

Steven Buchanan

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About Me

Mathematics PhD candidate working on geometric differential equations. Seeking to apply my analytical mindset, intellectual curiosity, and computational background to solve challenging problems within research-based and quantitative roles.

Skills

Programming and data analysis: Python (numpy, pandas, matplotlib, scipy), JavaScript/Typescript, C++

Mathematical methods: Probability theory, statistics, stochastic processes, time-series analysis, optimization, numerical methods, regression analysis, Monte Carlo simulations, linear algebra, differential equations

Other: Git, linux, VS Code, LaTeX, Jupyter, VSCode, optimization and regression analysis

Education

University of Toronto: Visiting PhD student	August 2025 – January 2026
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Australian National University: PhD in Mathematics	Sept 2023 – Present (est. Feb 2027)
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University of Tennessee: PhD in Mathematics (started)	Aug 2021 – Sept 2023
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Tennessee Technological University: M.S. in Mathematics	August 2019 – May 2021
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Tennessee Technological University: B.S. in Mathematics	August 2015 – May 2019
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Projects

Undergraduate research project – Probabilistic modeling of divisibility patterns in integers

Conducted asymptotic and probabilistic analysis of divisibility relations to quantify how often a generalized version of Euclid's lemma holds under random integer sampling. Published in the American Mathematical Monthly.

Master's Thesis – Asymptotic Analysis of Arithmetic Functions

Constructed asymptotic models for summations of classes of divisor functions over arithmetic progressions using analytic number theory.

Erdős Institute certification project – Market-Implied Stock Price Densities

Developed a Python framework for extracting and validating risk-neutral and real-world probability densities from SPX option prices using advanced numerical and probabilistic methods, including Black-Scholes inversion, cubic spline smoothing, and finite-difference second derivatives.

Teaching

Australian National University: Teaching Assistant, applied differential equations

Led problem-solving tutorials and graded assignments for an advanced undergraduate course on differential equations with numerical applications. Topics included ODE/PDE modeling, stability analysis, and numerical approximation methods.

Shandong University: Teaching Assistant, Linear Algebra (online)

Led problem-solving tutorials for an undergraduate course on vector spaces, eigenvalue analysis, and matrix methods for undergraduate mathematics students.

University of Tennessee: Instructor, Mathematical Reasoning; TA, college algebra

Designed and delivered lectures, problem sets, and exams to teach students problem solving methods in various areas of mathematics, including geometry, graph theory, and discrete mathematics. Supported instruction in college algebra, leading problem sessions and grading coursework.

Tennessee Tech University: Instructor, College Algebra

Designed and delivered lectures, problem sets, and exams to teach students the algebraic foundations of calculus and engineering mathematics.

Awards

Fall 2023 – Present: HDR Fee Remission Merit Scholarship and International PhD scholarship – Australian National University

F. M. Dryzer Math Fellowship – University of Tennessee