Yuan Gao

Seattle, WA
USA

ivan.y.gao@outlook.com
https://amath.washington.edu/people/yuan-gao

Education

Master of Science in Applied and Computational Mathematics — **Sept. 2024 - Expected: May 2025**
University of Washington (UW) — Seattle, WA, USA

Bachelor of Science, Major in Mathematics, Minor in Statistics (with distinction) — **Sept. 2019 - May 2024**
The University of British Columbia (UBC) — Vancouver, BC, Canada

Scholarships

Trek Excellence Scholarship (International Students), UBC — **2020 - 2021**

Awards

UBC MURC 2024 REX Awards (URO) - Poster Presentation First Place, UBC — **Apr. 2024**

Honours

Dean's List, UBC — **Sept. 2020 - May 2021**

Research Experience

Undergraduate Research Experience Program (URO REX) Math Bio Group, UBC — **Nov. 2023 - Feb. 2024**

- Investigate on how various Influenza A virus (IAV) receptor organizations influence its mobility under the presence of antibody.
- Implement a Julia-based simulation of filamentous IAV dynamics with periodic boundary conditions and restricted random movement.
- Write a comprehensive report along with a demonstration poster which has been used to present at the Multidisciplinary Undergraduate Research Conference (MURC) at the University of British Columbia.
- Won first prize in the poster presentation at UBC MURC 2024 REX Awards (URO).

Work Experience

Undergraduate Teaching Assistant for MATH101 (Integral Calculus with Applications) — **Jan. 2023 - Apr. 2023**
Department of Mathematics, University of British Columbia

- Facilitated instructor-led teaching, hosted discussions, and graded homework for two sections, totaling 71 students.

Skills

Communication:	Chinese (Native), English (Fluent).
Web Development:	Front-end: React, Redux, RTK Query, Ant Design, Bootstrap, Material-UI, Axios. Back-end: Django, REST, CORS.
Programming Languages:	C++, Julia, R, Python, Shell, LaTeX, Markdown, JavaScript, Java, Lua, CMake, Dockerfile.
Frameworks and Libs:	Qt6, OpenCL, OpenMP, Google Test/Mock/Benchmark.
Tools and Software:	Jupyter Lab, VS Code, RStudio, IntelliJ.
Operating Systems:	Manjaro, Ubuntu 20.04, Arch Linux, Windows 10.

Additional Training

Lattice Boltzmann Method - Self-Directed Study — **Mar. 2023 - Aug. 2023**

- Conducted a comprehensive study using the *Lattice Boltzmann Method: Fundamentals and Engineering Applications with Computer Codes* by A. A. Mohamad.
- Developed a D2Q9 library using C++/Julia, aimed at executing all textbook examples of Non-Isothermal Incompressible Fluid.
- Implemented a high-performance computation library for rapid simulation, specifically designed for 2D video game applications.

Project

Personal Platform — **Jan. 2024 - Present**
Project Owner and Lead Developer:

- Developed a single page application utilizing React + Redux as front-end and Django REST API as back-end, with UI designed using Ant Design.
- Implemented authentication using tokens and cookies, and managed internet communication through Axios.
- Initial version was developed using Bootstrap for UI, followed by a second version utilizing Material-UI before transitioning to Ant Design for the latest version.
- Created an automatic CI/CD pipeline combined with Dockerfile for automatic deployment in a custom registry. Deployed using Docker Compose.

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D2Q9FluidSimulation **Sept. 2021 - Present**

Project Owner and Lead Developer:

- Developed a high-performance fluid dynamics simulation framework based on the D2Q9 Lattice Boltzmann Method using C++ and Julia.
- Conducted a self-directed study of the fundamental theory of the Lattice Boltzmann Method, utilizing the book *Lattice Boltzmann Method - Fundamentals and Engineering Applications with Computer Codes* by A. A. Mohamad.
- Applied rigorous code quality and performance metrics, using testing tools such as gTest, gBenchmark, and gcovr to ensure the framework's robustness and scalability.
- Utilized the OpenCL framework for parallel computation, achieving the capability to process a 5k x 5k grid in 10 seconds on an Intel UHD 620 chip.
- Employed technologies including C++17 and QT 6.5.0 for cross-platform support on Windows 10 and Linux. Leveraged tools such as CMake, Doxygen, and Pandoc for generating Game Design Documents and project management-related files, as well as Valgrind.

Investigation and Application of Richardson Extrapolation **Sept. 2022 - Dec. 2022**

MATH 405 Group Project - Project Member

- Participated in an in-depth investigation into the theory of Richardson Extrapolation.
- Conducted a comprehensive study on the Bulirsch-Stoer Algorithm as an application of Richardson Extrapolation. Discussed in detail three major assumptions of the algorithm and procedures taken.
- Presented the findings to the class.

Investigation of the Average Wine Quality in Portugal **Sept. 2022 - Dec. 2022**

STAT 344 Group Project - Project Initiator and Lead Data Analyst

- Initiated the project and organized all group meetings. Setting timelines and milestones to drive project progress.
- Calculated the required sample size in alignment with a predefined margin of error to ensure the representativeness and accuracy of the study.
- Explored and compared different sampling methods, including stratified and cluster sampling, evaluating their accuracy and applicability for the study.
- Applied selected sampling techniques to real-world data related to the quality of Portuguese wine, effectively representing the quality distribution and contributing to our understanding of the factors that influence it.

Exploration of Factors that Influence the Final Sale Price of One-Family Dwellings in the City of Vancouver Between 2016-2019

STAT 306 Group Project - Project Initiator and Lead Data Analyst **Jul. 2022 - Aug. 2022**

- Monitored the project, organizing all group meetings, establishing timelines, and setting milestones to drive the project's progress.
- Executed rigorous data cleaning using mean imputation methods and calculated the sample size, ensuring robustness by accounting for the margin of error.
- Performed data transformation using logarithms to address heteroscedasticity, ensuring more reliable statistical inferences.
- Utilized Mallows's Cp and stepwise variable selection for model selection and conducted collinearity tests to improve model accuracy.
- Trained the model using k-fold cross-validation and carried out model diagnostics with residual plots and normal qq plots. Collaborated on strategies for outlier removal to enhance model predictability.

Conway's Game of Life Simulator **Sept. 2019 - Dec. 2019**

CPSC 210 Personal Project

- Created interactive software using Java and the Spring framework to implement Conway's Game of Life rules, supporting Von Neumann, Moore, and Extended Moore neighbourhoods, as well as fixed, reflexive, and periodic boundary conditions.
- Applied full test-driven development with detailed documentation and adhered to strict naming conventions, and followed SOLID principles of object-oriented design.

Community Involvement and Outreach

UBC Math Circle Workshops Mentor **Sep. 2023 - Dec. 2023**

- Assisted in delivering hands-on mathematics workshops for 4th to 7th graders, fostering an environment of curiosity and exploration.
- Distributed, maintained, and organized group activity materials.
- Provided helpful hints and guided students to understand math concepts.

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Imagine UBC 2023 Orientation Leader – Faculty of Science **Sep. 2023 - Oct. 2023**

- Creating and maintaining a supportive and engaged community for approximately ten new-to-UBC students, fostering a sense of friendship and belonging while serving as an ambassador for student leadership within the Faculty of Science.
- Facilitated and assisted with the planning, organization, and delivery of the Imagine UBC orientation activities while ensuring effective and timely communication.
- Pursuing personal and professional growth by developing key competencies in areas such as communication, teamwork, problem-solving, initiative, and adaptability.
- Demonstrating a commitment to equity and inclusion, by respecting all people and their differences, providing referrals to campus resources, and participating in ongoing training related to these topics.

Elmacon 2023 Volunteer Exam Grader **2023-04-29**

- Grading math contest exam papers in an accurate, efficient manner while adhering to set marking guidelines to ensure fairness and consistency.
- Collaborating with the exam coordinating team, ensuring smooth progress of the grading process and promptly communicating any issues or updates.

GVRSF 2023 UBC Campus Guide Volunteer Lab Tours Leader **2023-04-14**

- Led and managed a group of 12 participants, ensuring a safe, secure, and educational tour experience within the UBC Physics Project Lab.
- Facilitating interactive and informative lab tours, effectively communicating the purpose and details of various projects, experiments, and activities within the physics lab.
- Upholding and enforcing safety protocols during lab tours, ensuring all participants comply with the lab's safety regulations and practices.