PROCEEDINGS OF SPIE

International Conference on Internet of Things and Machine Learning (IoTML 2023)

Badrul Hisham bin Ahmad Kannimuthu Subramaniyam Editors

15–17 September 2023 Singapore, Singapore

Organized by Anna University, Chennai (India)

Sponsored by
Nanyang Technological University (Singapore)
AEIC—Academic Exchange Information Centre (China)

Published by SPIE

Volume 12937

Proceedings of SPIE 0277-786X, V. 12937

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

International Conference on Internet of Things and Machine Learning (IoTML 2023), edited by Badrul Hisham bin Ahmad, Kannimuthu Subramaniyam, Proc. of SPIE Vol. 12937, 1293701© 2023 SPIE · 0277-786X · doi: 10.1117/12.3016467

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 SPIEDigitalLibrary.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 Internet of Things and Machine Learning (IoTML 2023), edited by Badrul Hisham bin Ahmad, Kannimuthu Subramaniyam, Proc. of SPIE 12937, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510671805

ISBN: 9781510671812 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) 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. 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.



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

INTERNET OF THINGS DATA MINING AND ENVIRONMENTAL MONITORING

12937 02	Design and implementation of intelligent analysis software for teaching behavior based on near-field speech [12937-62]
12937 03	Large data mixed attribute feature detection method based on Kalman algorithm [12937-39]
12937 04	Development of a programmable and scalable smart IoT cultivation apparatus [12937-15]
12937 05	Research on wind vibration hazard identification of conductors based on machine learning technology [12937-59]
12937 06	A DDOS attack detection method based on recurrent neural network [12937-48]
12937 07	Optimized data storage and retrieval in blockchain systems leveraging zero-knowledge proofs and sharding techniques [12937-31]
12937 08	A SOA-based unified service framework design and implementation [12937-66]
12937 09	A design to realize power loss data protection based on non-volatile DIMM in domestic platform [12937-63]
12937 0A	High resolution underwater object detection network based on multi-scale attention feature fusion [12937-11]
12937 OB	Research on motion state detection based on multi-modal analysis [12937-35]
12937 OC	A novel hot washing monitoring and management system of oil wells based on the Internet of Things $[12937\text{-}19]$
12937 OD	A new adversarial attack method based on Shapelet applied to traffic flow prediction model based on GCN [12937-40]
12937 OE	Research on network security algorithms in distributed computing environment [12937-75]
12937 OF	A small target detection method for UAV aerial images based on improved YOLOv5 [12937-6]
12937 OG	Research and implementation of data mining algorithms based on logistics information systems [12937-67]

12937 OH	Classification method of road landslide in reservoir area based on deep learning and analytic hierarchy process [12937-37]
12937 OI	Research on distributed photovoltaic data acquisition system based on Internet of Things [12937-25]
12937 OJ	Product order data analysis and demand forecasting based on machine learning [12937-7]
12937 OK	Research on intelligent inspection system of substation [12937-68]
12937 OL	Research on intelligent patrol system of photovoltaic power station based on lidar [12937-69]
12937 OM	Nonlinear prediction models and cluster analysis for global plastic waste management [12937-30]
	INDUSTRIAL INTERNET OF THINGS AND INTELLIGENT MACHINERY MEASUREMENT AND CONTROL
12937 ON	Research towards a multi-actor vehicle-pile-net interaction strategy [12937-38]
12937 00	Design of multifunctional self-defense alarm based on Internet of Things supplied with photovoltaic panel [12937-22]
12937 OP	Steel surface defect detection algorithm using deep learning [12937-45]
12937 0Q	Comparative study of machine learning methods for influenza outbreak forecasting [12937-60]
12937 OR	Research on lightweight firmware update method of distribution IoT terminal [12937-28]
12937 OS	Three-category colorectal lesion image automatic detection based on G-YOLOv8 [12937-8]
12937 OT	Research on project cost prediction of ultra-high voltage transmission lines based on RF-HKELM [12937-14]
12937 OU	Research on computing offloading methods based on edge computing and reinforcement learning in the industrial Internet of Things [12937-74]
12937 0V	The investigation of La ₂ Ti ₂ O ₇ based ferroelectric memristors for brain-inspired computing [12937-12]
12937 OW	Automatic execution algorithm of supply chain intelligent operation robot scheduling logic based on machine learning [12937-61]
12937 OX	A review of Al-assisted motion control [12937-56]
12937 OY	Research on automated anomaly localization in the power Internet of Things based on fuzzing and semantic analysis [12937-46]

12937 OZ	Wind turbine temperature prediction based on stochastic differential equation + Markov combination model [12937-71]
12937 10	Overall framework of IoT platform in urban agglomeration-cross-city, cross-domain, cross-level, and one-network unified management architecture [12937-10]
12937 11	Research on optimization of UAV patrol inspection path planning for the intelligent warehouse [12937-72]
12937 12	Transient stability assessment for power system based on importance evaluation and enhancement of samples [12937-18]
12937 13	Machine learning-based quality prediction for laser cleaning of composite paint layers [12937-42]
	MACHINE LEARNING AND WEB SERVICE MODELING
12937 14	Research on detection of insulator damage based on improved YOLOv4-tiny network [12937-23]
12937 15	Betweenness centrality approximation in large networks using shortest paths approximation and adaptive sampling [12937-55]
12937 16	Unsupervised hypergraph convolutional clustering networks [12937-53]
12937 17	Surrogate-based optimization algorithm in application of design of ship dimensions [12937-51]
12937 18	Water quality evaluation of water sources based on artificial neural network [12937-34]
12937 19	Pedestrian target detection algorithm based on improved YOLO v5 [12937-65]
12937 1A	Security awareness scheme for edge computing services in IoT systems [12937-20]
12937 1B	Research on Chinese machine reading comprehension method based on deep learning [12937-73]
12937 1C	Research on face recognition based on deep learning algorithm [12937-50]
12937 1D	Incorporating non-intrusive load monitoring into the residential electrical vehicle identification [12937-32]
12937 1E	Machine learning platform design and application based on spark [12937-57]
12937 1F	Improved particle swarm optimization for feature selection combining simplex method and niche [12937-64]
12937 1G	Feature selection based on improved transformed length particle swarm optimization algorithm [12937-58]

12937 1H	A review of research on multimodal knowledge graphs in agriculture [12937-16]
12937 11	Research on communication network intrusion detection method based on machine learning algorithm [12937-52]
12937 1J	Multi-type patrol task assignment method for UAV based on deep reinforcement learning [12937-54]
12937 1K	Design and implementation of an intelligent recommendation system for product information on an e-commerce platform based on machine learning [12937-44]
12937 1L	Vi-WiFi-Gate: a WiFi sensing gait recognition method inspired by the image vision field [12937-43]
12937 1M	Meta-learning-based recommendation method for self-supervised hybrid comparison learning [12937-47]
12937 1N	Is it better to have more layers and nodes of neural networks in deep learning? [12937-41]
12937 10	Deciphering modern customer loyalty: a machine learning approach [12937-33]

Conference Committee

Conference Chairman

Chau Yuen, Nanyang Technological University (Singapore)

Conference Co-Chair

Ming Xie, Nanyang Technological University (Singapore)

Publication Chair

Badrul Hisham Bin Ahmad, Universiti Teknikal Malaysia Melaka (Malaysia)

Technical Program Committee Chair

Fausto Pedro García Márquez, Universidad de Castilla-La Mancha (Spain)

Technical Program Committees

Kannimuthu Subramaniyam, Anna University, Chennai (India)
Sahil Verma, Lovely Professional University (India)
Ander Garcia, Vicomtech (Spain)
Attlee M. Gamundani, Namibia University of Science and Technology (Namibia)
Prateek Srivastav, Chinese Academy of Sciences (China)

Ling Cen, UAE British Telecom Innovation Center (United Kingdom)
Kannimuthu Subramaniyam, Anna University, Chennai (India)

Organizing Committees

Noor Zaman Jhanjhi, Taylor's University (Malaysia)
Azim Zaliha Abd Aziz, Universiti Sultan Zainal Abidin (Malaysia)
Thota Sivasankar, NIIT University (India)
Omar DIB, Wenzhou-Kean University (China)
Dimitrios Kollias, University of Greenwich (United Kingdom)