



# Mobile Devices and Multimedia: Enabling Technologies, Algorithms, and Applications 2023

## Conference Chairs

David Akopian, The University of Texas at San Antonio (US)

Reiner Creutzburg, Technische Hochschule Brandenburg (Germany)

This document details the conference program, held as part of the 2023 IS&T International Symposium on Electronic Imaging, 15-19 January 2023. Manuscripts of conference papers are reproduced from PDFs as submitted and approved by authors; no editorial changes were made.

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Society for Imaging Science and Technology  
7003 Kilworth Lane • Springfield, VA 22151 USA  
703/642-9090; 703/642-9094 fax  
info@imaging.org; www.imaging.org

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ISSN 2470-1173

<https://doi.org/10.2352/EI.2023.35.3.MOBMU-A03>

# Mobile Devices and Multimedia: Enabling Technologies, Algorithms, and Applications 2023

## Conference overview

The goal of this conference is to provide an international forum for presenting recent research results on multimedia for mobile devices, and to bring together experts from both academia and industry for a fruitful exchange of ideas and discussion on future challenges. The authors are encouraged to submit work-in-progress papers as well as updates on previously reported systems. Outstanding papers may be recommended for the publication in the Journal Electronic Imaging or Journal of Imaging Science and Technology.

**Conference Chairs:** David Akopian, The University of Texas at San Antonio (US); Reiner Creutzburg, Technische Hochschule Brandenburg (Germany)

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*Paper authors listed as of 1 January 2023; refer to manuscript for final authors. Titles that are not listed with the proceedings files were presentation-only.*

# Mobile Devices and Multimedia: Enabling Technologies, Algorithms, and Applications 2023

MONDAY 16 JANUARY 2023

## Monday 16 January PLENARY: Neural Operators for Solving PDEs

Session Chair: Robin Jenkin, NVIDIA Corporation (United States)

2:00 PM – 3:00 PM

Cyril Magnin I/II/III

*Deep learning surrogate models have shown promise in modeling complex physical phenomena such as fluid flows, molecular dynamics, and material properties. However, standard neural networks assume finite-dimensional inputs and outputs, and hence, cannot withstand a change in resolution or discretization between training and testing. We introduce Fourier neural operators that can learn operators, which are mappings between infinite dimensional spaces. They are independent of the resolution or grid of training data and allow for zero-shot generalization to higher resolution evaluations. When applied to weather forecasting, neural operators capture fine-scale phenomena and have similar skill as gold-standard numerical weather models for predictions up to a week or longer, while being 4-5 orders of magnitude faster.*

**Anima Anandkumar**, Bren professor, California Institute of Technology, and senior director of AI Research, NVIDIA Corporation (United States)

*Anima Anandkumar is a Bren Professor at Caltech and Senior Director of AI Research at NVIDIA. She is passionate about designing principled AI algorithms and applying them to interdisciplinary domains. She has received several honors such as the IEEE fellowship, Alfred. P. Sloan Fellowship, NSF Career Award, and Faculty Fellowships from Microsoft, Google, Facebook, and Adobe. She is part of the World Economic Forum's Expert Network. Anandkumar received her BTech from Indian Institute of Technology Madras, her PhD from Cornell University, and did her postdoctoral research at MIT and assistant professorship at University of California Irvine.*

## EI 2023 Highlights Session

Session Chair: Robin Jenkin, NVIDIA Corporation (United States)

3:30 – 5:00 PM

Cyril Magnin II

*Join us for a session that celebrates the breadth of what EI has to offer with short papers selected from EI conferences.*

*NOTE: The EI-wide "EI 2023 Highlights" session is concurrent with Monday afternoon COIMG, COLOR, IMAGE, and IQSP conference sessions.*

IQSP-309

**Evaluation of image quality metrics designed for DRI tasks with automotive cameras**, *Valentine Klein, Yiqi Li, Claudio Greco, Laurent Chanas, and Frédéric Guichard, DXOMARK (France)*

SD&A-224

**Human performance using stereo 3D in a helmet mounted display and association with individual stereo acuity**, *Bonnie Posselt, RAF Centre of Aviation Medicine (United Kingdom)*

IMAGE-281

**Smartphone-enabled point-of-care blood hemoglobin testing with color accuracy-assisted spectral learning**, *Sang Mok Park<sup>1</sup>, Yuhyun Ji<sup>1</sup>, Semin Kwon<sup>1</sup>, Andrew R. O'Brien<sup>2</sup>, Ying Wang<sup>2</sup>, and Young L. Kim<sup>1</sup>; <sup>1</sup>Purdue University and <sup>2</sup>Indiana University School of Medicine (United States)*

AVM-118

**Designing scenes to quantify the performance of automotive perception systems**, *Zhenyi Liu<sup>1</sup>, Devesh Shah<sup>2</sup>, Alireza Rahimpour<sup>2</sup>, Joyce Farrell<sup>1</sup>, and Brian Wandell<sup>1</sup>; <sup>1</sup>Stanford University and <sup>2</sup>Ford Motor Company (United States)*

VDA-403

**Visualizing and monitoring the process of injection molding**, *Christian A. Steinparz<sup>1</sup>, Thomas Mitterlehner<sup>2</sup>, Bernhard Praher<sup>2</sup>, Klaus Straka<sup>1,2</sup>, Holger Stitz<sup>1,3</sup>, and Marc Streit<sup>1,3</sup>; <sup>1</sup>Johannes Kepler University, <sup>2</sup>Moldsonics GmbH, and <sup>3</sup>datavisyn GmbH (Austria)*

COIMG-155

**Commissioning the James Webb Space Telescope**, *Joseph M. Howard, NASA Goddard Space Flight Center (United States)*

HVEI-223

**Critical flicker frequency (CFF) at high luminance levels**, *Alexandre Chapiro<sup>1</sup>, Nathan Matsuda<sup>1</sup>, Maliha Ashraf<sup>2</sup>, and Rafal Mantiuk<sup>3</sup>; <sup>1</sup>Meta (United States), <sup>2</sup>University of Liverpool (United Kingdom), and <sup>3</sup>University of Cambridge (United Kingdom)*

HPCI-228

**Physics guided machine learning for image-based material decomposition of tissues from simulated breast models with calcifications**, *Muralikrishnan Gopalakrishnan Meena<sup>1</sup>, Amir K. Ziabari<sup>1</sup>, Singanallur Venkatakrishnan<sup>1</sup>, Isaac R. Lyngaas<sup>1</sup>, Matthew R. Norman<sup>1</sup>, Balint Joo<sup>1</sup>, Thomas L. Beck<sup>1</sup>, Charles A. Bouman<sup>2</sup>, Anuj Kapadia<sup>1</sup>, and Xiao Wang<sup>1</sup>; <sup>1</sup>Oak Ridge National Laboratory and <sup>2</sup>Purdue University (United States)*

3DIA-104

**Layered view synthesis for general images**, *Loic Dehan, Wiebe Van Ranst, and Patrick Vandewalle, Katholieke University Leuven (Belgium)*

ISS-329

**A self-powered asynchronous image sensor with independent in-pixel harvesting and sensing operations**, Ruben Gomez-Merchan, Juan Antonio Leñero-Bardallo, and Ángel Rodríguez-Vázquez, University of Seville (Spain)

COLOR-184

**Color blindness and modern board games**, Alessandro Rizzi<sup>1</sup> and Matteo Sassi<sup>2</sup>; <sup>1</sup>Università degli Studi di Milano and <sup>2</sup>consultant (Italy)

## TUESDAY 17 JANUARY 2023

### Tuesday 17 January PLENARY: Embedded Gain Maps for Adaptive Display of High Dynamic Range Images

Session Chair: Robin Jenkin, NVIDIA Corporation (United States)

2:00 PM – 3:00 PM

Cyril Magnin I/II/III

*Images optimized for High Dynamic Range (HDR) displays have brighter highlights and more detailed shadows, resulting in an increased sense of realism and greater impact. However, a major issue with HDR content is the lack of consistency in appearance across different devices and viewing environments. There are several reasons, including varying capabilities of HDR displays and the different tone mapping methods implemented across software and platforms. Consequently, HDR content authors can neither control nor predict how their images will appear in other apps.*

*We present a flexible system that provides consistent and adaptive display of HDR images. Conceptually, the method combines both SDR and HDR renditions within a single image and interpolates between the two dynamically at display time. We compute a Gain Map that represents the difference between the two renditions. In the file, we store a Base rendition (either SDR or HDR), the Gain Map, and some associated metadata. At display time, we combine the Base image with a scaled version of the Gain Map, where the scale factor depends on the image metadata, the HDR capacity of the display, and the viewing environment.*

**Eric Chan**, Fellow, Adobe Inc. (United States)

*Eric Chan is a Fellow at Adobe, where he develops software for editing photographs. Current projects include Photoshop, Lightroom, Camera Raw, and Digital Negative (DNG). When not writing software, Chan enjoys spending time at his other keyboard, the piano. He is an enthusiastic nature photographer and often combines his photo activities with travel and hiking.*

**Paul M. Hubel**, director of Image Quality in Software Engineering, Apple Inc. (United States)

*Paul M. Hubel is director of Image Quality in Software Engineering at Apple. He has worked on computational photography and image quality of photographic systems for many years on all aspects of the imaging chain, particularly for iPhone. He trained in optical engineering at University*

of Rochester, Oxford University, and MIT, and has more than 50 patents on color imaging and camera technology. Hubel is active on the ISO-TC42 committee Digital Photography, where this work is under discussion, and is currently a VP on the IS&T Board. Outside work he enjoys photography, travel, cycling, coffee roasting, and plays trumpet in several bay area ensembles.

## WEDNESDAY 18 JANUARY 2023

### Imaging, Detection, Systems (W1)

**Session Chair:** Reiner Creutzburg, Technische Hochschule Brandenburg (Germany)

8:45 – 10:10 AM

Balboa

8:45

#### Conference Welcome

8:50

MOBMU-349

**Comparative study of various object detection sensors for an autonomous valet parking system with line tracking,** Harshi Ghai<sup>1</sup>, Rahul Nethilath Vinod<sup>1</sup>, Saurabh Kothale<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Michael Hartmann<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)

9:10

MOBMU-350

**iPhone12 imagery in scene-referred computer graphics pipelines,** Eberhard Hasche<sup>1</sup>, Oliver Karaschewski<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>Technische Hochschule Brandenburg and <sup>2</sup>SRH Berlin University of Applied Sciences (Germany)

9:30

MOBMU-351

**Improving the performance of web-streaming by super-resolution upscaling techniques,** Yuriy Reznik<sup>1</sup> and Nabajeet Barman<sup>2,3</sup>; <sup>1</sup>Brightcove, Inc. (United States), <sup>2</sup>Brightcove UK Ltd (United Kingdom), and <sup>3</sup>Kingston University (United Kingdom)

9:50

MOBMU-352

**Integrity and authenticity verification of printed documents by smartphones,** Simon Bugert, Julian Heeger, and Waldemar Berchtold, Fraunhofer Institute for Secure Information Technology (Germany)

### Open Source Intelligence: Social Media (W2)

**Session Chair:** Mohammad Nadim, The University of Texas at San Antonio (United States)

10:50 AM – 12:30 PM

Balboa

10:50

MOBMU-353

**Evaluation and test of various tools for OSINT-based email investigation,** Samrudha Mhatre<sup>1</sup>, Franziska Schwarz<sup>2</sup>, Klaus Schwarz<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)

11:10

MOBMU-354

**Importance of OSINT/SOCMINT for modern disaster management evaluation - Australia, Haiti, Japan,** Nazneen Mansoor<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Daniel Arias Aranda<sup>2</sup>, and Reiner Creutzburg<sup>1,3</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences (Germany), <sup>2</sup>University of Granada (Spain), and <sup>3</sup>Technische Hochschule Brandenburg (Germany)



11:30

MOBMU-355

**Practical OSINT investigation in Twitter utilizing AI-based aggressiveness analysis**, Artem Sklyar<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Daniel Arias Aranda<sup>2</sup>, and Reiner Creutzburg<sup>1,3</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences (Germany), <sup>2</sup>University of Granada (Spain), and <sup>3</sup>Technische Hochschule Brandenburg (Germany)

11:50

MOBMU-356

**Practical OSINT investigation - Similarity calculation using Reddit user profile data**, Valeria Vishnevskaya<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Daniel Arias Aranda<sup>2</sup>, and Reiner Creutzburg<sup>1,3</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences (Germany), <sup>2</sup>University of Granada (Spain), and <sup>3</sup>Technische Hochschule Brandenburg (Germany)

12:10

MOBMU-357

**Open-source Intelligence (OSINT) investigation in Facebook**, Pranesh Kumar Narasimhan<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Hasan Dag<sup>2</sup>, and Reiner Creutzburg<sup>1,3</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences (Germany), <sup>2</sup>Kadir Das University (Turkey), and <sup>3</sup>Technische Hochschule Brandenburg (Germany)

### **Wednesday 18 January PLENARY: Bringing Vision Science to Electronic Imaging: The Pyramid of Visibility**

Session Chair: Andreas Savakis, Rochester Institute of Technology (United States)

2:00 PM – 3:00 PM

Cyril Magnin I/II/III

*Electronic imaging depends fundamentally on the capabilities and limitations of human vision. The challenge for the vision scientist is to describe these limitations to the engineer in a comprehensive, computable, and elegant formulation. Primary among these limitations are visibility of variations in light intensity over space and time, of variations in color over space and time, and of all of these patterns with position in the visual field. Lastly, we must describe how all these sensitivities vary with adapting light level. We have recently developed a structural description of human visual sensitivity that we call the Pyramid of Visibility, that accomplishes this synthesis. This talk shows how this structure accommodates all the dimensions described above, and how it can be used to solve a wide variety of problems in display engineering.*

**Andrew B. Watson**, chief vision scientist, Apple Inc. (United States)

*Andrew Watson is Chief Vision Scientist at Apple, where he leads the application of vision science to technologies, applications, and displays. His research focuses on computational models of early vision. He is the author of more than 100 scientific papers and 8 patents. He has 21,180 citations and an h-index of 63. Watson founded the Journal of Vision, and served as editor-in-chief 2001-2013 and 2018-2022. Watson has received numerous awards including the Presidential Rank Award from the President of the United States.*

### **Mobile Applications (W3)**

**Session Chair:** Reiner Creutzburg, Technische Hochschule Brandenburg (Germany)

3:30 – 4:10 PM

Balboa

3:30 MOBMU-358  
**Mobile incident commanding dashboard (MIC-D)**, *Yang Cai, CMU (United States)*

3:50 MOBMU-359  
**Performance evaluation of keyword detection for the chatbot model**, *Ganesh Reddy Gunnam, Devasena Inupakutika, Rahul Mundlamuri, Sahak Kaghyan, and David Akopian, The University of Texas at San Antonio (United States)*

**Mobile Devices and Multimedia: Enabling Technologies, Algorithms, and Applications 2023 Interactive (Poster) Paper Session**

5:30 – 7:00 PM

Cyril Magnin Foyer

*The following works will be presented at the EI 2023 Symposium Interactive (Poster) Paper Session.*

MOBMU-360  
**Evaluation and test of various tools for OSINT Reddit investigation - Scenarios and use cases**, *Shubham Pandya<sup>1</sup>, Klaus Schwarz<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)*

MOBMU-361  
**Comparison of OSINT-based marketing tools for Pinterest**, *Amith Rajolkar<sup>1</sup>, Klaus Schwarz<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)*

MOBMU-362  
**Evaluation and test of various tools for OSINT-based Snapchat investigation**, *Shashank Markapuram Ramesh<sup>1</sup>, Klaus Schwarz<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRh Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)*

MOBMU-363  
**Improvement of vehicle accident detection using object tracking with U-Net**, *Kirsnaragavan Arudpiragasam<sup>1</sup>, Kannuri Taraka Rama Krishna Kanth<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Michael Hartmann<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)*

MOBMU-364  
**Generative adversarial network (GAN) and object tracking for vehicle accident detection**, *Kirsnaragavan Arudpiragasam<sup>1</sup>, Kannuri Taraka Rama Krishna Kanth<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Michael Hartmann<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)*

MOBMU-365  
**Multimodal approach for classifying road accident severity**, *Kirsnaragavan Arudpiragasam<sup>1</sup>, Sanskruti Sawant<sup>1</sup>, Kannuri Taraka Rama Krishna Kanth<sup>1</sup>, Klaus Schwarz<sup>1</sup>, Michael Hartmann<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)*



MOBMU-366

**An RF modulation recognition method using machine learning**, *Rahul Mundlamuri, Devasena Inupakutika, Ganesh Reddy Gunnam, Thinh Ngo, and David Akopian, The University of Texas at San Antonio (United States)*

MOBMU-367

**Flood prediction with deep learning**, *Ganesh Reddy Gunnam, Devasena Inupakutika, Rahul Mundlamuri, Sahak Kaghyan, and David Akopian, The University of Texas at San Antonio (United States)*

MOBMU-368

**A qualitative study of LiDAR technologies and their application areas**, *Daniel Jaster<sup>1</sup>, Eberhard Hasche<sup>1</sup>, and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>Technische Hochschule Brandenburg and <sup>2</sup>SRH Berlin University of Applied Sciences (Germany)*

MOBMU-369

**Survey into predictive maintenance analysis of photovoltaic systems**, *Reiner Creutzburg<sup>1,2</sup> and Saiful Islam<sup>2</sup>; <sup>1</sup>Technische Hochschule Brandenburg and <sup>2</sup>SRH Berlin University of Applied Sciences (Germany)*

MOBMU-370

**Evaluation and test of various tools for OSINT investigation in social media networks: Facebook, Twitter, Instagram, and Telegram**, *Klaus Schwarz<sup>1</sup> and Reiner Creutzburg<sup>1,2</sup>; <sup>1</sup>SRH Berlin University of Applied Sciences and <sup>2</sup>Technische Hochschule Brandenburg (Germany)*

MOBMU-371

**Performance of keyword extraction tools**, *Mohammad Nadim, Adolfo Matamoros, and David Akopian, The University of Texas at San Antonio (United States)*