

Juntao Chen

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EDUCATIONAL BACKGROUND

Chongqing University of Arts and Sciences *joint with*
University of North Carolina Wilmington
(CQWU-UNCW Joint Bachelor's Degree Program)

Chongqing, China
North Carolina, United States

B.A. in Mathematics and Applied Mathematics

Sep. 2020-Jun. 2024

GPA: 90.1/100 (top 2%)

Relevant Coursework: Calculus (99), Probability Theory and Mathematical Statistics(98), Applied Multivariate Statistical Analysis(99), Time Series Analysis(96), Advanced Real Analysis(90), Big Data Modeling and Application(93), Numerical Methods and Experiments(95), Data Visualization(92), Machine Learning(96), Operations Research and Optimization(85), Functions of Complex Variable(95), Mathematical Model and Mathematical Experiment(88), Discrete Mathematics(91).

PUBLICATIONS

1. **Juntao Chen**, Jibo Wu*. The prediction of Chongqing's GDP based on the LASSO method and chaotic whale group algorithm–back propagation neural network–ARIMA model. *Sci Rep* **13**, 15002 (2023). <https://doi.org/10.1038/s41598-023-42258-z>. (JCR Q2)
2. **Juntao Chen**, Xueying Fu, Lingli Zhang, Haoye Shen, Jibo Wu*, A novel offshore wind power prediction model based on TCN-DANet-sparse transformer and considering spatio-temporal coupling in multiple wind farms, *Energy*, Volume 308, 2024, 132899, ISSN 0360-5442, <https://doi.org/10.1016/j.energy.2024.132899>. (JCR Q1 TOP)
3. Pengyi Li, Xueying Fu, **Juntao Chen***, Junyi Hu. CoGraphNet enhancing Information Encoding and Interpretability through Word-Sentence Heterogeneous Graphs in Text Classification (*Scientific Reports* Under revision JCR Q2)
4. **Juntao Chen**, Jibo Wu*. Advancing Extreme Learning Machines: A Novel Approach with $LL_2,1$ Regularization for Improved Model Robustness. (*Journal Of Applied Statistics* Under review)

RESEARCH

CoGraphNet: Enhancing Information Encoding and Interpretability through Word-Sentence Heterogeneous Graphs in Text Classification, *Collaborated on research with Xueying Fu, Pengyi Li, Junyi Hu*

Sep.2023-Feb.2024

- A CoGraphNet model was proposed, which represents text as a graph structure based on word sentence heterogeneous graphs to improve training efficiency and model interpretability
- Using pre trained BERT embeddings to transform sentences improves text representation.
- The introduction of edge weights, combined with cosine similarity and positional deviation information, effectively captures the context of the document, improves classification accuracy and efficiency.
- Utilizing hierarchical attention networks to capture multi-level contextual information of text data to address the challenges of large-scale datasets
- Integrating SwiGLU activation functions in the GRU layer makes the internal structure of the model easier to understand and improves its interpretability

A novel offshore wind power prediction model based on improved TCN-DANet-Sparse Transformer and Considering spatio-temporal coupling multiple wind farms, *Collaborated on research with Xueying Fu, Lingli Zhang, Haoye Shen and Jibo Wu*

Nov. 2022-July. 2023

- Resorted to Pearson's correlation coefficient method to analyze the correlation between the biggest 29 wind power plants in Europe
- Extract multidimensional features from raw wind power data and capture spatiotemporal relationships through DANet feature extraction and TCN spatiotemporal relationship modeling.
- The Transformer introduces a sparse attention mechanism to further extract high-dimensional spatiotemporal features

and retain key information.

- Utilize FCNN to process the spatiotemporal features of Transformer output and model complex high-dimensional nonlinear relationships.
- Finally, by integrating features and prediction mechanisms, accurate wind power predictions are generated, taking into account multidimensional spatiotemporal information and providing a reliable decision-making basis.

The Prediction of Chongqing's GDP Based on the LASSO Method and Chaotic Whale Group Algorithm -Back Propagation Neural Network-ARIMA Model, Collaborated on research with Jibo Wu. June. 2022-Mar. 2023

- Introduced a point-interval prediction method for Chongqing's GDP, utilizing the LASSO method and the Chaotic Whale Group Algorithm-Back Propagation Neural Network-ARIMA (CWOA-BP-ARIMA) model
- Identified that essential economic indicators that are closely associated with Chongqing's GDP, which were also utilized as inputs for the neural network model by means of Pearson correlation and Lasso regression
- Established the CWOA-BP-ARIMA combined forecasting model and optimized it through the Chaotic Whale Group Algorithm (CWOA) to predict Chongqing's GDP
- Compared the accuracy and reliability of the model with benchmark methods, our model showed notable improvement

Data-Driven Approaches for Accurate Temperature Forecasting: A Machine Learning Perspective

The Scientific Technological Research Program of Chongqing Municipal Education Commission Jan. 2023-July. 2023

- Explored data-driven methods for temperature prediction and analyzed them from a machine learning perspective
- Compared the accuracy and precision of Random Forest, Decision Tree Regression, and Multiple Linear Regression in predicting the temperature
- Demonstrated the effectiveness of Random Forest in temperature prediction

PROJECT (Course Projects and Competitions)

A Research on the Economic Impact of Covid-19 on Industry July. 2021-Mar. 2022

National University Student Statistical Modeling Competition Project, Skill: Python, R

- Used Python crawler technology to obtain and calculate the epidemic impact index factor
- Investigated the impact of the new crown epidemic on industrial economy based on gray system and regression analysis theory
- Established a final coupled nested prediction model to predict the quarterly economic development of Chongqing's industry in 2022

Handwritten Font Recognition based on Machine Learning Mar. 2022-May. 2022

Machine Learning course project, Skill: Python, Origin

- Implemented a handwritten font recognition system with SVM algorithm
- Compared the different effects of SVM algorithm and k-Nearest Neighbors algorithm, Logistic regression, Naive Bayes and other algorithms on handwritten font recognition
- Worked out an 8-page evaluation plan, including logic model, evaluation objective, problem discussion, research design, data list, data analysis and promotion plan

A Study on Adaptive Quadrature Algorithms based on Undamped Spring Systems Oct. 2022-Dec. 2022

Numerical Methods and Experiments course project, Skill: MATLAB, Python

- Investigated the use of adaptive quadrature algorithms for the numerical approximation of integrals, with a focus on their application to undamped spring systems
- Proposed and analyzed the performance of two adaptive quadrature algorithms - the adaptive trapezoidal rule and the adaptive Simpson's rule for the efficient and accurate approximation of integrals
- Explored the potential applications of these algorithms in the context of undamped spring systems, where they could be used to solve complex equations of motion and determine system parameters

A Research on the Development of Digital Economy in Chengdu-Chongqing Economic Circle based on PVAR and Deep Learning Models

National University Student Statistical Modeling Competition Project, Skills: Python, Stata, R Mar. 2023-June. 2023

- Obtained the comprehensive evaluation index of digital economy through principal component analysis and the improved entropy evaluation method
- Built PVAR to analyze the influence of per capita gross regional product, urbanization rate, Theil index and green overage

of built-up areas on the digital economy development

- Verified that Bayesian optimization-based LSTM neural network model performed well in retrospectively predicting the digital HP financial index and per capita gross regional product

SKILLS & OTHER

Computer skills: Python, R, Stata, SAS, MATLAB, Origin.

Language: Chinese Mandarin (native), English (fluent).

Honors: University-level Special Scholarships (2021, 2022 and 2023)

Professional First-Class Scholarship (2021, 2022 and 2023)

National Inspirational Scholarship (2021 and 2022 top 3%)

Second prize of the National University Student Statistical Modeling Competition (2022 and 2023)

Meritorious of International Mathematics Modeling Contest for Higher Education (2023)

Second Prize in the China Undergraduate Mathematical Contest in Modeling (CUMCM 2023 winning rate: 2.2%)