RUZHANG ZHAO

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EDUCATION

Tsinghua University (THU), Beijing, China *Aug. 2015-Jul. 2019(expected)*
Department of Mathematical Sciences GPA: **3.79/4.00**
Bachelor of Science in Pure and Applied Mathematics major GPA: **3.90/4.00**

Relevant Courses: Probability Theory(A), Functional Analysis(A), Statistical Inference(A-), Applied Stochastic Processes(A), Linear Regression(**A**+), Methods of Optimization(**A**+), Complex Analysis(A)

PUBLICATIONS AND MANUSCRIPTS

[1] **Zhao, R.**, Yang, L., "Modeling of the HFMD with the Carrier Population." *International Journal of Applied Physics and Mathematics (IJAPM), ISSN: 2010-362X.* (**in press**)

[2] **Zhao, R.**, Fang, Y., Horn, B.K.P., "A Simple Change Comparison for Image Sequence Based on Relative Mutual Information." In *IEEE UV 2018*, MIT Boston, USA. (**accepted**)[arXiv]

[3] **Zhao, R.**, et al., "Protective Quarantine Model of Hand-Foot-Mouth Disease." In *AMS 2019 Oral*, Kuala Lumpur, Malaysia. (**accepted**)

[4] Li, J., Liu, H., Lv, Z., **Zhao, R.**, Deng, F., Wang, C., Qin, A., Yang, X.,"Updating PM2.5 Health Effects in China with New Exposure Estimation and Local C-R Functions." *Environmental Pollution.* (**SCI**)[PDF]

[5] Li, J., **Zhao, R.**, Ouyang, Y., Li, M., "A Bottom-Up Design Model for Improving Efficiency of Transit System." In *IEEE UV 2018*, MIT Boston, USA. (**accepted**)

[6] **Zhao, R.**, Hong, P., Liu J., "R package: Immigrate: Iterative Max-Min Entropy Margin-Maximization with Interaction Terms for Feature Selection." [CRAN]

[7] **Zhao, R.**, Hong, P., Liu J., "IMMIGRATE: A Margin-based Feature Selection Method with Interaction Terms." (under review at AISTATS 2019)[arXiv]

[8] **Zhao, R.**, Li, D., "Linear Regression with AR(∞) Errors under Constrained Coefficients applying Maximum A Posteriori Estimation." (to be submitted to Journal of Econometrics)

[9] **Zhao, R.**, et al., "Continuous Inoculation Model of HFMD." (to be submitted to Mathematical Biosciences)

RESEARCH EXPERIENCES

Iterative Max-Min-Entropy Margin-Max with Iteration Term Jul. 2018 - Sep. 2018
Advisor: Prof. Jun S. Liu, Dept. of Statistics, ***Harvard*** *University; Prof. Pengyu Hong, Dept. of Computer Science,* ***Brandeis*** *Univeristy*

· Proposed innovative IMMIGRATE algorithm for feature selection with interaction terms and imIM4E for feature selection with margin-quality. Designed new classification method for IMMIGRATE.
· Compared the results of IMMIGRATE, imIM4E with about 20 classifiers on UCI datasets while IMMIGRATE outperforms in most times.
· Complete the R package for IMMIGRATE, imIM4E and some other margin-based methods. [CRAN]

Classification for Coronary Heart Disease Dataset Jul. 2018 - Sep. 2018
Advisor: Prof. Jun S. Liu, Dept. of Statistics, ***Harvard*** *University*

· Implemented SODA, Logistic LASSO Regression and etc. Compared the performance of classification for Coronary Heart Disease high-dimensional dataset among about 10 methods.
· Designed innovative Deep-learning framework for raw audio files with small sample size and compared the results of deep-learning with statistical methods. Obtained satisfactory results.

Existence of DNA Sequences based on K-mer Natural Vector Method Oct. 2018 - now
Advisor: Prof. Stephen Shing-Toung Yau, Dept. of Mathematical Sciences, ***THU*** *and* ***UIC***

- Developed Advanced Swarm Particle Optimization Algorithm for finding global minimum to achieve breakthrough for the project which was stuck for several months.
- Proposed an innovative natural vector method which outperformed original one in existence testing.

Change Comparison for Image Sequence Jan. 2018 - Feb. 2018
Advisor: Prof. Berthold K.P. Horn, Dr. Yajun Fang, CSAIL, ***MIT***

- Proposed CCUC method applying uncertainty coefficient to compare change between image sequences.
- Implemented CCUC on comparable image sequences and showed it is applicable in real situation.

Comprehensive Evaluation for Transit-Oriented Development Jan. 2018 - Feb. 2018
Advisor: Prof. Berthold K.P. Horn, CSAIL, ***MIT****; Dr. Faan Chen,* ***Harvard University***

- Combined Density, Diversity and Design principles with Rank sum ratio(RSR) method to establish a new indictor for ranking Transit-Oriented Development level, which outperforms the results of RSR.
- Analyzed the relationship between built environment and vehicles miles traveled by Tobit Regression and Structural Equational Method on Shanghai Road datasets.

Linear Regression with AR(∞) Errors under Constrained Coef. Nov. 2017 - Mar. 2018
Advisor: A/Prof. Dong Li, Center for Statistical Science ***THU***

- Applied maximum a posterior estimation to obtain the estimation of regression coefficient and coefficients of ARCH(∞) errors.
- Computed an upper bound for convergence rate of the coefficients of AR(∞) errors under elliptical constraint. Applied constrained estimator under euclidean norm to evaluate consistency results.
- Ran simulation to show the robustness of the new estimation.

Modeling of the Hand-Foot-Mouth-Disease (HFMD) related topics Dec. 2016 - Jun.2017
Advisor: A/Prof. Lijun Yang, Dept. of Mathematical Sciences, ***THU***

- Developed an innovative infectious model including people carrying pathogen as new research subject when analyzing distribution channel and analyzed the stability of equilibriums by Liapunov function.
- Proposed new models using the continuous/impulsive inoculation analyzed the stability of equilibriums, and obtained the minimum/maximum inoculation rate under continuous/impulsive inoculation.
- Simulated models under different conditions, which supports the stability analysis well.

ACADEMIC ACHIEVEMENTS AND LEADERSHIP

Honors: ***1.*** Meritorious Winner in the MCM/ICM Contest (2017);
2. Bank of Tokyo-Mitsubishi UFJ Scholarship (2017) for Excellent Comprehensive Performance (**1/92**).
3. Qualcomm Scholarship (2017) for Outstanding Achievements in Scientific Research in THU (**50/3000**).
4. Evergrande Scholarship (2018) for Excellent Comprehensive Performance (**2/92**).
5. Excellent Project of Scientific Research Program in THU (**20/3000**, only 1 from Dept. of Math).
Fellowships: ***1.*** Membership of International Academy of Science and Engineering for Development;
2. Fellowship of Spark Talents Program, for Excellent Performance on Research at THU (top 48 in THU, top 1 and only 1 in Dept. of Math);
Leadership: ***1.*** Minister, Ministry of Sports of Student Union of Dept. of Math(Aug.2016 - Jun.2017);
2. Held a Marathon Game with 2000+ Participants. Held 100+ Basketball Matches in THU;
3. Be the Captain of Class Football Team and Lead Football Team to Rank 16/100+ twice in THU.

PROFESSIONAL SKILLS AND MISCELLANEOUS

Computer Languages	Python, R, Matlab, C/C++, Java, MATLAB
Software & Tools	LaTeX, Microsoft Office, Markdown, vim, git
Standardized tests	GRE General: Verbal 161 (88%) + Quantitative 170 (99%)
	TOEFL: 107/120 (Reading 28, Listening 27, Speaking 24, Writing 28)