

Nicholas Richardson

Curriculum Vitae

Institute of Applied Mathematics
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njericha.github.io

Research Interests

Audio & Signal Processing, Unsupervised Learning, and Tensor Factorizations

Education

- Sep. 2022 – **Doctor of Philosophy**, *University of British Columbia*, Vancouver, B.C.
(Apr. 2026) Institute of Applied Mathematics, sup. by Michael Friedlander
- Sep. 2020 – **Master of Mathematics**, *University of Waterloo*, Waterloo, Ont.
May 2022 *A Sparse Random Feature Model for Signal Decomposition* sup. by Giang Tran
- Sep. 2016 – **Bachelor of Mathematics**, *University of Waterloo*, Waterloo, Ont.
Apr. 2020 Mathematical Physics Major, Pure Mathematics Minor

Employment

- Sep. 2023 – **Instructor**, *University of British Columbia*, Vancouver, B.C.
(Apr. 2025) ◦ Calculus I (Fall 2023, Winter 2025)
- Sep. 2022 – **Teaching Assistant**, *University of British Columbia*, Vancouver, B.C.
Dec. 2024 ◦ Calculus I (Fall 2024)
◦ Calculus II (Winter 2023)
◦ Calculus III (Fall 2022)
- Sep. 2022 – **Mathematics Learning Centre Tutor**, *University of British Columbia*,
Apr. 2024 Vancouver, B.C.
- June 2020 – **Mathematics & Physics Tutor**, *Self-Employed*
Dec. 2024 High School and Undergraduate Levels
- May 2019 – **Computational Fluids Research Assistant**, *University of Waterloo*,
Aug. 2019 Waterloo, Ont.
- Jan. 2018 – **Teaching Assistant**, *University of Waterloo*, Waterloo, Ont.
Dec. 2021 ◦ Mathematics of Music (Fall 2020, 2021)
◦ Special Topics in Mathematical Connections: Math & Music (Fall 2021)
◦ Complex Analysis (Winter 2020)
◦ Calculus 1 & 2 (Fall 2019, Winter 2018, 2020, 2021)
- May 2017 – **Software Engineering Research Assistant**, *McMaster University*,
Aug. 2017 Hamilton, Ont.

Publications

Naomi Graham, **Nicholas Richardson**, Michael P. Friedlander, and Joel Saylor. Tracing Sedimentary Origins in Multivariate Geochronology via Constrained Tensor Factorization. *Mathematical Geosciences*, Feb. 2025.

Joel Saylor, **Nicholas Richardson**, Naomi Graham, Robert Lee, and Michael P. Friedlander. Tracking cu-fertile sediment sources via multivariate petrochronological mixture modelling of detrital zircons. 2024. (in review).

Michael L Waite and **Nicholas Richardson**. Viscous and diffusive generation of potential vorticity in stratified turbulence. In *AGU Fall Meeting Abstracts*, volume 2023, pages NG41A–06, 2023.

Michael L. Waite and **Nicholas Richardson**. Potential Vorticity Generation in Breaking Gravity Waves. *Atmosphere*, 14(5):881, 2023.

Nicholas Richardson, Hayden Schaeffer, and Giang Tran. SRMD: Sparse Random Mode Decomposition. *Communications on Applied Mathematics and Computation*, 2023.

Lam Si Tung Ho, **Nicholas Richardson**, and Giang Tran. Adaptive group Lasso neural network models for functions of few variables and time-dependent data. *Sampling Theory, Signal Processing, and Data Analysis*, 21(2):28, 2023.

Nicholas Richardson. A Sparse Random Feature Model for Signal Decomposition. *UWSpace*, 2022. (Master's Thesis).

Conference Presentations & Posters

Dec 2024 **Density Separation with Tensor Factorization**,
2024 CMS Winter Meeting, Richmond, BC, Pres.

Oct 2024 **Density Separation with Tensor Factorization**,
2024 INFORMS Annual Meeting, Seattle, WA, Pres.

July 2024 **Density Separation with Tensor Factorization**,
2024 SIAM Annual Meeting, Spokane, WA, Pres.

Oct 2023 **Non-negative Tensor Decompositions for Unsupervised Learning**, *4th Biennial Meeting of SIAM Pacific Northwest Section*, Bellingham, WA, Pres.

June 2021 **Sparse Random Wavelet Representation & Decomposition**, *Canadian Applied and Industrial Mathematics Society (CAIMS)*, Waterloo, Ont., Poster
Runner up in annual poster competition

Awards

Natural Sciences and Engineering Research Council of Canada

- May 2023 Canadian Graduate Scholarship – Doctoral (330 awards nationwide)
- May 2021 Canadian Graduate Scholarship – Master's (840 awards nationwide)
- May 2019 Undergraduate Student Research Award (3 149 awards nationwide)

University of British Columbia

- May 2022 Faculty of Science PhD Tuition Award
- Sep. 2022 Four Year Doctoral Fellowship
- Sep. 2022 President's Academic Excellence Initiative PhD Award

University of Waterloo

- May 2021 President's Graduate Scholarship
- Aug. 2020 K.D. Fryer Gold Medal
- June 2020 Dean's Honours List With Distinction
- May 2019 President's Research Award
- Jan. 2019 Paul Berg Memorial Award
- Jan. 2019 Arthur Beaumont Memorial Scholarship
- Sep. 2016 President's Scholarship of Distinction
- Sep. 2016 Alumni @ Microsoft Entrance Scholarship in Mathematics

Computer Skills

Julia, Python, MATLAB, Quarto, Typst, \LaTeX , Adobe Software

Relevant Coursework

- Analysis (Functional, Numerical, Real/Complex)
- Convex Optimization
- Calculus of Variations
- Computational Audio
- Fourier to Wavelets
- Acoustics
- Fluid Mechanics
- Tensor Decompositions
- Probability
- Compressed Sensing