

Qilian Liang · Wei Wang · Jiasong Mu ·  
Xin Liu · Zhenyu Na · Xiantao Cai *Editors*

# Artificial Intelligence in China

Proceedings of the 2nd International  
Conference on Artificial Intelligence in  
China

# Lecture Notes in Electrical Engineering

Volume 653

## Series Editors

Leopoldo Angrisani, Department of Electrical and Information Technologies Engineering, University of Napoli Federico II, Naples, Italy

Marco Arteaga, Departament de Control y Robótica, Universidad Nacional Autónoma de México, Coyoacán, Mexico

Bijaya Ketan Panigrahi, Electrical Engineering, Indian Institute of Technology Delhi, New Delhi, Delhi, India

Samarjit Chakraborty, Fakultät für Elektrotechnik und Informationstechnik, TU München, Munich, Germany

Jiming Chen, Zhejiang University, Hangzhou, Zhejiang, China

Shanben Chen, Materials Science and Engineering, Shanghai Jiao Tong University, Shanghai, China

Tan Kay Chen, Department of Electrical and Computer Engineering, National University of Singapore, Singapore, Singapore

Rüdiger Dillmann, Humanoids and Intelligent Systems Laboratory, Karlsruhe Institute for Technology, Karlsruhe, Germany

Haibin Duan, Beijing University of Aeronautics and Astronautics, Beijing, China

Gianluigi Ferrari, Università di Parma, Parma, Italy

Manuel Ferre, Centre for Automation and Robotics CAR (UPM-CSIC), Universidad Politécnica de Madrid, Madrid, Spain

Sandra Hirche, Department of Electrical Engineering and Information Science, Technische Universität München, Munich, Germany

Faryar Jabbari, Department of Mechanical and Aerospace Engineering, University of California, Irvine, CA, USA

Limin Jia, State Key Laboratory of Rail Traffic Control and Safety, Beijing Jiaotong University, Beijing, China

Janusz Kacprzyk, Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland

Alaa Khamis, German University in Egypt El Tagamoa El Khames, New Cairo City, Egypt

Torsten Kroeger, Stanford University, Stanford, CA, USA

Qilian Liang, Department of Electrical Engineering, University of Texas at Arlington, Arlington, TX, USA

Ferran Martín, Departament d'Enginyeria Electrònica, Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain

Tan Cher Ming, College of Engineering, Nanyang Technological University, Singapore, Singapore

Wolfgang Minker, Institute of Information Technology, University of Ulm, Ulm, Germany

Pradeep Misra, Department of Electrical Engineering, Wright State University, Dayton, OH, USA

Sebastian Möller, Quality and Usability Laboratory, TU Berlin, Berlin, Germany

Subhas Mukhopadhyay, School of Engineering & Advanced Technology, Massey University, Palmerston North, Manawatu-Wanganui, New Zealand

Cun-Zheng Ning, Electrical Engineering, Arizona State University, Tempe, AZ, USA

Toyoaki Nishida, Graduate School of Informatics, Kyoto University, Kyoto, Japan

Federica Pascucci, Dipartimento di Ingegneria, Università degli Studi "Roma Tre", Rome, Italy

Yong Qin, State Key Laboratory of Rail Traffic Control and Safety, Beijing Jiaotong University, Beijing, China

Gan Woon Seng, School of Electrical & Electronic Engineering, Nanyang Technological University, Singapore, Singapore

Joachim Speidel, Institute of Telecommunications, Universität Stuttgart, Stuttgart, Germany

Germano Veiga, Campus da FEUP, INESC Porto, Porto, Portugal

Haitao Wu, Academy of Opto-electronics, Chinese Academy of Sciences, Beijing, China

Junjie James Zhang, Charlotte, NC, USA

The book series *Lecture Notes in Electrical Engineering* (LNEE) publishes the latest developments in Electrical Engineering - quickly, informally and in high quality. While original research reported in proceedings and monographs has traditionally formed the core of LNEE, we also encourage authors to submit books devoted to supporting student education and professional training in the various fields and applications areas of electrical engineering. The series cover classical and emerging topics concerning:

- Communication Engineering, Information Theory and Networks
- Electronics Engineering and Microelectronics
- Signal, Image and Speech Processing
- Wireless and Mobile Communication
- Circuits and Systems
- Energy Systems, Power Electronics and Electrical Machines
- Electro-optical Engineering
- Instrumentation Engineering
- Avionics Engineering
- Control Systems
- Internet-of-Things and Cybersecurity
- Biomedical Devices, MEMS and NEMS

For general information about this book series, comments or suggestions, please contact [leontina.dicecco@springer.com](mailto:leontina.dicecco@springer.com).

To submit a proposal or request further information, please contact the Publishing Editor in your country:

#### **China**

Jasmine Dou, Editor ([jasmine.dou@springer.com](mailto:jasmine.dou@springer.com))

#### **India, Japan, Rest of Asia**

Swati Meherishi, Editorial Director ([Swati.Meherishi@springer.com](mailto:Swati.Meherishi@springer.com))

#### **Southeast Asia, Australia, New Zealand**

Ramesh Nath Premnath, Editor ([ramesh.premnath@springernature.com](mailto:ramesh.premnath@springernature.com))

#### **USA, Canada:**

Michael Luby, Senior Editor ([michael.luby@springer.com](mailto:michael.luby@springer.com))

#### **All other Countries:**

Leontina Di Cecco, Senior Editor ([leontina.dicecco@springer.com](mailto:leontina.dicecco@springer.com))

**\*\* This series is indexed by EI Compendex and Scopus databases. \*\***

More information about this series at <http://www.springer.com/series/7818>

Qilian Liang · Wei Wang · Jiasong Mu ·  
Xin Liu · Zhenyu Na · Xiantao Cai  
Editors

# Artificial Intelligence in China

Proceedings of the 2nd International  
Conference on Artificial Intelligence in China

 Springer

*Editors*

Qilian Liang  
Department of Electrical Engineering  
University of Texas at Arlington  
Arlington, TX, USA

Jiasong Mu  
Tianjin Normal University  
Tianjin, China

Zhenyu Na  
School of Information Science and  
Technology  
Dalian Maritime University  
Dalian, China

Wei Wang  
Tianjin Normal University  
Tianjin, China

Xin Liu  
Dalian University of Technology  
Dalian, China

Xiantao Cai  
Wuhan University  
Wuhan, Hubei, China

ISSN 1876-1100

ISSN 1876-1119 (electronic)

Lecture Notes in Electrical Engineering

ISBN 978-981-15-8598-2

ISBN 978-981-15-8599-9 (eBook)

<https://doi.org/10.1007/978-981-15-8599-9>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2021, corrected publication 2021

This work is subject to copyright. All rights are solely and exclusively licensed to the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd. The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

# Contents

<b>Research on Improved K-Means Clustering Algorithm for Smart Energy Meter Based on Climatic Features</b> . . . . .	1
Hongyu Cao, Huiying Liu, Xin Yin, Ruxin Wen, and Yue Chen	
<b>A Method to Solve the Measurement Error of Track Safety Control Based on Weighted Fusion</b> . . . . .	9
Jianping Pan, Shengdong Ji, Pengfei Hao, Zhiguo Ren, and Quansheng He	
<b>Improved Spectral Efficiency Based on Double Spatially Sparse in Millimeter Wave MIMO System</b> . . . . .	18
Yanping Zhu, Sicheng Guo, Yinxuan Sun, and Jing Liu	
<b>Electromagnetic Compatibility Test Analysis of Space Launch Field Based on Wavelet Analysis</b> . . . . .	26
Bo Zhou, Yao lou Jiang, Zong ju Xiong, Chun guang Shi, Zhen Chen, Mei Yang, and Gai qin Li	
<b>Design of a Biometric Access Control System Based on Fingerprint Identification Technology</b> . . . . .	34
Hai Wang, Zhihong Wang, Guiling Sun, Limin Zhang, Yi Gao, Ying Zhang, and Chaoran Bi	
<b>Aeronautical Meteorological Decision Supporting Technology Based on 4D Trajectory Prediction</b> . . . . .	43
Yi Mao, Yuxin Hu, and Jiajing Zhang	
<b>Evaluation Index System and Case Study for Smart ATM Based on ASBU</b> . . . . .	52
Chao Jiang	
<b>Research on the Development Trend of Artificial Intelligence Based on Papers and Patent Analysis—Data Comparison Between China and the United States</b> . . . . .	60
Jinyi Feng and Xiangyang Li	

<b>Analysis of 5G and Beyond: Opportunities and Challenges</b> . . . . .	68
Liedong Wang	
<b>Prediction of PM2.5 Concentration Based on Support Vector Machine and Ridge</b> . . . . .	76
Haocun Zhang	
<b>Helmet Detection Based on an Enhanced YOLO Method</b> . . . . .	84
Weizhou Zheng and Jiayi Chang	
<b>Feature Extraction and Classification of Unknown Types of Communication Emitter</b> . . . . .	93
Xu Zhang, Zhuo Sun, Suyu Huang, Shaolin Ma, and Anhao Ye	
<b>Research on Escape Strategy Based on Intelligent Firefighting Internet of Things Virtual Simulation System</b> . . . . .	102
Hai Wang, Guiling Sun, Yi Gao, and Xiaochen Li	
<b>Weather Identification-Based Multi-level Visual Feature Combination</b> . . . . .	111
Ziheng Li, Anliang Zhou, and Yilong Geng	
<b>Railway Tracks Defects Detection Based on Deep Convolution Neural Networks</b> . . . . .	119
Zhong-Jun Wan and Song-Qi Chen	
<b>Efficiency Evaluation of Deep Model for Person Re-identification</b> . . . . .	130
Haijia Zhang, Sen Wang, Nuoran Wang, Shuang Liu, and Zhong Zhang	
<b>Cloud Recognition Using Multimodal Information: A Review</b> . . . . .	137
Linlin Duan, Jingrui Zhang, Yaxiu Zhang, Zhong Zhang, Shuang Liu, and Xiaozhong Cao	
<b>Graph Convolution Network for Person Re-identification</b> . . . . .	145
Wenmin Huang, Yilin Xu, Zhong Zhang, and Shuang Liu	
<b>Cross-Domain Person Re-identification: A Review</b> . . . . .	153
Yanan Wang, Shuzhen Yang, Shuang Liu, and Zhong Zhang	
<b>A Weighted Least Square Support Vector Regression Method with MPP-GGP Based Sequential Sampling for Efficient Reliability Analysis</b> . . . . .	161
Yang Guo, Nan-nan Wang, and Gen-shen Kai	
<b>Design of Quadrotor Automatic Tracking UAV Based on OpenMV</b> . . . . .	171
Hai Wang, Ying Zhang, Guiling Sun, Zhihong Wang, Binghao Tian, and Penghui Li	
<b>A Reliability Evaluation Model of Intelligent Energy Meter in Typical Environment</b> . . . . .	179
You Gong, Huiying Liu, Xin Yin, Heng Hu, and Guorui Wu	

**Analysis and Prediction of the Resettlement for Climate Refugees in the Maldives** . . . . . 186  
 Jiasong Mu and Hao Ma

**Smart Electricity Meters Test Data Management Service System** . . . . . 194  
 Liu Huiying, Yin Xin, Wang Xiaoyu, Wen Ruxin, Zhang Qiuyue, and Du Bo

**Power Equipment Identification Based on Single Shot Detector** . . . . . 202  
 Hanwu Luo, Wenzhen Li, Qirui Wu, Hailong Zhang, and Zhonghan Peng

**RETRACTED CHAPTER: Power Equipment Defect Detection Algorithm Based on Deep Learning** . . . . . 211  
 Hanwu Luo, Qirui Wu, Kai Chen, Zhonghan Peng, Peng Fan, and Jingliang Hu

**Research on Active Learning Method Based on Domain Adaptation and Collaborative Training** . . . . . 220  
 Wenzhen Li, Qirui Wu, Hanwu Luo, Guoli Zhang, Zhonghan Peng, and Kai Chen

**Evolution Analysis of Research Hotspots in the Field of Machine Learning Based on Complex Network** . . . . . 228  
 Tala, Cui Yimin, Li Junmei, and Su Xiaoyan

**Research on Index Network Construction and Effectiveness Evaluation Method of Air Traffic Control System Based on CDM Data** . . . . . 242  
 Zheng Li, Yinfeng Li, Xiaowen Wang, Meng Xu, and Shenghao Fu

**Rerouting Path Planning Based on MAKLINK Diagram and MS-Genetic Algorithm** . . . . . 251  
 Tong Wei, Manzhen Duan, Bin Dong, Yinfeng Li, and Shenghao Fu

**Data-Driven Fault-Aware Multi-objective Optimization for Flexible Job-Shop Scheduling Problem** . . . . . 261  
 Zhibo Sui, Xiaoxia Li, Jie Yang, and Jianxing Liu

**Research on Airspace Conflict Resolution Algorithm Based on Dempster–Shafer Theory** . . . . . 270  
 Zelin Li, Tianhao Tan, and Shiming Zhu

**A Learning Based Automated Algorithm Selection for Flexible Job-Shop Scheduling** . . . . . 277  
 Xinyu Wang, Xiaoxia Li, Rongyin Zhu, and Zetao Lv

**Controller’s Workload and Sector Capacity Assessment Based on 4D Track** . . . . . 285  
 Changcheng Li and Yuxin Hu



<b>Classification of Tea Pests Based on Automatic Machine Learning</b> . . . . .	296
Heng Zhou, Fuchuan Ni, Ziyang Wang, Fang Zheng, and Na Yao	
<b>Thunderstorm Service and Decision Support Technology Based on Composite Reflectivity Information</b> . . . . .	307
Yao Shan, Yuxin Hu, and Yungang Tian	
<b>Research on Intrusion Detection Method Based on PGoogLeNet-IDS Model</b> . . . . .	315
Min Sun, Xue Hao, and Wenbin Li	
<b>Research on ADS-B Interference Principle and Suppression Method</b> . . . . .	324
Yi Yang, Ruheng Xie, and Yang Ding	
<b>A Multispectral Image Enhancement Algorithm Based on Frame Accumulation and LOG Detection Operator</b> . . . . .	334
FengJuan Wang, BaoJu Zhang, CuiPing Zhang, ChengCheng Zhang, and Man Wang	
<b>Research on Intelligent Release Strategy of Air Traffic Control Automation System Based on Control Experience</b> . . . . .	344
Liu Yan	
<b>A Method Based on Deep Reinforcement Learning to Generate Control Strategy for Aircrafts in Terminal Sector</b> . . . . .	356
Qiucheng Xu, Jinglei Huang, Zeyuan Liu, and Hui Ding	
<b>Sand Table Design of Virtual Reality Psychotherapy</b> . . . . .	364
Chaoran Bi, Hai Wang, and Rui Dong	
<b>Massive Flights Real-Time Rerouting Planning Based on Parallel Discrete Potential Field Method</b> . . . . .	372
Yang Ding, Zelin Li, Bingyu Li, and Ruheng Xie	
<b>Remote Sensing Image Detection Based on FasterRCNN</b> . . . . .	380
Shunmin Liu, Zhiming Ma, and Bingcai Chen	
<b>Research on Airport Surface Simulation Method Based on Dynamic Path Planning</b> . . . . .	387
Shenghao Fu, Xiaowen Wang, Bin Dong, and Yan Liu	
<b>Triple-Channel Feature Mixed Sentiment Analysis Model Based on Attention Mechanism</b> . . . . .	396
DeGang Chen, Azragul, and Bingcai Chen	
<b>National Food Safety Standard Graph and Its Correlation Research</b> . . . . .	405
Li Qin and ZhiGang Hao	

**Research on the Hydraulic System of the Expandable Shelter Improved by the Servo Motor Pump** . . . . . 412  
 Fang Bai and Shucheng Wang

**Recognition of Grape Species with Small Samples Based on Attention Mechanism** . . . . . 424  
 Yanuo Lu and Bingcai Chen

**F-Measure Optimization of Forest Flame Salient Object Detection Based on Boundary Perception** . . . . . 436  
 Tiantian Tang and Bingcai Chen

**Cluster Analysis of Student Scores Based on Global K-Means Algorithm** . . . . . 443  
 Jiashan Cui, Mei Nian, Jun Zhang, and Bingcai Chen

**Microblog Rumors Detection Based on Bert-GRU** . . . . . 450  
 Lianjin Han, Weimin Pan, and Haijun Zhang

**Intelligent Ocean Governance—Deep Learning-Based Ship Behavior Detection and Application** . . . . . 458  
 Peng Qin and Yang Cao

**The Research on Disruptive Technology Identification Based on Scientific and Technological Information Mining and Expert Consultation: A Case Study on the Energy Field** . . . . . 469  
 Lucheng Lyu, Xuezhao Wang, Wei Chen, Xin Zhang, Xiaoli Chen, and Xiwen Liu

**Research on Transfer Learning Technology in Natural Language Processing** . . . . . 483  
 Ruilin Shen and Weimin Pan

**Identification of Key Audience Groups Based on Maximizing Influence** . . . . . 489  
 Jie Zhou, Weimin Pan, and Haijun Zhang

**Technical Theme Analysis of WeChat Graphic Based on Domain Science and Technology Information** . . . . . 497  
 Min Zhang, Rui Yang, Wei Chen, Jun Chen, Jinglin Xu, and Yanli Zhou

**Coronavirus Disease (COVID-19) X-Ray Film Classification Based on Convolutional Neural Network** . . . . . 508  
 Shixiang Yan and Bingcai Chen

**The Shortest Path Network Rumor Source Identification Method Based on SIR Model** . . . . . 516  
 Zhongyue Zhou, Hai-Jun Zhang, Weimin Pan, Bingcai Chen, and Yanjun Li

**Microblog Rumor Detection Based on Bert-DPCNN** ..... 524  
 Yan-Jun Li, Hai-Jun Zhang, Wei-Min Pan, Ru-Jia Feng,  
 and Zhong-Yue Zhou

**A New Method of Microblog Rumor Detection Based  
 on Transformer Model** ..... 531  
 Ru-Jia Feng, Hai-Jun Zhang, Wei-Min Pan, Zhong-Yue Zhou,  
 and Yan-Jun Li

**Research on Image Classification Method Based on Improved  
 Xception Model** ..... 538  
 Shuping Chen and Bingcai Chen

**Research on Real-Time Expression Recognition of Complex  
 Environment Based on Attention Mechanism** ..... 548  
 Shunping Li, Cheng Peng, and Bingcai Chen

**Identification Model of Crop Diseases and Insect Pests Based  
 on Convolutional Neural Network** ..... 557  
 Yong Ai, Chong Sun, Anran Liu, Feng Ding, and Jun Tie

**UBHIC: Top-Down Semi-supervised Hierarchical Image  
 Classification Algorithm** ..... 564  
 Jiang Qing Wang, Jian Quan Bi, Lei Zhang, Chong Sun, and Jun Tie

**Topic Mining and Effectiveness Evaluation of China’s Coal-Related  
 Policy Based on LDA Model** ..... 573  
 Fang Yue, Kaimo Guo, Mingliang Yue, and Wei Chen

**Feature Extraction and Selection in Hidden Layer of Deep Learning  
 Based on Graph Compressive Sensing** ..... 582  
 Yifei Yuan, Lei Xu, Yiman Ma, and Wei Wang

**Vehicle Detection in Aerial Images Based on YOLOv3** ..... 588  
 Ruiheng Hu, Bingcai Chen, and Tiantian Tang

**A New Node Optimization Algorithm of Wireless Sensor Network  
 Based on Graph Signal** ..... 594  
 Lei Xu, Yifei Yuan, and Wei Wang

**Research and Practice of Intelligent Water Conservancy Integration  
 Management Platform in Xinjiang** ..... 600  
 Yumeng Lin, Bingcai Chen, Zhiming Ma, Qian Ning, Yanting Xiao,  
 Lun Shao, Qiang Luo, and Xinzhi Zhou

**Retraction Note to: Power Equipment Defect Detection Algorithm  
 Based on Deep Learning** ..... C1  
 Hanwu Luo, Qirui Wu, Kai Chen, Zhonghan Peng, Peng Fan,  
 and Jingliang Hu