

PROCEEDINGS OF SPIE

# ***International Conference on Image, Signal Processing, and Machine Learning (ISPML 2025)***

**Shamik Tiwari  
Zhenghao Shi**  
*Editors*

**26–28 September 2025  
Xi'an, China**

*Organized by*  
Xi'an University of Technology (China)

*Sponsored by*  
IILM University (India)  
AEIC—Academic Exchange Information Centre (China)

*Published by*  
SPIE

**Volume 14058**

Proceedings of SPIE 0277-786X, V. 14058

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](http://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 *International Conference on Image, Signal Processing, and Machine Learning (ISPML 2025)*, edited by Shamik Tiwari, Zhenghao Shi, Proc. of SPIE 14058, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9798902320739

ISBN: 9798902320746 (electronic)

Published by

**SPIE**

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

Telephone +1 360 676 3290 (Pacific Time)

[SPIE.org](http://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](http://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](http://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*

## INTELLIGENT SENSING AND PROCESSING

---

- 14058 02 **Enhanced YOLOv11n algorithm for UAV small target detection** [14058-3]
- 14058 03 **MaixCAM-based Tic-Tac-Toe human-computer game system design** [14058-14]
- 14058 04 **Walnut recognition algorithm on tree based on improved lightweight YOLOv8n** [14058-25]
- 14058 05 **Development and application of a multimode intelligent knob control terminal** [14058-10]
- 14058 06 **Resolution-preserving background estimation network for efficient infrared small UAV target detection** [14058-46]
- 14058 07 **Design of intelligent service robot for the elderly and disabled based on RDK-X5** [14058-33]
- 14058 08 **Research on concrete crack recognition method based on improved YOLOv8** [14058-23]
- 14058 09 **A smart assistant based on ESP32 and AI large model API** [14058-2]
- 14058 0A **Face image super-resolution reconstruction based on an improved Real-ESRGAN**  
[14058-26]
- 14058 0B **Research on long-time target trajectory prediction technique based on the judgment of maneuvering behavior** [14058-17]
- 14058 0C **Simultaneous target and attribute detection with an enhanced YOLO model** [14058-47]
- 14058 0D **Machine learning of CT-derived vascular morphology distinguishes symptomatic from asymptomatic renal vein compression** [14058-29]
- 14058 0E **Quantifying holistic review: a multimodal approach to college admissions prediction**  
[14058-43]
- 14058 0F **Research on range resolution inversion technology for airborne fire control radar** [14058-36]
- 14058 0G **Research on dynamic radar cross-section testing method based on drone swarm**  
[14058-41]
- 14058 0H **Blind text image optimized sampling super-resolution diffusion model** [14058-8]

- 14058 OI **Ensemble-learning-driven hail identification model using FY-4A satellite data** [14058-11]
- 14058 OJ **HEFM-YOLO: a lightweight model for apple leaf disease detection in real-world environments** [14058-31]
- 14058 OK **A comparative study of GhostStem and C2f in YOLOv5s under near-constant compute** [14058-27]
- 14058 OL **Radar emitter signal recognition based on feature fusion and machine learning** [14058-1]
- 14058 OM **Research on tobacco market grid division model based on multisource data fusion and machine learning algorithms** [14058-45]
- 14058 ON **Evolution and future trends of rebar intersection detection methods** [14058-9]
- 14058 OO **Curvature-modeling intelligent detection of ablation morphology on CMC sharp leading edges** [14058-42]
- 14058 OP **Based on DDPG-FOPID control algorithm for high-precision motion control of optoelectronic platform** [14058-20]
- 14058 OQ **LoRA-diag: enhancing low-rank adaptation via diagonal modulation for power system modeling code generation** [14058-34]
- 14058 OR **Research on UAV signal detection algorithm based on coherent accumulation** [14058-44]
- 14058 OS **Research on bridge crack detection methods based on an improved YOLOv11n** [14058-22]
- 14058 OT **Application of adaptive background equalization in passive detection of underwater targets** [14058-15]
- 14058 OU **LRGO/MoS<sub>2</sub> heterojunction combined with artificial neural networks for intelligent identification of peach ripeness** [14058-19]
- 14058 OV **A target coverage mechanism for adjustable sensing radius sensors in wireless sensor networks** [14058-40]
- 14058 OW **Smart city pipeline detection system** [14058-30]
- 14058 OX **Study on all-optical mode crosstalk suppression technology based on Mach-Zehnder interferometer** [14058-37]
- 14058 OY **The application of STGCN with integrated attention mechanism in traffic speed prediction** [14058-12]