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Jinran WU

Research Interests

a. **Temporal Data Modelling**
Time series regression, and bio-signal recognition

b. **Statistical Machine Learning**
Kernel methods, robust methods, regularization methods, loss function designs, etc

c. **Engineering Optimizations**
Swarm intelligence for high-dimensional optimization problems

d. **Forecast and Inference**
Social sciences and engineering applications

Educations

2022 **Doctor of Philosophy in Statistics**, *Queensland University of Technology*, Brisbane, Australia

2017 **Master of Applied Statistics**, *Lanzhou University*, Lanzhou, PR China, *Grade* 90.76/100

2014 **Bachelor of Economics in Economic Statistics**, *Anhui University*, Hefei, PR China, *81.45/100*

PhD Thesis

Title *Statistical Support Vector Machines with Optimizations*
(The 2022 Executive Dean's Commendation for Outstanding Doctoral Thesis)

Supervisors Prof. You-Gan Wang, Prof. Kevin Burrage, & Prof. Yu-Chu Tian

Description This thesis combines support vector machines with statistical models for analyzing data generated by complex processes. The key contribution of the thesis is to propose five regression frameworks aiming for hyperparameter estimation, support vector selection, data modeling with unequal variances, temporal patterns, and cost-benefit analysis. A new optimizer is also proposed for high-dimensional optimization.

Employments

Feb 2025– **Research Fellow**, *School of Mathematics and Physics, The University of Queensland*, St Lucia, Australia

Dec 2022–Jan 2025 **Research Fellow**, *Faculty of Education and Arts, Australian Catholic University*, North Sydney, Australia

Jul 2022–Nov 2022 **Associate Lecturer**, *School of Mathematical Sciences, Queensland University of Technology*, Brisbane, Australia

Jul 2021–Nov 2021 **Sessional Academic**, *School of Mathematical Sciences, Queensland University of Technology*, Brisbane, Australia

Jun 2018–Dec 2018 **Research Assistant**, *UQ Business School, The University of Queensland*, St. Lucia, Australia

Refereed Journal Article

[1] **Jinran Wu**, You-Gan Wang, and Hao Zhang. Augmented support vector regression with an autoregressive process via an iterative procedure. *Applied Soft Computing*, 158:111549, 2024.

[2] **Jinran Wu**, Yang Yang, Shaolong Sun, and Yang Yu. Data-driven approaches for efficient smart grid systems. *Frontiers in Energy Research*, 12:1536459.

[3] Xi'an Li, **Jinran Wu**, Xin Tai, Jianhua Xu, and You-Gan Wang. Solving a class of multi-scale elliptic PDEs by fourier-based mixed physics informed neural networks. *Journal of Computational Physics*, 508:113012, 2024.

[4] Liya Fu, You-Gan Wang, and **Jinran Wu**. Recent advances in longitudinal data analysis. *Modeling and Analysis of Longitudinal Data*, 50:173, 2024.

[5] Zhesen Cui, Tian Li, Zhe Ding, Xi'an Li, and **Jinran Wu**. Probabilistic oil price forecasting with a variational mode decomposition-gated recurrent unit model incorporating pinball loss. *Data Science and Management*, 2024.

[6] Shaotong Zhang, Zixi Zhao, **Jinran Wu**, Yao Jin, Dong-Sheng Jeng, Sanzhong Li, Guangxue Li, and Dong Ding. Solving the temporal lags in local significant wave height prediction with a new VMD-LSTM model. *Ocean Engineering*, 313:119385, 2024.

[7] Zixi Zhao, Shaotong Zhang, **Jinran Wu**, Lulu Qiao, Guangxue Li, Hongyi Li, and Sanzhong Li. Analysis of fine-grained sediment dynamics from field observations with a vector autoregressive model. *Journal of Hydrology*, 644:132100, 2024.

[8] Yuming Mo, Jing Xu, Chanjuan Liu, **Jinran Wu**, and Dong Chen. Assessment and prediction of water quality index (WQI) by seasonal key water parameters in a coastal city: Application of machine learning models. *Environmental Monitoring and Assessment*, 196:1008, 2024.

[9] You-Gan Wang and **Jinran Wu**. Foreword: Machine learning in environmental modelling. *Environmental Modeling & Assessment*, pages 1–2, 2024.

[10] Zhesen Cui, Zhe Ding, Jing Xu, Shaotong Zhang, **Jinran Wu**, and Wei Lian. Probabilistic sunspot predictions with a gated recurrent units-based combined model guided by pinball loss. *Scientific Reports*, 14(1):13601, 2024.

[11] Chanjuan Liu, Jing Xu, Xi'an Li, Zhongyao Yu, and **Jinran Wu**. Water resource forecasting with machine learning and deep learning: A scientometric analysis. *Artificial Intelligence in Geosciences*, page 100084, 2024.

[12] Yang Yang, Yuchao Gao, Zhe Ding, **Jinran Wu**, Shaotong Zhang, Feifei Han, Xuelan Qiu, Shangce Gao, and You-Gan Wang. Advancements in Q-learning meta-heuristic algorithms: A survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 2024.

[13] Yang Yang, Hao Lou, **Jinran Wu**, Shaotong Zhang, and Shangce Gao. A survey on wind power forecasting with machine learning approaches. *Neural Computing and Applications*, pages 1–21, 2024.

[14] Yang Yang, Zijin Wang, Shangrui Zhao, Hu Zhou, and **Jinran Wu**. Robust autoregressive bidirectional gated recurrent units model for short-term power forecasting. *Engineering Applications of Artificial Intelligence*, 138:109453, 2024.

[15] Yang Yang, Yuchao Gao, Zijin Wang, Xi'an Li, Hu Zhou, and **Jinran Wu**. Multiscale-integrated deep learning approaches for short-term load forecasting. *International Journal of Machine Learning and Cybernetics*, pages 1–16, 2024.

[16] Yang Yang, Hao Lou, Zijin Wang, and **Jinran Wu**. Pinball-Huber boosted extreme learning machine regression: A multi-objective approach to accurate power load forecasting. *Applied Intelligence*, pages 1–16, 2024.

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[18] Xuelan Qiu, Jimmy de la Torre, You-Gan Wang, and **Jinran Wu**. The use of polytomous multidimensional forced-choice items to assess construct differentiation in personality psychology. *Educational Measurement: Issues and Practice*, 2024.

[19] Taoyun Cao, **Jinran Wu**, and You-Gan Wang. An adaptive trimming approach to Bayesian additive regression trees. *Complex & Intelligent Systems*, pages 1–19, 2024.

[20] Siyuan Liu, Jiaxin Deng, Jin Yuan, Weide Li, Xi'an Li, Jing Xu, Shaotong Zhang, **Jinran Wu**, and You-Gan Wang. Probabilistic quantile multiple Fourier feature network for lake temperature forecasting: incorporating pinball loss for uncertainty estimation. *Earth Science Informatics*, pages 1–14, 2024.

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[22] Zhuangcai Tian, Jinjian Huang, Jiaming Xiang, Shaotong Zhang, **Jinran Wu**, Xiaolei Liu, Tingting Luo, and Jianhua Yue. Interaction between internal solitary

waves and the seafloor in the deep sea. *Deep Underground Science and Engineering*, 2024.

[23] Jing Xu, Yuming Mo, Senlin Zhu, **Jinran Wu**, Guangqiu Jin, You-Gan Wang, Qingfeng Ji, and Ling Li. Assessing and predicting water quality index with key water parameters by machine learning models in coastal cities, China. *Heliyon*, page e33695, 2024.

[24] Chaojun Zou, Xinghui Zhu, Fang Wang, **Jinran Wu**, and You-Gan Wang. Rapeseed seed coat color classification based on the visibility graph algorithm and hyperspectral technique. *Agronomy*, 14(5):941, 2024.

[25] Shaotong Zhang, Zixi Zhao, Guangxue Li, **Jinran Wu**, You-Gan Wang, Peter Nielsen, Dong-Sheng Jeng, Lulu Qiao, Chenghao Wang, and Sanzhong Li. Estimation of sediment transport parameters from measured suspended concentration time series under waves and currents with a new conceptual model. *Water Resources Research*, 60(4):e2023WR034933, 2024.

[26] Xi'an Li, Jiaxin Deng, **Jinran Wu**, Shaotong Zhang, Weide Li, and You-Gan Wang. Physical informed neural networks with soft and hard boundary constraints for solving advection-diffusion equations using Fourier expansions. *Computers & Mathematics with Applications*, 159:60–75, 2024.

[27] Shaotong Zhang, Jiaxin Deng, Xi'an Li, Zixi Zhao, **Jinran Wu**, Weide Li, You-Gan Wang, and Dong-Sheng Jeng. Solving the one dimensional vertical suspended sediment mixing equation with arbitrary eddy diffusivity profiles using temporal normalized physics-informed neural networks. *Physics of Fluids*, 36(1), 2024.

[28] Yanan Song, **Jinran Wu**, Liya Fu, and You-Gan Wang. Robust augmented estimation for hourly PM $_{2.5}$ using heteroscedastic spatiotemporal models. *Stochastic Environmental Research and Risk Assessment*, 38:1423–1451, 2024.

[29] **Jinran Wu**, Noa Levi, Robyn Araujo, and You-Gan Wang. An evaluation of the impact of COVID-19 lockdowns on electricity demand. *Electric Power Systems Research*, 216:109015, 2023.

[30] You-Gan Wang, **Jinran Wu**, Zhi-Hua Hu, and Geoffrey J McLachlan. A new algorithm for support vector regression with automatic selection of hyperparameters. *Pattern Recognition*, 133:108989, 2023.

[31] Daniel VandenHeuvel, **Jinran Wu**, and You-Gan Wang. Robust regression for electricity demand forecasting against cyberattacks. *International Journal of Forecasting*, 39(4):1573–1592, 2023.

[32] Shangrui Zhao, Xuan-Ang Chen, **Jinran Wu**, and You-Gan Wang. Mixture extreme learning machine algorithm for robust regression. *Knowledge-Based Systems*, 281:111033, 2023.

[33] Shangrui Zhao, Zhen Yang, Shaotong Zhang, **Jinran Wu**, Zixi Zhao, Dong-Sheng Jeng, and You-Gan Wang. Predictions of runoff and sediment discharge at the lower

Yellow River Delta using basin irrigation data. *Ecological Informatics*, 78:102385, 2023.

[34] Zhesen Cui, **Jinran Wu**, Wei Lian, and You-Gan Wang. A novel deep learning framework with a COVID-19 adjustment for electricity demand forecasting. *Energy Reports*, 9:1887–1895, 2023.

[35] Jiali Fu, Fengjing Cai, **Jinran Wu**, Shangrui Zhao, and You-Gan Wang. Inflation transmission diagnostics via a Bayesian graph vector autoregressive model with markov switching. *Journal of Systems Science and Complexity*, pages 1–24, 2024.

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[42] Zihan Hao, Weide Li, **Jinran Wu**, Shaotong Zhang, and Shujuan Hu. A novel deep learning model for mining nonlinear dynamics in lake surface water temperature prediction. *Remote Sensing*, 15(4):900, 2023.

[43] Gayani Krishanthi, Harshanie Jayetileke, **Jinran Wu**, Chanjuan Liu, and You-Gan Wang. Enhancing feature selection optimization for COVID-19 microarray data. *COVID*, 3(9):1336–1355, 2023.

[44] Shuang Tan, Shangrui Zhao, and **Jinran Wu**. QL-ADIFA: Hybrid optimization using Q-learning and an adaptive logarithmic spiral-levy firefly algorithm. *Mathematical Biosciences and Engineering*, 20(8):13542–13561, 2023.

[45] Zhuangcai Tian, Hanlu Liu, Shaotong Zhang, **Jinran Wu**, and Jiahao Tian. Prediction of shear stress induced by shoaling internal solitary waves based on machine learning method. *Marine Georesources & Geotechnology*, 41(2):221–232, 2023.

[46] Yang Yang, Yuwei Zhang, Zijin Wang, **Jinran Wu**, and Xuefeng Si. Event-trigger-based fault-tolerant control of uncertain non-affine sys-tems with predefined performance. *International Journal of Control, Automation and Systems*, 21(2):519–535, 2023.

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[48] Ziqian Wang, Zihao Chen, Yang Yang, Chanjuan Liu, Xi'an Li, and **Jinran Wu**. A hybrid autoformer framework for electricity demand forecasting. *Energy Reports*, 9:3800–3812, 2023.

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[50] **Jinran Wu** and You-Gan Wang. Iterative learning in support vector regression with heterogeneous variances. *IEEE Transactions on Emerging Topics in Computational Intelligence*, 7(2):513–522, 2023.

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[52] Xi'an Li, **Jinran Wu**, Lei Zhang, and Xin Tai. Solving a class of high-order elliptic PDEs using deep neural networks based on its coupled scheme. *Mathematics*, 10(22):4186, 2022.

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[54] Zixi Zhao, **Jinran Wu**, Fengjing Cai, Shaotong Zhang, and You-Gan Wang. A statistical learning framework for spatial-temporal feature selection and application to air quality index forecasting. *Ecological Indicators*, 144:109416, 2022.

[55] Yang Yang, Zijin Wang, Shangrui Zhao, and **Jinran Wu**. An integrated federated learning algorithm for short-term load forecasting. *Electric Power Systems Research*, 214:108830, 2023.

[56] Shaotong Zhang, Yaqi Zhang, Jishang Xu, Lei Guo, Guangxue Li, Yonggang Jia, Lulu Qiao, **Jinran Wu**, Mingzheng Wen, and Chaoqi Zhu. In situ observations of hydro-sediment dynamics on the abandoned Diaokou lobe of the Yellow River Delta: Erosion mechanism and rate. *Estuarine, Coastal and Shelf Science*, 277:108065, 2022.

[57] Qibin Duan, **Jinran Wu**, and You-Gan Wang. Optimal battery capacity in electrical load scheduling. *Journal of Energy Storage*, 50:104190, 2022.

[58] Yaqi Zhang, **Jinran Wu**, Shaotong Zhang, Guangxue Li, Dong-Sheng Jeng, Jishang Xu, Zhuangcai Tian, and Xingyu Xu. An optimal statistical regression model for predicting wave-induced equilibrium scour depth in sandy and silty seabeds beneath pipelines. *Ocean Engineering*, 258:111709, 2022.

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[60] Maoxuan Miao, **Jinran Wu**, Fengjing Cai, and You-Gan Wang. A modified memetic algorithm with an application to gene selection in a sheep body weight study. *Animals*, 12(2):201, 2022.

[61] Chanjuan Liu, **Jinran Wu**, and Harshanie Lakshika Jayetileke. Overseas warehouse deployment for cross-border E-commerce in the context of the belt and road initiative. *Sustainability*, 14(15):9642, 2022.

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[64] Yang Yang, Zijin Wang, Yuchao Gao, **Jinran Wu**, Shangrui Zhao, and Zhe Ding. An effective dimensionality reduction approach for short-term load forecasting. *Electric Power Systems Research*, 210:108150, 2022.

[65] Yang Yang, Xiaorui Xi, Songtao Miao, and **Jinran Wu**. Event-triggered output feedback containment control for a class of stochastic nonlinear multi-agent systems. *Applied Mathematics and Computation*, 418:126817, 2022.

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[67] Shangrui Zhao, Qingyue Wu, Yueyi Zhang, **Jinran Wu**, and Xi'an Li. An asymmetric bisquare regression for mixed cyberattack-resilient load forecasting. *Expert Systems with Applications*, 210:118467, 2022.

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with opposition-based learning. *The Journal of Supercomputing*, 78(18):19566–19604, 2022.

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[75] Zhiyou Ouyang, Xu Zhai, **Jinran Wu**, Jian Yang, Dong Yue, Chunxia Dou, and Tengfei Zhang. A cloud endpoint coordinating CAPTCHA based on multi-view stacking ensemble. *Computers & Security*, 103:102178, 2021.

[76] Yang Yang, Xin Fan, Chuang Xu, **Jinran Wu**, and Baohua Sun. State consensus cooperative control for a class of nonlinear multi-agent systems with output constraints via ADP approach. *Neurocomputing*, 458:284–296, 2021.

[77] Xu Xu, Clare Anne McGrory, You-Gan Wang, and **Jinran Wu**. Influential factors on Chinese airlines' profitability and forecasting methods. *Journal of Air Transport Management*, 91:101969, 2021.

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[80] Min Zhu, **Jinran Wu**, and You-Gan Wang. Multi-horizon accommodation demand forecasting: A New Zealand case study. *International Journal of Tourism Research*, 23(3):442–453, 2021.

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Conference

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[2] Deng, J., Li, W., Li, X., **Wu, J.**, & Zhang, S. (2023). SFSeqPINN: A Hybrid Approach for Enhanced Prediction of Marine Sediment Concentration. *2023 The XIV Congress of the International Association for Engineering Geology and the Environment* . Chengdu, China

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[6] Zhang, B., Yang, Y., Zhao, D., & **Wu, J.** (2020). A robust decomposition-ensemble method for wind speed forecasting. *The 16th International Conference on Control, Automation, Robotics and Vision (ICARCV)*. Shenzhen, China

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Working Papers

[1] Prediction of inflection and outbreak size of COVID-19 in new epicentres.

[2] Network traffic forecasting with transfer learning-based algorithm for long continuous missing data.

[3] Multi-granularity autoformer for long sequence point/probabilistic prediction.

[4] Integrated energy system forecasting using multi-task learning algorithm with an attention mechanism.

[5] Feature selection for stock movement direction prediction using sparse least squares support vector machine.

[6] Normalized physics informed extreme learning machine to solve the biharmonic equation with Dirichlet boundaries in non-unitized domain.

[7] Identifying yellow-seeded Brassica Napus by fusion of hyperspectral features.

[8] A differential index measuring rater's capability in educational assessment data analysis.

[9] To pass or not to pass: a data-driven approach to detecting the minimum acceptance level.

[10] An adaptive regression algorithm via clustering process to forecast multi-modal data.

[11] Augmented physics informed extreme learning machine to solve the biharmonic equations via Fourier expansions.

[12] Spatiotemporal variations of water levels and river-lake interaction in the Poyang Lake basin under the 2022 extreme drought.

[13] Optimizing PID Controllers for Multi-Area Automatic Generation Control with Enhanced NSGA-II.

[14] Integrating behavior analysis with machine learning to predict online learning performance: A scientometric review and empirical study.

[15] Scheduling automated guided vehicles with considering the buffer location assignment constraints.

[16] Optimal Predictive Load Frequency Control with Energy Storage Devices.

[17] Grain yield loss caused by Fusarium crown rot was mainly due to reduced numbers of fertile tillers in barley.

[18] Transfer Learning with CNN-GRU for Air Quality Index Forecasting.

[19] Improving Long Time Series Power Probabilistic Forecasting: Tackling Complexity with Linformer.

[20] Improvement of Bayesian PINN Training Convergence in Solving Multi-scale PDEs with Noise.

[21] Effects of seawater salinity variations on nitrogen transport in the coastal reservoir and adjacent aquifer.

[22] Changed impacts of water parameter interactions and land use on water quality in a shallow lake under different rainfall characteristics.

[23] ASISTGCRN: A novel approach to traffic prediction using attention-based spatiotemporal graph networks.

[24] Cross-Citation Network Analysis of Educational Psychology Research across 60 journals (2015-2024): Leading Countries, Researchers, Journals, and Universities.

[25] Integrating attention mechanisms in graph neural networks for oil spill detection.

[26] ViT-GCN: A Novel Hybrid Model for Accurate Pneumonia Diagnosis from X-ray Images.

[27] Comparative Analysis of Regularization Methods for Predicting Student Certification in Online Courses.

[28] Graph Neural Network-Driven Learning Algorithm for Feature Selection.

[29] Comparing the Impact of COVID-19 on Student Mathematics Achievement: A Multilevel Machine Learning Analysis of PISA 2022.

[30] Fourier heuristic PINNs to solve the biharmonic equations based on its coupled scheme

[31] Spatial Heterogeneity of Groundwater Depths in Coastal Cities and their Responses to Multiple Factors Interactions by Interpretable Machine Learning Models

[32] Integrated scheduling of multiple handling equipment at an automated container terminal with buffer lanes and buffer zones

[33] Financial fraud detection in the manufacturing Industry of China based on CatBoost model

Peer Reviewer

Grants

- DAAD Postdoc-Net-AI under German Academic Exchange Service

Journals

- New England Journal of Medicine
- Energy
- Environmental Modeling and Assessment
- Theoretical and Applied Climatology
- Control Engineering Practice
- Journal of Hospitality & Tourism Research

- IEEE Access
- Journal of Ambient Intelligence and Humanized Computing
- Engineering Computations
- PeerJ Computer Science
- Environmental Science and Pollution Research
- Scientific Reports
- Artificial Intelligence Review
- Electronics
- IEEE Transactions on Systems, Man, and Cybernetics: Systems
- Agronomy
- Neural Processing Letters
- Sustainability
- Ocean & Coastal Management
- International Journal of Green Energy
- Statistics in Biosciences
- IEEE Transactions on Neural Networks and Learning Systems
- Frontiers in Marine Science
- Applied Energy
- Earth Science Informatics
- Journal of Supercomputing
- Frontiers of Information Technology & Electronic Engineering
- Applied Mathematical Modelling
- Nonlinear Dynamics
- Mathematical Biosciences and Engineering
- Sadhana
- Mathematics
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- Journal of Computational Social Science
- Expert Systems with Applications
- Entropy
- Transport Policy
- Machine Learning
- Applied Soft Computing
- Applied Intelligence
- Stochastic Environmental Research and Risk Assessment
- Electrical Engineering
- Soft Computing
- PloS One

Membership and Service

Jul 2024 Academic Editor of the *PLOS One* Editorial Board

Nov 2024 Member of the Program Committee of The Australasian Data Science and Machine Learning Conference (AusDM'24), Melbourne Australia

Jul 2024 Member of the Program Committee of the 17th International Conference on Educational Data Mining (EDM 2024), Atlanta USA

Sep 2024– Guest Editor, the Special Issue on "Deep-Sea Sediment Transport and Mining" of *Frontiers in Earth Science*

Jan 2024– Guest Editor, the Special Issue on "Data-Driven Approaches for Efficient Smart Grid Systems" of *Frontiers in Energy Research*

Dec 2023– Member of the Early Career Editorial Board of *Deep Underground Science & Engineering*

2023– Member, the Statistical Society of Australia (SSA)

Sep 2023 Session Convener, the XIV Congress of the International Association for Engineering Geology and the Environment, Chengdu China

Jan 2023– Guest Editor, the Special Issue on "Machine Learning in Environmental Modelling" of *Environmental Modeling and Assessment*

Jul 2022– Review Editor, Editorial Board of Machine Learning and Artificial Intelligence (specialty section of *Frontiers in Big Data* and *Frontiers in Artificial Intelligence*)

Teaching Experience

2024se2 **Coordinator** for EDCP600 (Interpreting Literature and Data), ACU

2022se2 **Coordinator** for MXB343 (Modelling Dependent Data), QUT

2022se1 **Guest Lecturer** for MXN441 (Advanced Statistical Inference and Modelling), QUT

2021se2 **Tutor** for MXB343 (Modelling Dependent Data), QUT

2021se1 **Guest Lecturer** for MXN441 (Advanced Statistical Inference and Modelling), QUT

Grants and Awards

2024 The 2024 Early Career Researcher Grant, Faculty of Education & Arts, ACU
Be awarded the amount of AUD$5,940.24

2023 The 2022 Executive Dean's Commendation for Outstanding Doctoral Thesis, Faculty of Science, QUT

2022 The Chinese Government Award for Outstanding Self-financed Students Abroad
The highest governmental award to Chinese graduate students studying abroad

2020 The QUT Science and Engineering Faculty's High Achiever Award

2018 The Australian Government Research Training Program Scholarship (International)

2018 The ACEMS Top Up Scholarship