



Dr. Ren Jia

Department of Digital and Intelligent Technology | Professor

Biography

Dr Ren Jia is a Professor and Doctoral Supervisor. He is a Professor (Grade III) at the School of Information and Communication Engineering, Hainan University, a Distinguished Scholar of Hainan University, and a Doctoral Supervisor. He is also Vice-Chairman of the Hainan Youth Federation, Distinguished Professor and Doctoral Supervisor at City University of Macau, and Distinguished Professor and Doctoral Supervisor at Xi'an Technological University. His research and applied work focus mainly on the design and manufacture of intelligent marine observation and monitoring equipment, multi-source marine information processing, and data applications related to national three-dimensional ocean observation. He has undertaken a number of national-level projects and provided important support for the development of an operational marine observation network in the South China Sea region. Dr Ren has served as Principal Investigator for eight national-level projects and eight provincial or ministerial-level projects. He received one First Prize of the Hainan Provincial Scientific and Technological Progress Award in 2023, ranked second; one Second Prize of the Hainan Provincial Scientific and Technological Progress Award in 2022, ranked first; one Third Prize of the Science and Technology Award of the China Institute of Navigation in 2021, ranked first; and one First Prize of the Hainan Provincial Teaching Achievement Award in 2022, ranked fourth. He has published 72 SCI/EI-indexed papers, authored two monographs, and obtained 27 patents and seven software copyrights. His major honours and talent titles include the National Baosteel Outstanding Teacher Award, Third Prize in the National Young Teachers' Teaching Competition, Most Beautiful Science and Technology Worker of Hainan Province, Hainan Youth May 4th Medal, Outstanding Science and Technology Worker of Hainan Province, Leading Talent of Hainan Province, Eminent South China Sea Scholar of Hainan Province, and Hainan Provincial "515 Talent Project". The autonomous and collaborative control technologies for unmanned surface vessels developed through his research have supported certain maritime missions on multiple occasions. The high-sea-state semi-submersible unmanned marine survey vessel developed by his team has filled a gap in China's marine surveying and mapping industry for semi-submersible surveying equipment. It has carried out multiple topographic survey missions in the waters

around Hainan Island and in key sea areas of the South China Sea, providing important support for the baseline data survey of the “Transparent Ocean” initiative of the Hainan Free Trade Port.

Professional Qualifications

Engineering Education Accreditation Expert, China Engineering Education Accreditation Association

Employment History

- Sept 2011 – Dec 2013 Lecturer, School of Information Science and Technology, Hainan University
- Jan 2014 – Dec 2017 Associate Professor, School of Information Science and Technology, Hainan University
- Mar 2017 – Jul 2018 Deputy Secretary, Communist Youth League Committee, Hainan University (Secondment)
- Jan 2018 – Dec 2022 Professor (Grade IV), School of Information and Communication Engineering, Hainan University
- Sept 2018 – Dec 2019 Deputy Dean, School of Information and Communication Engineering, Hainan University (Secondment)
- Dec 2019 – Dec 2021 Executive Dean, School of Information and Communication Engineering, Hainan University (Secondment)
- Jan 2023 – Present Professor (Grade III), School of Information and Communication Engineering, Hainan University

Education

- Sept 2000 – Jul 2004 Bachelor’s Degree in Automation, Xi’an Technological University
- Sept 2004 – Jul 2007 Master’s Degree in Information Processing, Xi’an Technological University
- Sept 2007 – Jul 2011 Doctoral Degree in Systems Engineering, Northwestern Polytechnical University

Research Interests

Artificial Intelligence, Intelligent Control and Intelligent Marine Equipment

Honours and Awards

1. Third Prize, Hainan Provincial Scientific and Technological Progress Award, 2012, ranked third
2. Outstanding Party Member of Hainan University, 2014
3. Second Prize, Hainan Provincial Scientific and Technological Progress Award, 2015, ranked third
4. Third Prize, National Young Teachers' Teaching Competition in Higher Education, 2016
5. National Outstanding Worker, Chinese Institute of Electronics, 2016
6. National Second Prize, China Graduate Electronic Design Contest, and Outstanding Supervisor, 2016
7. Excellence Award, Final of the Fifth China Innovation and Entrepreneurship Competition, 2016
8. Second Prize, Second Hainan Provincial Innovation and Entrepreneurship Competition, 2016
9. Gold Award, Hainan Provincial Internet+ Innovation and Entrepreneurship Competition, and Outstanding Supervisor, 2016
10. First Prize, Hainan University Young Teachers' Teaching Skills Competition, 2016
11. Outstanding Party Member of Hainan University, 2016
12. Third Prize, National Internet+ Innovation and Entrepreneurship Competition; Gold Award in the Hainan Division; and Outstanding Supervisor, 2017
13. May Day Labour Star of Hainan University, 2017
14. Hainan Provincial "515 Talent Project", 2018
15. Third Prize, Hainan Provincial Scientific and Technological Progress Award, 2018, ranked third
16. Second Prize, Haikou Division, China-US Young Maker Competition, and Outstanding Supervisor, 2018
17. Third Prize, Haikou Division, China-US Young Maker Competition, and Outstanding Supervisor, 2018
18. Outstanding Teacher of Hainan University, 2018
19. Silver Award, Hainan Division of the Fifth China "Internet+" College Students Innovation and Entrepreneurship Competition, and Outstanding Supervisor, 2019
20. Outstanding Science and Technology Worker of Hainan Province, 2019
21. Eminent South China Sea Scholar, Hainan Provincial High-Level Talent Programme, 2019
22. 26th Hainan Youth May 4th Medal
23. Baosteel Outstanding Teacher Award, 2020
24. Outstanding Supervisor of Master's Dissertations of Hainan Province, 2020
25. Excellence Award, Excellent Emergency Communications Solutions Solicitation Campaign, 2021
26. Most Beautiful Science and Technology Worker of Hainan Province, 2022
27. Second Prize, Hainan Provincial Scientific and Technological Progress Award, 2022, ranked first

28. First Prize, Hainan Provincial Scientific and Technological Progress Award, 2023, ranked second

Research Achievements

Publications

Selected recent publications are as follows:

- [1] **Gao Xiaoguang, Ren Jia*, Chen Daqing.** Developing Effective Algorithm for Dynamic UAV Path Planning with Incomplete Threat Information[J]. Journal of Aerospace Engineering, 2012, 26(4): 413-421.
- [2] Cui Yani, **Ren Jia***, Du Wencai, et al. UAVs target tracking algorithm based on task allocation consensus [J]. Journal of Systems Engineering and Electronics, 2016, 27(6): 1207-1218.
- [3] Cui Yani, Dong Chao, **Ren Jia***. Under actuated unmanned submarine path tracking method in complex environment [J]. Journal of Coastal Research, 2019, 94: 149-152.
- [4] Dai Jingguo, **Ren Jia***, Du Wencai, et al. An improved evolutionary approach-based hybrid algorithm for Bayesian network structure learning in dynamic constrained search space [J]. Neural Computing and Applications, 2020, 32(5): 1413-1434.
- [5] Dai Jingguo, **Ren Jia***, Du Wencai. Decomposition-based Bayesian network structure learning algorithm using local topology information [J]. Knowledge-Based Systems, 2020, 195: 105602.
- [6] Wang Zheng, Li Guangfu, **Ren Jia***. Dynamic path planning for unmanned surface vehicle in complex offshore areas based on hybrid algorithm [J]. Computer Communications, 2021, 166(17): 49-56.
- [7] **Ren Jia**, Liu Kun, Cui Yani*, et al. Search path planning algorithm based on the probability of containment model [J]. Mathematical Problems in Engineering, 2021, Article ID 74592392021, 12 pages.
- [8] **Ren Jia**, Zhang Jing, Cui Yani*. Autonomous obstacle avoidance algorithm for unmanned surface vehicles based on an improved velocity obstacle method [J]. ISPRS International Journal of Geo-information, 2021, 10(9): 618. (DOI: 10.3390/ijgi10090618)
- [9] **Ren Jia**, Wang Xu*, Li Guangfu. Bayesian method for water quality emergency monitoring in environmental pollution accident disposal [J]. Big Data, 2021, DOI: 10.1089/big.2020.0388.
- [10] Cui Yani, Zhi Shuaiqing, Liu Wenjin*, Deng Jiaxian, **Ren Jia***. An improved dark channel defogging algorithm based on the HSI color space [J]. IET Image Processing, 2022, 16(3): 823-838.
- [11] **Ren Jia**, Xu Nan, Cui Yani. Typhoon track prediction based on deep learning [J]. Applied

Sciences-Basel, 2022, 12(16): 8028.

[12] Wang Ziyue, Chen Min, Wan Mengyu, **Ren Jia***, Ding Jie. Coherent demodulated underwater wireless optical communication system based on convolutional neural network [J]. Optics Communications, 2023, 534: 129316.

[13] He Cheng, **Ren Jia***, Liu Wenjian. Dynamic causal modelling and online collaborative forecasting of air quality in Hong Kong and Macao [J]. Entropy, 2023, 25(9): 1337.

[14] Li Liangliang, **Ren Jia***, Wang Peng*, Gao Hui, Sun Mengyu, Sha Baolin, Lv Zhigang, Li Xiaoyan. A pixel-level weak supervision segmentation method for typical defect images in X-ray inspection of solid rocket motors combustion chamber [J]. Measurement, 2023, 211: 112497.

[15] **Ren Jia**, Gao Xiaoguang, Zhao Huanhuan. Decision-making model for UAV path replanning based on target state estimation [J]. Control and Decision, 2009, 24(7): 1034-1042.

[16] **Ren Jia**, Gao Xiaoguang, Zhang Yan. Path planning based on model predictive control algorithm under moving threat [J]. Control Theory & Applications, 2010, 27(5): 641-647.

[17] **Ren Jia**, Gao Xiaoguang, Zheng Jingsong, et al. Mission decision-making for UAV under dynamic environment [J]. Systems Engineering and Electronics, 2010, 32(1): 100-103.

[18] **Ren Jia**, Gao Xiaoguang, Ru Wei. Parameters learning of BN in small sample base on data missing [J]. Systems Engineering — Theory & Practice, 2011, 31(1): 172-178.

[19] **Ren Jia**, Gao Xiaoguang, Ru Wei. Parameter learning of discrete dynamic Bayesian networks with missing target data [J]. Systems Engineering and Electronics, 2011, 33(1): 1885-1890.

[20] **Ren Jia**, Gao Xiaoguang, Bai Yong. Discrete dynamic BN parameter learning under small sample and incomplete information [J]. Systems Engineering and Electronics, 2012, 34(8): 1723-1728.

[21] **Ren Jia**, Du Wencai, Bai Yong. UAV mission decision-making based on adaptive inference of Bayesian networks [J]. Systems Engineering — Theory & Practice, 2013, 33(10): 2575-2582.

[22] Chen Hong, **Ren Jia***. Improvement and research on efficient motion estimation algorithm in video compression [J]. International Journal of Multimedia and Ubiquitous Engineering, 2015, 10(11): 343-357.

[23] Cui Yani, **Ren Jia***, Du Wencai. Time-sensitive task dynamic allocation algorithm for multi-UAVs in battlefield environments [J]. Systems Engineering and Electronics, 2016, 34(4): 828-835.

[24] Cui Yani, **Ren Jia***, Du Wencai, Shikhin Vladimir. Network topology optimization control algorithm for multiple unmanned surface vehicle [J]. Control Theory & Applications, 2016, 33(12): 1639-1649.

[25] Cui Yani, **Ren Jia***, Fu Delong, et al. A formation generation algorithm of multiple agents in naval battlefield environments [J]. International Journal of Security and Networks, 2019, 14(1): 34-46.

- [26] Dai Jingguo, **Ren Jia***, Dong Chao, et al. BN structure adaptive learning algorithm based on dual-scale constraint model [J]. Acta Automatica Sinica, 2021, 47(8): 1988-2001.
- [27] **Ren Jia**, Gao Xiaoguang. Situation assessment model for UAV disaster relief in the city [C]//Proceedings of the 2011 International Workshop on Multi-platform/ multi-sensor Remote Sensing and Mapping. IEEE, 2011: 191-196.
- [28] Gao Xiaoguang, **Ren Jia***, Chen Daqing. Integrating structure-variable discrete dynamic Bayesian network into model prediction control for effective UAV path planning[C]//Proceedings of the 25th International UAV Systems Conference. IEEE, 2010: 96-101.
- [29] **Ren Jia**, Tang Tao, Wang Na. Flexibility discrete dynamic Bayesian networks modelling and inference algorithm[C]// Proceedings of the 24th Chinese Control and Decision Conference. IEEE, 2012: 212-216.
- [30] **Ren Jia**, Tang Tao, Yuan Ying. Bayesian networks parameter learning based on noise data smoothing in missing information[C]// Proceedings of the 5th International Symposium on Computational Intelligence and Design. IEEE, 2012: 136-139.
- [31] **Ren Jia**, Du Wencai, Du Feng. A UAV 3-D space dynamic path planning in complex battlefield environment[C]// Proceedings of the 3rd IEEE International Conference on Information Science and Technology. IEEE, 2013: 1-5.
- [32] Dai Jingguo, **Ren Jia***. Unsupervised evolutionary algorithm for dynamic Bayesian network structure learning[C]// Proceedings of the Workshop on Advanced Methodologies for Bayesian Networks. Springer International Publishing. IEEE, 2015: 136-151.
- [33] Cui Yani, **Ren Jia***, Du Wencai, et al. Decentralised cooperative tracking strategy based on the theory of consistency[C]// Proceedings of the 34th Chinese Control Conference. IEEE, 2015: 6969-6973.
- [34] Zhang Shengnan, **Ren Jia***, A hybrid optimal clustering algorithm for datasets with missing attributes[C]// Proceedings of the 13th International Conference on Signal Processing. IEEE, 2017: 315-319.
- [35] **Ren Jia**, He Cheng, Yi Jiafu, et al. Research on adaptive control model of miniature buoy for marine environment monitoring[C]// Proceedings of 2021 5th Asian Conference on Artificial Intelligence Technology. IEEE, 2021: 230-236.
- [36] He Cheng, Liu Wenjian, **Ren Jia***. Bayesian network structure learning: a review[C]//Proceedings of 2022 6th Asian Conference on Artificial Intelligence Technology. IEEE, 2022.
- [37] **Ren Jia**, Chen Min, Ding Jie, et al. A demodulator for UWOC-OAM-SK systems based on convolutional neural networks[C]// Proceedings of 2022 6th Asian Conference on Artificial Intelligence Technology. IEEE, 2022.
- [38] Li Liangliang, **Ren Jia***, Lv Zhigang, et al. Adaptive enhancement of high greyscale weld images based on the new pixel self-transformation method[C]// Proceedings of 2023 International Conference on Non-Traditional Machining and Intelligent Manufacturing. Journal of Physics: Conference Series. IOP, 2023, 2501(1): 012002.

Research Projects Undertaken by Dr Ren Jia as Principal Investigator or Participant

[1] National Special Project, “Multi-Energy Complementarity *****”, with funding of RMB4.6 million.

[2] National Special Project, “***** Technology for Typical Monsoon Seas”, with funding of RMB5.6 million.

[3] National Special Project, “***** in Shallow-Water Areas”, with funding of RMB4.9 million.

[4] Joint Research Project co-funded by the National Natural Science Foundation of China and the Macao Science and Technology Development Fund (“NSFC-FDCT”), “Cognition-Oriented Probabilistic Graph Theory for Multi-Source Data” (Project No. 6191101101), with funding of RMB1.44 million.

[5] National International Science and Technology Cooperation Project, “Research on Maritime Multi-Agent *****”, with funding of RMB5.4 million.

[6] National Natural Science Foundation of China Project, “Structure Learning Methods for Large-Scale Bayesian Networks Based on Graph Model Decomposition” (Project No. 62262016), with funding of RMB340,000.

[7] National Natural Science Foundation of China Project, “TVDBN Modelling Methods for Decision-Making and Control Models of Intelligent Systems” (Project No. 61562018), with funding of RMB390,000.

[8] National Natural Science Foundation of China Project, “Multi-Agent Collaborative Decision-Making Mechanisms Based on Hierarchical Dynamic Bayesian Networks” (Project No. 61440048), with funding of RMB150,000.

[9] Hainan Provincial Special Project, “***** Buoy”, with funding of RMB4.1928 million.

[10] Hainan Provincial Special Project, “***** Unmanned Surface Vessel Application Technology”, with funding of RMB7.31 million.

[11] Hainan Provincial Science and Technology Talent Innovation Project, “Key Technologies for **** Unmanned Surface Vessels” (Project No. KJRC2023C01), with funding of RMB1 million.

[12] Innovation Research Team Project of the Hainan Provincial Natural Science Foundation, “Learning and Application of Intelligent System Inference Models Based on Bayesian Networks” (Project No. 620CXTD434), with funding of RMB 300,000.

[13] Hainan Provincial Key R&D Programme (High and New Technology), “Development of Key Components for Autonomous Control of Unmanned Surface Vessels” (Project No. ZDYF2019014), with funding of RMB400,000.

[14] Hainan Provincial Higher Education Teaching Reform Research Project, “Research and Practice on an Industry–Academia–Research–Application Collaborative Talent Development Model: A Case Study of Hainan University” (Project No. Hnjg2018ZD-6).

[15] Hainan Provincial Natural Science Foundation Project, “Integrated Autonomous

Collaborative Command and Communication Technologies for Maritime Unmanned Platforms” (Project No. 614227).

[16] Hainan Provincial Natural Science Foundation Project, “Adaptive Inference of Bayesian Networks and Its Application in Emergency Command and Control” (Project No. 612130).

Patent Application

[1] **Ren Jia**, Cui Yani, Du Wencai. A Dynamic Allocation Algorithm for Time-Sensitive Tasks of Multiple UAVs in Battlefield Environments [P]. Chinese Patent: ZL 2014 1 0377834.4, 29 Mar 2017.

[2] Chen Baodan, Zhang Yu, **Ren Jia**. An Automatic Steering Device for Small Marine Electric Propulsion Units [P]. Chinese Patent: ZL 2017 1 0112299.3, 11 Dec 2018.

[3] Chen Baodan, Wei Feiyan, **Ren Jia**, Zhang Yu. A Catamaran-Stabilised Platform [P]. Chinese Patent: ZL 2017 1 0487134.4, 6 Jun 2023.

[4] Chen Baodan, Wang Tianlong, **Ren Jia**, Wang Lian, Qi Yipeng. A Roll-Reduction Mechanism and a Twin-Float Semi-Submersible Vessel Using the Mechanism [P]. Chinese Patent: ZL 2018 1 0906648.3, 8 Aug 2023.

[5] Chen Baodan, Wang Tianlong, **Ren Jia**, Wei Feiyan, Wang Lian. A Roll-Reducing Multi-Propeller Unmanned Vessel with Self-Generated Power [P]. Chinese Patent: ZL 2018 1 0297365.3, 15 Aug 2023.

[6] Chen Baodan, Wang Tianlong, **Ren Jia**, Wang Lian, Qi Yipeng. A Multi-Purpose Modular Quick-Detachable Deck Base for Ships [P]. Chinese Patent: ZL 201711258364.X, 19 Jan 2024.

Books and Book Chapters

[1] **Ren Jia**, Gao Xiaoguang. Bayesian Network Parameter Learning and Decision Support for UAVs. Beijing: National Defense Industry Press, 2012.

[2] Cui Yani, **Ren Jia**, and Du Wencai. Optimisation of Multi-Agent Collaborative Missions in Near-Sea-Surface Space. Beijing: National Defense Industry Press, 2017.