

PROCEEDINGS OF SPIE

***International Conference  
on Computer Application  
and Information Security  
(ICCAIS 2022)***

Vijayakumar Varadarajan  
Jerry Chun-Wei Lin  
Pascal Lorenz  
*Editors*

23–24 December 2022  
Wuhan, China

*Organized by*  
Hubei Zhongke Institute of Geology and Environment Technology (China)

*Sponsored and Published by*  
SPIE

**Volume 12609**

Proceedings of SPIE 0277-786X, V. 12609

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 Computer Application and Information Security (ICCAIS 2022)*, edited by Vijayakumar Varadarajan, Jerry Chun-Wei Lin, Pascal Lorenz, Proc. of SPIE 12609, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X  
ISSN: 1996-756X (electronic)

ISBN: 9781510663459  
ISBN: 9781510663466 (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 © 2023 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

ix *Conference Committee*

## INTERNATIONAL CONFERENCE ON COMPUTER APPLICATION AND INFORMATION SECURITY (ICCAIS 2022)

---

- 12609 02 **Research on optimization of multichannel and multipath routing protocols in wireless MESH networks** [12609-83]
- 12609 03 **Protocol state analysis and annotation methodology based on deep learning** [12609-35]
- 12609 04 **Research on path planning of automated guided vehicle based on improved RRT\* algorithm** [12609-51]
- 12609 05 **Threat detection based on multi-scale spatiotemporal feature fusion of user behavior** [12609-37]
- 12609 06 **A signal feature extraction method based on Hough transform** [12609-40]
- 12609 07 **Self-normalized double robust estimation for debiasing position bias** [12609-46]
- 12609 08 **Safety risk assessment of cabling using established tunnels** [12609-47]
- 12609 09 **Research on active protection technology of network attack traffic traction based on honeypot** [12609-48]
- 12609 0A **Weighted neighborhood classifier based on fuzzy neighborhood rough sets and its application to evaluate quality of experience for online gaming** [12609-49]
- 12609 0B **Research on WiFi radio signal and MAC address mapping based on stream label** [12609-50]
- 12609 0C **Influence evaluation of academic groups based on multi-attribute decision method** [12609-53]
- 12609 0D **Towards tiny object tracking for low-illumination wide-field** [12609-59]
- 12609 0E **Privacy protection method for blockchain transaction data based on homomorphic encryption and zero-knowledge proof** [12609-55]
- 12609 0F **Privacy protection oriented on data stream computing** [12609-56]
- 12609 0G **Mask guided attention for fetal standard plane recognition** [12609-57]

- 12609 0H **YOLOv5s-L: object detection for service robots** [12609-58]
- 12609 0I **Cooperative planning of multi-UAV logistics delivery by multi-graph reinforcement learning** [12609-61]
- 12609 0J **Optimization of UAV-assisted uplink transmission based on RSMA** [12609-62]
- 12609 0K **A novel model for SOH monitoring combining intelligent search algorithm and deep regression model** [12609-64]
- 12609 0L **A hybrid opinion dynamic model based on cognitive dissonance** [12609-72]
- 12609 0M **Research on relay protection inspection method based on operation information** [12609-73]
- 12609 0N **Cognitive method of spatial-temporal differentiation characteristics to collision risk** [12609-74]
- 12609 0O **Event-triggered control for stochastic singular systems with state delay under dual cyber attacks** [12609-75]
- 12609 0P **Defect detection of catenary cotter pin based on three-level cascade architecture and attention mechanism** [12609-76]
- 12609 0Q **Blind source separation method for multi-source ultra-high frequency partial discharge signals** [12609-77]
- 12609 0R **Research and application of adaptive security management and control framework for multi-party cloud complex environment of electric power** [12609-82]
- 12609 0S **A visual data analysis system of used cars based on Python and ECharts** [12609-54]
- 12609 0T **Ocean thermal infrared remote sensing image registration combining AKAZE features and area feature** [12609-84]
- 12609 0U **Edge node information model under the framework of elastic edge computing** [12609-93]
- 12609 0V **Research on security assessment and control technology for power mobile terminal** [12609-71]
- 12609 0W **Dynamic modelling and control of differential-drive mobile robot** [12609-81]
- 12609 0X **Multi-focus image registration algorithm based on image preprocessing and improved SIFT** [12609-79]
- 12609 0Y **Efficient alltoall\_inplace communication algorithms with limited buffer space** [12609-78]
- 12609 0Z **Efficient deployment in UAV from the perspective of distributed potential games** [12609-65]
- 12609 10 **Dermoscopic image segmentation combining pigment separation and deep learning networks** [12609-31]

- 12609 11 **Coverage optimization in wireless sensor networks with a modified arithmetic optimization algorithm [12609-27]**
- 12609 12 **Energy efficiency and resource allocation of massive MIMO systems based on MMSE precoding [12609-25]**
- 12609 13 **Important hyperedge sorting method based on grounded Laplacian matrix [12609-9]**
- 12609 14 **Game-theoretical cyber deception strategy generation based on honeynet and intrusion prediction [12609-34]**
- 12609 15 **Offline performance and energy consumption prediction model of deep learning training tasks [12609-28]**
- 12609 16 **A multiple kernel ensemble approach for genomic prediction [12609-26]**
- 12609 17 **Confidence-based fuzzy assessment model of LINK16 situational quality [12609-18]**
- 12609 18 **Network environment-adaptive erasure coding scheme for decentralized ubiquitous storage [12609-1]**
- 12609 19 **A mining vehicle loading assessment and information query system [12609-3]**
- 12609 1A **Identify power stealing time period based on user power consumption data [12609-42]**
- 12609 1B **Highway traffic accident duration prediction based on ensemble learning and data augmentation [12609-45]**
- 12609 1C **Research on security risk assessment of power IoT network based on quantitative scoring from threat perspective [12609-41]**
- 12609 1D **Malware behavior detection method based on reinforcement learning [12609-36]**
- 12609 1E **Can speeding behavior be reduced? The effect of the display mode and color change of UI [12609-17]**
- 12609 1F **Study of data transaction-centered artificial intelligence data annotation industry [12609-10]**
- 12609 1G **Study on traffic organization optimization of unbalanced traffic load [12609-60]**
- 12609 1H **Robust low rank canonical polyadic tensor decomposition [12609-63]**
- 12609 1I **Research on synchronous control of closed hydraulic walking system for tracked vehicles [12609-86]**
- 12609 1J **Research on investment benefit evaluation of distribution network based on improved clustering algorithm [12609-87]**

- 12609 1K **Robust optimization of the powertrain mounting system of a big mini passenger car** [12609-88]
- 12609 1L **Research on web front-end development based on integrated forest fire monitoring system of communication and remote control** [12609-94]
- 12609 1M **Research on Chinese content monitoring technology of darknet based on Scrapy** [12609-89]
- 12609 1N **Sentiment analysis-based social network rumor detection model with bi-directional graph convolutional networks** [12609-91]
- 12609 1O **An efficient method against adversarial attacks** [12609-95]
- 12609 1P **Design of nucleic acid detection system based on distributed control system** [12609-67]
- 12609 1Q **Part heuristic k-means based on improved grey correlation analysis for infectious analysis** [12609-2]
- 12609 1R **Research on the influencing factors of food waste in colleges and universities under the background of dual carbon** [12609-68]
- 12609 1S **Research on the application of holographic projection technology in apparel display** [12609-69]
- 12609 1T **Analysis of medical insurance in China by neural network** [12609-5]
- 12609 1U **The system design of WSN based on identified nodes** [12609-43]
- 12609 1V **Hotspots and trends of big data research in Chinese medicine based on text mining** [12609-39]
- 12609 1W **An operational concept capability requirement analysis method based on deep reinforcement learning** [12609-20]
- 12609 1X **Study on the influence factors of community built environment on residents' hypertension** [12609-22]
- 12609 1Y **Verification of a tongue color extraction method: taking clinical palpitations as an example** [12609-16]
- 12609 1Z **Detecting COVID-19 spreading phases with time series analysis** [12609-15]
- 12609 20 **Research on user demand response simulation of fused magnesium industry based on multi-agent modeling** [12609-11]
- 12609 21 **Big data analysis research and application in the field of oil and gas resources management** [12609-4]
- 12609 22 **Constructions of optimal  $(5m, 5n, \{3, 4, 5\}, 1, (3/5, 1/5, 1/5))$ -OOSPCs** [12609-80]
- 12609 23 **Haze pollution monitoring system based on semi-supervised learning** [12609-23]

- 12609 24 **New method of performance analysis for a class of neutral systems** [12609-44]
- 12609 25 **A practical case of differential equation solution** [12609-38]
- 12609 26 **An overview of gesture recognition** [12609-52]
- 12609 27 **Intelligent meteorological information acquisition service platform based on Internet of Things** [12609-29]
- 12609 28 **Data security risk analysis of typical internet companies in China** [12609-85]
- 12609 29 **Blockchain papers depository system based on web 3.0** [12609-90]
- 12609 2A **Formal verification of smart contracts from the perspective of logic** [12609-92]
- 12609 2B **Network education integrated system based on intelligent algorithm** [12609-6]
- 12609 2C **Improving the intelligent algorithm in the intelligent monitoring model of human settlement environment under fuzzy comprehensive evaluation (FCE)** [12609-12]
- 12609 2D **Recycled concrete (RC) structure engineering system based on ANSYS program under search algorithm (SA)** [12609-8]
- 12609 2E **An intelligent optimization algorithm of steel sheet pile foundation pit concrete thin seal technology** [12609-21]
- 12609 2F **Design of human resource management system based on progressive fuzzy algorithm** [12609-33]
- 12609 2G **Automatic testing system for ceramsite concrete bearing capacity based on genetic algorithm** [12609-30]
- 12609 2H **Reconstruction and teaching implementation of English teaching resources in smart classrooms** [12609-19]
- 12609 2I **Information technology basic course design based on Moodle platform** [12609-7]
- 12609 2J **Ant colony optimization algorithm in the design of international trade early warning system** [12609-13]
- 12609 2K **Back analysis of displacement of deep foundation pit based on genetic algorithm** [12609-14]
- 12609 2L **Demand analysis and technology selection of high-end equipment manufacturing innovation growth based on data mining technology** [12609-24]
- 12609 2M **Application of association rule algorithm in intelligent manufacturing of mechanical manufacturing and automation specialty** [12609-32]