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IS&T International Symposium on
Electronic Imaging
SCIENCE AND TECHNOLOGY

26 January 2020 — 30 January 2020 • Burlingame, CA, USA

PROCEEDINGS

Food and Agricultural Imaging Systems 2020

Editors: **Mustafa Jaber,** NantOmics, LLC (United States),
Grigorios Tsagkatakis, Institute of Computer Science, FORTH (Greece), and
Mohammed Yousefhussien, General Electric Global Research (United States)

These papers represent the program of Electronic Imaging 2020,
held 26 January — 30 January 2020, at the Hyatt Regency San Francisco Airport in Burlingame, CA.

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Food and Agricultural Imaging Systems 2020

Conference Chairs: **Mustafa Jaber**, NantOmics, LLC (United States); **Grigorios Tsagkatakis**, Institute of Computer Science, FORTH (Greece); and **Mohammed Yousefhussien**, General Electric Global Research (United States)

Overview

Guaranteeing food security, understanding the impact of climate change in agriculture, quantifying the impact of extreme weather events on food production, and automating the process of food quality control are a few topics where modern imaging technologies can provide much needed solutions. This conference welcomes contributions on innovative imaging systems, computer vision, machine/deep learning research, and augmented reality focusing on applications in food and agriculture. Conference topics consider how novel imaging technologies can address issues related to the impact of climate change, handling and fusion of remote sensing and in-situ data, crop yield prediction, intelligent farming, and livestock management among others. Topics related to food and beverage industry that include food recognition, calorie estimation, food waste management (among others) are included.

Highlights

The conference hosted two guest speakers, Dr. Jan van Aardt, professor, Chester F. Carlson Center for Imaging Science, Rochester Institute of Technology (United States), and Kevin Lang, general manager, PrecisionHawk (United States).

Jan van Aardt obtained a BSc in forestry (biometry and silviculture specialization) from the University of Stellenbosch, Stellenbosch, South Africa (1996). He completed his MS and PhD in forestry, focused on remote sensing (imaging spectroscopy and light detection and ranging), at the Virginia Polytechnic Institute and State University, Blacksburg, Virginia (2000 and 2004, respectively). This was followed by post-doctoral work at the Katholieke Universiteit Leuven, Belgium, and a stint as research group leader at the Council for Scientific and Industrial Research, South Africa. Imaging spectroscopy and structural (lidar) sensing of natural resources form the core of his efforts, which vary between vegetation structural and system state (physiology) assessment. He has received funding from NSF, NASA, Google, and USDA, among others, and has published more than 70 peer-reviewed papers and more than 90 conference contributions. VanAardt is currently a professor in the Chester F. Carlson Center for Imaging Science at the Rochester Institute of Technology, New York.

Dr. van Aardt is speaking on, *"Managing crops across spatial and temporal scales - the roles of UAS and satellite remote sensing."*

Kevin Lang is general manager of PrecisionHawk's agriculture business (Raleigh, North Carolina). PrecisionHawk is a commercial drone and data company that uses aerial mapping, modeling, and agronomy platform specifically designed for precision agriculture. Mr. Lang advises clients on how to capture value from aerial data collection, artificial intelligence and advanced analytics in addition to delivering implementation programs. Lang holds a BS in mechanical engineering from Clemson University and an MBA from Wake Forest University.

Kevin Lang is speaking on, *"Practical applications and trends for UAV remote sensing in agriculture."*

Paper authors listed as of 1 January 2020;
refer to manuscript for final authors.
Titles that are not listed with the proceedings
files were presentation-only.

FOOD AND AGRICULTURAL IMAGING SYSTEMS 2020

Tuesday, January 28, 2020

7:30 – 8:45 am Women in Electronic Imaging Breakfast; pre-registration required

Drone Imaging I — Joint Session

Session Chairs: Andreas Savakis, Rochester Institute of Technology (United States) and Grigorios Tsagkatakis, Foundation for Research and Technology (FORTH) (Greece)

8:45 – 10:10 am
Cypress B
This session is jointly sponsored by: Food and Agricultural Imaging Systems 2020, and Imaging and Multimedia Analytics in a Web and Mobile World 2020.

8:45
Conference Welcome

8:50 IMAWM-084
A new training model for object detection in aerial images, *Geng Yang[1], Yu Geng[2], Qin Li[1], Jane You[3], and Mingpeng Cai[1]; [1]Shenzhen Institute of Information Technology (China), [2]Shenzhen Shangda Xinzhi Information Technology Co., Ltd. (China), and [3]The Hong Kong Polytechnic University (Hong Kong)*

9:10 IMAWM-085
Small object bird detection in infrared drone videos using mask R-CNN deep learning, *Yasmin Kassim[1], Michael Byrne[1], Cristy Burch[2], Kevin Mote[2], Jason Hardin[2], and Kannappan Palaniappan[1]; [1]University of Missouri and [2]Texas Parks and Wildlife (United States)*

9:30 IMAWM-086
High-quality multispectral image generation using conditional GANs, *Ayush Soni, Alexander Loui, Scott Brown, and Carl Salvaggio, Rochester Institute of Technology (United States)*

9:50 IMAWM-087
Deep Ram: Deep neural network architecture for oil/gas pipeline right-of-way automated monitoring, *Ruixu Liu, Theus Aspiras, and Vijayan Asari, University of Dayton (United States)*

10:00 am – 7:30 pm Industry Exhibition - Tuesday

10:10 – 10:30 am Coffee Break

Drone Imaging II — Joint Session

Session Chairs: Vijayan Asari, University of Dayton (United States) and Grigorios Tsagkatakis, Foundation for Research and Technology (FORTH) (Greece)

10:30 – 10:50 am
Cypress B
This session is jointly sponsored by: Food and Agricultural Imaging Systems 2020, and Imaging and Multimedia Analytics in a Web and Mobile World 2020.

IMAWM-114
LambdaNet: A fully convolutional architecture for directional change detection, *Bryan Blakeslee and Andreas Savakis, Rochester Institute of Technology (United States)*

KEYNOTE: Remote Sensing in Agriculture I — Joint Session

Session Chairs: Vijayan Asari, University of Dayton (United States) and Mohammed Yousefhussien, General Electric Global Research (United States)

10:50 – 11:40 am
Cypress B
This session is jointly sponsored by: Food and Agricultural Imaging Systems 2020, and Imaging and Multimedia Analytics in a Web and Mobile World 2020.

FAIS-127
Managing crops across spatial and temporal scales - The roles of UAS and satellite remote sensing, *Jan van Aardt, professor, Chester F. Carlson Center for Imaging Science, Rochester Institute of Technology (United States)*

Biographies and/or abstracts for all keynotes are found on pages 9–14

KEYNOTE: Remote Sensing in Agriculture II — Joint Session

Session Chairs: Vijayan Asari, University of Dayton (United States) and Mohammed Yousefhussien, General Electric Global Research (United States)

11:40 am – 12:30 pm
Cypress B
This session is jointly sponsored by: Food and Agricultural Imaging Systems 2020, and Imaging and Multimedia Analytics in a Web and Mobile World 2020.

FAIS-151
Practical applications and trends for UAV remote sensing in agriculture, *Kevin Lang, general manager, Agriculture, PrecisionHawk (United States)*

Biographies and/or abstracts for all keynotes are found on pages 9–14

12:30 – 2:00 pm Lunch

PLENARY: Automotive Imaging

Session Chairs: Radka Tezaur, Intel Corporation (United States), and Jonathan Phillips, Google Inc. (United States)

2:00 – 3:10 pm
Grand Peninsula Ballroom D

Imaging in the Autonomous Vehicle Revolution, *Gary Hicok, senior vice president of hardware development, NVIDIA Corporation (United States)*

For abstract and speaker biography, see page 7

3:10 – 3:30 pm Coffee Break

Food and Agricultural Imaging

Session Chairs: Mustafa Jaber, NantVision Inc. (United States); Grigorios Tsagkatakis, Foundation for Research and Technology (FORTH) (Greece); and Mohammed Yousefhussien, General Electric Global Research (United States)

3:30 – 5:30 pm
Regency B

3:30 FAIS-171
Fish freshness estimation though analysis of multispectral images with convolutional neural networks, *Grigorios Tsagkatakis[1], Savas Nikolidakis[2], Eleni Petra[3], Argyris Kapantagakis[2], Kriton Grigorakis[2], George Katselis[4], Nikos Vlahos[4], and Panagiotis Tsakalides[1]; [1]Foundation for Research and Technology (FORTH), [2]Hellenic Centre for Marine Research, [3]Athena Research & Innovation Center, and [4]University of Patras (Greece)*

3:50 FAIS-172
Deep learning based fruit freshness classification and detection with CMOS image sensors and edge processors, *Tejaswini Ananthanarayana[1,2], Ray Ptucha[1], and Sean Kelly[2]; [1]Rochester Institute of Technology and [2]ON Semiconductor (United States)*

4:10 FAIS-173
Assessing the use of smartphones to determine crop ripeness, *Katherine Carpenter and Susan Farnand, Rochester Institute of Technology (United States)*

4:30 FAIS-174
Cattle identification and activity recognition by surveillance camera, *Haike Guan, Naoki Motohashi, Takashi Maki, and Toshifumi Yamaai, Ricoh Company, Ltd. (Japan)*

4:50 FAIS-175
High-speed imaging technology for online monitoring of food safety and quality attributes: Research trends and challenges, *Seung-Chul Yoon, US Department of Agriculture-Agricultural Research Service (United States)*

5:10 FAIS-176
A survey on deep learning in food imaging applications, *Mustafa Jaber[1], Grigorios Tsagkatakis[2], and Mohammed Yousefhussien[3]; [1]NantOmics (United States), [2]Foundation for Research and Technology (FORTH) (Greece), and [3]General Electric Global Research (United States)*

5:30 – 7:30 pm Symposium Demonstration Session

Wednesday, January 29, 2020

10:00 am – 3:30 pm Industry Exhibition - Wednesday

10:10 – 11:00 am Coffee Break

12:30 – 2:00 pm Lunch

PLENARY: VR/AR Future Technology

Session Chairs: Radka Tezaur, Intel Corporation (United States), and Jonathan Phillips, Google Inc. (United States)

2:00 – 3:10 pm
Grand Peninsula Ballroom D

Quality Screen Time: Leveraging Computational Displays for Spatial Computing, *Douglas Lanman, director, Display Systems Research, Facebook Reality Labs (United States)*

For abstract and speaker biography, see page 7

3:10 – 3:30 pm Coffee Break

Food and Computer Vision

Session Chair: Mustafa Jaber, NantVision Inc. (United States)

4:30 – 5:30 pm
Cypress B

This is a shared listing for a related Imaging and Multimedia Analytics in a Web and Mobile World 2020 Conference sesssion. Refer to the IMAWM Conference program for details.

5:30 – 7:00 pm EI 2020 Symposium Interactive Posters Session

5:30 – 7:00 pm Meet the Future: A Showcase of Student and Young Professionals Research

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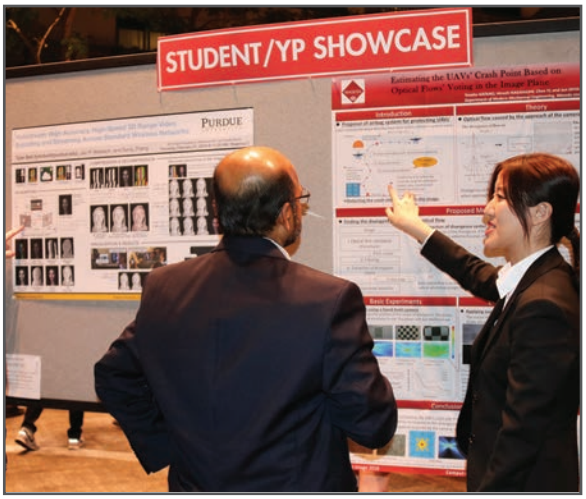

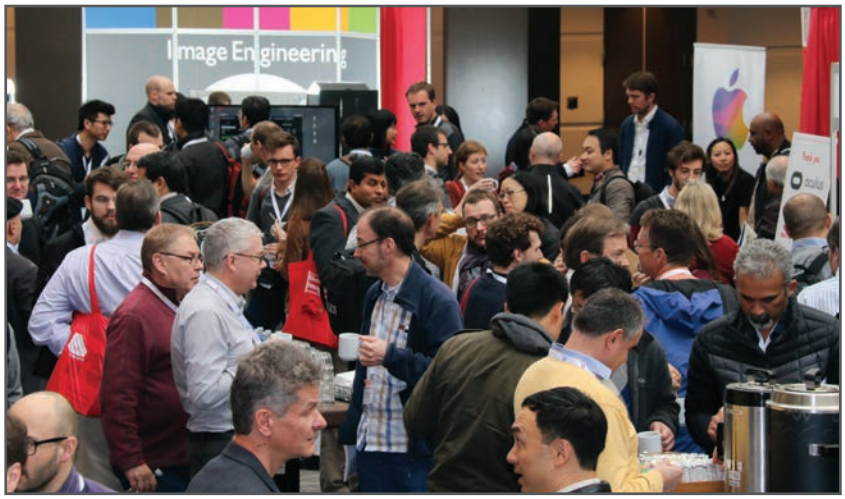

• SHORT COURSES • EXHIBITS • DEMONSTRATION SESSION • PLENARY TALKS •
• INTERACTIVE PAPER SESSION • SPECIAL EVENTS • TECHNICAL SESSIONS •

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