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PROCEEDINGS

Media Watermarking, Security, and Forensics 2021

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Nasir D. Memon, Tandon School of Engineering, New York Univ. (United States),
and **Gaurav Sharma,** University of Rochester (United States)

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Media Watermarking, Security, and Forensics 2021

Conference overview

The ease of capturing, manipulating, distributing, and consuming digital media (e.g., images, audio, video, graphics, and text) has enabled new applications and brought a number of important security challenges to the forefront. These challenges have prompted significant research and development in the areas of digital watermarking, steganography, data hiding, forensics, media identification, biometrics, and encryption to protect owners' rights, establish provenance and veracity of content, and to preserve privacy. Research results in these areas has been translated into new paradigms and applications for monetizing media while maintaining ownership rights, and new biometric and forensic identification techniques for novel methods for ensuring privacy.

The Media Watermarking, Security, and Forensics Conference is a premier destination for disseminating high-quality, cutting-edge research in these areas. The conference provides an excellent venue for researchers and practitioners to present their innovative work as well as to keep abreast of the latest developments in watermarking, security, and forensics. Early results and fresh ideas are particularly encouraged and supported by the conference review format: only a structured abstract describing the work in progress and preliminary results is initially required and the full paper is requested just before the conference. A strong focus on how research results are applied by industry, in practice, also gives the conference its unique flavor.

Paper authors listed as of 1 January 2021; refer to manuscript for final authors. Titles that are not listed with the proceedings files were presentation-only.

Media Watermarking, Security, and Forensics 2021

TUESDAY 19 JANUARY 2021

PLENARY: DEEP INTERNAL LEARNING—DEEP LEARNING WITH ZERO EXAMPLES

Session Chair: Charles Bouman, Purdue University (United States)
10:00 – 11:10

Deep internal learning—Deep learning with zero examples
Michal Irani, *professor, Department of Computer Science and Applied Mathematics, Weizmann Institute of Science (Israel)*

Michal Irani is a professor at the Weizmann Institute of Science. Her research interests include computer vision, AI, and deep learning. Irani's prizes and honors include the Maria Petrou Prize (2016), the Helmholtz "Test of Time Award" (2017), the Landau Prize in AI (2019), and the Rothschild Prize in Mathematics and Computer Science (2020). She also received the ECCV Best Paper Awards (2000 and 2002), and the Marr Prize Honorable Mention (2001 and 2005).

THURSDAY 21 JANUARY 2021

PLENARY: THE DEVELOPMENT OF INTEGRAL COLOR IMAGE SENSORS AND CAMERAS

Session Chair: Jonathan B. Phillips, Google Inc. (United States)
10:00 – 11:10

The development of integral color image sensors and cameras
Kenneth A. Parulski, *expert consultant: mobile imaging (United States)*

Kenneth Parulski is an expert consultant to mobile imaging companies and leads the development of ISO standards for digital photography. He joined Kodak in 1980 after graduating from MIT and retired in 2012 as research fellow and chief scientist in Kodak's digital photography division. His work has been recognized with a Technical Emmy and other major awards. Parulski is a SMPTE fellow and an inventor on more than 225 US patents.

MONDAY 25 JANUARY 2021

PLENARY: MAKING INVISIBLE VISIBLE

Session Chair: Jonathan B. Phillips, Google Inc. (United States)
10:00 – 11:10

Making invisible visible
Ramesh Raskar, *associate professor, MIT Media Lab (United States)*

Ramesh Raskar is an associate professor at MIT Media Lab and directs the Camera Culture research group. His focus is on AI and imaging for health and sustainability. They span research in physical (e.g., sensors, health-tech), digital (e.g., automated and privacy-aware machine learning), and global (e.g., geomaps, autonomous mobility) domains. He received the Lemelson Award (2016), ACM SIGGRAPH Achievement Award (2017), DARPA Young Faculty Award (2009), Alfred P. Sloan Research Fellowship (2009), TR100 Award from MIT Technology Review (2004), and Global Indus Technovator Award (2003). He has worked on special research projects at Google [X] and Facebook and co-founded/advised several companies.

WEDNESDAY 27 JANUARY 2021

PLENARY: REVEALING THE INVISIBLE TO MACHINES WITH NEUROMORPHIC VISION SYSTEMS: TECHNOLOGY AND APPLICATIONS OVERVIEW

Session Chair: Radka Tezaur, Intel Corporation (United States)
10:00 – 11:10

Revealing the invisible to machines with neuromorphic vision systems: Technology and applications overview
Luca Verre, *CEO and co-founder, Prophesee (France)*

Luca Verre is co-founder and CEO of Prophesee, the inventor of the world's most advanced neuromorphic vision systems. Verre is a World Economic Forum technology pioneer. His experience includes project and product management, marketing, and business development roles at Schneider Electric. Prior to Schneider Electric, Verre worked as a research assistant in photonics at the Imperial College of London. Verre holds a MSc in physics, electronic and industrial engineering from Politecnico di Milano and Ecole Centrale and an MBA from Institut Européen d'Administration des Affaires, INSEAD.

DEEPFAKE DETECTION

Moderator: Martin Steinebach, Fraunhofer SIT (Germany) / **Session Chair:** Gaurav Sharma, University of Rochester (United States)
11:40 – 13:00

11:40 MWSF-271
Detecting deepfakes with Haralick's texture properties, *Raphael Frick, Sascha Zmudzinski, and Martin Steinebach, Fraunhofer Institute SIT (Germany)*

12:00 MWSF-272
Detecting deepfake videos using Euler video magnification, *Rashmiranjan Das, Gaurav Negi, and Alan Smeaton, Dublin City University (Ireland)*

12:20 MWSF-273
Frequency domain-based detection of generated audio, *Emily Bartusiak and Edward Delp, Purdue University (United States)*

12:40 MWSF-274
Automated image metadata verification, *Kyra Wittorf, Martin Steinebach, and Huajian Liu, Fraunhofer SIT (Germany)*

WATERMARK AND FINGERPRINTING

Moderator: Lakshmanan Nataraj, Mayachitra Inc. (United States) / **Session Chair:** Adnan Alattar, Digimarc Corporation (United States)
13:30 – 14:30

13:30 MWSF-298
Fingerprinting blank paper and printed material by smartphones, *Waldemar Berchtold, Markus Suetter, and Martin Steinebach, Fraunhofer SIT (Germany)*

13:50 MWSF-299
Signal rich art: Object placement, object position modulation, and other advances, *Ajith Kamath, Digimarc (United States)*

14:10 MWSF-300
Attribution of gradient based adversarial attacks for reverse engineering of deceptions, *Michael Goebel[1], Jason Bunk[2], Srinjoy Chattopadhyay[2], Lakshmanan Nataraj[2], Shivkumar Chandrasekaran[2], and B.S. Manjunath[2]; [1]University of California Santa Barbara and [2]Mayachitra Inc. (United States)*

IMAGE FORENSICS

Moderator: Hui Zeng, Southwest University of Science and Technology (China) / **Session Chair:** Nasir Memon, New York University (United States)
18:15 – 19:15

18:15 MWSF-275
Replacing DWT with DTCWT in blind image rotation angle estimation, *Hui Zeng[1,2], Morteza Darvish Morshedi Hosseini[2], and Miroslav Goljan[2]; [1]Southwest University of Science and Technology (China) and [2]Binghamton University (United States)*

18:35 MWSF-276
Detection, attribution and localization of GAN generated images, *Michael Goebel[1], Lakshmanan Nataraj[2], Tejaswi Nanjundaswamy[2], Tajuddin Manhar Mohammed[2], Shivkumar Chandrasekaran[1,2], and B.S. Manjunath[1,2]; [1]University of California Santa Barbara and [2]Mayachitra Inc. (United States)*

18:55 MWSF-277
Holistic image manipulation detection using pixel co-occurrence matrices, *Lakshmanan Nataraj[1], Michael Goebel[2], Tajuadin Manhar Mohammea[1], Shivkumar Chandrasekaran[2], and B.S. Manjunath[2]; [1]Mayachitra Inc. and [2]University of California Santa Barbara (United States)*

KEYNOTE: CONTENT AUTHENTICITY

Session Chair: Nasir Memon, New York University (United States) / Moderator: Gaurav Sharma, University of Rochester (United States)
19:45 – 20:45

MWSF-349

KEYNOTE: The Content Authenticity Initiative: Provenance in the age of disinformation, *Andy Parsons, Adobe Inc. (United States)*

Keynote speaker Andy Parsons is the Director of Adobe's Content Authenticity Initiative (CAI), which is creating the open standards framework for a future of verifiably authentic content of all kinds. With collaborators across hardware, software, publishing and social platforms the CAI is empowering creators with attribution and provenance. For information consumers, this important work resiores trust and transparency to media. Prior to joining Adobe, Parsons founded Workframe (acquired in 2019), the pioneering visual project management platform for commercial architecture. Parsons previously served as Chief Technology Officer at McKinsey Academy, McKinsey's groundbreaking educational platform and he co-founded Happify, the world's leading mobile platform for digital therapeutics and behavioral health. He has enjoyed deep involvement over the years with the open-source ecosystem, most recently as the organizer of the Clojure/NYC engineering community, which grew to several thousand members under his stewardship.

THURSDAY 28 JANUARY 2021

MEDIA SOURCE IDENTIFICATION

Moderator: Martin Steinebach, Fraunhofer SIT (Germany) / **Session Chair:** Adnan Alattar, Digimarc Corporation (United States)
10:15 – 11:15

10:15 MWSF-336

Camera fingerprint estimation with a generative adversarial network (GAN), *Sujoy Chakraborty, Stockton University (United States)*

10:35 MWSF-337

Video source identification from MP4 data based on field values in atom/box attributes, *Erik Gelbing, Leon Würsching, Sascha Zmudzinski, and Martin Steinebach, Fraunhofer SIT (Germany)*

10:55 MWSF-338

PRNU estimation from encoded videos using block-based weighting, *Enes Altinisik[1], Kasim Tasdemir[2], and Husrev Taha Sencar[3]; [1]Qatar Computing Research Institute, [2]Abdullah Gul Universitesi, and [3]TOBB University (Turkey)*

USER IDENTIFICATION

Moderator: Adnan Alattar, Digimarc Corporation (United States) / **Session Chair:** Gaurav Sharma, University of Rochester (United States)
11:45 – 12:45

11:45 MWSF-344
AiroIdent – User identification based on analyzing WPA2 encrypted traffic containing search engine interactions, *Mario Hildebrandt, Kevin Lamshoeft, Christian Kraetzer, Aamir Shakir, Hannes Stuetzer, Mohamed Abdelrazek, Alexander Ziemke, Dominik Blut, and Jana Dittmann, Otto-von-Guericke-Universität Magdeburg (Germany)*

12:05 MWSF-345
A close look at robust hash flip positions, *Martin Steinebach, Fraunhofer SIT (Germany)*

12:25 MWSF-346
Proximally secure communication in public settings using specialized barcodes, *Irving Barron Martinez and Gaurav Sharma, University of Rochester (United States)*