# 19th International Symposium on Neural Networks

# Final Program

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# Welcome Messages

On behalf of the Organizing Committee, we sincerely welcome you to join us at the 19th International Symposium on Neural Networks (ISNN 2025) being held in Zhangye, Gansu, China, during August 22-24, 2025. Through this conference, we intend to exchange and discuss new theories and technologies, and to help the development of neural networks and intelligent control technologies, open up to each other in the professional field, and learn from each other. The conference features plenary speeches by world-renowned scholars and regular sessions with broad coverage and special topics. ISNN 2025 attracted about one hundred submissions, addressing the state-of-the-art development and research covering topics related to computational neuroscience, connectionist theory and cognitive science, mathematical modeling of neural systems, neurodynamic analysis, neurodynamic optimization, adaptive dynamic programming, and deep learning. Based on the rigorous peer reviews by the Program Committee members and reviewers, 52 papers were selected to be presented and included in the conference proceedings.

The conference program is highlighted with two plenary talks. We would like to express our sincere appreciation and acknowledgement to the distinguished plenary speakers: Professor Zidong Wang (IEEE Fellow, Member of the Academia Europaea, Member of the European Academy of Sciences and Arts, Editor-in-Chief of Neurocomputing, Editor-in-Chief for International Journal of Systems Science) and Professor Gary G. Yen (IEEE Fellow, IAPR Fellow, Past President of the IEEE Computational Intelligence Society, Founding Editor-in-Chief of the IEEE Computational Intelligence Magazine). Plenary talks are focused on Neural Networks and Intelligent Control.

Several organizations and many volunteers made significant contributions toward the success of this conference. We would like to express our sincere gratitude to Lanzhou University and City University of Hong Kong for their sponsorship, Hexi University, Lanzhou Jiaotong University, and Lanzhou University of Technology for their co-sponsorship, the Asian Pacific Neural Network Society and International Neural Network Society for their technical co-sponsorship, and Springer and Lecture Notes in Computer Science for their invaluable contribution to the publication and dissemination of the conference proceedings. Special thanks are extended to Program Committee Chairs and members for their thorough reviews of all the submissions, and the Organizing Committee and volunteers for their warm and thoughtful service to all participants. We would also like to express our appreciation and gratitude to all of the authors and participants. Without the contributions of the authors, the conference will be impossible.

We hope you enjoy the conference and stay in Zhangye academically and socially!

Derong Liu and Jun Wang, General Chairs
Wenbo Chen, Xinyi Le, Xiaoping Li, and Weirong Liu, Organizing Chairs
Long Jin and Lidan Wang, Program Chairs

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Jingnan Zhou, Lanzhou University, Lanzhou, China
Xiaoshu Zhu, Guilin University of Electronic Technology, Guilin, China

**Program at a Glance**

| August 22, 2025 | |
|---|---|
| 13:00-17:00 | Registration<br>Lobby, Jinyang International Hotel<br>Registration: Meng Li (Tel: 18736369969)<br>Accommodation: Yuxuan Zhao (Tel: 17393607255) |

| August 23, 2025 On-site Sessions @ Jinyang International Hotel | | | |
|---|---|---|---|
| Time | Opening Ceremony and Plenary Sessions @ Dehe Garden, 7th Floor | | |
| 9:00-9:10 | Opening Ceremony | | |
| 9:10-10:10 | Keynote Speech I: Professor Zidong Wang | | |
| 10:10-10:30 | Coffee Break | | |
| 10:30-11:30 | Keynote Speech II: Professor Gary G. Yen | | |
| 11:30-13:00 | Lunch Break @ Buffet restaurant, 7th Floor | | |
| | Taiwang Hall,<br>7th Floor | Juxian Hall,<br>7th Floor | Huiyi Pavilion,<br>7th Floor |
| 13:00-15:00 | S1: Design, Modeling, and Applications of AI Algorithms | S2: Control, Robotic, and Autonomous Systems | S3: Modeling, Analysis, and Implementation of Neural Networks |
| 15:00-15:15 | Coffee Break | | |
| 15:15-17:15 | S4: Signal, Image, and Video Processing | S5: Machine Learning Methods and Applications | |
| 18:00-19:30 | Banquet @ Juxian Hall, 7th Floor | | |

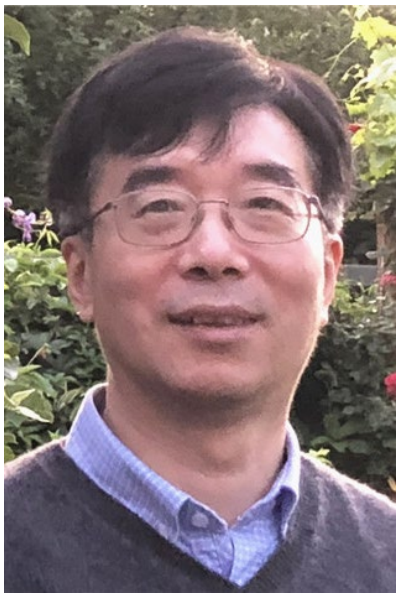
| August 24, 2025 Online Sessions (Tencent Meeting ID: 888 748 890) | |
|---|---|
| 8:00-12:10 | S6: Design, Modeling, and Applications of AI Algorithms<br>S7: Control, Robotic, and Autonomous Systems (Part 1) |
| 12:10-14:00 | Break |
| 14:00-18:10 | S7: Control, Robotic, and Autonomous Systems (Part 2)<br>S8: Machine Learning Methods and Applications |

Keynote Speech I

## State Estimation for Artificial Neural Networks with Communication Protocols: Challenges and Progress

Professor Zidong Wang
Brunel University, London, U.K.

Summary: In this talk, we talk about the state estimation problems for some classes of artificial neural networks subject to communication protocols. Some background knowledge is first introduced on communication protocols from the perspectives of concepts, applications and challenges. Then, some detailed discussions are given on the network-induced phenomena, communication protocols and cyber-attacks that complicate the estimator design problems. Various performance requirements are justified and the corresponding methodologies are summarized. Challenges and progresses are discussed. Finally, we conclude our main contributions and some future directions.



Biography: Zidong Wang is currently Professor of Dynamical Systems and Computing in the Department of Computer Science, Brunel University London, U.K. His research interests include dynamical systems, signal processing, bioinformatics, control theory and applications. He has published 600+ papers in IEEE Transactions and 120+ papers in Automatica with an H-index of 155. He is a holder of the Alexander von Humboldt Research Fellowship of Germany, the JSPS Research Fellowship of Japan, William Mong Visiting Research Fellowship of Hong Kong. Prof. Wang serves (or has served) as the Editor-in-Chief for Neurocomputing, the Editor-in-Chief for International Journal of Systems Science, and an Associate Editor for 12 international journals including IEEE Transactions on Automatic Control, IEEE Transactions on Control Systems Technology, IEEE Transactions on Neural Networks, IEEE Transactions on Signal Processing, and IEEE Transactions on Systems, Man, and Cybernetics-Part C. He is a Member of the Academia Europaea, a Member of the European Academy of Sciences and Arts, an Academician of the International Academy for Systems and Cybernetic Sciences, a Fellow of the IEEE, a Fellow of the Royal Statistical Society and a member of program committee for many international conferences.

Keynote Speech II

## Evolution Meets Diffusion: Yet Another Generative Model-based Large-scale Dynamic Multi-objective Optimization

Professor Gary G. Yen
Sichuan University, Sichuan, China & Oklahoma State University, Stillwater, USA

Summary: Large-scale, dynamic multi-objective optimization problems (LSDMOPs) extend traditional DMOPs into high-dimensional decision spaces, reflecting the growing complexity of real-world dynamic systems. A typical example is the economic control of gas transportation in a large-scale pipeline network, which involves hundreds or even thousands of decision variables, representing pipeline node pressures, compressor power settings, and valve operations. The system is simultaneously affected by various time-varying factors, such as consumer demand, market fluctuation, environmental temperature, and humidity. In such contexts, algorithms are required to quickly find optimal solutions after each environment change, maintaining supply-demand balance while minimizing energy consumption. In practice, there are many more such examples, including dynamic resource allocation of 5G networks in dense urban environments, UAV swarm dispatch in a disaster relief scenario, and large-scale dynamic vehicle routing planning, just to name a few. However, the effectiveness of existing dynamic multi-objective evolutionary algorithms is severely limited for LSDMOPs, due to inadequate training data, predictions in unknown environments, and large-scale dynamic search spaces. To address these challenges, we propose a diffusion learning-based evolutionary framework, inspired by the intrinsic analogy between iterative evolution of optimization search and stepwise denoising in diffusion learning. Specifically, a new training paradigm is designed to learn the changing patterns of optimal regions in dynamic fitness landscapes. It achieves this by using populations' evolutionary trajectories from initial solutions towards Pareto-optimal solutions across historical environments as rich supervised training data. In addition, we introduce a trajectory alignment loss that encourages the stepwise denoising process to conform to the true population evolutionary behaviors in terms of spatial exploration, convergence trends, and boundary adaptation. The trained model can gradually control denoising direction and intensity using predefined conditions, allowing it to generate optimization paths from random noise toward Pareto-optimal solutions for a new environment. Along with an adversarial autoencoder-based large-scale dynamic multi-objective evolutionary framework, we will assess how deep generative modeling techniques and large-scale multi-objective evolutionary algorithms can be seamlessly integrated to solve large-scale DMOPs effectively and efficiently. Experimental results on a typical dynamic multi-objective test suite with problem settings from 10 to 1,000 dimensions demonstrate that the optimization performance of the proposed framework outperforms existing state-of-the-art designs. Especially in large-scale scenarios, the proposed framework is considered superior in terms of solution quality and computational efficiency.

Gary G. Yen received his Ph.D. degree in electrical and computer engineering from the University of Notre Dame in 1992. He was a Regents Professor in the School of Electrical and Computer Engineering, Oklahoma State University. He recently joined Sichuan University, College of Computer Science as a Chair Professor. His research interests include intelligent control, computational intelligence, evolutionary multiobjective optimization, conditional health monitoring, signal processing and their industrial/defense applications. Gary was an associate editor of the IEEE Transactions on Neural Networks, IEEE Transactions on Evolutionary Computation, IEEE Transactions on Emerging Topics on Computational Intelligence, and IEEE Control Systems Magazine during 1994-1999, and of the IEEE Transactions on Control Systems Technology, IEEE Transactions on Systems, Man and Cybernetics (Parts A and B) and IFAC Journal on Automatica and Mechatronics during 2000-2010. He is currently serving as an associate editor for the IEEE Transactions on Cybernetics and the IEEE Transactions on Artificial Intelligence. Gary served as Vice President for the Technical Activities, IEEE Computational Intelligence Society in 2004-2005 and was the founding editor-in-chief of the IEEE Computational Intelligence Magazine, 2006-2009. He was elected to serve as the President of the IEEE Computational Intelligence Society in 2010-2011 and was elected as a Distinguished Lecturer for the term 2012-2014, 2016-2018, 2021-2023, and 2025-2027. He received the Regents Distinguished Research Award from OSU in 2009, 2011, the Andrew P Sage Best Transactions Paper award from IEEE Systems, Man and Cybernetics Society, 2013 Meritorious Service award from IEEE Computational Intelligence Society, and 2014 Lockheed Martin Aeronautics Excellence Teaching award. He is a Fellow of IEEE, IET, and IAPR.

August 23, 2025
Opening Ceremony and Plenary Session
Dehe Garden

| | |
|---|---|
| 9:00-9:10 | Opening Ceremony |
| 9:10-10:10 | Keynote Speech I: State Estimation for Artificial Neural Networks with Communication Protocols: Challenges and Progress<br>Prof. Zidong Wang |
| 10:10-10:30 | Coffee Break |
| 10:30-11:30 | Keynote Speech II: Evolution Meets Diffusion: Yet Another Generative Model-based Large-scale Dynamic Multi-objective Optimization<br>Prof. Gary G. Yen |
| 11:30 - 13:00 | Lunch Break |

Onsite sessions
S1: Design, Modeling, and Applications of AI Algorithms
Chairs: Sitian Qin, Yinyan Zhang
Taiwang Hall

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|---|---|
| 13:00-13:20 | Solution for Lyapunov Equation by A Novel Varying-Parameter Neural Dynamics With Its Kinematic Application to Redundant Manipulators<br>Ying Kong |
| 13:20-13:40 | Modeling Competitive Behavior in Weight-Unbalanced Social Networks<br>Ruoxiao Liu, Jiayi Wang |
| 13:40-14:00 | Recurrent Neurodynamics Models for Computation of Wireless Sensor Network Nodes Localization<br>Shuqiao Wang, Yu Ma, Duoliang Han |
| 14:00-14:20 | Regression-based Index Tracking versus Clustering-based Index Tracking: An Empirical Study<br>Fangyu Zhang, Qintong Lyu, Jun Wang |
| 14:20 - 14:40 | Adversarial Imitation Learning Based on Weighted Wasserstein Distance<br>Zhengzuo Qin, Yuejiao Wang, Dongdong Zhao, Shi Yan |
| 14:40 - 15:00 | Joint Forecasting of Stock Price Change Rate Based on Pretrained Models Using Text and Temporal Data<br>Hailing He, Chen Peng, Lieping Zhang, Zhengping Liu |
| 15:00 – 15:15 | Coffee Break |

S2: Control, Robotic, and Autonomous Systems
Chairs: Dongsheng Guo, Zhengtai Xie
Juxian Hall

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|---|---|
| 13:00-13:20 | Tanh-Function-Based RMP Control of Redundant Manipulators Based on Dynamic Neural Networks<br>Weicheng Xu, Yuhui Bao, Tianhao Ai |
| 13:20-13:40 | Position/Orientation-based Feedback Control<br>Yi Tao |
| 13:40-14:00 | Distributed Fault-Tolerant Consensus Control Based on Zero-Sum Differential Games for Nonlinear Multi-Agent Systems<br>Jiawen Li, Mingduo Lin, Bo Zhao, Derong Liu |

14:00-14:20 A Fuzzy Logic-Based Noise-Suppression Scheme for Motion Planning of Robotic Manipulators
Xiyuan Zhang, Shuo Li, Yaran Liu, Wenjie Yuan, Weiqi Fan, Dongsheng Guo

14:20 - 14:40 TV-DLS Enhanced RNN Control for Robotic Manipulators with Unknown Inertial Parameters
Xingwei Bai, XinYi Wang, Zhaohui Hao, JingYi Chen

14:40 - 15:00 A Novel Synchronization Control Scheme for Time-delayed SMDS Teleoperation System with Damping Adjustment
Jiangning Wen, Haochen Zhang, Dingbiao Zhang, Shaobo Shen, Liyue Fu, Weirong Liu, Er Chao Li, Jinyan Li, Zhuoyue Zhang

15:00 – 15:15 Coffee Break

S3: Modeling, Analysis, and Implementation of Neural Networks
Chairs: Zhongbo Sun, Pengfei Guo
Huiyi Pavilion

13:10 - 13:20 A General One-Parameter Discrete-Time Recurrent Neural Network for Solving Discrete-Form Time-Varying Augmented Sylvester Matrix Equation
Yueyang Ma, Weijie Su, Jian Li, Dimitrios K. Gerontitis, Yang Shi, Jiyun Wang

13:20 - 13:40 Multiple μ-Stability of Delayed State-Dependent Switching Neural Networks With Discontinuous Activation Function
Manchun Tan, Weihao Du

13:40 - 14:00 Multiple-Order Time-Delay Zhang Neural Dynamics Model for Handling Tracking Control Problem of Lu Chaotic System with Mixed Inputs
Pengfei Guo, Yunong Zhang

14:00 – 14:20 Noise-Suppression Zeroing Neural Network-Assisted Trajectory Tracking Scheme for Omni-Directional Redundant Manipulators With Physical Constraints
Shijun Tang, Yunfeng Hu, Zhishuo Zhang, Yuzhe Fei, Lixian Cao

14:20 - 14:40 An Adaptive Zeroing Neural Network Model Based on Fuzzy Factors for Solving Time-Varying Quadratic Programming
Yidan Wang, Zhongbo Sun, Bokai Han, Chunling Xu, Chao Cheng

14:40 - 15:00 Noise-suppression Neural Network for Upper Limb Continuous Motion Prediction
Kai Yang, Keping Liu, Zenghui Wang, Zhongbo Sun, Zhifei Zhai

15:00 – 15:15 Coffee Break

S4: Signal, Image, and Video Processing
Chairs: Yongji Guan, Liangming Chen
Taiwang Hall

15:15 - 15:35 Application of Quantum Multi-classification Network in Image Processing
Jingru Qiu, Shuang Cong

15:35 - 15:55 KANFace: A Novel Approach to Face Recognition Using Kolmogorov-Arnold Networks
Hung Pham, Bac Dao, Phi Ngoc Tran, Thai Nguyen, Cuong Do

15:55 - 16:15 Global Cross Attention Transformer for Image Super-Resolution
Changhong Shi, Weirong Liu, Jiahao Meng, Zhijun Li, Jie Liu

16:15 - 16:35 Semi-supervised Multi-View Learning with Graph-based Consistent Feature Fusion
Guojie Li, Zhiwen Yu, Ziwei Fan, Kaixiang Yang

16:35 - 16:55 SW-YOLO: Wildlife Object Detection Based on Segment Anything and YOLO Models
Qirui Yang, Guoli Liu, Xinrui Zhao, Boxuan Ma, Chao Mou

16:55 - 17:15 Prediction of Ion Cluster Center-of-Mass Motion Trajectories based on Multiple Echo State Network Framework
Shang Ma, Guanghui Pan, Yongji Guan

S5: Machine Learning Methods and Applications
Chairs: Yang Shi, Jiazheng Zhang
Juxian Hall

15:15 - 15:35 Intelligent Recognition of Gram-Stained Microscopic Images Based on DIBAS Dataset
Weili Nie

15:35 - 15:55 PsyVisionNet: A Multi-Modal AI Model for Fear Detection Using Facial Expression & Psychological Parameters
Abinaya M and Vadivu G

15:55 - 16:15 Muography Inversion Based on First-Order Optimization Algorithm
Zining Su, Ting Li

16:15 - 16:35 An Energy Efficient Optimization Framework for Spiking Neural Networks Using Error-Resilient Approximation Techniques
Weikang Xu, Yan Sun, Jianmin Zhang, Zhiqiang Wen, Yu Ma

16:35 - 16:55 FFYOLO: A Lightweight Small Target Detection Algorithm for UAVs
Gengyang Su, Fuxiang Lu, Shi Yan

16:55 - 17:15 Fault Diagnosis for Automated Tightening: A Knowledge-embedded GAN Approach
Jingjing Wu, Xiaoben Lu, Qicang He, Yifei Zhu

August 24, 2025
Online sessions
Tencent Meeting ID: 888 748 890

S6: Design, Modeling, and Application of AI Algorithms
Chairs: Fan Wu, Liangming Chen
Tencent Meeting ID: 888 748 890

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|---|---|
| 8:00 - 8:20 | Trajectory Tracking Control of Underactuated AUV Based on RBF Neural Network and Nonsingular Terminal Sliding Mode<br>Yang Chen, Huiyi Luo, Weilin Luo |
| 8:20 - 8:40 | Hybrid Architecture Accelerator Co-design for DNN on FPGA and ASIC<br>Honghao Zhang, Ruidong Li, Ji Zhong, Meizhou Gao, Xinyi Le |
| 8:40 - 9:00 | Hyperspectral Endmember Material Identification Using Spectral Library Matching<br>Nian Zhang, Fred Rischmiller, Wagdy H. Mahmoud |
| 9:00 - 9:20 | CDEDI: A Conditional Diffusion Based Model for Environmental Data Imputation<br>Hegeng Zhang, Zhanhong Ye, Cong Zhang, Fan Wu |
| 9:20 - 9:40 | Multimodal Deep Learning for Retinal Disease Diagnosis<br>Dongmei Wang, Yuansong Cai, Wanli Qiao, Menglei Liu |
| 9:40 - 10:00 | Pole Placement Based ZN Control in Continuous and Discrete Forms for TILS Output Tracking<br>Yunong Zhang, Junyang Huang, Zhengyang Tang |
| 10:00 - 10:20 | AC Optimal Power Flow Based on Collaborative Neurodynamic Optimization<br>Yanghe Zou, Meng Xu, Zhongying Chen |
| 10:20 - 10:40 | DeeP-Mod: Deep Dynamic Programming based Environment Modelling using Feature Extraction<br>Chris Child, Lam Ngo |
| 10:40 - 10:50 | Break |

S7: Control, Robotics, and Autonomous Systems
Chairs: Kewei Zhang, Jiazheng Zhang
Tencent Meeting ID: 888 748 890

| | |
|---|---|
| 10:50 - 11:10 | Continuous and Discrete Zhang Neuro PID Controller Plus PD One for Ship Course Tracking<br>Yunong Zhang, Xinshen Fu, Junyan Liu |
| 11:10 - 11:30 | Universal Function Projective Synchronization of Delayed Chen System and Delayed Lorenz System With Unknown Parameters by Using Adaptive Control Method<br>Baojie Zhang, Liuying Cha, Zhiyuan Zhu, Changchao Liu |
| 11:30 - 11:50 | Jerk-Layer Multi-Criteria Simultaneous Optimization for Control of Redundant Robots<br>Binbin Qiu, Yusheng Zeng, Jinjin Guo, Guangfeng Cheng |
| 11:50 - 12:10 | Quantized State/Input-Based Course Tracking Control for Unmanned Surface Vehicles<br>Yuwei Zhang, Wei Li, Jun Ning |

12:10 - 14:00 Break

14:00 - 14:20 A Lightweight Method Based on YOLOv8 for Metal Surface Defect Detection in Industrial Manufacturing
Yixuan Huang, Danchen Zheng

14:20 - 14:40 Transparent Object Depth Completion with Stereo Image Guidance
Yifan Zhou, Wanli Peng, Zhongyu Yang, He Liu, Yi Sun

14:40 - 15:00 Statistical Enhancement of ICA-FFT-Based Blind Source Separation in AWGN Conditions
M.R. Ezilarasan, V. Muthu, G. Kavitha, Man-Fai Leung, Jin Zhang, Xiangguang Dai, Yuming Feng

15:00 - 15:20 A Hybrid LSTM-CNN Algorithm for Swine Posture Recognition Using Multimodal Sensor Data
Xiaoshu Zhu, Lei Wei, Tao Zhou, Jianpeng Zhang, Changna Qian, Xiao Luo

S8: Machine Learning Methods and Applications
Chairs: Jianfeng Lv, Zhengtai Xie
Tencent Meeting ID: 888 748 890

15:20 - 15:40 Investigation of Tea Yield Forecasting in Xiangxi Prefecture Utilizing Random Forest and Gradient Boosting Techniques
Bingjie Wang, Xinyi Tao, Jingwen Li, Pengfei Yin, Junping Shi, Fanghui Mo, Qian Xu

15:40 - 16:00 Degree-aware Graph Contrastive Learning for Long-Tail Recommendations: An Empirical Analysis for Hazard Inspection
Zexi Li, Xinbo Ai, Yanjun Guo, Wei Ma, Ruoxuan Wang, Shaoyang Cheng

16:00 - 16:20 Text2Grasp: Synthesis of Grasps by Text Prompts for Object Grasping Parts
Xiaoyun Chang, Yi Sun

16:20 - 16:30 Break

16:30 - 16:50 Ded-YOLOv5: An Efficient Defect Detection Network Based on HR Imaging
Yu Chen, Xinzhe Wang, Ying Hao, Jianchao Fan, Chang Kou

16:50 - 17:10 Novel Genetic Algorithm with Hill Climbing for Optimizing Animal Feed Formulation Optimization
Tingting Weng, Dongqing Wu

17:10 - 17:30 Robust and Efficient Early Exit for Large Language Models: Mitigating KV Cache Loss and Enhancing Exit Stability
Long Meng, Ruiqing Zhang, Weiqiao Shan

17:30 - 17:50 Quantization-Based and Event-Triggered Observer-Based Formation Control of Unmanned Surface Vehicles Under False Data Injection Attacks
Yijun You

17:50 - 18:10 Orderly charging strategy of EVs based on genetic algorithm: dual optimization of reducing charging cost and grid fluctuation
Yuhan Kang