IS&T International Symposium on

Electronic Imaging 2018

SCIENCE AND TECHNOLOGY

Where Industry and Academia Meet

28 January – 2 February 2018
Hyatt San Francisco Airport, CA

Join us

EI16: JOINT DESIGN OF OPTICS AND IMAGE PROCESSING FOR IMAGING SYSTEMS

Instructor: David Stork, Rambus (US) | **Tuesday January 30**, 8:30 AM – 12:45 PM | **Course Level:** Introductory to Intermediate

Fee: Member: $275/ Non-member: $300 / Student: $95 (*prices for all increase by $50 after January 8, 2018)

For centuries, optical imaging system design centered on exploiting the laws of the physics of light and materials (glass, plastic, reflective metal,) to form high-quality (sharp, high-contrast, undistorted,) images that "looked good." In the past several decades, the optical images produced by such systems have been ever more commonly sensed by digital detectors and the image imperfections corrected in software. The new era of electro-optical imaging offers a more fundamental revision to this paradigm, however, now the optics and image processing can be designed jointly to optimize an end-to-end digital merit function without regard to the traditional quality of the intermediate optical image. Many principles and guidelines from the optics-only era are counterproductive in the new era of electro-optical imaging and must be replaced by principles grounded on both the physics of photons and the information of bits. This short course describes the theoretical and algorithmic foundations of new methods of jointly designing the optics and image processing of electro-optical imaging systems. The course also focuses on the new concepts and approaches rather than commercial tools.

Benefits:

- Describe the basics of information theory.
- Characterize electro-optical systems using linear systems theory.
- Compute a predicted mean-squared error merit function.
- Characterize the spatial statistics of sources.
- Implement a Wiener filter, spatial convolution, and digital filtering.
- Make the distinction between traditional optics-only and end-to-end digital merit functions.
- Perform point-spread function engineering.
- Become aware of the image processing implications of various optical aberrations.
- Describe wavefront coding and cubic phase plates.
- Utilize the power of spherical coding.
- Compare super-resolution algorithms and multi-aperture image synthesizing systems.
- Simulate the manufacturability of jointly designed imaging systems.
- Evaluate new methods of electro-optical compensation.

Intended Audience: Optical designers familiar with system characterization (f#, depth of field, numerical aperture, point spread functions, modulation transfer functions,) and image processing experts familiar with basic operations (convolution, digital sharpening, information theory).

Instructor: **David Stork** is distinguished research scientist and research director at Rambus Labs and a Fellow of the International Association for Pattern Recognition. He holds 40 US patents and has written nearly 200 technical publications including eight books or proceedings volumes such as *Seeing the Light, Pattern Classification (2nd ed.)* and *HAL's Legacy*. He has given more than 230 technical presentations on computer image analysis of art in 19 countries.

SYMPOSIUM PLENARY TALKS

Monday: Overview of Modern Machine Learning and Deep Neural Networks – Impact on Imaging and the Field of Computer Vision, **Greg Corrado, co-founder of Google Brain and Principal Scientist at Google**

Tuesday: Fast, Automated 3D Modeling of Buildings and Other GPS Denied Environments, **Avideh Zahkor, Qualcomm Chair & Professor at UC Berkeley**

Wednesday: Ubiquitous, Consumer AR Systems to Supplant Smartphones, **Ronald T. Azuma, Intel Labs Researcher and Augmented Reality Pioneer**

SYMPOSIUM HIGHLIGHTS

- 18 conferences featuring 30 keynote talks by world reknown experts
- 3D Theatre
- Tours of Stanford University Labs
- Industry Exhibition
- Meet the Future: Showcase of Student and Young Professional Research
- Demonstration Session
- Poster Session
- Welcome Reception
- Women in Electronic Imaging Breakfast
- Human Vision in Electronic Imaging 30th Year Banquet

To register or learn more, visit
www.ElectronicImaging.org

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Information confirmed as of 12/06/17