate fellow. He performed research for 27 years at the Environmental Research Institute of Michigan and Veridian Systems, where he was a senior scientist. He joined the faculty at the University of Rochester in 2002 as the Robert E. Hopkins Professor of Optics. Professor Fienup is a fellow of the Optical Society of America and of the International Society for Optical Engineering (SPIE), and is a senior member of IEEE. He was awarded the Rudolf Kingslake Medal and Prize for 1979 by the SPIE, the International Prize in Optics for 1983 by the International Commission for Optics, the Emmett N. Leith Medal by the Optical Society of America (OSA) for 2013 and became a member of the National Academy of Engineering in 2012. He was a distinguished visiting scientist at the Jet Propulsion Laboratory in 2009. He was editor-in-chief of the Journal of the Optical Society of America A, 1997-2003. He previously served as division editor of Applied Optics - Information Processing, and associate editor of Optics Letters. One of his papers [J.R. Fienup, "Phase Retrieval Algorithms: a Comparison," Appl. Opt. 21, 2758-2769 (1982)] has received more than 4,600 citations (Google Scholar) and is the most highly cited paper (out of over 50,000) in the journal Applied Optics.

Recent Advances in Scientific CT I

Session Chairs: Doga Gursoy, Argonne National Laboratory Advanced Photon Source (United States); K. Aditya Mohan, Lawrence Livermore National Laboratory (United States); and Singanallur Venkatakrishnan, Oak Ridge National Laboratory (United States)
18:00 – 19:00

18:00 COIMG-119

Weighted minimum norm algorithm for improved phase unwrapping, *Tegan F. Lakshmanan[1], Kyle M. Champley[2], and K. Aditya Mohan[2]; [1]University of California, Berkeley and [2]Lawrence Livermore National Lab (United States)*

18:15 N/A

Nondestructive characterization systems to defend the homeland, with emphasis on an x-ray CT system independent feature space (Invited) [Presentation-Only], *Harry E. Martz, Steven M. Glenn, Kyle M. Champley, Isaac Seetho, Jeff Kallman, and K. Aditya Mohan, Lawrence Livermore National Laboratory (United States)*

18:30 N/A

Denoising advanced x-ray tomography data using deep learning without high-quality reference data (Invited) [Presentation-Only], *Daniel Pelt, Leiden University (the Netherlands)*

Recent Advances in Scientific CT II

Session Chairs: Doga Gursoy, Argonne National Laboratory Advanced Photon Source (United States); K. Aditya Mohan, Lawrence Livermore National Laboratory (United States); and Singanallur Venkatakrishnan, Oak Ridge National Laboratory (United States)
19:15 – 20:15

19:15 N/A

Grazing-incidence diffraction tomography with synchrotron x-rays (Invited) [Presentation-Only], *Esther Tsai, Masafumi Fukuto, and Ruipeng Li, Brookhaven National Laboratory (United States)*

19:30 N/A

Hyperspectral neutron CT with material decomposition (Invited) [Presentation-Only], *Thilo Balke[1], Alexander M. Long[1], Sven C. Vogel[1], Brendt Wohlberg[1], and Charles A. Bouman[2]; [1]Los Alamos National Laboratory and [2]Purdue University (United States)*

19:45 COIMG-129

A metal artifact reduction scheme for accurate iterative dual-energy CT algorithms, *Tao Ge[1], Maria Medrano[1], Rui Liao[1], Jeffrey F. Williamson[1], David Politte[1], Bruce R. Whiting[2], and Joseph A. O'Sullivan[1]; [1]Washington University in St. Louis and [2]University of Pittsburgh (United States)*

20:00 N/A

Non-paraxial multiple scattering model for multiplexed intensity diffraction tomography [Presentation-Only], *Jiabei Zhu[1], Hao Wang[1], Alex Matlock[2], and Lei Tian[1]; [1]Boston University and [2]Massachusetts Institute of Technology (United States)*

TUESDAY 18 JANUARY 2022

Photon-Limited Imaging I

Session Chairs: Stanley Chan, Purdue University (United States) and Keigo Hirakawa, University of Dayton (United States)
10:00 – 11:00

10:00 N/A

Photon-starving and high-dynamic-range imaging with photon-counting quanta image sensors (Invited) [Presentation-Only], *Jiaju Ma, GigaJot Technology (United States)*

10:15 N/A

Photon-limited object detection for CMOS cameras and quanta image sensors (Invited) [Presentation-Only], *Stanley Chan[1], Chengxi Li[1], Xiangyu Qu[1], Abhiram Gnanasambandam[1], Omar Elgendy[2], and Jiaju Ma[2]; [1]Purdue University and [2]GigaJot Technology (United States)*

10:30 N/A

High dynamic range single photon LiDAR (Invited) [Presentation-Only], *Robert K. Henderson, University of Edinburgh (United Kingdom)*

10:45 N/A

Log-simplex denoising for color images (Invited) [Presentation-Only], *Sarah Miller[1], Keigo Hirakawa[1], and Chen Zhang[2]; [1]University of Dayton and [2]OmniVision Technologies, Inc. (United States)*

Photon-Limited Imaging II

Session Chairs: Stanley Chan, Purdue University (United States) and Keigo Hirakawa, University of Dayton (United States)
11:30 – 12:30

11:30 N/A

Computational imaging, one photon at a time (Invited) [Presentation-Only], *Mohit Gupta, University of Wisconsin, Madison (United States)*

11:45 N/A

From a handful of photons (Invited) [Presentation-Only], *Hamid Sheikh, Samsung Research America (United States)*

12:00 COIMG-151

An improved image enhancement algorithm using a statistical model for pixel value error, *Henry G. Dietz, University of Kentucky (United States)*

12:15 COIMG-152

Blind estimation of noise level based on pixels values prediction, *Mykola Ponomarenko[1], Oleksandr Miroshnichenko[2], Vladimir Lukin[2], and Karen Egiazarian[1]; [1]Tampere University (Finland) and [2]National Aerospace University (Ukraine)*

Computational Chemical Imaging I

Session Chairs: Ji-Xin Cheng, Boston University (United States) and Garth Simpson, Purdue University (United States)
13:00 – 14:00

13:00 N/A

Computational chemical imaging with deep UV microscopy [Presentation-Only], *Francisco E. Robles, Georgia Tech and Emory University (United States)*

13:15 N/A

Advances in diagnostics with mid-IR photothermal spectroscopic imaging [Presentation-Only], *Chalapathi Cajjela, Rupali Mankar, Ragib Ishrak, Sharmin Afrose, Xinyu Wu, Camille Artur, David Mayerich, and Rohith Reddy, University of Houston (United States)*

13:30 N/A

Computational label-free microscopy [Presentation-Only], *Lei Tian, Boston University (United States)*

Computational Chemical Imaging II

Session Chairs: Ji-Xin Cheng, Boston University (United States) and Garth Simpson, Purdue University (United States)
18:00 – 19:00

18:00 N/A
Deep learning stimulated Raman scattering microscopy [Presentation-Only], *Haonan Lin and Ji-Xin Cheng, Boston University (United States)*

18:15 N/A
Spectral super-resolution using device-informed machine learning [Presentation-Only], *Yuhyun Ji, Sang Mok Park, Yunsang Kwak, and Young L. Kim, Purdue University (United States)*

18:30 N/A
Multi-agent consensus equlibrium (MACE) for improving chemical structure determination [Presentation-Only], *Jiayue Rong, Garth Simpson, Gregery T. Buzzard, Lyudmila Slipchenko, and Charles A. Bouman, Purdue University (United States)*

18:45 N/A
Multi-agent consensus equilibrium (MACE) in molecular spectral analysis [Presentation-Only], *Ziyi Cao, James Ulcickas, Charles A. Bouman, Lyudmila Slipchenko, Gregery T. Buzzard, and Garth Simpson, Purdue University (United States)*

Methods in Computational Imaging I

Session Chairs: Charles Bouman, Purdue University (United States) and Gregery Buzzard, Purdue University (United States)
19:15 – 20:15

19:15 COIMG-179
Drone object detection using RGB/IR fusion, *Lizhi Yang, Ruhang Ma, and Avideh Zakhor, University of California, Berkeley (United States)*

19:30 N/A
Visual vibration tomography: Estimating interior material properties from monocular video [Presentation-Only], *Berthy Feng, Alexander Ogren, Chiara Dararío, and Katherine L. Bouman, California Institute of Technology (United States)*

19:45 N/A
Deep radio interferometric imaging with POLISH: DSA-2000 and weak lensing [Presentation-Only], *Liam Connor, Gregg W. Hallinan, Vikram Ravi, and Katherine L. Bouman, California Institute of Technology (United States)*

20:00 N/A
End-to-end sequential sampling and reconstruction for MR imaging [Presentation-Only], *Zihui Wu[1], Tianwei Yin[2], He Sun[1], Adrian Dalca[3], Yisong Yue[1], and Katherine L. Bouman[1]; [1]California Institute of Technology, [2]The University of Texas at Austin, and [3]Harvard Medical School (United States)*

WEDNESDAY 19 JANUARY 2022

PLENARY: In situ Mobility for Planetary Exploration: Progress and Challenges

10:00 – 11:15

Larry Matthies, Jet Propulsion Laboratory (United States)

This year saw exciting milestones in planetary exploration with the successful landing of the Perseverance Mars rover, followed by its operation and the successful technology demonstration of the Ingenuity helicopter, the first heavier-than-air aircraft ever to fly on another planetary body. This plenary highlights new technologies used in this mission, including precision landing for Perseverance, a vision coprocessor, new algorithms for faster rover traverse, and the ingredients of the helicopter. It concludes with a survey of challenges for future planetary mobility systems, particularly for Mars, Earth's moon, and Saturn's moon, Titan.

Larry Matthies received his PhD in computer science from Carnegie Mellon University (1989), before joining JPL, where he has supervised the Computer Vision Group for 21 years, the past two coordinating internal technology investments in the Mars office. His research interests include 3-D perception, state estimation, terrain classification, and dynamic scene analysis for autonomous navigation of unmanned vehicles on Earth and in space. He has been a principal investigator in many programs involving robot vision and has initiated new technology developments that impacted every US Mars surface mission since 1997, including visual navigation algorithms for rovers, map matching algorithms for precision landers, and autonomous navigation hardware and software architectures for rotorcraft. He is a Fellow of the IEEE and was a joint winner in 2008 of the IEEE's Robotics and Automation Award for his contributions to robotic space exploration.

Computational Imaging XX Posters
11:20 – 12:20

Poster interactive session for all conferences authors and attendees.

COIMG-185

P-02: Improvement of aerial image by simulations, *Katsunari Ashimine[1], Munemitsu Abe[1], and Kazuhiro Wako[2]; [1]Alps Alpine Co., Ltd. and [2]National Institute of Technology, Sendai College (Japan)*

Neural Networks for Computational Imaging I
Session Chairs: Charles Bouman, Purdue University (United States) and Gregery Buzzard, Purdue University (United States)
12:30 – 13:30

12:30 COIMG-217

Image denoising with control over deep network hallucination, *Qiyuan Liang, Florian Cassayre, Haley Owsianko, Majed El Helou, and Sabine Süsstrunk, École Polytechnique Fédérale de Lausanne (EPFL) (Switzerland)*

12:45 COIMG-218

FiveNet: Joint image demosaicing, denoising, deblurring, super-resolution, and clarity enhancement, *Mykola Ponomarenko[1], Vladimir Marchuk[2], and Karen Egiazarian[1]; [1]Tampere University (Finland) and [2]Don State Technical University (Russian Federation)*

13:00 COIMG-219

Transfer learning for no-reference image quality metrics using large temporary image sets, *Sheyda Ghanbaralizadeh Bahnemiri, Mykola Ponomarenko, and Karen Egiazarian, Tampere University (Finland)*

13:15 COIMG-220

Recognition aware learned image compression (Invited), *Maxime Kawawa-Beaudan, Ryan Roggenkemper, and Avideh Zakhor, University of California, Berkeley (United States)*

Neural Networks for Computational Imaging II
Session Chairs: Charles Bouman, Purdue University (United States) and Gregery Buzzard, Purdue University (United States)
13:50 – 14:50

13:50 N/A

Deep generative priors for imaging ptycho-tomography [Presentation-Only], *Selin Aslan[1], Viktor Nikitin[2], Zhengchun Liu[2], Tekin Bicer[2], Sven Leyffer[2], and Doga Gursoy[2]; [1]Virginia Tech and [2]Argonne National Laboratory (United States)*

14:05 COIMG-227

Fully RNN for knee ligament tear classification and localization in MRI scans, *Kaiyue Zhu[1], Ying Chen[1], Xu Ouyang[1], Gregory White[2], and Gady Agam[1]; [1]Illinois Institute of Technology and [2]Rush Medical College (United States)*

14:20 N/A

Correction filter for single image super-resolution: Robustifying off-the-shelf deep super-resolvers [Presentation-Only], *Shady Abu-Hussein, Tel Aviv University (Israel)*

14:35 COIMG-229

Multiresolution DECOLOR for camouflaged moving foreground detection using a redundant wavelet transform, *Zoe Fowler[1], James Fowler[2], and Agnieszka Miguel[3]; [1]Georgia Institute of Technology, [2]Mississippi State University, and [3]Seattle University (United States)*

Methods in Computational Imaging II
Session Chairs: Charles Bouman, Purdue University (United States) and Gregery Buzzard, Purdue University (United States)
18:00 – 19:00

18:00 N/A

Structural biology by cryo-EM: From in vitro to in situ structures [Presentation-Only], *Wen Jiang, Purdue University (United States)*

18:15 N/A

Chemically selective imaging by fluorescence-detected photothermal mid-infrared microscopy [Presentation-Only], *Aleksandr Razumtcev, Minghe Li, and Garth Simpson, Purdue University (United States)*

18:30 N/A

A Good RAP: Converting between mismatched backprojector and modified prior model [Presentation-Only], *Gregery T. Buzzard[1], Emma J. Reid[2], and Charles A. Bouman[1]; [1]Purdue University and [2]Oak Ridge National Laboratory (United States)*

18:45 N/A

Computational field sensor for aperture synthesis [Presentation-Only], *Casey J. Pellizzari[1], Timothy Bate[1], David Strong[2], and Mark Spencer[3]; [1]United States Air Force Academy, [2]Strong Inc., and [3]Air Force Research Laboratory (United States)*

Methods in Computational Imaging III

Session Chairs: Charles Bouman, Purdue University (United States) and Gregery Buzzard, Purdue University (United States)

19:15 – 20:15

19:15 COIMG-247

OldVSR: A model for the video super-resolution and restoration of old real-world TV series, *Tony Nokap Park and Taeyoung Na, SK Telecom (Republic of Korea)*

19:30 COIMG-248

Accurate measurement of charge density in nanoscale particles using an aperture optimization of Fourier based phase reconstruction, *Takuma Okada, Yoshihiro Midoh, Koji Nakamae, and Noriyuki Miura, Osaka University (Japan)*

19:45 N/A

Jeweler: A Python module for searching binary sequences optimized for coded aperture [Presentation-Only], *Daniel J. Ching, Argonne National Laboratory (United States)*

20:00 N/A

What is the cost of applying a constraint in least squares? [Presentation-Only], *Ramakrishna Kakarala and Jun Wei, Omnivision Technologies (United States)*

THURSDAY 20 JANUARY 2022

Autonomous Science

Session Chairs: Doga Gursoy, Argonne National Laboratory Advanced Photon Source (United States) and Benji Maruyama, Air Force Research Laboratory (United States)

13:00 – 14:00

13:00 N/A

Physical discovery in automated scanning probe and electron microscopy (Invited) [Presentation-Only], *Sergei V. Kalinin, Oak Ridge National Laboratory (United States)*

13:15 N/A

Domain-aware Gaussian processes and high-performance mathematical optimization for optimal autonomous data acquisition (Invited) [Presentation-Only], *Marcus M. Noack, Lawrence Berkeley National Laboratory (United States)*

13:30 N/A

Active learning for jump regression estimation with applications to materials discovery [Presentation-Only], *Chiwoo Park[1], Peihua Qiu[1], Jennifer Carpena-Nunez[2], Rahul Rao[2], Michael Susner[2], and Benji Maruyama[2]; [1]Florida State University and [2]Air Force Research Laboratory (United States)*

13:45 N/A

Constrained matrix factorization enabling real-time insights of in situ and high-throughput experiments [Presentation-Only], *Phillip M. Maffettone[1], Aidan C. Daly[2], and Daniel Olds[1]; [1]Brookhaven National Laboratory and [2]Flatiron Institute (United States)*

Latent Fields in Additive Manufacturing: From Sensing to Reconstruction I

Session Chairs: Megna Shah, Air Force Research Laboratory (United States); Jeff Simmons, Air Force Research Laboratory (United States); and Amir Ziabari, Oak Ridge National Laboratory (United States)

18:00 – 19:00

18:00 N/A

Opportunities and challenges in metallic additive manufacturing [Presentation-Only], *Edwin J. Schwalbach, Air Force Research Laboratory (United States)*

18:15 N/A

Computer vision techniques for additive manufacturing quality control [Presentation-Only], *Vincent Paquit, Luke Scieme, Michael Sprayberry, and James Haley, Oak Ridge National Laboratory (United States)*

18:30 N/A

Physics based compressive sensing for melt pool monitoring in laser powder bed fusion [Presentation-Only], *Yanglong Lu and Yan Wang, Georgia Institute of Technology (United States)*

18:45 N/A

Challenges and progress in physical tomographic reconstruction of light doses for additive manufacturing [Presentation-Only], *Vishal Bansal[1], Indrasen Bhattacharya[1], Kyle M. Champley[2], Erika Fong[2], Chi C. Li[1], Robert McLeod[3], Charles Rackson[3], Maxim Shusteff[2], Hayden Taylor[1], and Joseph Toombs[1]; [1]University of California, Berkeley, [2]Lawrence Livermore National Laboratory, and [3]University of Colorado (United States)*

Latent Fields in Additive Manufacturing: From Sensing to Reconstruction II

Session Chairs: Megna Shah, Air Force Research Laboratory (United States); Jeff Simmons, Air Force Research Laboratory (United States); and Amir Ziabari, Oak Ridge National Laboratory (United States)

19:15 – 20:15

19:15 N/A

Linking processing to microstructure development under additive manufacturing conditions [Presentation-Only], *Amy J. Clarke, Colorado School of Mines (United States)*

19:30 COIMG-306

Inferring surface properties of oscillating fluids from video by inversion of physics models, *Bob Price[1], Svyatoslav Korneev[1], Adrian Lew[2], Christoforos Somarakis[1], and Raja Bala[3]; [1]Palo Alto Research Center Incorporated, [2]Stanford University, and [3]Amazon (United States)*

TUESDAY 25 JANUARY 2022

PLENARY: Physics-based Image Systems Simulation

10:00 – 11:00

Joyce Farrell, Stanford Center for Image Systems Engineering, Stanford University, CEO and Co-founder, ImagEval Consulting (United States)

Three quarters of a century ago, visionaries in academia and industry saw the need for a new field called photographic engineering and formed what would become the Society for Imaging Science and Technology (IS&T). Thirty-five years ago, IS&T recognized the massive transition from analog to digital imaging and created the Symposium on Electronic Imaging (EI). IS&T and EI continue to evolve by cross-pollinating electronic imaging in the fields of computer graphics, computer vision, machine learning, and visual perception, among others. This talk describes open-source software and applications that build on this vision. The software combines quantitative computer graphics with models of optics and image sensors to generate physically accurate synthetic image data for devices that are being prototyped. These simulations can be a powerful tool in the design and evaluation of novel imaging systems, as well as for the production of synthetic data for machine learning applications.

Joyce Farrell is a senior research associate and lecturer in the Stanford School of Engineering and the executive director of the Stanford Center for Image Systems Engineering (SCIEN). Joyce received her BS from the University of California at San Diego and her PhD from Stanford University. She was a postdoctoral fellow at NASA Ames Research Center, New York University, and Xerox PARC, before joining the research staff at Hewlett Packard in 1985. In 2000 Joyce joined Shutterfly, a startup company specializing in online digital photofinishing, and in 2001 she formed ImagEval Consulting, LLC, a company specializing in the development of software and design tools for image systems simulation. In 2003, Joyce returned to Stanford University to develop the SCIEN Industry Affiliates Program.

PANEL: The Brave New World of Virtual Reality

11:00 – 12:00

Advances in electronic imaging, computer graphics, and machine learning have made it possible to create photorealistic images and videos. In the future, one can imagine that it will be possible to create a virtual reality that is indistinguishable from real-world experiences. This panel discusses the benefits of this brave new world of virtual reality and how we can mitigate the risks that it poses. The goal of the panel discussion is to showcase state-of-the art synthetic imagery, learn how this progress benefits society, and discuss how we can mitigate the risks that the technology also poses. After brief demos of the state-of-their-art, the panelists will discuss: creating photorealistic avatars, Project Shoah, and digital forensics.

Panel Moderator: Joyce Farrell, Stanford Center for Image Systems Engineering, Stanford University, CEO and Co-founder, ImagEval Consulting (United States)
Panelist: Matthias Neissner, Technical University of Munich (Germany)
Panelist: Paul Debevec, Netflix, Inc. (United States)
Panelist: Hany Farid, University of California, Berkeley (United States)