

2022 7th International Conference on Computational Intelligence and Applications (ICCIA 2022)

2022 2nd International Workshop on Image Processing (IWIP 2022)

June 24-26, 2022 | Nanjing, China

Conference Venue: Sofitel Nanjing Galaxy

Address: No. 9 Shanxi Road, Jiangsu Province, 210009 Nanjing, China

Time Zone: Beijing Time, GMT + 8h

Co-sponsored by



南京工业大学
NANJING TECH
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电气工程与控制科学学院

COLLEGE OF ELECTRICAL ENGINEERING AND CONTROL SCIENCE

Patrons



INSTRUCTIONS

Onsite Registration Guide:

Arrive at the Conference Venue→Inform the conference staff of your paper ID→Sign your name on the Participants List→Check your conference kits.

Devices Provided by the Conference Organizers:

Laptops (with MS-Office & Adobe Reader)

Projectors & Screen

Laser Sticks

Materials Prepared by the Presenters:

PowerPoint or PDF files

Duration of Each Presentation:

Regular Oral Session: 15 minutes of presentation including 2-3 minutes of Q&A

Notice:

*The organizer will not provide accommodation, so we suggest you make an early reservation.

*One “Best Presentation” will be selected from each oral session. For onsite session, it will be announced at the end of meeting and will be awarded by the session chair in the meeting room. For virtual session, it will be announced after the conference on the website.

*Please take good care of your safety, as well as belongings during the business trip and convention time. Looking forward to meeting you soon in the conference!

Attention:

*Due to situation of COVID-19, please attend the whole conference with a mask on.
And wear your delegate badge (name tag) for all conference activities.



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WELCOMING ADDRESS

On behalf of the conference committees, we are pleased to welcome you to 2022 7th International Conference on Computational Intelligence and Applications (ICCIA 2022) and 2022 2nd International Workshop on Image Processing(IWIP 2022), which will be held jointly in Nanjing, China during June 24-26, 2022, co-sponsored by Nanjing Tech University, China and IEEE, hosted by College of Electrical Engineering and Control Science, Nanjing Tech University, China.

As you have been aware, COVID-19 is still out of control for many countries, and the safety and well-being of our participants is of paramount importance to us. Therefore, after serious consideration, the committee decides to have ICCIA 2022 and IWIP 2022 as an onsite conference combined with virtual mode.

The objective of the conference is to provide a premium platform to bring together researchers, scientists, engineers, academics and graduate students to share up-to-date research results. We are confident that during this time you will get the theoretical grounding, practical knowledge, and personal contacts that will help you build a long term, profitable and sustainable communication among researchers and practitioners in the related scientific areas.

This year's conference will be composed of 5 oral parallel sessions (2 onsite+3 online sessions), 5 Keynote Speeches delivered respectively by Prof. Jie Lu (IEEE Fellow, IFSA Fellow, Australian Laureate Fellow, University of Technology Sydney, Australia), *Prof. Qing-Long Han* (IEEE Fellow, Fellow of The Institution of Engineers Australia, Swinburne University of Technology, Australia), *Prof. Xin Yao* (IEEE Fellow, Southern University of Science and Technology, China), *Prof. Huijun Gao* (IEEE Fellow, Harbin Institute of Technology, China), *Prof. Min-Ling Zhang* (Southeast University, China) and 2 Invited Speech given by *Prof. Sheng Zhang* (Nanchang Hangkong University, China), *Assoc. Prof. Jing Dong* (Nanjing Tech University, China). We would like to express our gratitude to all the speakers in this conference.

Special thanks to all of our conference committees and participants for always being supportive to the conferences and those who are coming to Nanjing during your busy schedule to share your knowledge with us. We hope the conferences will be proved to be intellectually stimulating to us all.

Finally, we wish you a very successful conference!

Organizing Committee
ICCIA 2022 & IWIP 2022

AGENDA OVERVIEW

Venue in Nanjing: Sofitel Nanjing Galaxy/南京索菲特银河大酒店	
Zoom Meeting ID: Room A: 884 0912 8871 https://us02web.zoom.us/j/88409128871 Room B: 894 2358 2599 https://us02web.zoom.us/j/89423582599	
Friday, June 24	
10:00-17:00	Onsite Registration & Conference Kits Collection <Hotel Lobby 1F>
09:30-12:00	Zoom Pre-test for ALL Online Attendees <see page. 7>
Saturday, June 25 Plenary Meeting	
< VIP Room 1 / 贵宾 1厅,8F > Room A: 884 0912 8871 https://us02web.zoom.us/j/88409128871	
Chairman	Assoc. Prof. Huimin Ouyang (Program Chair) <i>Nanjing Tech University, China / 南京工业大学电气工程与控制科学学院 副院长</i>
09:00-09:10	Opening Remarks - Prof. Zhi Fang (Honorary Chair) <i>Nanjing Tech University, China / 南京工业大学电气工程与控制科学学院 院长</i>
09:10-09:50	Speaker I –Prof. Xin Yao <i>IEEE Fellow, Southern University of Science and Technology, China</i> Speech Title: Multi-objective Approaches to Fair Machine Learning
09:50-10:30	Speaker II –Prof. Jie Lu <i>IEEE Fellow, IFSA Fellow, Australian Laureate Fellow, University of Technology Sydney, Australia</i> Speech Title: Fuzzy Transfer Learning
10:30-10:50	Group Photo & Coffee Break
10:50-11:30	Speaker III - Prof. Min-Ling Zhang <i>Southeast University, China</i> Speech Title: Research on Partial Label Learning
11:30-12:10	Speaker IV- Prof. Huijun Gao <i>IEEE Fellow, Harbin Institute of Technology, China</i> Speech Title: Robotic Micromanipulation and Its Applications
12:10-13:40	Buffet Lunch <自助餐厅, 7F>
13:40-14:20	Speaker V- Prof. Qing-Long Han <i>IEEE Fellow, Swinburne University of Technology, Australia</i> Speech Title: Towards Resource-Efficient and Secure Automated Vehicle Platoons
14:20-14:40	Invited Speech I- Prof. Sheng Zhang <i>Nanchang Hangkong University, China</i> Speech Title: Global efficiency estimation method of complex network based on fractal property
14:40-15:00	Invited Speech II- Assoc. Prof. Jing Dong <i>Nanjing Tech University, China</i> Speech Title: Dictionary Learning and Its Applications in Image Processing and Pattern Classification
Saturday, June 25 Onsite Parallel Session	
<VIP Room 1 / 贵宾 1厅,8F> 15:15-18:00	Onsite Session 1: Computer Modeling and Computation A030 A048 A009 A050 A063 A013 A051 A062 A1002 A045 A027
<Pearl Room /珍珠厅, 8F> 15:15-17:15	Onsite Session 2: Modern Information Theory and Image Processing A014 A005 A043 A010 A029 A1004 A046 A016
14:30-15:30	Coffee Break
18:00-19:30	Buffet Dinner <自助餐厅, 7F>

Saturday, June 25 Online Parallel Session	
Room A: 884 0912 8871 15:00 -18:00	Online Session 1: Computer Simulation and Computation A066 A018 A028 A074 A055 A073 A015 A1005 A047 A024 A031 A1003
Room B: 894 2358 2599 14:30-16:30	Online Session 2: Computer and Electronic Information Engineering A022 A026 A035 A036 A059 A071 A0002 A072
Room B: 894 2358 2599 16:45-19:00	Online Session 3: Next-Generation AI and Applications A044 A004 A034 A006 A032 A068 A1006 A033 A058

ZOOM PRE-TEST On June 24, 2022

[Virtual Background](#)

Room A: 884 0912 8871 || <https://us02web.zoom.us/j/88409128871>

Note:

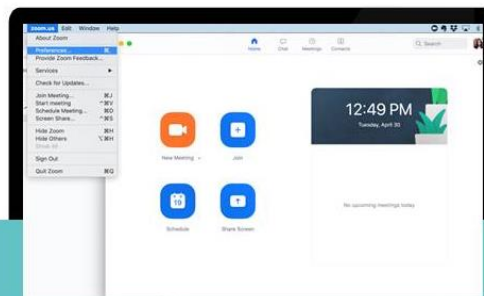
1. **11:30-12:00**, is specially arranged for those who are unavailable to finish the pre-test on his/her allocated time.
2. Each presenter will be given 3-5 mins for this pre-test, you can leave once the testing for your presentation is done.
3. Normally the **onsite** presenters are not required to join the pre-test in Zoom, but if you cannot physically attend the conference as planned, please also join us in Zoom to do the testing.

09:30-10:10	10:10-10:50	10:50-11:30
A066	A044	A022
A018	A004	A026
A028	A034	A035
A074	A006	A036
A055	A032	A059
A073	A068	A071
A015	A1006	A0002
A1005	A033	A072
A047	A024	A031
A1003	A058	

Zoom Guidance

Rename before Join in

Keynote Speaker: Keynote-Name
Committee: Position-Name
Author: Paper ID-Name
Listener: Listener-Name



Join a Meeting

Each meeting has a unique **9, 10, or 11-digit** number called a **meeting ID** that will be required to join a Zoom meeting.

Download

URL: <https://zoom.us/download>

Assistant 1

For any questions on the meeting day, you can text privately to "Assistant 1" for help.



Audio muted and video off (both indicated by a red slash).

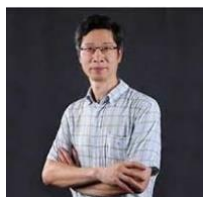
Click to open the Participants box. This will allow you to "Raise Hand".

To share screen or contents.

Click to open the Chat box. This will allow you to chat with Hosts and Participants.

Please download the Zoom platform before June 24. The testing will consist of screen sharing, audio & video on/off, and how to "Raise Hand" in Zoom. Please get your PPT slides, or PDF slides, and computer equipment prepared beforehand.

INTRODUCTION OF SPEAKERS



Prof. Xin Yao

教育部重大人才项目专家, IEEE Fellow, Southern University of Science and Technology, China

Speech Title: Multi-objective Approaches to Fair Machine Learning

Abstract: As the rapid development of artificial intelligence (AI) and its real-world applications in recent years, AI ethics has become increasingly important. It is no longer a nice feature to consider, but a must for both AI research and applications. First, this talk first tries to recall what classical ethics is about from an historical perspective. It tries to understand how technology ethics and AI ethics grow out of the broad ethics field. Specific features of AI ethics will be discussed. Second, a brief review of current research into AI ethics will be given. Key research topics will be extracted from a large number of reports to give a more concrete picture of most important issues covered in AI ethics. Third, we will examine the fairness issue in AI ethics and demonstrate how an algorithmic approach could help machine learning to be fairer. In other words, the results from machine learning will have less biases. Finally, some open research questions will be touched upon.

Biography: Xin Yao is a Chair Professor of Computer Science at the Southern University of Science and Technology, Shenzhen, China, and a part-time Professor of Computer Science at the University of Birmingham, UK. His major research interests include evolutionary computation, ensemble learning and search-based software engineering. More recently, he has been working on AI ethics, especially fairness. He is an IEEE fellow, a former (2014-15) president of IEEE Computational Intelligence Society (CIS) and a former (2003-08) Editor-in-Chief of IEEE Transactions on Evolutionary Computation. His research work won the 2001 IEEE Donald G. Fink Prize Paper Award, 2010, 2016 and 2017 IEEE Transactions on Evolutionary Computation Outstanding Paper Awards, 2010 BT Gordon Radley Award for Best Author of Innovation (Finalist), 2011 IEEE Transactions on Neural Networks Outstanding Paper Award, and many other best paper awards. He received a Royal Society Wolfson Research Merit Award in 2012, the IEEE CIS Evolutionary Computation Pioneer Award in 2013, and the 2020 IEEE Frank Rosenblatt Award.



Prof. Jie Lu

IEEE Fellow, IFSA Fellow, Australian Laureate Fellow, University of Technology Sydney, Australia

Speech Title: Fuzzy Transfer Learning

Abstract: This talk will describe how fuzzy transfer learning can innovatively and effectively learn from data to support data-driven decision-making in uncertain and dynamic situations. The core idea behind fuzzy transfer learning is to leverage previously acquired knowledge to assist in completing a prediction task in a related domain by integrating fuzzy techniques with the transfer learning process. A set of new fuzzy transfer learning theories, methodologies, and algorithms is introduced, which transfers knowledge learned in one or more source domains to target domains. The fuzzy transfer learning set incorporates (1) a fuzzy refinement domain adaptation algorithm by utilizing the fuzzy system and similarity/dissimilarity concepts to modify the target instances' labels for classification; (2) fuzzy rule-based systems with mapping functions by building latent spaces to facilitate knowledge transfer for regression tasks in both homogeneous and heterogeneous scenarios; (3) unsupervised domain adaptation, to recognize newly emerged patterns in target domains that may be unlabelled. Patterns in target domains are recognized by leveraging knowledge from patterns learned from source domains and solutions to heterogeneous unsupervised domain adaptation via e.g., fuzzy equivalence relations. These new developments can enhance data-driven prediction and decision support systems in complex real-world environments. Applications of transfer learning will be discussed at the end.

Biography: Distinguished Professor Jie Lu is a scientist in the field of computational intelligence, primarily known for her work in fuzzy transfer learning, concept drift, recommender systems, and decision support systems. She is an IEEE Fellow, IFSA Fellow, and Australian Laureate Fellow. Currently, Prof Lu is the Director of the Australian Artificial Intelligence Institute (AII) and Associate Dean (Research Excellence) at the Faculty of Engineering and Information Technology, University of Technology Sydney (UTS). She has published over 400 papers in leading journals and conferences; won 10 Australian Research Council (ARC) Discovery Projects and led 15 industry projects; and supervised 50 doctoral students to completion. Prof Lu serves as Editor-In-Chief for Knowledge-Based Systems and International Journal of Computational Intelligence Systems, and is a recognized keynote speaker, delivering 30 keynote speeches at international conferences. She is the recipient of the IEEE Transactions on Fuzzy Systems Outstanding Paper Award (2019), the Computer Journal Wilkes Award (2018), Australia's Most Innovative Engineer Award (2019), and the UTS Chancellor's Medal for Research Excellence (2019).



Prof. Min-Ling Zhang

青年长江学者特聘教授, Southeast University, China

Speech Title: Research on Partial Label Learning

Abstract: Partial label learning (PLL) is one of the important weakly-supervised learning frameworks. Under the partial label learning framework, each example is associated with multiple candidate labels among which only one is valid. Partial label learning techniques have been widely used in many scenarios including automatic multimedia content annotation, natural language processing, ecoinformatics, etc. In this talk, the state-of-the-art on partial label learning will be introduced from three aspects. Firstly, the problem setting of partial label learning and its relationships to other weakly-supervised learning frameworks are briefly discussed. Secondly, existing works as well as our recent progresses on designing partial label learning algorithms are summarized. Thirdly, related academic resources on partial label learning are given.

Biography: Min-Ling Zhang received the BSc, MSc, and PhD degrees in computer science from Nanjing University, China, in 2001, 2004 and 2007, respectively. Currently, he is a Professor at the School of Computer Science and Engineering, Southeast University, China. His main research interests include machine learning and data mining. In recent years, Dr. Zhang has served as the General Co-Chairs of ACML'18, Program Co-Chairs of CCDM'20, PAKDD'19, CCF-ICAI'19, ACML'17, CCFAI'17, PRICAI'16, Senior PC member or Area Chair of AAAI 2017-2021, IJCAI 2017-2021, KDD 2021, ICDM 2015-2021, etc. He is also on the editorial board of IEEE Transactions on Pattern Analysis and Machine Intelligence, ACM Transactions on Intelligent Systems and Technology, Neural Networks, Science China Information Sciences, Frontiers of Computer Science, etc. Dr. Zhang is the Steering Committee Member of ACML and PAKDD, Vice Chair of the CAAI Machine Learning Society, standing committee member of the CCF Artificial Intelligence & Pattern Recognition Society. He is a Distinguished Member of CCF, CAAI, and Senior Member of ACM, IEEE.



Prof. Huijun Gao

长江学者、国家杰青、IEEE Fellow, Harbin Institute of Technology, China

Speech Title: Robotic Micromanipulation and Its Applications

Abstract: Micromanipulation technology has been an increasingly hot research area that enables new science discoveries and industrial applications by multidisciplinary interactions. This lecture will introduce cutting-edge micromanipulation technologies especially developed for biological targets, such as zebrafish, a kind of important vertebrate model animals widely used in scientific research and bioindustry. Specially, traditional operation of zebrafish larva is laborious, time-consuming, and of low accuracy due to its limited controllability, complicated structures, fragile body, and inaccessible in vivo organs. Here we develop a series of micromanipulation technologies that can flexibly position and orient a single zebrafish to desired postures, trap it in a lowdamage manner, detect its in vivo organs, track trajectories for a large number of zebrafish larvae. Several practical applications based on the developed techniques will also be introduced including behavior study, heart monitor, transportation, and drug test.

Biography: Huijun Gao received the Ph.D. degree in control science and engineering from Harbin Institute of Technology, Harbin, China, in 2005. From 2005 to 2007, he carried out his postdoctoral research with the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, AB, Canada. Since 2004, he has been with the Harbin Institute of Technology, where he is currently a Chair Professor, the Director of the Research Institute of Intelligent Control and Systems, and the Director of Interdisciplinary Research Center. His research interests include intelligent and robust control, robotics, mechatronics, and their engineering applications, etc.

Dr. Gao is a Vice President of IEEE Industrial Electronics Society, and a Council Member of IFAC. He serves as the Co-Editor-in-Chief for the IEEE Transactions on Industrial Electronics, a Senior Editor for the IEEE/ASME Transactions on Mechatronics, and an Associate Editor for Automatica, the IEEE Transactions on Cybernetics, and the IEEE Transactions on Industrial Informatics, etc. He is also a Distinguished Lecturer of IEEE Systems, Man, and Cybernetics Society.



Prof. Qing-Long Han

教育部长江学者讲座教授, IEEE Fellow, 现为澳大利亚墨尔本 Swinburne University of Technology (斯威本科技大学) 副校长和杰出教授, Swinburne University of Technology, Australia

Speech Title: Towards Resource-Efficient and Secure Automated Vehicle Platoons

Abstract: Vehicle platooning has been regarded as a promising intelligent transportation system technology for achieving cooperative automated driving systems and automated highway systems due to its promising benefits, including improved road safety, highway capacity and traffic congestion relief, and reduced fuel consumption. Two critical challenges of accomplishing automated vehicle platoons are: 1) to deal with the intermittent and sporadic vehicle-to-vehicle data transmissions caused by limited wireless communication resources; and 2) to tackle the malicious cyber-attacks on the vehicle-to-vehicle communication channels.

The essentials of evolutionary platooning control technologies are first introduced for connected automated vehicles. After a brief historical background of connected automated vehicles and vehicle platooning, several key issues in the design and implementation of an automated vehicle platooning control system are elaborated. An emphasis is then placed on two emerging platooning control techniques: resource-efficient vehicle platooning and secure vehicle platooning. Furthermore, simulation and validation results under these two control techniques are presented. Finally, some challenging issues and concluding remarks are drawn.

Biography: Distinguished Professor Qing-Long Han is Swinburne's Pro Vice-Chancellor (Research Quality). He is a Fellow of The Institute of Electrical and Electronic Engineers and a Fellow of The Institution of Engineers Australia. He has served as an AdCom Member of IEEE Industrial Electronics Society (IES) and a Member of IEEE IES Fellows Committee.

Professor Han is a Highly Cited Researcher by Clarivate Analytics (Thomson Reuters) in 2014-2016, 2018-2020. He is one of Australia's Top 5 Lifetime Achievers (Research Superstars) in Engineering and Computer Science in The Australian's Research Magazine in 2019 and 2020. He is ranked No. 320 in the world ranking in the 6th Edition of the 2020 Ranking of Top 1000 Scientists in the field of Computer Science and Electronics and No. 5 in Australia in the field of Computer Science and Electronics according to Guide2Research.

Professor Han received The 2020 IEEE Systems, Man, and Cybernetics (SMC) Society Andrew P. Sage Best Transactions Paper Award (IEEE Transactions on Systems, Man, and Cybernetics: Systems), The 2020 IEEE Industrial Electronics Society IEEE Transactions on Industrial Informatics Best Paper Award, and The 2019 IEEE Systems, Man, and Cybernetics (SMC) Society Andrew P. Sage Best Transactions Paper Award (IEEE Transactions on Cybernetics).

Professor Han has served as an Associate Editor for 12 international journals including IEEE Transactions on Industrial Electronics, IEEE Transactions on Industrial Informatics, IEEE Industrial Electronics Magazine, IEEE Transactions on Cybernetics, Control Engineering Practice, Information Sciences, and a Guest Editor for 13 Special Issues.



Prof. Sheng Zhang
Nanchang Hangkong University, China

Speech Title: Global efficiency estimation method of complex network based on fractal property

Abstract: A method of network efficiency estimation based on fractal property was proposed for solving the problems of high complexity and time-consuming calculation of efficiency in large scale networks. Considering the fractal properties of complex network topology, the relationship between network efficiency and node correlation sum was analyzed, and the global network efficiency was estimated by partial nodes. Besides, to rapidly find the fractal properties of complex networks, a fractal property discrimination method based on node correlation sum was proposed. The experimental analysis in the construction network and the real-world network show that the proposed method can accurately and effectively estimate the global efficiency of the network, which reduces the calculation time by at least 90% compared with the original method.

Biography: Dr. Sheng ZHANG is a Professor and former deputy Dean of the School of Information Engineering, Nanchang Hangkong University (NCHU), China. He is also a member of Association for Computing Machinery (ACM), a senior member of China Computer Federation (CCF), a director of Jiangxi Computer Federation, and a member of program/technical committee of many International Conferences, such as, ISD (the International Conference on information system development), ICCIA (the International Conference on Computational Intelligence and Applications), and ICCST (the International Conference on computer science and Technology). He is reviewer of well-known journals, such as, the International Journal of Distributed Sensor Networks, the Internet of Things Journal, IEEE, the Journal of software, the Journal of Computer Science, the Journal of communications, the Journal of Computer Research and Development etc. He is also a project evaluation expert of the National Natural Science Foundation of China and the science and technology projects of many provinces in China.

His research interests focus on wireless sensor networks, data mining, artificial intelligence, Web information processing, and GIS/GPS.

Up to now, he has presided over and completed 2 National Natural Science Foundation of China, 1 Aeronautical Science Foundation, 2 Jiangxi Natural Science Foundation, 1 Postdoctoral Science Foundation of Jiangxi Province, 3 Education Department Science Foundation of Jiangxi Province, and a number of National Defense Science and Technology Projects. He has published more than 100 papers, including the Journal of software, the Journal of communications, the Journal of Computer Research and Development, the Entropy, the International Journal of Distributed Sensor Networks, International Journal of Electronics and Communications, International Journal of Intelligent and Fuzzy Systems etc. He was awarded as a young and middle-aged backbone teacher in Jiangxi Province and an excellent postgraduate instructor in Jiangxi Province.



Assoc. Prof. Jing Dong
Nanjing Tech University, China

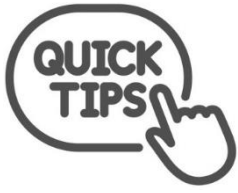
Speech Title: Dictionary Learning and Its Applications in Image Processing and Pattern Classification

Abstract: Sparse representation which aims to represent signals of interest as sparse vectors using an overcomplete dictionary has attracted much attention in recent years. In sparse representation, adaptive dictionaries learned from signals can also achieve better results as compared with pre-defined dictionaries generally, and dictionary learning has become a useful technique to improve the performance of sparse representation. This presentation will introduce some recent research progress in dictionary learning and its applications in image processing and pattern classification. Firstly, a centralized analysis dictionary learning algorithm is introduced followed by its applications in removing additive noise and multiplicative noise in images. Secondly, we focus on distributed dictionary learning which aims to learn a global dictionary from data geographically distributed on nodes of a network. Two distributed analysis dictionary learning algorithms are presented, where one is based on consensus constraints to and the other employs a diffusion strategy. Finally, a recent work on discriminative dictionary learning is introduced, where a structured synthesis dictionary and a structured analysis dictionary are jointly learned with the consideration of an SVM embedded regularizer. This algorithm has been applied to pattern classification with both image and speech data.

Biography: Jing Dong received the B.Eng. degree in automation in 2010 and the M.Eng. degree in navigation guidance and control in 2013, both from Harbin Engineering University, Harbin, China. She received the Ph.D. degree in electronic engineering from University of Surrey, Guildford, UK, in 2016. She is currently an associate professor at Nanjing Tech University. Her current research interests include sparse representation, image processing, and machine learning.

Her research is mainly supported by grants from the Natural Science Foundation of China, the Natural Science Foundation of Jiangsu Province of China, and the Higher Education Institutions of Jiangsu Province of China. She is a guest editor of *Frontier in Signal Processing*. She is also a member of China Computer Federation (CCF), Chinese Association for Artificial Intelligence (CAAI), and IEEE. She serves as a member of the technical committee of many international conferences, such as International Conference on Signal and Image Processing (ICSIP), International Conference on Computational Intelligence and Applications (ICCIA), International Conference on Machine Learning, Control, and Robotics (MLCR), and so on. She is a reviewer of journals including *IEEE Transactions on Signal Processing*, *IEEE Transactions on Image Processing*, *Signal Processing*, *Neural Networks*, and *Neurocomputing*.

PARALLEL SESSIONS & ABSTRACT



- ✓ Onsite presenters please arrive at the session 15 minutes earlier to upload your report files to conference computer. It is recommended to save two versions of your presentation file on USB in case of any error.
- ✓ Online presenters please also join your session at least 15 minutes earlier to get prepared in advance.
- ✓ There will be a group photo part at the end of each session.
- ✓ Presentation time: 15 minutes each, 2-3 mins for Q&A included.

Onsite Session 1: Computer Modeling and Computation

Session Chair: Assoc. Prof. Yiping Cheng, Beijing Jiaotong University, China

Time: 15:15-18:00

Venue: VIP Room 1 / 贵宾 1 厅, 8F

15:15-15:30
A030

Water level prediction based on SSA-LSTM model
Kang Xu, Nanjing Tech University, China

Abstract—Considering the non-linear, non-stationary and high noise characteristics of the water level of Hongze Lake, a short-term water level prediction model based on Singular Spectrum Analysis (SSA) and Long Short-Term Memory network (LSTM) is proposed in this paper. The model first uses SSA to decomposed the original water level of Hongze Lake into several subsequences of trend component, oscillation component and noise component, and the noise component is removed, and the decomposed trend component and oscillation component reconstructed to obtain the reconstructed sequence; then the reconstructed trend component and the oscillatory component are respectively predicted by LSTM; finally, the results of the reconstructed prediction are superimposed to get the actual water level prediction result. Through many experiments, it has been proved that the SSA-LSTM model has higher accuracy than LSTM, LightGBM, and SSA-LightGBM, and is closer to the real value.

15:30-15:45
A048

Prediction of Luoma Lake Water Level Based on Improved ICEEMDAN-LSTM Model
Qingpeng Shan, Nanjing Tech University, China

Abstract—Aiming at solving the problems of more noise, poor stationarity and low prediction accuracy of traditional time series models, a water level prediction model is proposed in combination with improved complete ensemble empirical mode decomposition with adaptive noise (ICEEMDAN) and Long Short-Term Memory (LSTM). The modeling process is as follows: The data mirror is extended to improve the endpoint effect caused by ICEEMDAN decomposition; The extended data is decomposed into several intrinsic mode components (IMF) by ICEEMDAN; The high-frequency noise component (denoted by IMF₁) will be eliminated, and the LSTM parallel prediction model of middle and low frequency components will be established; The final prediction result is obtained by reconstructing the prediction result of medium and low frequency components. Experiments show that this model has higher prediction accuracy than LSTM, LightGBM, EMD-LSTM, ICEEMDAN-LightGBM, and ICEEMDAN-LSTM model without mirror continuation and high-frequency noise elimination. In the prediction of the upper water level of Luoma Lake Reservoir, MAE is 0.008m and RMSE is 0.022m, and R² reaches 99.8%.

15:45-16:00
A009

Research on Dosing Time Series Prediction in Wastewater Turbidity Removal
Yuan Chen, The 36th Research Institute of China Electronics Technology Group Corporation, China

	<p>Abstract—In wastewater treatment plants, turbidity is an essential and universal indicator to measure water quality. How to quickly determine the dosing frequency in turbidity removal treatment online is important for efficient and intelligent control. After analyzing potential relationships contained in the multi-dimensional water quality data, this paper introduce multivariate adaptive regression splines (MARS) and dual-stage attention-based RNN (DA-RNN) to construct time series regression models respectively to achieve high-precision of dosing frequency based on inlet and outlet water quality data. The experiment of 95-day water quality data from a wastewater plant has comprehensively verified that the models can mine the features of high-dimensional data and realize time series prediction with goodness of fit and prediction accuracy.</p>
<p>16:00-16:15 A050</p>	<p>TCN Short-Term Water Level Prediction Based on CEEMDAN-VMD Time-Frequency Double Layer Feature Extraction Feihu Wang, Nanjing Tech University, China</p> <p>Abstract—This paper is devoted to treat an issue with poor performance of CEEMDAN-TCN model in high-frequency signal prediction by employing a CEEMDAN-VMD double-layer time-frequency feature extraction method. Firstly, the short-term water level features are extracted through CEEMDAN (complete ensemble empirical mode decomposition with adaptive noise) and TCN (Temporal Convolutional Network) parallel prediction is performed on the extracted series of sub-signals. After that, the VMD (Variational mode decomposition) secondary feature extraction method is employed on the high frequency complex sub-signals and the traversal method is applied to determine the optimal decomposition method for achieving high tracking accuracy of TCN on the sub-signals. Finally, prediction results for each sub-signal are superimposed linearly. The validity of the proposed method for improving the prediction accuracy on short-term water level is verified by predicting the short-term water level data of Hung-tse Lake. To be specific, prediction accuracy achieves 99.7%, MAE and RMSE increase 29.6% and 30%, respectively.</p>
<p>16:15-16:30 A063</p>	<p>Regularized Echo State Network with an Improved Log Penalty Wenting Wang, University of Jinan, Jinan, China</p> <p>Abstract—Echo state networks (ESNs) are a kind of special recurrent neural networks, which have super performance on time series predictions. However, ESNs with over large reservoirs may lead to the output collinearity problem. In this paper, a regularized ESN with an improved log penalty is proposed to solve this problem. First, an improved log penalty is introduced to the quadratic loss function. Second, the coordinate descent algorithm is employed to optimize the loss function for a sparse solution. Finally, the proposed model is tested using two benchmark data sets. The experimental results show that our method improves the ability of ESNs to deal with the output collinearity problems.</p>
<p>16:30-16:45 A013</p>	<p>Extreme learning machine algorithm based on IPSO for prediction of blood glucose concentration in patients with type 1 diabetes Liling Yu, Institution of medical instruments Guangdong Food and Drug Vocational college, China</p> <p>Abstract—Aiming at the complexity and instability of blood glucose data of diabetic patients, this paper introduces an extreme learning machine algorithm (ELM) based on improved particle swarm optimization (IPSO) into the prediction of blood glucose concentration in patients with type I diabetes. First, the blood glucose concentration time series of diabetes patients collected by dynamic blood glucose monitoring is smoothed and normalized to improve the smoothness of the blood glucose data sequence and weaken the randomness of the original blood glucose data sequence. Then, the extreme learning machine is optimized, the improved particle swarm optimization algorithm is introduced to select the appropriate parameters required by the extreme learning machine, and the optimized algorithm is applied to the prediction of blood glucose concentration of diabetic patients. The experimental results show that the extreme learning machine algorithm based on improved particle swarm optimization has higher accuracy for short-term blood glucose concentration prediction of</p>

	patients.
16:45-17:00 A051	<p>Weighted combined water level prediction based on nonlinear programming genetic algorithm Wanbing Cuan, Nanjing Tech University, China</p> <p>Abstract—A single prediction method has its own advantages and disadvantages in different aspects. In order to improve the accuracy of water level prediction, a water level prediction method combining The Autoregressive Integrated Moving Average (ARIMA) Model, Exponential Smoothing (ES) model and Long Short-term Memory (LSTM) model through nonlinear programming genetic algorithm is proposed in this paper. By combining the advantages of local search of nonlinear programming and global search of genetic algorithm, this method uses nonlinear programming genetic algorithm to allocate the weights of ARIMA model, ES model and LSTM model, and obtains the final water level prediction result by weighting. The empirical results show that this method not only has higher prediction accuracy than single model, but also has higher prediction accuracy than using nonlinear programming or genetic algorithm to allocate weight.</p>
17:00-17:15 A062	<p>Echo State Networks with Special Memory Module Qianwen Liu, University of Jinan, Jinan, China</p> <p>Abstract—Echo State Networks (ESNs) are efficient recurrent neural networks (RNNs), which have attracted extensive attention due to their simple training processes and special reservoir structures. However, if the nonlinearity of the network is improved, the memory capability is decreased. Therefore, this paper proposes a novel ESN model (MM-ESN) to solve this problem. We introduce the linear memory network (LMN) into the reservoir based on the idea of the relative separation for memory and nonlinearity. Therefore, the memory capability of the network is improved while maintaining the nonlinearity. Experimental results on the Lorenz chaotic time series datasets and randomly generated datasets have demonstrated the effectiveness of the proposed MM-ESN.</p>
17:15-17:30 A1002	<p>Modeling and Solving of Platform Resource Scheduling Problem Based on Capability as a Service Shuangling WANG, Science and Technology on Information Systems Engineering Laboratory, Nanjing, China</p> <p>Abstract—Command information system can realize flexible matching between platform resources and tasks on the basis of platform combat capability as a service. In order to satisfy the intelligent decision-making need of command information system, the platform resource scheduling problem under the condition of capability as a service is described mathematically. Then, a scheduling model aiming to maximize the task processing quality is constructed and a model solving algorithm with heuristic strategy is designed. Finally, the method is simulated and verified with detailed examples. The experiment results show that the method proposed is effective and efficient, which can support intelligent decision-making of command information system.</p>
17:30-17:45 A045	<p>Experimental Comparison between MLP and FCCN in Convolutional Neural Networks Yiping Cheng, Beijing Jiaotong University, China</p> <p>Abstract—The fully connected cascade network (FCCN) is an emerging neural network architecture which is known to be compact, having only one structural parameter which makes it convenient to use. FCCN, just like MLP, can be used in convolutional neural networks (CNN) as the final fully connected component. However, there has not been report of the use of FCCN in CNNs. In this paper we describe two CNNs with identical structure except for the fully connected component, one of which using MLP which is called CNN-MLP and the other using FCCN which is called CNN-FCCN. These two CNNs are applied to the famous MNIST digit recognition problem and their performances are compared. We used various sizes and two loss functions (MSE and cross-entropy). The performance data we obtained suggest that the two machines offer comparable performances, whereas for MSE loss, FCCN is slightly better, and for cross-entropy loss, MLP is slightly better.</p>

17:45-18:00
A027

A Hybrid modelling method for batch process based on LSTM-RNN
Dong Chao, Nanjing Tech University, China

Abstract—Batch process is characterized by a complex reaction mechanism and has nonlinear and time-varying properties, which makes it more difficult to establish a mathematical model of the process. Therefore, this paper proposes a hybrid model for aniline hydrogenation. Firstly, the input and output variables of the LSTM-RNN are determined, and the model is trained using the production process data to obtain the data-driven reactivity model for aniline hydrogenation. Then, the reactivity is fitted using the trained model based on the reaction temperature, concentration and other information measured in real time during the production process, and the results are passed to the mechanistic model. Finally, the validation of the model was verified by comparing the hybrid model prediction results with the industrial data of aniline hydrogenation.

Onsite Session 2: Modern Information Theory and Image Processing Session Chair: TBA Time: 15:15-17:15 Venue: Pearl Room /珍珠厅, 8F	
15:15-15:30 A014	<p>Low-rank domain adaptive method with inter-class difference constraint for Multi-site Autism Spectrum Disorder Identification Lei Yu, Nanjing Tech University, China</p> <p>Abstract—Autism spectrum disorder (ASD) is an incurable neurodevelopmental disorder with a wide range of clinical symptoms that mainly include social and communication deficits. Unfortunately, there is still no effective method for ASD diagnosis. Recently, researchers have presented a number of machine learning methods for ASD identification based on multi-site data, and these methods have achieved remarkable results. However, multi-site data is directly used, ignoring the heterogeneity between different sites. To address this issue, we propose a low-rank domain adaptive method with inter-class difference constraint (LRDAIC) for multi-site ASD identification based on resting-state functional magnetic resonance imaging (rs-fMRI). Firstly, we treat one site as the target domain and the remaining sites as the source domains. Then, data from these domains is transformed into a common space while considering inter-class difference, and the inter-class difference constraint term is further introduced to maximize the distance between different classes to enhance data discrimination ability. Moreover, each class of data from each source domain is linearly represented by all the data of the corresponding class from the target domain in this space. Finally, we evaluate the performance of our method on the basis of the ABIDE1 dataset, and the results demonstrate that our method is superior to several state-of-the-art low-rank domain adaptation methods.</p>
15:30-15:45 A005	<p>Research on Recognition Method of Truck Brand Types Based on Machine Learning Jialun Wu, Southeast University, China</p> <p>Abstract— Aiming at the problem that truck brand type recognition is easily affected by complex scenes and illumination changes, this paper studies the truck brand type recognition method based on machine learning. The feature extraction method--Scale-Invariant Feature Transform (SIFT) and Histogram of Oriented Gradient (HOG) are compared and analyzed. Then different kernel functions of support vector machine classifier such as Linear Kernel, Gaussian Kernel, Sigmoid Kernel, Polynomial Kernel and Laplace Kernel are proposed and analyzed. Based on the truck face image set of Southeast University, a comparative experimental study is carried out. The theoretical analysis and experimental results show that: Based on HOG feature and Linear Kernel function, the performance of truck brand type recognition method based on support vector machine is better than the other four methods, and its recognition accuracy reaches 89.63%.</p>
15:45-16:00 A043	<p>Using olfactory and visual information to assist mobile robots in classifying ground stains Lifan Wu, Nanjing Tech University, China</p> <p>Abstract— The obstacle avoidance system of indoor mobile robots is difficult to identify the ground stains that might reduce the robotic environmental safety in households and medical applications. This paper proposes a new method of fusing the information from the camera and electronic nose (e-nose). A two-layer network is built for feature extraction and decision. The first layer consists of three branches: vision branch, olfaction branch, and fusion branch. They will extract public and private features from different modal information. The second layer determines the weights for the output of the first layer. Two experiments are implemented to verify the proposed model. The results show that the proposed method provides an effective, practical, and promising solution for improving the vision-based ground stain identification.</p>

<p>16:00-16:15 A010</p>	<p>Research on ROI Region Detection Methods of Meteorological Image in Expressway Scenes Xiaoming Qin, Southeast University, China</p> <p>Abstract— In order to accurately detect "Mass Fog", it is usually necessary to locate the Region of Interest (ROI) of feature extraction procedure. This paper studies the ROI detection method of meteorological image based on road vanishing point in intelligent expressway scene. Five road vanishing point detection methods are compared and analyzed, which are general modified Weber local descriptor model, modified Weber local descriptor of sigmoid model, general Hough transform model, removing-outlier-based Hough transform model and optimal local dominant orientation method, respectively. Then five experiments based on different road vanishing point detection methods are implemented by expressway image datasets under different meteorological environments. Theoretical analysis and experimental results show that the road vanishing point detection method based on modified Weber local descriptor of sigmoid model is better than the other four road vanishing point detection methods, and its detection rate reaches 90.36%.</p>
<p>16:15-16:30 A029</p>	<p>Simplified Structured Analysis Dictionary Learning for Image Classification Liu Yang, Nanjing Tech University, China</p> <p>Abstract— In this paper, we focus on image classification based on dictionary learning. The structured analysis dictionary learning (SADL) algorithm introduces a mapping matrix to the representation coefficient matrix and imposes a structural constraint to enhance the capability of discrimination, and it achieves promising classification results. However, in the formulation of SADL, the discrimination of the model is mainly based on the transformed coefficient matrix rather than the original coefficients, and thus the sparsity of the original coefficients has little impact on classification. In addition, classification is based on a linear classifier learned simultaneously with the dictionary, which may also restrict the performance of the algorithm. To address these issues, we propose a simplified SADL (SSADL) algorithm by simplifying the original formulation of SADL and introducing a new classification approach based on support vector machine (SVM). Simulation results on widely used databases demonstrate that the proposed SSADL algorithm achieves better performance than several state-of-the-art classification algorithms based on dictionary learning.</p>
<p>16:30-16:45 A1004</p>	<p>Robust Structure-Aware Low-Light Enhancement via a Latent Low-Rank Embedding Retinex Model Mingna Wu, Anhui Institute of Optics and Fine Mechanics, Hefei Institute of Physical Science, Chinese Academy of Sciences, Hefei, China & Science Island Branch of Graduate School, University of Science and Technology of China, Hefei, China</p> <p>Abstract— Robustness to noise is a significant issue in the field of low-light image enhancement (LLIE). Most existing LLIE methods, which ignore the intensive noise contained in images or use a pre/postprocessing step to remove noise, fail to achieve pleasant visual effects in practical tasks. To address this problem, in this paper, based on Retinex theory, we propose jointly integrating low-light enhancement and denoising into a unified framework with latent low-rank embedding. Specifically, an $\ell_{2,1}$-norm term is first introduced to measure the reconstruction error and enhance the robustness of decomposed components to various types of noise. Then, a smooth prior is applied to the illumination component, and a structure-aware gradient fidelity term and latent low-rank embedding are deployed to resist noise and retain the texture of the reflectance component. Considering the expensive time cost of low-rank processing, we design an accelerated low-rank approximation strategy without losing structural information. Afterward, the decomposed components are sequentially estimated, avoiding noise from the other component. Finally, the enhanced images are generated by combining the estimated reflectance with the illumination adjusted based on gamma correction. Extensive experiments demonstrate that our method performs significantly better than several state-of-the-art methods in terms of enhancing and denoising on three public datasets.</p>

<p>16:45-17:00 A046</p>	<p>DCR: Dual Compression Method for Traffic Signs Recognition and Embedded Deployment Zegang SUN, Nanjing Tech University, China</p> <p>Abstract— In order to solve the problems of large memory consumption and complex model of CNN in traffic signs recognition, we propose an improved deep learning method DCR (Dual Compression Recognition) based on BNN (Binary Neural Network) model. We compress BNN's network structure and dataset (remove the color information on the dataset). Experiments show that the DCR model with only one binary convolutional layer is enough to achieve about 75.18% accuracy on the GTSRB dataset, while the trainable parameters are only 1.4M and the model memory is only 16.1M. Moreover, the DCR model with three binary convolutional layers has an accuracy comparable to that of the classical CNN's models, with an accuracy of 92.86%, while the trainable parameters is only 0.83M and the model memory is only 9.60M. As a result, most arithmetic operations have been simplified, and the memory access and memory size have been reduced by 32 times. In addition, because the color information of the dataset is removed, the training speed of the model is effectively improved. All these make our model more suitable for embedded deployment with lower cost.</p>
<p>17:00-17:15 A016</p>	<p>A Novel Discrete ABC Algorithm-Based SLM Scheme for PAPR Reduction in OFDM Systems Xing Cheng, Beijing Information Science and Technology University, China</p> <p>Abstract— High peak-to-average power ratio (PAPR) is one of the major drawbacks of orthogonal frequency division multiplexing (OFDM) systems. Selected mapping (SLM) scheme is an attractive one among various PAPR reduction solutions, because this scheme does not cause any signal distortion and is easy to realize. However, an exhaustive search is needed to find the optimal phase rotation sequence in conventional SLM scheme, which will cause unbearable complexity of transmitter. In this paper, we propose a discrete artificial bee colony algorithm based SLM (DisABC-SLM) scheme. Simulation results show that the DisABC-SLM scheme can get lower PAPR than the existing SLM schemes and has a low computational complexity.</p>

Online Session 1: Computer Simulation and Computation Session Chair: Time: 15:00-18:00 Venue: Room A: 884 0912 8871 https://us02web.zoom.us/j/88409128871	
15:00-15:15 A066	<p>Multi-hop Knowledge Reasoning with Deep Reinforcement Learning Bin Shang, Xi'an Jiaotong University, China</p> <p>Abstract— Multi-hop reasoning is an effective and explainable approach to predicting missing facts in Knowledge Graphs (KGs). It usually adopts the Reinforcement Learning (RL) framework and searches over the KG to find an evidential path. However, there are few RL based reasoning methods in Knowledge Forests (KFs), the existing approach is usually to transfer multi-hop reasoning methods in the KG to the KF. However, this way often leads to a long reasoning path with a lot of redundant information. And the existing reasoning methods tend to capture vector representations from local structures, which will lead to get meaningless paths. In order to solve these two problems, we present, in this paper, a deep reinforcement learning based model named by MultiKR for KFs and KGs, which reduces redundant information in the path by learning global vector representations. In addition, we construct a novel reward function that guides the agent's choice of actions by considering accuracy, diversity and rationality to get valid and short path. We test our model on two KF datasets, that is, COMPUTER SCIENCE (CS) and MEDICINE (MED), and two KG datasets FB15K-237 and NELL- 995. Extensive experiments show that our model is effective and competitive with many current state-of-the-art methods, and also performs well in practice.</p>
15:15-15:30 A018	<p>Extrapolation method for solving fuzzy Volterra integral equations in two dimensions Ting Deng, University of Electronic Science and Technology of China, China</p> <p>Abstract—In this paper, we introduce an extrapolation method for solving two-dimensional linear and nonlinear fuzzy Volterra integral equations. The iterative algorithm based on a twodimensional fuzzy trapezoid quadrature formula is constructed and obtains the error asymptotic expansion of the numerical method. Then, an extrapolation algorithm based on error asymptotic expansion is built. By the first extrapolation, we can raise the order of convergence from $O(h_{20})$ to $O(h_{30})$, and by the second extrapolation, the order of convergence can reach $O(h_{40})$. Finally, two numerical experiments demonstrate the accuracy and efficiency of the method.</p>
15:30-15:45 A028	<p>Event-B Modeling for Use Case Diagrams and application in immune system model Xue Geng, College of Information Engineer, Yangzhou University, China</p> <p>Abstract—UML is a general modeling language. The use case diagram in UML macroscopically describes the functions that can be realized by the system, which has been widely used in the requirement analysis phase of the system. However, UML is a semi-formal modeling language, which cannot be formally verified. Event-B is a formal modeling method based on Rodin platform. Rodin platform contains rich provers that can be formalized in the early stage of software development to improve the consistency, integrity and reliability of software design. This paper proposes a method to convert the use case diagram to Event-B based on relationship, and gives the abstract implementation steps. It was applied in the biological immune system, and the conversion process of the use case diagram of cellular immunity to Event-B was given. Finally, a simple verification is carried out with the ProB prover.</p>
15:45-16:00 A074	<p>Intent-Aware Long Short-Term Memory for Intelligent Training of Clinical Handover Xiang Zhang, The Hong Kong Polytechnic University, China</p> <p>Abstract—Clinical handover is a crucial yet high-risk communication event in the provision of safe patient care. However, training standardized clinical handover in real-world scenarios often requires huge labor cost. To tackle with this issue, we propose a computer-aided method for delivering intelligent training of clinical handover at a low labor cost. Specifically,</p>

	<p>we formulate it as a continuous intent detection task that provides timely feedback during a simulated clinical handover conversation. Towards this goal, we collaborate with experts from a local hospital to collect a clinical handover dataset on real-world handover scenarios. According to the sequential nature of the handover conversation, we further propose the Intent-Aware Long Short-Term Memory (IA-LSTM) model that yields superior performance to baseline methods. Our work shows promise for the computer-aided training of clinical handover in hospitals and can encourage researchers in natural language processing to develop methods on standardized communication.</p>
<p>16:00-16:15 A055</p>	<p>t-SNE Dimensionality Reduction Method Based on Sobol Sequence Initialized Archerfish Hunting Optimizer Algorithm Wei Nai, Tongji Zhejiang College, China</p> <p>Abstract—t-distributed stochastic neighbor embedding (t-SNE), is a famous supervised, nonlinear dimensionality reduction and data visualization method in manifold learning, its core idea is to pursue the probability isomorphism of data points from high-dimensional space to low-dimensional space, that is, it requires the points in high-dimensional space to meet a certain probability distribution, and still meet a similar probability distribution after projecting them into low-dimensional space. Generally, t-SNE algorithm will be eventually transformed into a problem of solving Kullback-Leibler (KL) divergence by gradient descent (GD) method or stochastic gradient descent (SGD) method. However, gradient dependent methods are easy to fall into the trap of local optimum, and the closer they are to the optimal value, the more oscillatory sawtooth effect will occur. Therefore, in order to overcome the shortcomings, in this paper, a novel Sobol sequence initialized archerfish hunting optimizer (SSAHO) has been proposed, which can increase the randomness and robustness of the algorithm, and via numerical experiment, its performance in improving the optimization ability has been verified.</p>
<p>16:15-16:30 A073</p>	<p>Multi-scaled Topic Embedding for Text Classification JIAHENG ZHANG, Nanyang Technological University, Singapore</p> <p>Abstract—Topic modeling and word embedding are commonly used techniques in natural language processing. However, word embedding lacks discriminating information of homonymy and polysemy as they typically assign a single vector for each word even if they have different meanings in different contexts. Many models were proposed to solve this issue by jointly learning topic modeling and word embedding together so that words can have different embeddings under various latent topics. However, the number of latent topics is set manually by human experiences before learning the topic modeling, which makes the final performance of the topical model largely rely on the subjective human judgment. If the number of topics is set too many, the topics learned may suffer from overfitting issues. On the other hand, if the number of topics is too small, the topics may contain little useful information. Experiments from other researchers show that the scale we used to model the latent topics is crucial to the performance of the topical word embeddings. We proposed Multi-scaled Topic Embedding (MTE) to learn the document representation with multiple latent topics for topic modeling based on this idea. With multi-scaled topics, MTE learns topical information on a large scale and captures key information from dense topic distributions. Most importantly, MTE reduces the influence of the number of topics on the model's performance. In this paper, we apply MTE in three commonly used datasets and test the performances of our model for text classification tasks on these datasets. The experimental results show that our model outperforms deep learning baseline models and typical topical word embeddings.</p>
<p>16:30-16:45 A015</p>	<p>Study on Natural Gas Price Forecasting Based on Prophet-GRU Nonlinear Combination You Zhou, Nanjing Tech University, China</p> <p>Abstract—The daily average price of natural gas has an important impact on the business decisions of natural gas companies, so the accurate prediction of future natural gas prices has become a hot topic. The current single forecasting model has low accuracy for complex time series forecasting and cannot predict the future natural gas prices well. Based on the in-depth</p>

	<p>analysis of the properties of Prophet additive model and GRU neural network model, a Prophet-GRU nonlinear combined forecasting model based on improved BP neural network is designed based on the trend of natural gas price change from 1997 to 2020, compared with the pre-combined GRU, Prophet single model and the current more popular Long short-term memory LSTM model, the improved BP neural network-based Prophet-GRU nonlinear combined forecasting model has higher accuracy and is more suitable for complex time series forecasting, which provides a powerful help for natural gas enterprises' business decisions.</p>
<p>16:45-17:00 A1005</p>	<p>The prediction of Ship's magnetic field based on Improved Radial Basis Function Neural Network Li-ting Lian, Unit 91388, Zhanjiang, Guangdong, China</p> <p>Abstract—There are many methods can be used to calculate ship's magnetic field such as harmonic wave analysis, finite element method, integral equation method, boundary element method and so on. But these methods generally have disadvantage of complex calculation and poor universality. In this paper, we have built a predicted model based on improved Radial Basis Function (RBF) neural network to study the relationship between ship's important parameters and magnetic field directly. Generally, the parameters of RBF are set by experience. In order to get the best result, we have chose the spread parameter according to Particle Swarm Optimization (PSO) algorithm and verified the effect of network by an example.</p>
<p>17:00-17:15 A047</p>	<p>On Sample Based Explanation Methods for Sequence-to-sequence Applications Yun Qin, Nanjing Tech University, China</p> <p>Abstract— As deep learning models continue to develop more and more complex, the scale of natural language processing(NLP) datasets is also increasing, which challenges the ability of sample based explanation methods in terms of their interpretability, faithfulness, etc. In this work, we propose a matching influence function TracInS by selecting representative sequence-to-sequence applications that require high interpretability according to the needs of people who want to understand model behavior. Thereafter, we design enhancement based on TracInS, using arbitrary spans as fine-grained explanation units to achieve interpretability for sequence-to-sequence applications on valid datasets. Finally, we design targeted influence function evaluations, which are semantic-based and retraining-based evaluation methods, to verify that the influence function is effective. At the same time, the improvement of the experimental effect proves that the enhancement is more interpretable.</p>
<p>17:15-17:30 A024</p>	<p>Integral Sliding Mode Exponential Synchronization of Inertial Neural Networks with Time Delays Jiefei Yan, Chang'an University, China</p> <p>Abstract— In this article, the exponential synchronization issue for inertial neural networks (INNs) with time varying delays is addressed. A new synchronous lemma, Lemma 1, has been obtained through some inequality techniques. Also, inspired by sliding mode control method, a new integral sliding mode control law with mode-dependent integral terms is designed to solve the INNs synchronization problem. By using the new lemma and integral sliding mode controller, a theorem of exponential synchronization is proposed and some novel synchronization criteria are given. Finally, one numerical example is given to show the validity, and the merit of the proposed controller is provided.</p>
<p>17:30-17:45 A031</p>	<p>Network traffic prediction based on a CNN-LSTM with attention mechanism Juan Wu, Research Institute of China Telecom Co., Ltd., Guangzhou, China</p> <p>Abstract—With the increase of Internet users and the rapid development of various large traffic network applications such as video and games, the network traffic load increases sharply, and network congestion occurs from time to time. Existing routers cannot solve this problem. Network expansion is a costly solution, so intelligent routers should be adopted. Traffic prediction is the precondition of intelligent routing algorithms. Because network traffic has strong nonlinear characteristics, the traditional linear model has great error in</p>

predicting network traffic. Machine learning algorithms such as support vector regression (SVR) , long-term and short-term memory network (LSTM) and convolutional neural network long-term and short-term memory network (CNN- LSTM) have achieved certain results, but their prediction accuracy still can not meet the requirements of practical application. In this paper, a CNN- LSTM with attention mechanism is used to efficiently extract timing information and other relevant feature information, so as to achieve a more accurate prediction of network traffic. The experiment of this paper used the network traffic data of China Telecom in Guangdong Province as an example to predict. The results show that the performance of the model is satisfactory.

17:45-18:00
A1003

Research on information sharing mechanism based on blockchain technology
Sicong Yu, Institute of Techonology and Standaerds Reasearch, China Academy of Information and Communications Beijing, China

Abstract— Information sharing is becoming popular for its efficiently processing and modeling in intelligent era. During the information sharing procedure, especially in the Industrial Internet area, some problems should be considered, such as storage centralization, low integration efficiency, data isolation, weak trust, poor security performance, and privacy protection, which are the challenges for forming free circulation. For this purpose, blockchain technology could be used to realize the decentralized storage, distrust and traceability of information. This paper proposes a sharing mechanism of information based on blockchain technology, for the processes of collection, storage and application. It is concluded that building a multi-collaborative information sharing mechanism based on blockchain, can satisfy the requirement of safe and efficient sharing.

<p align="center">Online Session 2: Computer and Electronic Information Engineering</p> <p align="center">Session Chair: TBA</p> <p align="center">Time: 14:30-16:30</p> <p align="center">Venue: Room B: 894 2358 2599 https://us02web.zoom.us/j/89423582599</p>	
<p>14:30-14:45 A022</p>	<p>Identifying influential nodes based on optimized structural holes in complex networks Rui Liu, Nanchang Hangkong University, China</p> <p>Abstract— The influential nodes identification has been an interesting problem in this issue. Aiming at the existing influential nodes identification methods that only consider the number of neighbors of the node, the topological relationship between the node and the neighbor is ignored, resulting in a one-sided problem. Proposing the influential nodes identification based on optimized structural holes. This method uses the similarity between nodes to distinguish the differences of neighboring nodes to optimize the constraint. The optimized constraint reflects the number of neighbors of the node and the topological structure between nodes and neighbors. The propagation ability of the influential nodes identified by the proposed method is verified on the SI (susceptible-infection) model, and compared with other methods, it is found that the proposed method is effective and feasible for the identification of influential nodes.</p>
<p>14:45-15:00 A026</p>	<p>Heart Sound Classification Based on Feature Analysis and Selection Min Li, Tiangong University, Tianjin, China</p> <p>Abstract— Most of the causes of death are related to cardiovascular disease. Heart sound classification plays a key role in the early detection of cardiovascular disease. The distinction between normal and abnormal heart sounds is not obvious, making heart sound classification a challenging task. This paper proposes a method based on statistical analysis and feature engineering to analyze the features extracted from heart sound signals. The discriminative features are selected and input into the classifier to classify the heart sound. While ensuring accuracy, the method reduces the scale of the input data and computational time for classification. The selected distinguishable features achieved an accuracy of 96.5 % for the classification of abnormal and normal heart sounds. The experimental results show that the selected features can achieve a high accuracy rate in the classification of heart sound, which is suitable for real-time applications.</p>
<p>15:00-15:15 A035</p>	<p>Reliability Analysis of the Effective Load Carrying Capacity of New Energy in the Integration of Source, Network, Load and Storage Junhao Xiao, State Grid Information and Telecommunication Group Co., Ltd. & Institute of Information and Telecommunication Technology, Beijing, China</p> <p>Abstract— With the development of society, the number of grid-connected renewable energy has greatly increased, and the model of my country's power system is undergoing subversive changes. Although renewable energy enhances the cleanliness of the power grid, the instability and randomness of new energy also create a series of difficulties for the power system, which makes the supply side of the power system less stable and controllable. When large-scale renewable energy sources such as distributed photovoltaics, centralized photovoltaics and a series of facilities are integrated into the grid, the power generation output on the supply side cannot be stably controlled and difficult to predict due to the randomness of the environment, and it is impossible to form a predictable or The stable power generation curve has caused a series of problems such as difficulty in obtaining power on the load side and unsafe power acquisition. Therefore, the random problem of electricity consumption on the supply side of new energy needs to be paid attention to, and it is also a problem that needs to be solved today. In response to the above problems, this paper proposes the concept of "effective carrying capacity of new energy in the integration of source, network, load and storage" to analyze the stochastic characteristics of sustainable development of new energy power supply, as well as stability analysis. That is to form a controllable power generation process through the close cooperation of power supply, power grid, load, and energy storage. So, to solve this current random problem, it is necessary to</p>

first use simulation to evaluate the reliability of new energy sources, so that the stability can be more effectively controlled in the following links such as power generation. This article is to carry out research on the reliability analysis of the effective carrying capacity of new energy, to provide a reference for the entire power supply system. The following are the main analysis steps of this paper. First, by studying traditional theoretical methods to compare and study the operation mechanism of the new energy generation side and the coordination of the four aspects of the source, network, load and storage to analyze a series of solar energy data. Second, by understanding the classic methods of power system reliability analysis and evaluation, different reliability indices and related knowledge of solar energy. Use these methods to improve power system planning and stability. Thirdly, through the simulation research of power system planning scheme based on Monte Carlo method in MATLAB, the improved multivariate linear Monte Carlo simulation method is designed according to the characteristics of the power system, and the output of photovoltaic power generation is linearly divided and sampled. Determine its Effective Load Carrying Capability (ELCC) to inform the decision of the scheme. Fourth, the evaluation and research on the entire system planning scheme is obtained through case analysis, which can effectively conduct comprehensive evaluation and comparison of multiple case schemes from the four perspectives of power supply, power grid, load, and energy storage, and promote the development of "source". The implementation of network load storage' coordination and optimization. Fifth, the trade-offs between power system cost and reliability are explored through various analyses and as close as possible to the power company's index in the final case study.

15:15-15:30
A036

Design and Simulation Application of Fuzzy Controller Based on Granular Computing
Huiyue Li, Dalian University of Technology, China

Abstract— Fuzzy control theory generates fuzzy rules based on expert experience and experimental data, so fuzzy control method can control complex and large-scale systems without precise mathematical models. But fuzzy control method still has problems: complex structure and rule explosion problem. Aiming at the above problems, this paper proposes a fuzzy control method based on granular computing. Firstly, design the fuzzy controller, the fuzzy rules are generated by the fuzzy space division method. Then, using the information granulation method, each fuzzy rule is granulated into an information granule. Taking points in the information granules to fit the realization function of the granular function, using that function control the object instead of the fuzzy controller. The fuzzy reasoning process is omitted, and the number of rules has nothing to do with the accuracy, it is only related to the number of granules. Therefore, the structure of the control system can be simplified under the condition of ensuring the accuracy of the system, and the problem of rule explosion can be avoided at the same time. The simulation experiment using the second-order inverted pendulum as the control object proves the feasibility and effectiveness of the fuzzy control method based on granular computing.

15:30-15:45
A059

Digital-Twin Driven of Cyber-Physical Intelligent Transport System
Yuxin Zhang, Tongji University, China

Abstract— The transport physical objects and transport information world are combined, mapped and refined, and then they transform “pedestrians-vehicles-roads-clouds” protocols into transport spatio-temporal data. This paper proposes to combine the theory and method of artificial intelligence and cyber physical systems(CPS) into the intelligent transport system and its application, explore the interdisciplinary innovation of “Cyber Physical Transportation System (CPS-T)”. CPS-T mostly plays a role in the joint cooperation of the computing process and the controlling process, and forms intelligent information judging, real-time feedback control and transport response services for transport scenarios. It was found that CPS-T can effectively express, map, feature and regulate traffic signals and data volume.

<p>15:45-16:00 A071</p>	<p>PhysioVec: IoT Biosignal Based Search Engine for Gastrointestinal Health Yi Huang, James Cook University Singapore, Singapore</p> <p>Abstract— Gastrointestinal problems are major health threats to term newborn babies. There are currently no known methods for monitoring the gastrointestinal health of these babies in ICU units contributing to thousands of yearly mortality rates in Australia alone. The internet and Health Social networks (HSN) provide a large amount of useful information for patients. However, finding the right information on HSN is time-consuming and challenging because data from HSN is too large to be processed manually. We develop PhysioVec, a Bowel-Sound IoT to HSN search engine that extracts physiological measurements from bowel sounds providing an automated search of HSN. PhysioVec consists of three parts: Local Recurrent Transformer (LRT), a Multivariate radial-basis Logistic Interpreter (MLI), and a sentence embedding module. LRT combines local attention and recurrent Transformer encoder to reduce overfitting and improve the performance of bowel sound segmentation. The physiological measurements extracted from bowel sounds are used to search for relevant health information on the internet. PhysioVec achieved 100.00% precision in the top one search results for bowel sound with both vomiting and bowel obstruction. Our proposed framework allows patients and doctors to search for useful information in HSN by continuously monitoring bowel sounds with minimal discomfort.</p>
<p>16:00-16:15 A0002</p>	<p>Unsupervised Region-Based Denoising for Optical Coherence Tomography Framework Hanya Ahmed, Queen Mary University of London, UK</p> <p>Abstract— Optical Coherence Tomography (OCT) is an emerging imaging tool that is now widely adopted in various medical settings such as cardiology and ophthalmology and is emerging in dentistry. In OCT, light of low coherence is used for image capturing which results in the introduction of speckle noise. Specifically, a degraded signal-to-noise ratio accentuates ambiguity in feature-extraction and contributes to the introduction of artefacts. This ultimately impacts its clinical utility where clear diagnostic detail is essential. In this work a concentrated-unsupervised deep learning denoising framework for OCT images is proposed, incorporating attention gate encoders. Attention gates are utilized to ensure focus on denoising the foreground and to ‘hard-threshold’ the background. Training data was created by processing the image with state-of-the-art denoisers (BM3D and NLM, etc.) to emphasize only essential data removal. The proposed framework was analysed quantitatively and visually, in comparison against state-of-the-art denoising algorithms. The experimental results show that the approaches verifiably remove speckle noise and achieves superior quality to well-known denoisers. The method improved the PSNR by 29.6 dB, CNR by 11.5 dB and, ENL by 1196.6 dB compared to original image and state-of-the-art denoisers.</p>
<p>16:15-16:30 A072</p>	<p>CardioVec: Searching Heart Health Information Using ECG Signals Yi Huang, James Cook University Singapore, Singapore</p> <p>Abstract— Health Social Networks (HSNs) provides a scalable, sustainable, and rich medical knowledge base. However, retrieving the right information from HSN can be time-consuming and challenging as users are often required to use the right keywords to search and filter relevant information. IoT provides a non-invasive, easy, low-cost way to collect patient data. However, the current IoT approaches cannot provide interpretable clinical information. IoT also cannot be directly interfaced with HSNs for searching health conditions. To overcome the disadvantages of both approaches, we develop an ECG-IoT search engine, called CardioVect. CardioVect converts ECG signals into human-readable clinical descriptions to interface ECG-IoT with HSN. This allows doctors and patients directly search relevant articles on the Internet and HSNs using ECG signals collected through IoT devices or portable ECG recorders. The search results achieved precision of 79.14% in top-one search results. Our proposed CardioVec improves the effectiveness and usefulness of IoT and HSN for patients to find right information on cardiovascular diseases and learn about their potential health risks more easily and conveniently.</p>

Online Session 3: Next-Generation AI and Applications**Session Chair: TBA****Time: 16:45-19:00****Venue: Room B: 894 2358 2599 || <https://us02web.zoom.us/j/89423582599>**16:45-17:00
A044Solving Raven's Progressive Matrices Using RNN Reasoning Network
Lyu Muyang, Beijing Normal University, China

Abstract— Although enormous progress has been made by Deep Neural Networks (DNN) in basic perception tasks, they are long criticized for lack of reasoning quality and interpretability. Raven's Progressive Matrices (RPMs) are standard tests for assessing human Intelligence Quotient, also acting as a tool to evaluate Artificial Intelligence. Existing methods of pure DNN combining perception and reasoning are difficult to confirm DNN's ability of logical reasoning. Hybrid DNN methods reasoning by algorithms, not DNN. Existing methods use end-to-end training, while perception and reasoning are detached modules functionally and neurologically. Here we propose a method of separating visual perception by a perfect convolutional neural network perception module abstracting RPMs to panel-level interpretable encoding and inferring it with our Recurrent Neural Network reasoning model. With a trained perfect perception module, our model attaches great performance on the RPM dataset Impartial-RAVEN of 96.72% and RAVEN of 90.77%. Our method tests the abstract reasoning quality of DNNs and also provides a platform for further research in neuroscience.

17:00-17:15
A004Network Attack Traffic Recognition Based on Quantum Neural Network
Meng Zhang, China Academy of Information Communications Technology(CAICT), MIIT , China

Abstract— Network attacks are increasingly being paid attention to. People are constantly studying effective attack recognition and prevention methods. This paper presents a method of network attack traffic recognition based on quantum neural network for the first time. The problem of gradient explosion is avoided by making full use of the bounded gradient function of quantum neural network. A method of transforming the classical traffic characteristic value data into quantum state representation is proposed. And the preliminary experimental verification is carried out on Google Tensorflow Quantum platform. The feasibility of the method is verified.

17:15-17:30
A034Accurate identification of closing state of horizontal rotary disconnectors in a substation based on mask R-CNN
Renwei Cao, System Operation Department, Guangzhou Power Supply Co., Ltd., China

Abstract— Disconnectors are extremely important equipments in a substation. Long-term use may lead to abnormal structure, resulting in inadequate closing, which means a serious accident. Therefore, the judgment of disconnector closing in place has become a very important problem. Judging whether the closing is in place requires very accurate state identification, which is difficult to judge by the current method. Firstly, this paper used mask R-CNN network for target recognition, and obtained a model with high recognition accuracy. Then, this paper used HED method to extract the edge, and proposed an algorithm to detect the closing state. Experiments show that this method can effectively identify the closing state of a horizontal rotary disconnector.

17:30-17:45
A006Heterogeneous Seismic Waves Pattern Recognition in Oil Exploration with Spectrum Imaging
Wang Yuyang, Beijing University of Technology, Beijing, China & University College Dublin, Ireland

Abstract— The use of seismic waves to explore the subsurface underlying the ground is a widely used method in the oil industry, since different kinds of the rocks and mediums have different reflection rate of the seismic waves, so the amplitude of the reflected waves can

	<p>unraveling the geological structure and lithologic character of a certain area under the ground, but the management and processing of seismic wave data often affects the efficiency of oil exploration and development. Different kinds of the seismic data bulk are always mixed and hard to be classified manually. This paper presents a classification model for four main types of seismic data, and proposed a classification method based on Mel-spectrum. An accuracy of 98.32% was achieved using pre-trained ResNet34 with transfer learning method. The accuracy is further improved compared with the pure fourier transformation method widely used in previous studies. Meanwhile, the transfer learning method and fine-tune strategy to train the neural network by training the first $N - 1$ layers of the network separately and then train the fully connected layers further improves the training efficiency. Our model can also be seen as an efficient data quality control scheme for oil exploration and development. Meanwhile, our method is future-proofed, for further improvement of the seismic data processing quality control system, according to the spectrum characteristics, this model can be further extended into a error data classification model, reduces the workload of the bulk data management.</p>
<p>17:45-18:00 A032</p>	<p>Color Restoration Method for Endoscope Image Using Multiscale Discriminator based Model Compression Strategy Pengcheng Hao, Beijing Institute of Technology, Beijing China</p> <p>Abstract— Color restoration of endoscopic images is an urgent clinical need during photodynamic surgery. In recent years, deep learning methods achieved notable results in the fields of image processing. The model compression algorithm and hardware performance enhancement improved the model inference speed. It is possible to apply deep learning methods to the task of endoscopic image color restoration during surgery. However, experiments show that model compression can lead to image deterioration. To solve this issue, we propose a fast color restoration method for endoscopic images, which use multiscale discriminator based on model compression. Initially, we train a CycleGAN teacher network with multiscale discriminator. Then, we obtain the student model through knowledge distillation and neural architecture search. We use the trained teacher discriminator to guide the student model and add feature matching loss to stabilize the training process. Experiments show that our method ameliorates the performance of compressed models.</p>
<p>18:00-18:15 A068</p>	<p>Joint Detection Model Based on YOLOv5 to Detect Lithium Battery Defects with Noisy Label Chao Yao, South China Normal University, China</p> <p>Abstract— Data-driven intelligent detection methods have been widely used in the detection of defects in lithium batteries, with outstanding results. However, there are situations of inaccurate labeling due to category similarity in the labeling process, resulting in noisy labels that subsequently influence the model's prediction. To solve this problem, we propose a joint detection model based on YOLOv5, in which the whole is decoupled into two main parts, i.e., a fully supervised detection model and a semi-supervised classification model which uses clustering to divide the data. These two parts can effectively focus on key domains so as to attenuate the impact of noise labels under the relevant domains, and achieve overall noise immunity by connecting detection with classification in the validation phase. The approach outperforms the native YOLOv5 (mAP@0.5 as metric) by 5.7 percent, 10.2 percent, and 10.7 percent at 10%, 20%, and 30% noise fractions, respectively.</p>
<p>18:15-18:30 A1006</p>	<p>An Improved GaborNet Visual Encoding Model with Nonlinear Mapping and Data Augmentation Jingwei Li, Henan Key Laboratory of Imaging and Intelligent Processing PLA Strategic Support Force Information Engineering University Zhengzhou, China</p> <p>Abstract—Constructing visual encoding model is an important way to understand the human visual system. Data-driven encoding models learn features by directly fitting neural data, providing novel insights for visual encoding. Prediction accuracy is an important performance goal of visual encoding. The GaborNet visual encoding (GaborNet-VE) model has both good expressiveness and interpretability, while its prediction performance still</p>

	<p>needs to be improved. In this work, we proposed an improved GaborNet-VE model by adding data augmentation and nonlinear mapping module. The experimental results show that the improved GaborNet-VE model achieves higher prediction accuracy in V2, V3, V4 and LO. Our research provides a new framework for the data-driven encoding model.</p>
<p>18:30-18:45 A033</p>	<p>Study of Supervised Learning Algorithms for the Prediction of Road Accident Severity in Senegal Yoro DIA, UFR-SES Iba Der Thiam University of Thies, Senegal</p> <p>Abstract—According to a literature search, current studies on road accidents in Senegal are mostly conducted using conventional descriptive statistics, which, however, does not correctly identify cause and effect relationships and is unable to establish models that could predict accidents. An alternative way to reduce traffic accidents is to develop a model for predicting accident fatality. This model relates the severity of accidents to the main actors involved, namely the driver, the vehicle and the various characteristics of the road environment. This paper presents a study of several models for predicting the severity of traffic accidents in Senegal based on supervised learning algorithms such as Random Forest, k-nearest neighbor, SVM, logistic regression and naive Bayesian classifier, in order to estimate the accident severity from historical data. To solve the problem of unbalanced classes, we use several measures of models' performance namely percentage performance (Accuracy), area under the ROC curve, accuracy, Recall and F1 criterion. The best results were obtained by the Random Forest and SVM algorithms respectively, based on the percentage performance and the F1 criterion. Regarding the value of the area under the ROC curve, the best results were obtained by Random Forests and K-nearest neighbor algorithms, respectively. The Random Forests algorithms, which give the best results in model practice, can be used in studies on the prediction of road accident severity.</p>
<p>18:45 -19:00 A058</p>	<p>A Survey on TCM tongue diagnosis based on Data Mining Jiixin Cai, Xiamen University of Technology, China</p> <p>Abstract— Tongue diagnosis is one of the most important methods of diagnosis and treatment in ancient Chinese medicine. Traditional Chinese Medicine (TCM) experts can judge the health status of the human body through the tongue image, and then take care and treatment accordingly. According to the collected literature, this paper first discusses the history of TCM tongue diagnosis and tongue observation, which can let us better understand TCM tongue diagnosis, and then introduces the exploration of TCM tongue diagnosis and diseases, so as to deepen the understanding of tongue observation. Then it discusses the research and auxiliary diagnosis of traditional Chinese medicine tongue diagnosis, combines traditional Chinese medicine with modern technology, and uses modern technology to assist tongue diagnosis, so as to achieve better diagnostic effect.</p>

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