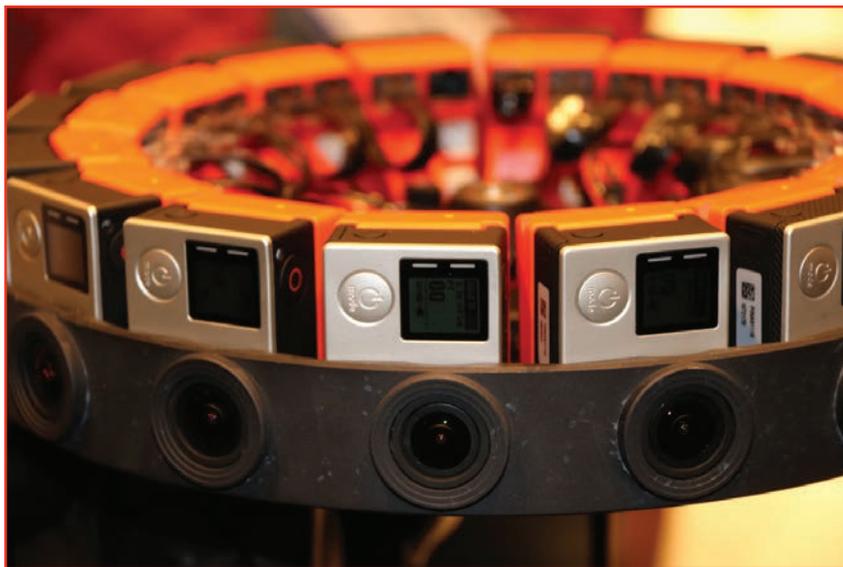# Computational Imaging XV

Conference overview
More than ever before, computers and computation are critical to the image formation process. Across diverse applications and fields, remarkably similar imaging problems appear, requiring sophisticated mathematical, statistical, and algorithmic tools. This conference focuses on imaging as a marriage of computation with physical devices. It emphasizes the interplay between mathematical theory, physical models, and computational algorithms that enable effective current and future imaging systems. Contributions to the conference are solicited on topics ranging from fundamental theoretical advances to detailed system-level implementations and case studies.

Special Session
This year Computational Imaging hosts a special session on Computational Imaging for Advanced Manufacturing. Presentations will cover such topics as advances in metallic 3D printing, neutron tomography, and more, presented by researchers at Oak Ridge National Laboratory and Wright-Patterson AFB.

Conference Chairs and Program Committee:
Charles A. Bouman, Purdue University (United States), and **Robert Stevenson,** University of Notre Dame (United States)

Computational Imaging XV

Monday January 29, 2018

Tomography

8:50 – 10:10 am
Harbour A-B

8:50   COIMG-101
Accelerating iterative image reconstruction via adaptive surrogate functions, *Ayan Mitra[1], David Politte[2], and Joseph O'Sullivan[1]; [1]Washington University in St. Louis and [2]Washington University School of Medicine (United States)*

9:10   COIMG-102
Distributed modular framework for fast iterative CT reconstruction, *Venkatesh Sridhar, Gregery Buzzard, and Charles Bouman, Purdue University (United States)*

9:30   COIMG-103
Ultrasonic model-based iterative reconstruction with spatially variant regularization for one-sided non-destructive evaluation, *Hani Almansouri[1], Singanallur Venkatakrishnan[2], Dwight Clayton[2], Yarom Polsky[2], Charles Bouman[1], and Hector Santos-Villalobos[2]; [1]Purdue University and [2]Oak Ridge National Laboratory (United States)*

9:50   COIMG-472
Deep learning based sinogram correction for metal artifacts reduction, *Muhammad Usman Ghani and W. Clem Karl, Boston University (United States)*

10:10 – 10:50 am   Coffee Break

Smart Imaging

10:50 am – 12:30 pm
Harbour A-B

10:50   COIMG-130
Autonomous alpha matting using consensus equilibrium, *Stanley Chan[1], Xiran Wang[1], and Jason Juang[2]; [1]Purdue University and [2]HypeVR Inc. (United States)*

11:10   COIMG-131
SLADS-Net: Supervised learning approach for dynamic sampling using deep neural networks, *Yan Zhang[1], Dilshan Godaliyadda[2], Nicola Ferrier[1], Emine Gulsoy[3], Charles Bouman[2], and Charudatta Phatak[1]; [1]Argonne National Laboratory, [2]Purdue University, and [3]Northwestern University (United States)*

11:30   COIMG-132
A supervised learning approach for dynamic sampling in raman hyperspectral imaging, *Shijie Zhang[1], Zhengtian Song[1], Dilshan Godaliyadda[1], Dong Hye Ye[1], Atanu Sengupta[2], Gregery Buzzard[1], Charles Bouman[1], and Garth Simpson[1]; [1]Purdue University (United States) and [2]Dr. Reddy's Laboratory (India)*

11:50   COIMG-133
Data-driven compressed sensing tomography, *Marc Kassubeck[1], Stephan Wenger[1], Matthew Gomez[2], Eric Harding[2], Jens Schwarz[2], and Marcus Magnor[1]; [1]TU Braunschweig (Germany) and [2]Sandia National Laboratories (United States)*

12:10   COIMG-134
Feature engineering and explosive detection, *Parisa Babaheidarian and David Castañón, Boston University (United States)*

12:30 – 2:00 pm   Lunch

Plenary Session

2:00 – 3:00 pm
Grand Peninsula Ballroom D

Overview of Modern Machine Learning and Deep Neural Networks - Impact on Imaging and the Field of Computer Vision, *Greg Corrado, Google, Inc. (United States)*

Dr. Greg Corrado, co-founder of Google Brain, principal scientist, and director of augmented intelligence research at Google, provides an overview of modern machine learning and deep neural networks, with particular attention to its impact on imaging and the field of computer vision.

Dr. Corrado is a senior research scientist interested in biological neuroscience, artificial intelligence, and scalable machine learning. He has published in fields ranging across behavioral economics, neuromorphic device physics, systems neuroscience, and deep learning. At Google he has worked for some time on brain inspired computing, and most recently has served as one of the founding members and the co-technical lead of Google's large scale deep neural networks project. Prior to joining Google, Dr. Corrado was a staff research scientist at IBM. He received his MS in computer science and PhD in neuroscience from Stanford University.

3:00 – 3:30 pm   Coffee Break

Special Session on: Computational Imaging for Advanced Manufacturing JOINT SESSION

Session Chairs: Vincent Paquit and Hector Santos-Villalobos, Oak Ridge National Laboratory (United States)

3:30 – 5:10 pm
Harbour A-B

This session is jointly sponsored by: Computational Imaging XVI and Intelligent Robotics and Industrial Applications using Computer Vision 2018.

3:30   COIMG-177
Advanced manufacturing research activities in the scaling of additive, battery, carbon fiber, and composites fabrication, *William Peter, Merlin Theodore, Lonnie Love, Ryan Dehoff, Vlastimil Kunc, and Vincent Paquit, Oak Ridge National Laboratory (United States)*

3:50   COIMG-178
Automated in-situ defects detection in metal additive manufacturing parts, *Vincent Paquit, James Ferguson, Sean Yoder, Michael Kirka, and Ryan Dehoff, Oak Ridge National Laboratory (United States)*

4:10   COIMG-179
Spectral neutron tomography for crystalline materials, *Singanallur Venkatakrishnan[1], Luc Dessieux[2], and Philip Bingham[1]; [1]Oak Ridge National Laboratory and [2]University of Tennessee Knoxville (United States)*

4:30   COIMG-180

Application of characterization, modeling and analytics towards understanding process-structure-property relationships in metallic 3D printing, *Michael Groeber, Edwin Schwalbach, Sean Donegan, Kevin Chaput, Todd Butler, and Jonathan Miller, Wright-Patterson AFB (United States)*

4:50   COIMG-181

Separable models for cone-beam MBIR reconstruction, *Thilo Balke[1], Michael Groeber[2], Gregery Buzzard[1], and Charles Bouman[1]; [1]Purdue University and [2]Wright-Patterson AFB (United States)*

5:00 – 6:00 pm   All-Conference Welcome Reception

Tuesday January 30, 2018

7:15 – 8:45 am   Women in Electronic Imaging Breakfast

Image Analysis and Modeling I

9:10 – 10:10 am
Harbour A-B

9:10   COIMG-199

Tubule segmentation of fluorescence microscopy images based on convolutional neural networks with inhomogeneity correction, *Soonam Lee[1], Chichen Fu[1], Paul Salama[2], Kenneth Dunn[2], and Edward Delp[1]; [1]Purdue University and [2]Indiana University (United States)*

9:30   COIMG-200

Development of screening echocardiogram for detection of asymptomatic left ventricular dysfunction, *Irmina Gradus-Pizlo[1], Edward Delp[2], and Zygmunt Pizlo[1]; [1]University of California Irvine and [2]Purdue University (United States)*

9:50   COIMG-201

Deep gang graffiti component analysis, *He Li, Joonsoo Kim, and Edward Delp, Purdue University (United States)*

10:00 am – 7:30 pm   Industry Exhibition

10:10 – 10:50 am   Coffee Break

Image Analysis and Modeling II

10:50 am – 12:30 pm
Harbour A-B

10:50   COIMG-227

Simulation of rare events in images, *Shruthi Kubatur and Mary Comer, Purdue University (United States)*

11:10   COIMG-228

Top down approach to height estimation of sorghum with stereo cameras, *Jihui Jin[1,2] and Avideh Zakhor[1]; [1]University of California, Berkeley and [2]Georgia Institute of Technology (United States)*

11:30   COIMG-229

Recovery of Soil Moisture Active Passive (SMAP) instrument's active measurements via coupled dictionary learning, *Konstantina Fotiadou[1,2], Grigorios Tsagkatakis[1], Mahta Moghaddam[3], and Panagiotis Tsakalides[1,2]; [1]Foundation for Research and Technology (Greece), [2]University of Crete (Greece), and [3]University of Southern California (United States)*

11:50   COIMG-230

Image modeling for fiber-reinforced composite materials, *Tianyu Li, Camilo Aguilar Herrera, and Mary Comer, Purdue University (United States)*

12:10   COIMG-471

Square coded aperture: A large aperture with extended depth of field, *Ruojun He[1], Yi Zhang[2], and Keigo Hirakawa[3]; [1]China University of Political Science and Law School (China), [2]Argo AI, LLC (United States), and [3]University of Dayton (United States)*

12:30 – 2:00 pm   Lunch

Plenary Session

2:00 – 3:00 pm
Grand Peninsula Ballroom D

Fast, Automated 3D Modeling of Buildings and Other GPS Denied Environments, *Avideh Zakhor, University of California, Berkeley (United States)*

Professor Avideh Zahkor discusses fast, automated 3D modeling of buildings and other GPS denied environments with examples from her work in 3D reality capture, and visual and metric documentation of building interiors. Dr. Zakhor is a serial entrepreneur with startups in outdoor mapping, indoor mapping, and micro-lithography, currently CEO and founder of Indoor Reality, a Silicon Valley startup with products in 3D reality capture, and visual and metric documentation of building interiors.

Dr. Zakhor has been faculty member at University of California, Berkeley since 1994 where she holds the Qualcomm Chair in the electrical engineering and computer science department. She co-founded OPC technology in 1996, which was acquired by Mentor Graphics in 1998, and UrbanScan Inc. in 2005, acquired by Google in 2007. UrbanScan created the first fully automated 3D outdoor mapping system for 3D exterior models of buildings in urban environments. She has received a number of best paper awards in 3D computer vision, image processing, signal processing, is an IEEE fellow, and received the presidential young investigator award in 1992. Dr. Zakhor received her BSc in electrical engineering, from the California Institute of Technology (1983), and her MS (1985) and PhD (1987) in electrical engineering and computer science from MIT.

3:00 – 3:30 pm   Coffee Break

Computational Imaging

3:30 – 5:30 pm
Harbour A-B

3:30   COIMG-270

A shooting direction control camera based on computational imaging without mechanical motion, *Keigo Takahashi and Tomohiro Yendo, Nagaoka University of Technology (Japan)*

3:50   COIMG-271

Fast, automated indoor light detection, classification, and measurement, *Craig Hiller and Avideh Zakhor, University of California, Berkeley (United States)*

4:10   COIMG-272

Superfast joint demosaicing and super-resolution, *Ivan Glazistov[1,2] and Xenya Petrova[1]; [1]Samsung R&D Institute Rus and [2]Lomonosov Moscow State University (Russian Federation)*

4:30   COIMG-273

Warping-based motion artifact compensation for multi-line scan light field imaging, *Nicole Brosch, Svorad Štolc, and Doris Antensteiner, AIT Austrian Institute of Technology GmbH (Austria)*

4:50   COIMG-274

Illuminant estimation using ensembles of multivariate regression trees, *Peter van Beek and R. Wayne Oldford, University of Waterloo (Canada)*

5:10   COIMG-473

Depth estimation using a multi-scale matched filter for decoding structured light reflected from a scene, *Hasib Siddiqui, Qualcomm Technologies Inc. (United States)*

Symposium Demonstration Session

5:30 – 7:30 pm
Grand Peninsula Ballroom E

Wednesday January 31, 2018

10:00 am – 4:00 pm   Industry Exhibition

12:40 – 2:00 pm   Lunch

Plenary Session

2:00 – 3:00 pm
Grand Peninsula Ballroom D

Ubiquitous, Consumer AR Systems to Supplant Smartphones, *Ronald T. Azuma, Intel, Corp. (United States)*

Dr. Ronald T. Azuma, researcher and augmented reality pioneer, shares his vision for achieving ubiquitous, consumer AR systems. Recent large investments in augmented reality reflect the commercial interest in its inherent potential to replace current smartphone technology, but much remains to be done. In his talk, Dr. Azuma gives a vision for achieving this goal, which requires not just solving numerous technical challenges but also determining new, compelling AR experiences that will establish AR as a new platform and novel form of media.

Dr. Azuma leads a team in Intel Labs that designs and prototypes novel experiences and key enabling technologies to enable new forms of media. These technology areas include computational imaging and photography, computational displays, and head-worn displays. Dr. Azuma is recognized as a pioneer and innovator in augmented reality, and has held prominent leadership roles in that research area, including leading and implementing research projects and demonstrations in areas such as AR, visualization, and mobile applications. Dr. Azuma received his BSc (1988) in electrical engineering from University of California, Berkeley, and MS (1990) and PhD (1995) in computer science from University of North Carolina, Chapel Hill. Prior to joining Intel, he was a research leader at Nokia Research Center Hollywood, and a senior researcher at Hughes Research Laboratories.

3:00 – 3:30 pm   Coffee Break

Computational Imaging XVI Interactive (Poster) Papers Session

5:30 – 7:00 pm
The Grove

The following works will be presented at the EI 2018 Symposium Interactive Papers Session.

COIMG-402

Estimating the UAVs' crash point based on optical flows' voting in the image plane, *Yusaku Hatano, Chen Yi, and Jun Ohya, Waseda University (Japan)*

COIMG-403

Noise analysis and restrain of ghost imaging system, *Shaofan Qu, Beihang University (China)*

Meet the Future: A Showcase of Student and Young Professionals Research

5:30 – 7:30 pm
The Grove