Tian Bai

Recent Bachelor's Graduate of McGill University Montreal, Canada
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EDUCATION

McGill University, Montreal, Canada — 09.2021 — 12.2024
Bachelor of Science in Honours Mathematics and Computer Science — Cumulative GPA: 4.00/4.00
Minor in Statistics — Graduated with First-Class Honours

RESEARCH EXPERIENCE

Remote Research Collaboration — Remote
Research Assistant — 08.2024 — Present

- Developed OptCS, a broad extension of conformal selection that enabled simultaneous model selection and candidate selection by addressing the selection bias, achieving enhanced statistical power
- Proved general statistical theory for distribution-free FDR control under data-driven score optimization
- Conducted extensive simulations to demonstrate the superior performance of the purpose methods
- Applied these innovations to challenges in drug discovery and large language model (LLM) alignment
- Supervisor: Dr. Ying Jin (*Incoming Professor of Statistics at the University of Pennsylvania*)

McGill University — Montreal, Canada
Research Assistant — 05.2024 — Present

- Applied model-free selection technique based on conformal inference to drug research and development
- Collaborated with statisticians and scientists at Merck to innovate old methods lacking statistical assurance
- Purposed and proved generalizations of the conformal selection method to multivariate targets
- Published a preprint summarizing our findings and presented at McGill Undergraduate Research Conference
- Earned the Science Undergraduate Research Award (SURA)
- Supervisor: Prof. Archer Yi Yang

McGill University & MILA — Montreal, Canada
Research Assistant — 01.2024 — 08.2024

- Implemented several graph-based machine learning models (GAT, KCN) for single-cell velocity analysis
- Enhanced expertise in model implementation and gained experience in biomedical data analysis
- Supervisor: Prof. Jun Ding, Prof. Archer Yi Yang

Lady Davis Institute for Medical Research & McGill University — Montreal, Canada
Research Assistant — 09.2023 — 05.2024

- Developed multiple machine learning models for triage acuity prediction in emergency departments
- Achieved superior prediction accuracy versus the traditional method with Canadian Triage Acuity Scale (CTAS)
- Improved model interpretability by evaluating predictor significance using the Shapley score
- Co-authored a research paper published in the Canadian Journal of Emergency Medicine
- Supervisor: Prof. Lars Grant

McGill University — Montreal, Canada
Research Assistant — 11.2022 — 04.2023

- Designed and developed a software in C for low-latency distance approximation and presented a live demo
- Acquired hand-on experience working with microcontrollers (ESP32), Raspberry Pi and low-level C programming
- Integrated accelerometers, magnetometers, and gyroscopes with ESP32 for future applications
- Supervisor: Prof. Muthucumaru Maheswaran

WORK EXPERIENCE

Vffice, Inc. — Longueuil, Canada
Software Developer Intern — 05.2023 — 08.2023

- Developed digital business management platforms using Microsoft Business Central and Microsoft Azure
- Achieved expertise in Microsoft AL and C# through hands-on development and implementation
- Partnered with functional consultants to deliver custom solutions with seamless integration
- Conducted peer code reviews to ensure high-quality standards and maintain best practices
- Managed source code repositories and workflows using Git, Git Bash, and Microsoft Azure DevOps
- Supervisor: Yisheng Cao

PUBLICATIONS

Journal Paper

- Grant L, Diagne M, Aroutiunian R, Hopkins D, Bai T, Kondrup F, Clark G. Machine learning outperforms the Canadian Triage and Acuity Scale (CTAS) in predicting need for early critical care. *Canadian Journal of Emergency Medicine 2024.* `https://doi.org/10.1007/s43678-024-00807-z`

Preprint

- Bai T, Tang P, Xu Y, Svetnik V, Khalili A, Yu X, Yang A. Conformal Selection for Efficient and Accurate Compound Screening in Drug Discovery. *ChemRxiv 2024.* `https://doi.org/10.26434/chemrxiv-2024-pf3ph`
- Bai T, Jin Y. Optimized Conformal Selection: Powerful Selective Inference After Conformity Score Optimization. *ArXiv 2024.* `https://arxiv.org/abs/2411.17983`
- Bai T, Zhao Y, Yu X, Yang A. Multivariate Conformal Selection. *Accepted at the 42th International Conference on Machine Learning (ICML 2025).* `https://www.arxiv.org/abs/2505.00917`

In Progress

- Bai T, Jin Y. Selective Conformal Risk Control with E-values. *TBD.*

PRESENTATIONS

- Model-Free Selection Inference for Drug Discovery via Conformal Prediction. *McGill 7th Undergraduate Research Conference, August 2024.*

SELECTED ADVANCED COURSES

- MATH 680 Computation Intensive Statistics*
- COMP 551 Applied Machine Learning*
- COMP 579 Reinforcement Learning*
- MATH 523 Generalized Linear Models*
- MATH 423 Applied Regression
- MATH 454 Honours Analysis 3 (Measure Theory)
- MATH 455 Honours Analysis 4 (Functional Analysis)
- MATH 457 Honours Algebra 4 (Galois Theory)
- MATH 447 Introduction to Stochastic Processes
- COMP 421 Database Systems

*Graduate Courses. Click on the courses for more details.

AWARDS AND HONOURS

Stanford Graduate Fellowship (SGF) Stanford, CA, USA
University-nominated fellowship supporting outstanding doctoral research
Amount: $174600 USD 03.2025

Science Undergraduate Research Award (SURA) Montreal, Canada
15 weeks of full-time research under the supervision of a professor, with financial support
Amount: $8700 CAD 03.2024

Tomlinson Engagement Award for Mentoring Montreal, Canada
For the Helpdesk Tutor positions
Amount: $300 CAD 12.2023, 03.2024

Sir Edward Beatty Memorial Scholarships in Mathematics Montreal, Canada
For high academic standing
Amount: $2100 CAD 09.2024

A. D. Pelletier Scholarship in Mathematics and Statistics Montreal, Canada
For high academic standing
Amount: $4400 CAD 09.2023

Robert W Wilson Scholarship Montreal, Canada
For high academic standing
Amount: $2500 CAD 09.2022

Dean's Honour List Montreal, Canada
Top 10% of continuing students 09.2022, 09.2023

CERTIFICATES

Microsoft Certified: Azure Data Engineer Associate 06.2023
Microsoft Certified: Azure Developer Associate 08.2023

OTHER EXPERIENCES

McGill University Montreal, Canada
CSUS (Computer Science) Helpdesk Tutor 01.2024 — 04.2024

- Helped students tackle their assessments and understand coursework through effective teaching techniques

McGill University Montreal, Canada
Math Helpdesk Tutor 09.2023 — 12.2023

- Provided intuitive explanations and active assistance on mathematics problems

McGill University Montreal, Canada
Teaching Assistant 09.2023 — 04.2024

- (Fall 2023) MATH 350 Honours Discrete Mathematics taught by Prof. Sergey Norin
- (Winter 2024) MATH 457 Honours Algebra 4 taught by Prof. Henri Darmon

McGill University Montreal, Canada
Note-taker 09.2023 — 04.2024

- Voluntary note taking and sharing for students with disabilities at McGill University
- (Fall 2023) COMP 302 Programming Language and Paradigms
- (Winter 2024) COMP 579 Reinforcement Learning and COMP 421 Database Systems

EXTRACURRICULAR ACTIVITIES

Competitive Programming

- Contestant, Compete McGill (competitive programming club at McGill). Team ranked 5th in the 2023 NAQ contest.
- Presentation on Mo's algorithm.
- Presentation on Advanced Dynamic Programming techniques.

SKILLS

- **Programming: Python (Pytorch, Scikit-learn), R, C/C++, SQL**
- **Software/Tool: LaTeX, Git, Powershell, Microsoft Azure, Rstudio**

LANGUAGES

- **English** TOEFL 112 (R 30, L 29, S 27, W 26); GRE 331 (V 161, Q 170, AWA 4.5)
- **Chinese (Mandarin)** Native