MINGYU YU

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EDUCATION

University of California, Berkeley — Aug 2022 – May 2024 (Expected)
B.A. (Hons) Applied Mathematics; GPA: 3.94 — *Berkeley, CA*
Senior Thesis: A numerical self-similar study of singularity formation of the slender-jet model

University of California, San Diego — Sept 2020 – June 2022
Transferred to UC Berkeley — *La Jolla, CA*

RESEARCH EXPERIENCE

Faculty supervised research: nonlinear PDE — May 2023 – Present
Mentor: Federico Pasqualotto — *UC Berkeley*

- Studied the self-similar approach and implemented basic numerical methods for partial differential equations and conservation laws in MATLAB
- Performed numerical simulations for the slender-jet model and conducted dimensional analysis for the self-similar scheme in the slender-jet model
- Implementing a numerical simulation of the slender-jet model around the singularity formation using the self-similar scheme

Faculty supervised research: Combinatorics — Jan 2022 – Present
Mentor: Reuven Hodges — *Remote & UC San Diego*

- Studied *Combinatorics of Coxeter Groups* by Bjorner and Brenti and the pattern avoidance criterion for maximal sphericality in type A_n Coxeter groups (symmetric groups)
- Conjectured that maximal sphericality in type B_n Coxeter groups can be characterized by its associated pattern avoidance criterion
- Constructed algorithms to provide heuristic evidence for the above conjecture
- Proving the above conjecture by introducing the notion of divisible pairs for signed permutations and partitioning the patterns to be avoided in the criterion

ACADEMIC SERVICE

Supplemental Instruction Leader — July 2021 – June 2022
University of California, San Diego — *La Jolla, CA*

- Directed four weekly one-hour discussion sessions in Math 20C (Calculus & Analytic Geometry For Science & Engineering), with about 20 students in each session
- Attended various training workshops and completed session plans to improve the quality of sessions
- Created a thriving environment during sessions to promote diversity, equity, and inclusion

PROJECTS

Tikhonov regularization and the L-curve — Fall 2023
Course project for MATH 221 (Advanced Matrix Computations) at UC Berkeley

- Studied the classic L-curve model by Hansen and explored recent advancements of its implications
- Implemented algorithms to generate the L-curve for an ill-posed question and selected the best regularization parameter that balanced the residual norm and the solution seminorm

Circulant matrices and fast Fourier transforms (MATLAB)   Spring 2023

Course project for MATH 128B (Numerical Analysis 2) at UC Berkeley

- Proved the useful properties of discrete Fourier transforms
- Applied the fast Fourier transform algorithm to circulant matrices to generate an algorithm of performing `matvec` of ciruclant matrices in $O(N \log N)$ flops

Modified `zero-in` method for root-finding (MATLAB)   Fall 2022

Course project for MATH 128A (Numerical Analysis 1) at UC Berkeley

- Presented a modified root-finding algorithm with a combination of bisection method and inverse quadratic interpolation (IQI) method
- Improved the root-bracketing procedure to decrease the function calls and improve the method's efficiency

Huffman encoding (C++)   Spring 2022

Course project for CSE 100 (Advanced Data Structures) at UC San Diego

- Constructed a Huffman encoding script to achieve lossless compression
- Encoded and decoded files based on serialized Huffman tree to obtain better performance

TECHNICAL SKILLS

Programming Skills: Python, Java, R/RStudio, C/C++, MATLAB