CHANGKAI ZHOU

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RESEARCH INTERESTS

The Intersection of Machine Learning, Bayesian Statistics, and Neuroscience
- Gaussian process regression
- Bayesian neural networks
- Bioinspired learning

Statistical Models for Complex Systems
- Non-equilibrium phenomena such as non-normality and asymmetry
- Statistical methods for dynamic systems

EDUCATION

Hangzhou Dianzi University, China *Sept. 2019 - Now*
Master of Science in Applied Statistics *GPA: 3.7 / 4.0*

- Ranking: 1/9 in Professional Courses
- Supervisor: Wensheng Wang
- Courses: Theory and Application of Statistical Model, Multivariate Statistical Analysis, Machine Learning, Mining Technology and Application of Data, Applied Time Series Analysis, Research Methods of Qualitative Data, etc.

Hangzhou Dianzi University, China *Sept. 2015 - Jun. 2019*
Bachelor of Economics in Finance (Mathematics and Applied Mathematics Compound) *GPA: 3.0 / 4.0*

- Courses: Applied Random Process, Numerical Analysis, Operations Research and Optimization, Differential Equations in Mathematical Physics, Econometrics, Mathematical Modeling, Probability and Statistics, etc.

JOURNAL PUBLICATIONS

A Two-Layer Aggregation Model with Effective Consistency for Large-Scale Gaussian Process Regression
Wensheng Wang, Changkai Zhou*
Engineering Applications of Artificial Intelligence (Impact Factor: 6.212), Volume 106, November 2021, 104449.

- I faced a comprehensive challenge on ideas, theoretical derivation, experimental design, and paper writing and revision. And I have overcome technical difficulties and emotional depression in a year and a half. This experience has strengthened my confidence to continue research.
- It takes much time from the rough idea to the published paper. So the best way for me to get to the forefront of research is to enter a research group with a wide range of interests and participate in more seminars.
- The innovation of this paper needs to be improved, which also spurs me to pursue high quality of research.

Temporal Moduli of Non-Differentiability for Linearized Kuramoto–Sivashinsky SPDEs and Their Gradient
Wensheng Wang*, Changkai Zhou
Symmetry (Impact Factor: 2.713), Volume 13, July 2021, 1306.

- The work of reviewing and editing this paper deepened my mind of sticking to the theoretical foundations of mathematics.

WORKING PAPERS

Variational Model Selection for Sparse Heteroscedastic Gaussian Process Regression
Wensheng Wang, Changkai Zhou*
Submitted to *Knowledge-Based Systems* (Impact Factor: 8.038) in January 2021.

- I almost completed the idea, theory, and experiments independently for this great work that I thought. To break through my bottleneck, I also need to continue learning and the guidance of a wide-sighted supervisor.
- Although the theory and model of this paper were from the latest papers, the mathematical foundation of the theory was published in 20 years ago or earlier. I learned from it the importance of classical ideas and literature.

The Relationship Between Gaussian Process Regression and Other Models
Changkai Zhou*, Wensheng Wang
Working paper, 2021, Part I of my Master's Thesis *Gaussian Process Regression Research for Big Data*.

- The origin of this work is the relationship between Gaussian process regression and Kriging (a classic geostatistical model), so I began to focus on classical knowledge.
- The part about neural networks in this work aroused my great interest. Therefore, I urgently need to study more extensively.

A Review of Gaussian Process Regression for Big Data
Changkai Zhou*, Wensheng Wang
Working paper, 2021, Part II of my Master's Thesis *Gaussian Process Regression Research for Big Data*.

- This work originated from the insufficient understanding of the existing papers on Gaussian process for big data. It made me more clear about the direction for further research.
- The process is a challenge for me to sum up knowledge and find connections. I have read more than 100 references to tell myself that I can do it.

Predictive Analysis of Customer Churn Early Warning and Return to Factory Based on XGBoost
Changkai Zhou*, Huasong Hu, Xiaoying Chang
Competition paper of *National Graduate Case Competition for Master of Applied Statistic* (In Chinese), 2020.

- I came into contact with a series of data processing procedures. And I used different costs for different samples to solve the imbalance that I am interested in. Although I was confident in the improved model, this experience made me re-recognize the importance of data processing.

Financial Risk Early Warning Model Based on Machine Learning
Wensheng Wang, Changkai Zhou*
Submitted to *Times Finance* (In Chinese), 2020.

- This work was based on my interest (the paper of the professor I am interested in), research (Gaussian process regression), course (financial data analysis), and observation (the financial crisis occurred during the outbreak of COVID-19). I was satisfied with the idea, but inadequate understanding of the application domain bounded me.

Business Cycle and Economic Chaos
Changkai Zhou
Course paper of *Statistical Analysis of the Macroeconomic* (In Chinese), 2020.

- This was the first time I have tried to write a review. The significant difference in business cycle theories between different schools implied a lot of room for the development of complex systems.
- I discovered the necessity of expanding statistical tools in the process of searching for economic chaos, because chaos is far from economics in books.
- I was invited to give a 45-minute speech in the course.

Statistical Analysis of Typhoon Disaster Loss in Zhejiang Province Based on Wrapped Gaussian Process Regression
Wensheng Wang, Changkai Zhou*
Submitted to *Statistical Science and Practice* (In Chinese), 2019.

- I learned that application is an excellent way to understand the theory. And I made a lot of improvements on the model. But it is difficult to apply knowledge to practical problems well.

Statistical Analysis of Global Warming and Local Extreme Cold Phenomenon
Qian Liu*, Changkai Zhou, Xiaoying Chang
Competition paper of *National Post-Graduate Mathematical Contest in Modeling* (In Chinese), 2019.

- This work taught me that it is impossible to solve application problems without mastering enough theoretical knowledge.

The Relationship Between Stock Liquidity and Corporate Value in China
Changkai Zhou
Undergraduate Thesis (In Chinese), 2019.

- I initially completed the process of hypotheses, design indicators, model construction, and testing. Because of the lack of theory and application, I participated in a graduate program.

Pricing Analysis of the Task of "Taking Photos to Make Money"
Henghao Gu*, Xing Zhou, Changkai Zhou
Competition paper of *Contemporary Undergraduate Mathematical Contest in Modeling* (In Chinese), 2017.

- The lack of theoretical knowledge makes practical problems difficult to manipulate.

Optimal Design of Medication Regimen for the Treatment of Mycoplasma Pneumonia
Changkai Zhou*, Hongxiang Chen, Shiyu Zhang
Competition paper of *Campus Mathematical Contest in Modeling* (In Chinese), 2017.

- We established a differential equation model of human blood drug concentration w.r.t. time after oral medication (or intravenous injection), and provided an optimized dosing plan. Although I got the highest award based on it, the conditions of the given topic make this content still far away from the real application.

WORK EXPERIENCE

ICT Talent Learning and Development Business, Zhejiang Telecom Industrial Group Company Holdings
AI Algorithm Engineer *Apr. 2021 - Sept. 2021*

Migrated code of CV and NLP online learning courses from GPU to NPU

- I learned the theory (e.g., long short-term memory networks) and application (e.g., image style transfer) of neural networks and the use of TensorFlow. And I have experienced the impact of hardware on algorithm implementation.

Developed and debugged a lane line recognition algorithm for the intelligent transportation project
Deployed a face recognition algorithm at a demo board

- I have learned that industrial applications not only pay attention to the theory of models, but also pay attention to the efficiency of implementation.

Labeled data of traffic sign images for the intelligent transportation project

- I realized that high-quality data is essential but challenging to obtain. Besides the model, other important factors will affect the practical application.

Recorded comprehensive introduction courses of reinforcement learning (First Edition)

- I learned theories about reinforcement learning (e.g., deep Q learning and actor-critic algorithms). And I felt the novelty that is different from the traditional statistical model.

Communicated in group exchange meetings

- Others shared mostly about neural networks, which made me consider industrial applications of Gaussian process regression, the superiority of uncertainty quantification, and the connection between neural networks and Gaussian process regression.

HONORS & AWARDS

2021

- (2nd Prize) Postgraduate Academic Scholarship, School of Economics, Hangzhou Dianzi University.
- Henry Dai Special Fund for Innovation and Entrepreneurship, School of Economics, Hangzhou Dianzi University.
- (Top 5%) National Postgraduate Scholarship Honorary Nomination, School of Economics, Hangzhou Dianzi University.

2020

- (2nd Prize) Postgraduate Academic Scholarship, School of Economics, Hangzhou Dianzi University.
- (3rd Prize) National Graduate Case Competition for Master of Applied Statistics (MAS), National MAS Education Steering Committee.

2019

- (2nd Prize) Postgraduate Academic Scholarship, School of Economics, Hangzhou Dianzi University.
- (Honorable Mention) National Post-Graduate Mathematical Contest in Modeling, China Academic Degrees Graduate Education Development Center.

2017

- (3rd Prize) Eleme Scholarship, School of Science, Hangzhou Dianzi University.
- (3rd Prize) Contemporary Undergraduate Mathematical Contest in Modeling, China Society for Industrial and Applied Mathematics.
- (1st Prize, 1/33) Campus Mathematical Contest in Modeling, School of Science, Hangzhou Dianzi University.
- (5th Place) Men's Group A 54kg in Chinese University Student Taekwondo Championship (Competitive), Federation of University Sports of China.

ACTIVITIES

2020

- Participant, the 2020 Chinese Engineering Probability and Statistics Academic Annual Conference, Hangzhou, China, December 4-6.
- Participant, the 2020 Gaussian Process Summer Schools, Virtual Event, September 14-17.
- Temporary Tutor for College Mathematics Courses, August.
- Assistant of Graduation Thesis Guidance for Undergraduates, School of Economics, Hangzhou Dianzi University, June.

2019

- Research Assistant, Internet Public Opinion Early Warning System Design Team, School of Economics, Hangzhou Dianzi University, September-December.
- Person in Charge, the 2019 Class of Master of Applied Statistics, School of Economics, Hangzhou Dianzi University, September 2019-Now.

2017

- Captain, the Taekwondo School Team, Hangzhou Dianzi University, May 2017-September 2018.
- Temporary Coach, the Taekwondo School Team, Hangzhou Dianzi University, September 2017-September 2018.

2016

- Volunteer, the E-Commerce Health Project, Ningbo, China, July 11-14.
- Minister, the Student Union, School of Science, Hangzhou Dianzi University, September 2016-June 2017.

2015

- Group Member, the Student Union, School of Science, Hangzhou Dianzi University, September 2015-June 2016.
- Group Member, the Taekwondo School Team, Hangzhou Dianzi University, September 2015-May 2017.

TECHNICAL SKILLS

Intermediate level:	MATLAB, Python, R, TensorFlow
Beginner Level:	LaTeX, Lingo, Ubuntu, MySQL, Eviews, Stata, Jupyter