KUAN YANG

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EDUCATION

Cuiying Honors College[1] & School of Mathematics and Statistics, Lanzhou University **Sept. 2017 - Jun. 2021**

- **Candidate of China's Top - Notch Undergraduate Training Program**
- Combined modules in Pure and Applied Mathematics: Mathematical Analysis (92), Advanced Algebra (90), Theory of Probability (91), C++ Programming (91), Operational Research (A+), Abstract Algebra (95), Numerical Analysis (96), Graph Theory (95), Stochastic Process (91), Fundamentals of Topology (Algebraic Topology, 93)
- Solid **quantitative background** with flexible **cross-disciplinary** application
- **Average: 91.43, Rank: 3 / 184(Three Year Avg.), 1 / 184 (Penultimate Year)**

School of Mathematics, University of Leeds **Sept. 2019 - Feb. 2020**

- One of two nominee of **Ministry of Education Outstanding Undergraduate Study Abroad Program** in Lanzhou University
- 85 Credits of modules in Level 2 - 3: Metric and Function Spaces (98), Statistical Methods (98), Analytic Solutions of Partial Differential Equations (92), Computational Mathematics (91)
- Preparation for **research career** in **Stochastic Dynamics and Statistics**
- **Average: 90.34**

Massive Open Online Course

- **Introductory Lectures on Economics, Prof. Zhaofeng Xue, Peking University** **Jun. 2017- Sept. 2017**
  Fundamental principles and theories on finance and economics, enrich basis for **cross-disciplinary application** of Mathematics
- **Coding with C Programming Language, Prof. Kai Weng, Zhejiang University** **Feb. 2018- Apr. 2018**
  Structured **coding logic** and methods with advanced algorithm introduced

RESEARCH PROJECT

Study on Resistive Switching Behavior of ZnO RRAM by Numerical Simulation **Tutor: Prof. Ying-tao LI and Prof. Jing QI**

Lab of Prof. Deyan He, School of Physical Science and Technology, Lanzhou University *Sept. 2018 to present*

- Professional and **long-term experience** on **cross-disciplinary stochastic modelling** based on application of mathematics and learned courses including Stochastic Process, C/C++ Programming Language, Mathematical Analysis
- **Aimed** at resistive switching **mechanism explanation** and optimization for cycle-to-cycle variability for mass production
- **Novel** for **updating traditional kMC to Markov Chain model and Markov Random Field** as **stochastic nature** of ion flux recognized ; **Dynamical Revised Drift-Diffusion Model based on PDE and SDE**
- **Achieved systematical** explanation for resistive switching behavior ; **Better precision** compared with existing mainstream models ; Explained device failure, impact of electrode material and gas bubble phenomena which barely **analyzed theoretically** before
- With models and explanation reported as **paper** and **invited conference presentation** ; Won grants and award by University
- Sought financial sponsor and performance test facility for the team voluntarily

Introductory Study on Spectral Theory **Tutor: Prof. Alexander STROHMAIER**

School of Mathematics, University of Leeds *Jul. 2020 to present*

- First research in advanced pure mathematics ; Interpret abstract content **straightforwardly** by **graphical depiction** such as iso-value map ; **In-depth understanding towards mechanism of dynamical systems** through spectra and eigenfunctions
- **Aimed** at learning pure mathematics together with numerical analysis ; focus on eigenvalues and the Dirichlet to Neumann map ; Obtaining new techniques including **Calderon projectors, Dirichlet to Neumann map**, some elements of **pseudodifferential operators** and a bit of intuition about the **meaning of eigenfunctions** ; **Generalization and classification for random systems**
- **Progressed** by reading Partial Differential Equations I by Michael Taylor, Spectral Theory and Differential Operators by Brian Davies along with some course notes; Numerical Exeriments of spectra and eigenfunctions and investigate **impact of domain, boundary condition** on systems ; Picked up coding by **Freefem++**
- **Will expand** the work to more types of Differential Equations ; **Reproduce similar things in random setting to classify and relate stochastic systems**

Innovative Research on Evidence-Based Economics **Tutor: Prof. Lili WEI**

Institute of Green Finance, Lanzhou University *Feb. 2018 - Oct. 2018*

- **Aimed** at analysis of core factors for poverty and fundamental five alleviation method applied by government by Evidence-Based tools
- **Completed correlation analysis and visualization** of importance for certain keywords through massive literature reading and Graph Theory ; Independently writing codes by C++ to arrange and format literature for the whole research team

Analysis on the Stability and Spatial Evolution of Boxed Pigs **Tutor: Prof. Ruiwu WANG**

Research Center for Ecology and Environmental Sciences, Northwestern Polytechnical University *Aug. 2018 - Feb. 2019.2*

- **Game Theory** research by cooperative team work to propose methodology to maximize income and **expanded** for practical usage
- **Novel** for introducing **different weights of power** for pigs compared with basic models, and calculate the estimated income under various circumstance

[1]Cuiying Honors College was founded within Lanzhou University as part of China's Top-Notch Undergraduate Training Program supported by central government. This pilot plan aimed at fostering future scientists with exceptional talent in fundamental disciplines. Every year, this national program admits only the best 1,000 students among the 6 million new undergraduates across China. Details: http://chc.lzu.edu.cn

- **Achieved stable solutions for replicator equations** and the results for spatial evolution
- **Will** be submitted to Physical Review E as 3rd author

CONFERENCE PRESENTATIONS

- Analysis on the resistive switching behavior and the morphology of conductive filament of RRAM by Markov Random Field simulation, 22nd. Chun - Tsung Fellow Annual Conference, Fudan University, **Plenary Talk**, Nov. 2020, Shanghai, China
- Eigenvalue problems on manifold and changes of mesh, MEsh Generation and Applications Symposium (MEGAS 2021), Chinese Aerodynamics Research Society, **Oral Presentation**, May. 2020, Hangzhou, China
- A comprehensive stochastic modeling for the effect of Cu ions and Oxygen Vacancies in Cu/ZnO/Pt RRAM, CIMTEC Congress 2021, IEEECSC, **Oral Presentation**, Jun. 2021, Montecatini Terme, Italy
- 11th. Representative Congress and 15th. Symposium of Operations Research Society of China, Operations Research Society of China, Oct. 2020, Hefei, China

JOURNAL PAPERS

- Anatomy of Resistive switching Behavior in Titanium Oxide Based RRAM Device
  Kuan YANG, Liping FU, Junhao CHEN et al, IEEE Transaction on Electron Device (TED-2021-01-0037-R), Under Peer Review
  Brief: **Modelling** impact of different initial states on the electrical performance and with experiments presented for verification
- The Conduction Mechanism Explanation Under Co-existence of Cu Atom and Oxygen Vacancy in Zinc Oxide Based RRAM By by Markov Random Field Simulation
  Junjie HU, **Kuan YANG, (co-first)**, Junhao CHEN et al, Journal of Physics D: Applied Physics (JPhysD-127805), Under Peer Review
  Brief: **Markov Random Field** based Model,**hasn't been reported in Physics before**, **simplifies calculation** and point out complementary role in conduction of both copper atoms and oxygen vacancy
- Revelation of the Mechanism of a High-Uniform Unidirectional Volatile Switching Device
  Yingtao LI, **Kuan, YANG, (co-first)**, Liping FU et al, submitted to Advanced Functional Materials (adfm.202101331)
  Brief: **Combined experiments and simulation** of mechanism explanation for unidirectional volatile behavior in multilayer device
- Analysis on the multi-level storage of Ag/ZnO/Ag nanowire by Markov Chain Model
  Kuan YANG, Junjie HU, Junhao CHEN et al, in progress
  Brief: Illustrate **schematics of morphology** of conductive filament under different applied bias, based on which propose conduction mechanism for multi-level stages in resistance
- Analysis on Gas Bubble Phenomena and Resistive Switching Mechanism in Alumina
  Liping FU, **Kuan YANG**, Junhao CHEN et al, in progress
  Brief: Inspired by gas bubble on electrode after testing, simulation reasons it as gathering of oxygen ions by applied bias

GRANTS, AWARDS AND SCHOLARSHIPS

- **China Top-Notch Undergraduate Training Program Funding** — **Ministry of Education**
  2% — *RMB 150,000 = GBP 16,600*
- **Outstanding Undergraduate Study Abroad Scholarship** — **China Scholarship Council**
  2 of university — *RMB 80,000 = GBP 9,000*
- **Hui-Chun Chin and Tsung-Dao Lee Chinese Undergraduate Research Endowment**[2] — **Top Research Grants in University**
  Ranked 1st among applicants, 1% — *RMB 15,000 = GBP 2,150*
- **National Scholarship** — **Ministry of Education**
  1 of grade, < 1% — *RMB 8,000 = GBP 900*
- **Contemporary Undergraduate Mathematical Contest in Modelling** — **China Society for Industrial and Applied Mathematics**
  < 1%, Ranked 1st provincially for the selected problem — *National Second Prize*
- **University of Leeds - CSC Scholarship** — **University of Leeds**
  < 1% — *GBP 830*
- **Cuiying Foundation with University Level Excellence Recognition** — **Lanzhou University**
  Ranked 1st and received extended sponsorship — *RMB 8,000 = GBP 900*
- **Top Student Award** — **Lanzhou University**
  Ranked 1st in the class, < 10% — *RMB 1,000 = GBP 110*

PROFESSIONAL QUALIFICATIONS

- **Chun-Tsung Fellow** — **Since Jun. 2020**
- **Member of Operations Research Society of China** — **Since Oct. 2020**
- **Reviewer** — **Jul. 2020 - Aug. 2020**
  Assist Teachers in our Lab for review task for Journal of Computer Engineering and Science

INTERNSHIP

Office Assistant for General Affairs — **Cuiying Honors College, Lanzhou University**
Report to: Executive Dean, Prof. Deyan He and School Mgr. Ms. Yan Fang — *Sept. 2018 - present*

- **Responsibility** of general business travel arrangement, financial affairs, foreign affairs and drafting official document
- **For Bizness Travel** obtained lowest negotiated rate among same scale company with hotels including Marriott, IHG and Hilton ; Cut down 20% cost in Australia travelling by leading strategic cooperation with Quest on William

[2]This Endowment was donated to six universities including Lanzhou University, Peking University and National Tsinghua University by the Nobel Prize Winner Dr. Tsung-Dao Lee, only 40 quota per year available for best students in research, details: https://en.wikipedia.org/wiki/Tsung-Dao_Lee#Educational_activities

- **Events Arrangement** of preparation and operation for **two academic conference** ; Cut down cost for conference but maintain the quality of the service ; Reception for famous scholars including CAS fellow Prof. Yigong SHI
- **Foreign Cooperation** with external professors and **Inviting Talks from scholars from University of Leeds**; **Raised donation** from Quest on William to set up foundation and accomplished first issue of **AUD 1,000 donation**

Mathematical Analysis for Sales, Marketing and Quality Control for Industries **Sept. 2017 - present**
Analysis for Sales and Marketing **MaxMara, with Delia Giangregorio (COO, China)**
- Classification of customers by **data characteristics**
- **Applied** Monte Carlo model with parameters **formulating purchasing power, price sensitivity, income scale**, etc. ; Try to transfer **Drift - Diffusion Model** and **SIR model** for **spatial evolution** of customers

Analysis on the Warranty and After-Sales Problems **Tods, with Amanda Chen**
- **Predicted** warranty service through **survival analysis and statistics**
- **Achieved Pricing Solution** for extended warranty ; Suggestions of optimization in the covering period and content for warranty to minimize the after-sales cost ; Efficient workflow to spot quality flow
- **Applied Pricing Theory** , **Sampling Theory** , Basic **Continuous Optimisation**

Pricing Strategy and Revenue Analysis **Marriott Hotels Group & Quest on William Hotel**
- **Pricing** based on customer preference and revenue prediction under COVID-19
- **Achieved behavioural models** of leisure and business guests to analyze the preference ; Based on which proposing directional offer and loyalty program to stimulate consumption and attract targeted guest on the lowest cost ; **Simulate the guest reaction to COVID-19**, with parameters including tolerance for cost and measurement to describe the eagerness to travel ; **Obtained remuneration from Quest on William and donated to University**

Voluntary Work **over 180 hours**
Local epidemic prevention **Feb. 2020 - Apr. 2020**
- **Estimated** evolution of local epidemic spreading by **revised SIR dynamical and data-driven models**
- Coding work of database to **track exposed ones**
- Put forward efficient positive testing workflow from **Operations Research** for COVID-19

Voluntary interpreter in Lanzhou Urban Planning Exhibition Museum **Once per Semester**
- Held the introductory introduction for overseas guests
- Learn the concerning factors for urban structuring and history of the city construction
- Obtain practical utilization and interpretation of the **Shortest Path Problem** in the planning of roads

INTEGRATED SKILLS

- Coding: Proficient: C/C++, Linux/UNIX, LaTeX, Python, MATLAB; Intermediate: R, HTML, Markdown, Freefem++
- Language: Mandarin(Native), English(Fluent, IELTS:7.5 (R: 9.0, L: 8.5, S:6.5, W:6.5))
- Others: Violin, HPC operation
- GRE: (Q:169, V:154, W:3.5)

REFEREE

- **Professor Alexander Strohmaier** **Academic and Research**
  Chair in Analysis, University of Leeds *A.Strohmaier@leeds.ac.uk*
- **Professor Deyan He** **Academic, Research and Professional Skills**
  Associate Provost & Executive Dean of Cuiying Honors College, Lanzhou University *hedy@lzu.edu.cn*
- **Professor Wantong Li** **Academic**
  Dean of School of Mathematics and Statistics *wtli@lzu.edu.cn*
- **Professor Yingtao Li** **Academic, Research**
  Professor in Physics, Lanzhou University *li_yt06@lzu.edu.cn*
- **Professor Jing Qi** **Academic, Research**
  Professor in Physics, Lanzhou University *qijing@lzu.edu.cn*
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  Associate Professor in Applied Mathematics, Lanzhou University *lixianyue@lzu.edu.cn*
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  Lecturer in Statistics, University of Leeds *L.Cutillo@leeds.ac.uk*
- **Ms. Yan Fang** **Professional Skills**
  School Manager of Cuiying Honors College, Lanzhou University *fangydhh@lzu.edu.cn*