## PROCEEDINGS OF SPIE

# Third International Conference on Artificial Intelligence and Computer Engineering (ICAICE 2022)

**Xiaoli Li** *Editor* 

11–13 November 2022 Wuhan, China

Organized by
Dalian Jiaotong University (China)
Dalian Computer Society (China)

Sponsored by
Dalian Ocean University (China)
Dalian Minzu University (China)
Nanjing University of Aeronautics and Astronautics (China)
AEIC Academic Exchange Information Centre (China)

Published by SPIE

**Volume 12610** 

Part One of Two Parts

Proceedings of SPIE 0277-786X, V. 12610

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 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 *Third International Conference on Artificial Intelligence and Computer Engineering (ICAICE 2022)*, edited by Xiaoli Li, Proc. of SPIE 12610, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510663473

ISBN: 9781510663480 (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**

XV

Conference Committees

#### Part One

#### ROBOT MODELLING AND AUTOMATIC PROGRAMMING

12610 02	A design of transcendental function accelerator [12610-188]
12610 03	Comprehensive decision-making model of crowdsourcing operation and maintenance of charging stations based on computer aided technology [12610-207]
12610 04	Application of virtual reality technology in motion simulation and control of industrial robot [12610-250]
12610 05	Impact analysis model of high proportion new energy penetration on the whole cost chain of power grid [12610-227]
12610 06	Crop weed image recognition of UAV based on improved HRNet-OCRNet [12610-143]
12610 07	Modular design of aircraft system software [12610-221]
12610 08	Live detection method of transmission line piezoelectric tube defects based on UAV [12610-162]
12610 09	Research on modeling method of aeroengine on-board model based on flight data [12610-257]
12610 0A	Human-object interaction detection based on graph model [12610-138]
12610 OB	Distributed multi-robot obstacle avoidance via logarithmic map-based deep reinforcement learning [12610-86]
12610 OC	A robust and novel semantic segmentation deep neural network for robotic surgery vision with a single RGB camera [12610-186]
12610 0D	Highly integrated modular avionics from platform to payload for micro-satellites [12610-196]
12610 OE	Software technology analysis based on wearable devices [12610-191]
12610 OF	Aquila optimizer integrating Gaussian walk and somersault strategy [12610-131]

12610 0G	Revealing the influential mechanism of voice interactivity with or via smart voice robots on user satisfaction [12610-43]
12610 OH	STACnovGRU: weather forecasting based on spatio-temporal adaptive convolutional GRU [12610-22]
12610 01	A training method for face representation models in realistic scenarios [12610-140]
12610 OJ	UAV obstacle avoidance based on improved artificial potential field method [12610-193]
12610 OK	Dynamic state estimation method of urban electricity-gas-heat coupled energy network based on multiple time scales [12610-93]
12610 OL	Data flow analysis in automotive engine underpower fault detection [12610-237]
12610 OM	Single event effect evaluation of different communication ways based on 40nm SRAM-FPGA [12610-146]
12610 ON	Automatic detection system for sandpaper defects based on digital image processing [12610-185]
12610 00	Fast cleaning method for smart grid data based on sparse self-coding [12610-169]
12610 OP	A human-machine interaction method and process based on the intelligent medical robot [12610-213]
12610 0Q	Low dropout regulator with double operational amplifiers based on FVF structure [12610-72]
12610 OR	Evaluate the performance of the support vector machines ensemble [12610-79]
12610 0\$	Lane detection algorithm based on multi-head self-attention and multi-level feature fusion [12610-115]
12610 OT	Emotional computing-intelligent vehicle interaction and driver emotion recognition based on machine learning [12610-216]
12610 OU	A new min-max limit protection design method for aero-engine based on inverse mapping [12610-14]
12610 OV	Offloading strategy for UAV power inspection task based on deep reinforcement learning [12610-224]
12610 OW	The anomaly behavior detection algorithm with video-packet attention in transportation surveillance videos [12610-109]
12610 0X	Hybrid recommendation model based on multi-head attention mechanism and cross network fusion [12610-15]
12610 OY	Nonlinear programming-based liner shipping route optimization under ECA restriction [12610-92]

12610 OZ	Research on adaptive canny-based detection method for print overprint deviation [12610-40]
12610 10	Research on on-orbit calibration method of kinematic parameters of space manipulator [12610-130]
12610 11	Exploiting the power of StarGANv2 in the wild [12610-184]
12610 12	Short-term traffic flow prediction of BP based on adaptive BWO optimization [12610-4]
12610 13	Defect detection of vaccine glass tubes based on semantic segmentation [12610-141]
12610 14	Research on prediction of abnormal overtime behavior of expressway vehicles [12610-145]
12610 15	The prediction of wrinkle formation in multi-layered biaxial fabrics during press tool forming [12610-217]
12610 16	Global critic and local actor for campaign-tactic combat management in the joint operation simulation software [12610-118]
	COMPUTER VISION AND IMAGE PROCESSING
12610 17	3D visualization information system for water quality detection unmanned ship based on virtual reality technology [12610-65]
12610 18	Aspect-level sentiment analysis model fused with GPT and multi-layer attention [12610-182]
12610 19	Interactive haptic simulation of cell microinjection task [12610-41]
12610 1A	Research on quality evaluation of user generated content in new media academic community [12610-206]
12610 1B	Multi-classification recognition of blood cell images based on transfer learning [12610-70]
12610 1C	A multi-modal model based on transformers for medical visual question answering [12610-200]
12610 1D	Chinese named entity recognition incorporating syntactic information [12610-84]
12610 1E	CL-SRGAN: generative adversary network equipped with curriculum learning for image super-resolution [12610-195]
12610 1F	Does gender affect the processing of object classification in natural scenes [12610-52]
12610 1G	RCM maintenance strategy modeling based on logic language [12610-47]
12610 1H	Permittivity inversion of GPR images based on DeepLab [12610-236]

12610 11	Mural image shedding diseases inpainting algorithm based on structure priority [12610-128]
12610 1J	Retinex-SIE: self-supervised low-light image enhancement method based on Retinex and homomorphic filtering transformation [12610-77]
12610 1K	Visualizing the intellectual structure of anti-monopoly research: a scientometric analysis in CiteSpace [12610-58]
12610 1L	A medical image segmentation algorithm based on spatial and channel attention mechanisms and data augmentation [12610-177]
12610 1M	Study on urinary erythocyte images classification based on supervised comparative learning [12610-154]
12610 1N	Image matching algorithm in outdoor environment [12610-166]
12610 10	Research and application of MetaEdit+ based modeling language for Hot working domain [12610-99]
12610 1P	Entity embedding and relational path on small samples for knowledge graph completion [12610-108]
12610 1Q	RRANet: low-light image enhancement based on Retinex theory and residual attention [12610-149]
12610 1R	Comparison and analysis of computer vision models based on images of catamount and canid [12610-215]
12610 18	An improved longitude correction algorithm for fisheye image edge distortion [12610-242]
12610 1T	GAN-based algorithm for efficient image inpainting [12610-246]
12610 1U	Learning facial details for high-resolution face anti-spoofing [12610-172]
12610 1V	E-OrbF: a robust image feature matching algorithm [12610-71]
12610 1W	Deep learning networks for microbiology images recognition [12610-205]
12610 1X	A traffic image semantic segmentation algorithm based on UNET [12610-35]
12610 1Y	Research on the network substitution effect of Mask R-CNN algorithm for fuzzy input images [12610-174]
12610 1Z	Road network information extraction from high-resolution remote sensing images based on improved U-Net [12610-126]
12610 20	Maize disease segmentation method based on improved image segmentation network model [12610-152]

12610 21	Comparison of ResNet-50 and vision transformer models for trash classification [12610-111]
12610 22	Combining feature fusion and attention mechanism for face image restoration [12610-132]
12610 23	Research on image reconstruction algorithm of capacitance imaging based on elastic network [12610-32]
12610 24	Research on painting image classification based on convolution neural network [12610-225]
12610 25	Research on the construction of learner personas [12610-6]
12610 26	COVID-19 x-ray image detection algorithm based on deep learning [12610-103]
12610 27	Research on neural cell image segmentation based on improved U-Net model [12610-165]
12610 28	Battery health analysis of electric vehicle based on EL-SVR [12610-66]
12610 29	Scraper conveyor chain pitch measurement based on speckle structured light [12610-113]
12610 2A	Analysis of influencing factors on investment risk of expressway project in China [12610-101]
12610 2B	Research on intention tendency detection for Chinese medical question answering task [12610-197]
12610 2C	Simultaneous escape routing based on multi-commodity flow [12610-81]
12610 2D	Fact relation and keywords fusion abstractive summarization [12610-97]
12610 2E	A novel PCB fault diagnosis method based on tiny object detection [12610-60]
12610 2F	Real-time EEG-based detection of ship driving fatigue using sample entropy [12610-87]
	MULTIMEDIA DATA AND INFORMATION RECOGNITION
12610 2G	Big data analysis model for water property forecasting [12610-120]
12610 2H	Research, development and application of railway bridge information construction management platform based on BIM+GIS+IoT technology [12610-171]
12610 21	Bert-BiLSTM-CRF based financial entity identification [12610-3]
12610 2J	Address and place name database of electric power intelligent customer service based on intelligent question and answer technology [12610-249]

12610 2K	Target localization network based on optical flow for object tracking [12610-144]
12610 2L	Driver behavior detection method based on convolutional neural network and data enhancement [12610-5]
12610 2M	Object tracking based on foreground adaptive bounding box and motion state redetection [12610-155]
12610 2N	Research on micro-expression recognition method based on attention mechanism [12610-230]
12610 20	Dynamic gesture recognition based on temporal shift module [12610-201]
12610 2P	Human gait recognition algorithm based on MobileNetV1 with attention mechanism [12610-179]
12610 2Q	Preemptive resource scheduling strategy of cloud video based on Kubernetes [12610-199]
12610 2R	Research on named entity identification method based on medical field [12610-192]
12610 2S	Hand gesture recognition using multi-sensor information fusion [12610-153]
12610 2T	A multi-scale sarcasm sentiment recognition algorithm incorporating sentence hierarchical representation [12610-26]
12610 2U	An improvement of vehicle and passerby recognition based on YOLO-V3 algorithm [12610-127]
12610 2V	A DDoS attack detection method based on AE network in the internet of vehicles [12610-209]
12610 2W	Research on transaction optimization strategy based on data analysis of second-hand car trading platform [12610-25]
12610 2X	Single-stage face detection method based on feature fusion and data enhancement [12610-27]
12610 2Y	Vehicle identification and speed calculation method for general road camera perspective [12610-24]
12610 2Z	Forecasting method of clearing price in spot market of electric power based on data mining [12610-80]
12610 30	Intelligent recording live broadcast of practical training based on Al technology [12610-259]
12610 31	The MDSC paradigm design for serverless computing defense [12610-78]
12610 32	Wireless communication algorithm based on radio frequency identification technology: wireless communication system design and research [12610-263]

#### Part Two

12610 33	The entity and event recognition method of power dispatching text information based on BERT-CRF [12610-211]
12610 34	Gesture recognition fusion two-stream 3D CNN and FPN [12610-7]
12610 35	Vehicle logo recognition based on depth residual shrinkage network [12610-210]
12610 36	Improving conditions for recording human gaze data [12610-95]
12610 37	Three-stream fusion networks for student engagement recognition based on TimeSformer [12610-63]
12610 38	Upper bounds for the minimal eigenvalue of M-matrices [12610-53]
12610 39	Agricultural products traceability e-commerce platform based on speech recognition [12610-178]
12610 3A	Working modes recognition method of phased array radar based on TCN-BiLSTM parallel processing $[12610\text{-}34]$
12610 3B	Research on the construction and application of event based electromagnetic space big data knowledge graph [12610-204]
12610 3C	<b>Dynamic optimization of load balancing for streaming server clusters based on LAE-KNN</b> [12610-39]
12610 3D	Research on aerobics action pose recognition based on deep learning [12610-104]
12610 3E	Dimensional emotion recognition based on ConvLSTM network with double stream convolution feature $[12610\text{-}83]$
12610 3F	Research on pattern recognition and retrieval of reliance based on deep learning [12610-223]
12610 3G	Tomato identification and picking point location based on YOLOv5 [12610-94]
12610 3H	An approach to detect IoT botnet attacks based on hierarchical clustering [12610-75]
12610 31	Weibo rumor detection based on GCN [12610-19]
12610 3J	Random aggregate packing algorithm for asphalt concrete based on geographical information systems (GIS) [12610-231]
12610 3K	Research on single-person apartment fire accident based on numerical simulation [12610-57]
12610 3L	An extraction method of one-dimensional binary discrete wavelet packet coefficients of underwater acoustic signals [12610-233]

12610 3M	Dynamic feature removal method based on relative geometry [12610-82]
12610 3N	Binary function similarity detection based on text semantics [12610-161]
12610 30	Discrete element simulation research on accumulation characteristics of coal bulk in carriage [12610-116]
12610 3P	New estimation for spectral radius of Hadamard product [12610-59]
	INTERNET EDUCATION AND ELECTRONIC SYSTEM
12610 3Q	Design and research of international student training management system based on cloud computing [12610-187]
12610 3R	Design of a video co-processing system for unmanned equipment [12610-54]
12610 3S	Prediction method of power grid marketing cost based on improved ARIMA model [12610-252]
12610 3T	Research on detection method of over-current fault point of transmission cable ring network based on fault tree [12610-180]
12610 3U	Low-carbon park fire safety monitoring system based on multi-sensor [12610-255]
12610 3V	Explore the potential factors affecting the medical experience of the smart medical platform based on the method of word embedding [12610-51]
12610 3W	Design and implementation of patient monitoring system based on Java [12610-164]
12610 3X	Intelligent electrical fire warning system design [12610-238]
12610 3Y	Research on trust-based secure routing in wireless sensor networks [12610-256]
12610 3Z	SWPNet: shifted windows parallel network for polyp segmentation [12610-183]
12610 40	Research on multi-service local processing and application based on edge IoT agent [12610-98]
12610 41	A high availability method for network storage based on PCIe nontransparent bridge technology [12610-121]
12610 42	Research on intelligent agricultural decision-making system based on Bayesian optimization [12610-151]
12610 43	Design of digital intelligent flight test comment system [12610-173]

12610 44	Research on university network public opinion sentiment analysis based on BERT and Bi-LSTM [12610-20]
12610 45	Design of classification system for cupping-induced plaque images based on deep learning [12610-62]
12610 46	Enterprise risk assessment system based on text mining [12610-30]
12610 47	Research and improvement of load balancing technology based on SIP server clusters [12610-55]
12610 48	Urgency coefficient and responsibility coefficient facilitate the evolution of cooperation in multi-agent systems [12610-67]
12610 49	Design of fruit classification system based on deep learning [12610-46]
12610 4A	Design and research of VR interactive game based on mirror elements [12610-198]
12610 4B	Intelligent monitoring system of oil tank liquid level based on infrared thermal imaging [12610-253]
12610 4C	An application study of an STM32-based control system for low-temperature shock therapy [12610-208]
12610 4D	Flight disruption impact assessment based on expert system [12610-56]
12610 4E	RTS-Net: efficient and accurate network for real-time tongue segmentation [12610-90]
12610 4F	Personalized design of power marketing intelligent customer service system based on knowledge map [12610-254]
12610 4G	Research and implementation of deep-learning-based stock opening price forecasting system [12610-158]
12610 4H	Angle of arrival localization in wireless sensor networks with inaccurate anchor positions [12610-45]
12610 41	Implement deep neuron networks on VPipe parallel system: a ResNet variant implementation [12610-181]
12610 4J	The recent progress and state-of-art detection approaches of black holes [12610-241]
12610 4K	Enhanced priority-based search for multi-agent path finding in roadway map [12610-96]
12610 4L	Research on the construction of visual virtual reality platform for Chinese pattern design [12610-112]
12610 4M	Analysis of a multi-state HIV transmission model based on differential dynamical system [12610-150]

12610 4N	Offline handwritten signature authentication based on perceptual hash and DFT [12610-248]
12610 40	Coaxiality error compensation and experimental verification of RV reducer test system based on laser displacement sensor [12610-134]
12610 4P	The comparison between different option pricing models: evidence from Black-Scholes model and Leland model [12610-258]
12610 4Q	Research on power grid investment decision model based on constraints of key factors of transmission and distribution price [12610-163]
12610 4R	Comparison of the performances for CAPM and Fama-French models during COVID-19 [12610-222]
12610 4S	Comparison of large-scale pre-trained models based VIT, swin transformer and ConvNeXt [12610-105]
12610 4T	Exploring ethanol-coupled preparation of ethylene based on nonlinear regression analysis [12610-175]
12610 4U	Research on product competitiveness evaluation based on IPVFWA operator [12610-17]
12610 4V	Research on PAMGCN based recommendation model for Chinese medicine [12610-212]
	ARTIFICIAL INTELLIGENCE ALGORITHM AND NEURAL NETWORK
12610 4W	An active learning application on loan default prediction: based on forest classifier model [12610-226]
12610 4X	Object detection algorithm based on improved Yolov5 [12610-251]
12610 4Y	An invalid idling start-stop prediction method based on BP neural network [12610-243]
12610 4Z	Hippocampus MRI diagnosis based on deep learning in application of preliminary screening of
	Alzheimer's disease [12610-229]
12610 50	Alzheimer's disease [12610-229]  Optimization of building target aiming point based on DDPGPSO algorithm [12610-33]
12610 50 12610 51	
	Optimization of building target aiming point based on DDPGPSO algorithm [12610-33]
12610 51	Optimization of building target aiming point based on DDPGPSO algorithm [12610-33]  A dropout-resilient verifiable privacy-preserving federated learning [12610-68]

12610 55	An efficient fair exchange privacy-preserving protocol for V2G based on blockchain [12610-203]
12610 56	Natural gas station flame detection based on YOLO v5 target detection algorithm [12610-49]
12610 57	Research on recommendation algorithm based on neural network fusing user behavior sequence [12610-142]
12610 58	Few-shot relation extraction based on multi-level feature metric learning [12610-21]
12610 59	Semantic matching method-based question and answer classification algorithm research [12610-73]
12610 5A	Feature point matching algorithm based on metric learning [12610-168]
12610 5B	An optimized cloud edge server placement method based on k-mean algorithm [12610-61]
12610 5C	Multi-cost fusion stereo matching algorithm based on guided filter aggregation [12610-119]
12610 5D	Classification algorithm based on convolutional neural network for wild fungus [12610-13]
12610 5E	Instance-based adaptive attention algorithm for human-object interaction detection [12610-50]
12610 5F	Research on defect detection algorithm of strip steel based on improved YOLOv4 [12610-106]
12610 5G	Research on an improved deepsort object tracking algorithm of yolov5 framework based on fused temporal difference [12610-167]
12610 5H	Research on local path planning of intelligent vehicle based on improved dynamic window approach [12610-31]
12610 51	Research on distributed sensor network faulty recovery method based on attention mechanism [12610-190]
12610 5J	Reinforcement learning multi-hop reasoning method with GAN network [12610-91]
12610 5K	Distortion correction algorithm based on GPSO and improved LM [12610-18]
12610 5L	Multifunctional intelligent crutch based on IoT [12610-240]
12610 5M	Siamese network tracking algorithm based on reinforcement learning [12610-38]
12610 5N	Optimization control with multi-constraint of aeroengine acceleration process based on reinforcement learning [12610-74]
12610 50	Multi-classification on the diagnosis of four early stages of Alzheimer's disease by transfer learning models [12610-194]

12610 5P	Research on forklift obstacle detection and distance warning method based on deep learning [12610-42]
12610 5Q	Deep neural network prediction method of ring network tank life based on internal discharge characteristics [12610-88]
12610 5R	Research on path planning based on improved ant colony algorithm [12610-36]
12610 5S	Mask detection algorithm based on the improved YOLOv4 - tiny [12610-239]
12610 5T	A study of stock price analysis algorithms for new energy companies based on random forest and genetic algorithms [12610-139]
12610 5U	Research on the application of artificial intelligence in the library sector [12610-218]
12610 5V	Improved affinity propagation optimal clustering number algorithm based on merging similar clusters [12610-189]
12610 5W	Isonicotinic acid yield prediction by BP neural network based on optimization of grey wolf algorithm [12610-247]
12610 5X	Study on the prediction of aerodynamic loss coefficient of the airfoil by GA-BP neural network $[12610\text{-}85]$
12610 5Y	Development of neural network model based on attention mechanism applied to the prediction of ship damaged stability [12610-156]
12610 5Z	A comparative study of stock price prediction based on BP and LSTM neural network [12610-117]
12610 60	Parameter optimization design of isolated bridge based on improved genetic algorithm [12610-232]
12610 61	Dynamic path planning for ships in pirate attack areas [12610-2]
12610 62	A new energy vehicle sales forecasting model based on high-dimensional tensor CNN [12610-9]
12610 63	Research on the opinion evolution process under the effect of time delay [12610-89]