Yuchen Ge

Oxford, United Kingdom — lina4506@ox.ac.uk — (44) 7421801229 — https://yuchenge-am.github.io/

EDUCATION

Shandong University, Jinan, China — September 2019 - June 2023
Bachelor of Science with Honors — GPA: 3.98 (out of 4.00)
Major: Mathematics and Applied Mathematics — Class Rank: 1st (in a class of 130)

University of Oxford, Oxford, United Kingdom — October 2023 - October 2024
MSc in Mathematics and Foundations of Computer Science
Major: Mathematics and Computer Science

EXPERIENCE

Peking University — Beijing, China
Research Assistant — July 2023 - Ongoing
Supervisor: Prof. Guoliang Wang, School of Mathematics, Beijing Institute of Technology

- Aimed to study the non-e-positivity of Spider Graphs
- Transformed the non-e-positivity problem to the problem of number theory

Semitronix — Hangzhou, China
Mathematical Consultant — September 2022 - November 2022
Supervisor: Dr. Christine Tan, Vice President, Semitronix Corporation

- Solved non-convergence problem for simulation of chip design
- Studied research literature in Chemical Mechanical Polishing (CMP) process and FFT/IFFT techniques in a month and invited two electronics graduates to form a research group
- Optimized the algorithm by adjusting the iteration equation and proposing the matrix normalization technique

PROJECTS

Observational Study with Multi-valued Treatment — New York, United States
Supervisor: Prof. Siyu Heng, Department of Biostatistics, New York University — July 2023 - Ongoing

- Aimed to study the observational study with multi-valued treatment
- Designed new test statistic for general observational study

Limiting Capacity of Finite State Channels — Jinan, China
Supervisor: Prof. Jun Chen, Department of Electrical and Computer Engineering, McMaster University — July 2023 - Ongoing

- Aimed to study the limiting capacity of finite state channels
- Designed new computing algorithms for the limiting capacity of finite state channels

Algebra for Machine Learning and Stochastic Optimization — Montréal, Canada
arXiv Link: `https://arxiv.org/abs/2303.06724` — July 2022 - Ongoing
Supervisor: Prof. Janosch Ortmann, Prof. Walter Rei, Département d'analytique, Opérations et Technologies de l'information, Université du Québec à Montréal

- Aimed to apply algebraic methods to reduce the complexity of large-scale stochastic optimization problem
- Developed an unsupervised machine learning approach that clusters these scenarios into similarity groups measured on the basis of solutions characterizing them
- Used Grobner Basis, Graver Basis and combinatorial methods to design new algorithms and reduce the computational complexity of our machine learning approach
- Implemented by Python and the algorithm's numerical result was much faster than existing algorithms

Concentration Inequalities for Discretization Errors of Stochastic Integration — Jinan, China
Supervisor: Prof. Hanchao Wang, School of Mathematics, Shandong University — January 2022 - June 2022

- Aimed to prove that the difference between the discretized approximation and the true value of Ito integral with Jumps is of sub-Gaussian distribution.
- Developed approaches of Ito's formula and construction of exponential martingale to study the exponential inequality of the discretization error
- Applied Daniell's mean, Picard's norm and functional inequalities in L_p-space to bound the discretization error
- Studied the real-world application to the hedging errors arising from discrete-time trading, mathematically expressed as the error rooting from the discretization of the stochastic integral

Breast Cancer Classification Based on Various CNNs and Classifier — Cambridge, United States
Paper Link: `https://ieeexplore.ieee.org/abstract/document/10071319` — April 2022 - July 2022
Supervisor: Prof. Mark Vogelsberger, MIT Kavli Institute for Astrophysics and Space Research

- Aimed to train a neural network for eight-classification of breast cancers and develop a conversational agent for patients based on highly accurate training datasets

- Used VGG-16, VGG-19, Xception, ResNet50, Inception-V3, and Inception-Resnet-V2 to extract features
- Employed fully connected layer, logistic regression, and SVM to classify breast cancers
- Designed some tricks for performance, including cyclic learning rate decay policy, finding local optimal solutions, and etc
- Obtained the optimal accuracy rate of 93.9% on eight-classification (much better than existing results) and developed a chatbot based on TKinter

SKILLS

- **Mathematics: geometry** (topology, smooth manifold, algebraic topology), **algebra** (linear algebra, commutative algebra, homological algebra, representation theory), **analysis** (mathematical analysis, real/complex analysis, ODE, PDE, analytic number theory), **probability and statistics** (measure theory, stochastic calculus, regression analysis, mathematical statistics, causal inference), **combinatorics** (probabilistic, algebraic combinatorics), **applied maths** (statistical learning theory, numerical analysis, stochastic and combinatorial optimization)
- **Programming:** Latex, Python, C++, R, Matlab, Java, Maple, Octave, Sage, HTML
- **Software:** Jupyter Lab, SageMath, Wolfram Alpha, Macaulay2, Maple, Sublime Text, Visual Studio, Matlab, Lingo, AnyLogic, Keil MDK, GitHub Desktop, Excel, Word, PowerPoint, IBM Db2
- **Communication:** English (TOEFL iBT 108, GRE 333), French (basic communication)