## PROCEEDINGS OF SPIE

## International Conference on Internet of Things and Machine Learning (IoTML 2022)

Hongzhi Wang Xiangjie Kong Editors

16–18 December 2022 Harbin, China

Organized by Zhejiang University of Technology (China)

Sponsored by AEIC Academic Exchange Information Centre (China)

Published by SPIE

**Volume 12640** 

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 2022)*, edited by Hongzhi Wang, Xiangjie Kong, Proc. of SPIE 12640, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510664913

ISBN: 9781510664920 (electronic)

Published by

SPIE

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

31 IL.OIG

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 SYSTEM AND BIG DATA APPLICATION

12640 02	Optimization of transmission line information management system based on Internet of Things [12640-63]
12640 03	A method of ship multi-constraint route planning based on AIS big data [12640-29]
12640 04	Architecture design of smart light pole system based on IoT technology [12640-20]
12640 05	Application of Internet of Things in smart environmental protection in the context of big data [12640-45]
12640 06	IOT and fusion algorithm based agriculture system [12640-18]
12640 07	Design of the temperature and humidity detection system for the Internet of Things based on the TPY Board development board [12640-80]
12640 08	Research on risk analysis method of industrial fieldbus based on data analysis [12640-83]
12640 09	Research on tourist volume monitoring system of smart scenic spot [12640-6]
12640 0A	Distance education management system for high-tech agricultural talents based on cloud computing [12640-52]
12640 OB	Variable screening with binary quantum behavior particle swarm optimization [12640-39]
12640 OC	Method for inland water body extraction fused atrous spatial pyramid pooling [12640-17]
12640 OD	Design of IoT monitoring platform for intelligent agricultural weather station [12640-14]
12640 OE	Personalized recommendation system of modern science and technology resources based on hybrid filtering [12640-72]
12640 OF	Design of troubleshooting tool for IOT terminal access problems [12640-32]
12640 OG	Research on a new electric power market trading strategy based on power big data [12640-64]

12640 OH	Research on location optimization in third-party logistics management system [12640-36]
12640 01	A metro traffic flow forecasting system coupling singular spectrum analysis, deep bidirectional LSTM networks, and ensemble strategy [12640-66]
12640 OJ	Research on the optimization of fresh food logistics distribution path under O2O e-commerce model [12640-33]
12640 OK	Primary education resource-sharing based on feature clustering optimization model [12640-48]
12640 OL	Study on factors affecting agricultural products logistics in Anhui Province based on grey relational analysis [12640-40]
12640 OM	Study on the prediction of primary energy consumption based on Markov chain model [12640-59]
	NETWORK SECURITY AND INTELLIGENT PATTERN RECOGNITION
12640 ON	Security risk assessment for distribution Internet of Things [12640-9]
12640 00	Research on the application of virtual simulation technology in the IoT programming class [12640-16]
12640 OP	Diagnosis method for the break size of marine nuclear power plant by variable interval classification and probabilistic neural networks [12640-19]
12640 OQ	A fine-grained SAR target recognition method based on bilinear fusion [12640-41]
12640 OR	Object detection based on RetinaNet+CBAM attention mechanism [12640-21]
12640 OS	Recognition of handwritten Tibetan numerals based on IoT devices [12640-28]
12640 OT	Monitoring method of electricity safety status at customer side based on Internet of Things perception [12640-73]
12640 OU	Structural re-parameterized YOLOv5s for rapid pig detection [12640-30]
12640 OV	A study of reinforcement learning for offloading of edge computing tasks [12640-57]
12640 OW	An adaptive black insertion display method based on human eye activity for virtual reality [12640-67]
12640 0X	Research and design of intelligent medicine box based on MCU [12640-53]
12640 OY	Integrate the key persona information and context to improve the performance of multi round dialogue generation [12640-49]

12640 OZ	Code obfuscation based adversarial example generation method [12640-22]
12640 10	Yolov4-Sensitive: Feature sensitive multiscale object detection network [12640-60]
12640 11	Research on terminal security access of the power Internet of Things [12640-34]
12640 12	Cause analysis of ship collision accident based on complex network theory [12640-77]
12640 13	Intelligent monitoring method of electronic equipment operation status based on Internet of Things technology [12640-54]
12640 14	Design and research of railway foreign material intrusion limit based on new sensor and network [12640-11]
12640 15	Spatio-temporal characteristics of highway toll stations based on K-means++ [12640-15]
12640 16	Research on the construction of reverse logistics network of waste household appliances under self-operating mode [12640-23]
12640 17	Research on scheduling optimization of yard crane under low carbon background [12640-75]
12640 18	A narrow band terahertz perfect absorber based on graphene polarization independence [12640-51]
12640 19	Automatic detection method of conveyor belt deviation based on DeepLabv3+ [12640-65]
	NEURAL NETWORK AND INTELLIGENT ALGORITHM MODELING
	NEUKAL NEIWORK AND INTELLIGENT ALGORITIM MODELING
12640 1A	Aerial target recognition based on convolutional neural network [12640-50]
12640 1B	Effluent water quality prediction method based on no-inflected point neural network [12640-42]
12640 1C	Intelligent hydroponic greenhouse based on Internet of Things [12640-46]
12640 1D	Design of intelligent waste recycling station based on ARM [12640-84]
12640 1E	Mechanical properties analysis of cell surface based on genetic simulated annealing optimization neural network [12640-13]
12640 1F	Deep learning-based technique for detecting fast lanes [12640-47]
12640 1G	Analysis and prediction of cardiovascular disease prevalence in middle-aged and elderly men based on machine learning [12640-88]
12640 1H	Research on the relationship between process parameters and mechanical properties of composites based on neural network [12640-26]

12640 11	The classification of patient blood samples with machine learning techniques [12640-78]
12640 1J	Research on similar handwritten character feature extraction algorithm by introducing deformable convolution [12640-10]
12640 1K	Research and implementation of Android fraud software detection technology based on machine learning [12640-25]
12640 1L	Construction of English teaching quality diagnosis and evaluation model combined with improved EM algorithm [12640-24]
12640 1M	Research on a cigarette placement method based on multi-source data and neural networks [12640-74]
12640 1N	Study on the mathematical model of multi-source time series prediction for gas insulated power equipment and the application of new environment-friendly insulating gas [12640-76]
12640 10	Task-based dialogue policy learning based on decision transformer [12640-58]
12640 1P	Heart disease prediction with discriminative deep neural network [12640-81]
12640 1Q	An action recognition method based on neural architecture search [12640-68]
12640 1R	Research on heavy truck operation characteristics recognition method based on machine learning [12640-31]
12640 1S	Carbon price forecasting based on data decomposition, adaptive boosting algorithm, and Elman neural network [12640-71]
12640 1T	PM <sub>2.5</sub> prediction method using back propagation neural network [12640-70]
12640 1U	Vibration mitigation design and effect prediction of ballast turnout in metro depot [12640-69]
12640 1V	Ship trajectory prediction model based on GAN and attention mechanism [12640-61]
12640 1W	Research on reliability of onshore wind farm power generation equipment [12640-87]