DUC TOAN NGUYEN

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EDUCATION

TEXAS CHRISTIAN UNIVERSITY — Fort Worth, Texas
College of Science and Engineering — Sep 2021 - May 2025
John V. Roach Honors College
Bachelor of Science in Mathematics — Current GPA: 4.0/4.0
Bachelor of Science in Computer Science

Relevant Coursework:

- **Mathematics Courses**: Applied Linear Algebra, Differential Geometry, Geometric PDEs, Statistics, Real Analysis I & II, Multivariable Analysis, Topology, Numerical Analysis, Abstract Algebra I
- **Computer Science Courses**: Analysis of Algorithms, Artificial Intelligence, Deep Learning, Data Mining and Visualizations, Database Systems, UNIX/Linux Admin, Computer Organizations

RESEARCH EXPERIENCE

Independent Research — Fort Worth, Texas
Variance-Reduced Shuffling Stochastic Optimization Project — April 2024-Present
Advisor: Dr. Lam M. Nguyen

- Investigate multiple variants of SARAH optimization method
- Propose a variance-reduced first-order optimization method using shuffling paradigm with complexity equal Gradient Descent in strongly-convex case

Texas Christian University, Department of Computer Science — Fort Worth, Texas
Research Assistant for GO2AI project — January 2023-Present
Advisors: Dr. Liran Ma, Dr. Ze-li Dou

- Implement Monte Carlo Search Tree and CNNs into the policy of AI agent playing the game Go
- Optimize performance of AI agent by improving the training process using distributed learning
- Implement Grad-CAM to investigate the robustness of Go playing agent for education

Texas Christian University, Department of Mathematics — Fort Worth, Texas
Honor Research Program — September 2022-Present
Advisor: Dr. Ken Richardson

- Propose an algorithm to construct approximate Steiner Tree with arbitrary number of points using Fermat-Torricelli points and inspired from bubble soap film
- Prove the existence of Fermat-Torricelli point on non-positive-curvature 2-D surfaces

Rice University, Department of Statistics — Houston, Texas
Research Experiences for Undergraduate (REU) STAT-DATASCI — May 2023-July 2023
Advisor: Dr. Eric C. Chi

- Investigate the dependence of optimal tuning parameter on the noise level of existing NMF methods
- Propose a new algorithm for NMF called Square-Root Min-Vol NMF with convergence guarantee proof
- Test the algorithm with large datasets of hyperspectral images and get a better errors than recent methods

ACADEMIC PUBLICATION

- Duc Toan Nguyen and Eric C. Chi. “Towards tuning-free minimum-volume nonnegative matrix factorization”, *Proceedings of the 2024 SIAM International Conference on Data Mining (SDM24)*. Society for Industrial and Applied Mathematics, 2024.
- Nguyen, Duc Toan. “Anti-Steiner Point Revisited.” *Mathematical Reflections,* Vol. 2020 and 2021, 30 Sep. 2022, pp. 568–608.

POSTERS/PRESENTATION

- Duc Toan Nguyen. “Towards Tuning-Free Minimum-Volume Nonnegative Matrix Factorization.” *Summer school on Bayesian learning and network analysis, VIASM, Hanoi,* July 2024. (poster)
- Duc Toan Nguyen and Eric C. Chi. “Towards Tuning-Free Minimum-Volume Nonnegative Matrix Factorization.” *SIAM International Conference on Data Mining (SDM24),* April 2024.
- Nguyen, Duc Toan. “A Majorization-Minimization Variant For Minimum-Volume Nonnegative Matrix Factorization.” *National Collegiate Research Conference (NCRC), Harvard University,* January 2024.
- Nguyen, Duc Toan. “Towards Tuning-Free Minimum-Volume Nonnegative Matrix Factorization.” *Gulf Coast Undergraduate Research Symposium (GCURS), Rice University,* October 2023.
- Nguyen, Duc Toan. “Searching for networks of minimum length.” *Research and Creative Activities Week, Texas Christian University,* September 2023 (poster).
- Nguyen, Duc Toan. “Geodesic Nets construction using Genetic Algorithm.” *Student Research Symposium (SRS), Texas Christian University,* April 2023 (poster).

HONORS/AWARDS

- 2024 Honors College Heritage Scholarship, The John V. Roach Honors College, TCU
- Student Travel Award for the 2024 SIAM International Conference on Data Mining (SDM24)
- Outstanding Session Presentation, Computational Mathematics and Operations Research, GCURS 2023
- Best Undergraduate Poster Presentation Finalist of TCU Student Research Symposium 2023
- Top 500 in the 83rd William Lowell Putnam Mathematical Competition 2022
- First prize in TCU Math Department Calculus Bee 2022, 2023, and 2024
- Third prize in Russian Sharygin Geometry Olympiad in 2019
- Third prize in Vietnam Mathematical Olympiad in 2019
- Pi Mu Epsilon - TCU Texas Alpha chapter
- Upsilon Pi Epsilon - TCU chapter
- TCU Scholar (GPA 4.0)

WORK EXPERIENCE

TRIO Program - TCU College of Education Fort Worth, Texas

SSS Peer Tutor January 2022-Present

- Support lower-income and first-generation students under federally funded program
- Teach 10 students to think critically and perform better in elective Math and Computer Science courses
- Tutor multiple graduate Math courses including Real Analysis I and Real Analysis II

TCU Department of Mathematics Fort Worth, Texas

Math Grader/Teaching Assistant January 2022-Present

- Grade student’s homework assignments and give them detailed feedback
- Discuss with Professor some problems in grading and other mathematical topics
- Review foundational topics to create a strong math base for future research

TECHNICAL SKILLS

- **Programming Languages:** Python, Java, MATLAB, R, MySQL, C++, HTML, JS, PHP
- **Machine Learning:** Pytorch, Scikit-learn, NetworkX, Numpy, Pandas, Captum
- **Operating Systems:** Linux, MacOS, Windows