

PROCEEDINGS OF SPIE

Sensing for Agriculture and Food Quality and Safety XVIII

**Moon S. Kim
Byoung-Kwan Cho
Fartash Vasefi**
Editors

**27–28 April 2026
National Harbor, Maryland, United States**

Sponsored and Published by
SPIE

Volume 14053

Proceedings of SPIE 0277-786X, V. 14053

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Sensing for Agriculture and Food Quality and Safety XVIII*, edited by Moon S. Kim, Byoung-Kwan Cho, Fartash Vasefi, Proc. of SPIE 14053, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9798902320623

ISBN: 9798902320630 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2026 Society of Photo-Optical Instrumentation Engineers (SPIE).

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.

**SPIE. DIGITAL
LIBRARY**

SPIDigitalLibrary.org

Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

Contents

v *Conference Committee*

MULTISPECTRAL SENSING

- 14053 02 **Water quality assessment using MRMR-GNB: an optimized probabilistic feature selection and classification framework** [14053-1]
- 14053 03 **Hyperspectral structured-illumination reflectance imaging for early-stage rot detection in blueberries** [14053-4]
- 14053 04 **AI-enabled multispectral sensing for improving crop management practices on small farms** [14053-5]

PORTABLE SPECTROSCOPY

- 14053 05 **Vision and challenges in the implementation of NIRS + IA + ML in the intelligent rendering industry (Invited Paper)** [14053-6]

FOOD SAFETY AND MICROBIAL SURVEILLANCE

- 14053 06 **Enhanced E. coli concentration level detection on multiple produce surfaces using CSI-D+ UV-C fluorescence imaging and custom deep learning architecture** [14053-11]
- 14053 07 **AI-based detection of E. coli concentration levels on diverse food-contact surfaces using UV-C fluorescence-based CSI-D+ handheld and Yolov11 deep learning** [14053-12]

AI, ROBOTICS AND AUTOMATED SYSTEMS

- 14053 08 **Real-time vision-guided catfish fillet recognition and suction handling for automated individual quick freezing preparation** [14053-16]
- 14053 09 **A 3D-guided deep learning pipeline for apple grading under stem/calyx-defect ambiguity** [14053-18]
- 14053 0A **Autonomous robotic-biosensing platform for real-time microbial surveillance in poultry processing facilities** [14053-17]
- 14053 0B **Operation status monitoring of sensors and actuators for smart vertical farming** [14053-19]

AI AND HYPERSPECTRAL IMAGING I

- 14053 OC **A multiclass classification approach for citrus leaf disease detection using small regions of hyperspectral imagery and CNNs [14053-23]**

AI AND HYPERSPECTRAL IMAGING II

- 14053 OD **Integration of RGB and hyperspectral reflectance imagery using vision transformer for citrus leaf disease classification [14053-25]**
- 14053 OE **Deep learning-enabled hyperspectral imaging for detecting light bruises in apples toward in-field grading [14053-26]**

POSTER SESSION

- 14053 OF **Integration of light sensors for spectrum-based daily light integral (DLI) control in agricultural systems [14053-34]**
- 14053 OG **Non-destructive imaging-based estimation of fresh weight and quality of *Stevia rebaudiana* during the early growth stage in a plant factory [14053-36]**
- 14053 OH **UVC inactivation of *Listeria monocytogenes* in salmon juice on food contact surfaces using the contamination sanitation inspection and disinfection (CSI-D+) device [14053-44]**
- 14053 OI **Assessing the quality of packaged cherry tomatoes using two hyperspectral imaging systems [14053-45]**
- 14053 OJ **Hyperspectral imaging for non-destructive quality prediction and automated harvest decision of table grape [14053-57]**