

PROCEEDINGS OF SPIE

International Conference on Signal Processing and Communication Security (ICSPCS 2025)

**Minghui Li
Zoran Bojkovic
Xuemei Lei**
Editors

**6–8 June 2025
Hohhot, China**

Organized by
Inner Mongolia University (China)

Sponsored by
AEIC—Academic Exchange Information Centre (China)

Published by
SPIE

Volume 13798

Proceedings of SPIE 0277-786X, V. 13798

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 *International Conference on Signal Processing and Communication Security (ICSPCS 2025)*, edited by Minghui Li, Zoran Bojkovic, Xuemei Lei, Proc. of SPIE 13798, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510694767

ISBN: 9781510694774 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2025 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

vii *Conference Committee*

SIGNAL PROCESSING AND IMAGE ANALYSIS

- 13798 02 **Research on individual cattle identification algorithm based on QR code** [13798-10]
- 13798 03 **An adaptive image restoration and object detection model for UAVs in hazy and sandstorm environments** [13798-33]
- 13798 04 **Joint image and acceleration-based algorithms for pavement recognition** [13798-19]
- 13798 05 **Estimation of the number of single channel source signals based on convolutional neural network** [13798-3]
- 13798 06 **Fast implementation algorithm of radix-32 million-point FFT** [13798-44]
- 13798 07 **Online road slope estimation for vehicles based on unscented Kalman filtering** [13798-37]
- 13798 08 **Deep adaptation network for cross-domain sitting posture recognition using pressure sensor arrays** [13798-20]
- 13798 09 **Insulator defect identification for transmission line drone inspection based on YOLOv8-transformer** [13798-34]
- 13798 0A **Estimation of lithium-ion power battery state of charge based on SRC-GRU modeling** [13798-32]
- 13798 0B **Sensorless control of interior permanent magnet synchronous motors based on an improved sliding mode observer** [13798-24]
- 13798 0C **Parameter estimation of sub-sampling LFM signal based on convolutional neural network** [13798-9]
- 13798 0D **Design of signal processing chip based on weak current sampling** [13798-49]
- 13798 0E **Design of closed-loop system for micromechanical resonators based on FPGA** [13798-6]
- 13798 0F **Deep-learning-based segmentation of interstitial lung disease lesions in chest HRCT** [13798-45]
- 13798 0G **Research on lake water quality prediction method based on WT-VMD-LSTM** [13798-22]

- 13798 OH **PAGNet: a perception-aware attention-guided network for building change detection in remote sensing images** [13798-48]
- 13798 OI **Deep-learning-based feature extraction method for single-vector hydrophone signals** [13798-40]
- 13798 OJ **Compressed reconstruction of electromyographic signals based on deep learning** [13798-46]
- 13798 OK **The determination of substorm phases based on SuperMAG auroral electrojet indices and interplanetary magnetic field** [13798-4]
- 13798 OL **A DEMON computation method based on variational mode decomposition with multifeature weighted reconstruction** [13798-21]
- 13798 OM **Pixel level algorithm and application of bridge surface cracks based on BSCS-Net** [13798-31]
- 13798 ON **Rapid parametric electrostatic modeling of TSV port cross-section using physics-informed neural network** [13798-12]
- 13798 OO **A graph-theoretic chiplet planning methodology for complex signal processing systems** [13798-5]
- 13798 OP **Optimizing 3D near-memory AI accelerators for image signal processing workloads using trust-region Bayesian optimization** [13798-15]
- 13798 OQ **Dual-domain feature decoupling: a hybrid network for deblurring and detecting low-voltage meters** [13798-51]

COMMUNICATION SECURITY AND SYSTEM OPTIMIZATION

- 13798 OR **Suggestions for constructing mobile information nodes** [13798-43]
- 13798 OS **A QSAR method for predicting biological activities of nanostructures with novel descriptors** [13798-38]
- 13798 OT **Four-mode 3D stacked cross-finger configuration quadriflar helix antenna for GNSS applications** [13798-2]
- 13798 OU **Design and implementation of phased array wave speed control system based on FPGA** [13798-29]
- 13798 OV **Design of a low-noise amplifier for ka-band phased array receivers** [13798-7]
- 13798 OW **Downhole digital twin technology based on high-temperature-adapted communication systems: a visualization application innovation in a high-temperature and high-pressure environment** [13798-50]

- 13798 0X **Fast transmit nulling method for 4D MIMO radar based on joint design of spatiality and temporality** [13798-30]
- 13798 0Y **Evaluation of equipment maintenance and support capability efficiency based on cloud model** [13798-52]
- 13798 0Z **A multitask learning recommendation approach fusing knowledge graph and user intention** [13798-23]
- 13798 10 **Encrypted communication technology based on RTP protocol and national cryptographic SM4** [13798-41]
- 13798 11 **Optimization research on real-time data replication technology in data disaster recovery systems** [13798-18]
- 13798 12 **The impact of individual security awareness deficiencies on malware propagation in scale-free networks** [13798-17]
- 13798 13 **Design of automatic test system for processing unit of airborne fire control radar** [13798-55]
- 13798 14 **Construction of digital intelligent public security talent competency model and innovation of cultivation mode based on wireless security technology** [13798-53]