Yuchen Ge

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EDUCATION

University of Oxford — Oxford, UK
MSc in Mathematics and Foundations of Computer Science — *Oct 2023 - Oct 2024 (Expected)*

Shandong University — Jinan, China
BSc (Hons) in Mathematics and Applied Mathematics, GPA: 3.98 out of 4.00 — *Sep 2019 - Jun 2023*

HONORS AND AWARDS

Shandong University President's Award (25 out of 10265) — *2022 - 2023*
China National Scholarship — *2019 - 2022*
Shandong University Advanced Individual in Innovation and Entrepreneurship — *2019 - 2020*

RESEARCH WORK

Ge, Y., Ortmann, J., Rei, W. (2023+) "Gröbner and Graver Bases for Calculating Opportunity Cost Matrices." [Paper Link]
Ge, Y., Liu, K., et al. (2022) "Breast Cancer Classification Based on Various CNNs and Classifiers." [Paper Link]

WORK & INDUSTRY COLLABORATIONS

Peking University - Algebraic Combinatorics — Beijing, China
Research Assistant, Advisor: Prof. Guoliang Wang, Beijing Institute of Technology — *July 2023 - Present*

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

Semitronix - Non-convergence Problem for EDA — Hangzhou, China
Data Scientist, Advisor: Dr. Christine Tan, Vice President, Semitronix Corp. — *Sep 2022 - Nov 2022*

- Self-studied research literature in Chemical Mechanical Polishing process and FFT/IFFT techniques
- Invited PhD students in THU 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 University
Advisor: Prof. Siyu Heng — *Jul 2023 - Present*

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

Limiting Capacity of Finite State Channels — McMaster University
Advisor: Prof. Jun Chen, Member, IEEE — *Jul 2023 - Present*

- 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 [Paper Link] — Université du Québec à Montréal
Advisor: Prof. Janosch Ortmann, Prof. Walter Rei — *Jul 2022 - Present*

- Applied algebraic methods to reduce the complexity of large-scale stochastic optimization problem
- Developed an unsupervised ML algorithm that clusters scenarios into similarity groups measured on the basis of solutions
- Used Grobner Basis and combinatorial methods to reduce the algorithm's computational complexity
- The Python-implemented algorithm exhibited superior performance over existing benchmarks

Concentration Inequalities for Discretization Errors of Stochastic Integration — Shandong University
Advisor: Prof. Hanchao Wang — *Jan 2022 - Jun 2022*

- Proved that the discretization error of specific Itô integrals with Jumps is of sub-Gaussian distribution
- Constructed exponential martingales with Ito's formula 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

Breast Cancer Classification Based on CNNs [Paper Link] — Massachusetts Institute of Technology
Supervisor: Prof. Mark Vogelsberger — *Apr 2022 - Jul 2022*

- Aimed to train a neural network for eight-classification of breast cancers
- Utilized the Inception-V3 and Inception-ResNet-V2 architectures, among others, for feature extraction, and employed logistic regression and Support Vector Machine (SVM) algorithms for classification
- Implemented a cyclic learning rate decay policy and the identification of local optimal solutions to optimize performance
- Obtained the accuracy rate of 93.9% (outperformed existing benchmarks) and developed a chatbot based on TKinter

SKILLS

Programming/Software: Python, Sage, R, LaTeX, C++, HTML, Matlab, Jupyter Lab, SageMath, Wolfram Alpha, Macaulay2, Sublime Text, Lingo, AnyLogic, Keil MDK, GitHub Desktop, IBM Db2
Language: English (fluent), Chinese (native)

Mathematics Proficiency

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
Prob & stats: measure theory, stochastic calculus, regression analysis, mathematical statistics, causal inference
Combinatorics: graph theory, probabilistic and algebraic combinatorics
Applied maths: statistical learning theory, numerical analysis, combinatorial optimization