Nicholas Barnfield

Department of Mathematics and Statistics, McGill University,
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Education

Bachelor of Arts[1] August 2021 - (expected) May 2024

Honours Probability and Statistics – Minor in Computer Science
GPA: 3.98
McGill University, Montréal (Québec)

Diplôme d'études collégiales (DEC) August 2019 - May 2021

Commerce Profile
R-score: 34.3
John Abbott College, Sainte-Anne-de-Bellevue (Québec)

Preprints and Publications

N. Barnfield, R. Grondin, G. Pozzoli and R. Raquépas. *On the Ziv-Merhav theorem beyond Markovianity II: A Thermodynamic Approach*. In preparation (2023).

N. Barnfield, R. Grondin, G. Pozzoli and R. Raquépas. *On the Ziv-Merhav theorem beyond Markovianity*. To appear in The Canadian Journal of Mathematics (2023). arXiv:2310.01367 [cs.IT]

Research Experience

Undergraduate Researcher Summer 2023
McGill University, Montréal (Québec) – CY Advanced Studies Institute, Neuville-sur-Oise (France)

Worked on generalizing a result of Ziv and Merhav regarding the convergence to the specific cross-entropy of a sequential parsing algorithm for sequence pairs. This work culminated in two publications which generalize to examples including regular g-measures from statistical physics and hidden-Markov measures.

Undergraduate Researcher Summer 2022
McGill University, Montréal (Québec) – CY Advanced Studies Institute, Neuville-sur-Oise (France)

Conducted research in entropic information theory under the supervision of Prof. Vojkan Jakšić of McGill University and Dr. Renaud Raquépas of NYU. Studied how recurrences and waiting times can be used to estimate entropic quantities of sequences generated by shift-invariant probability measures.

Invited Talks

Mini-workshop on Entropies for Complex processes December 9, 2023
Mathematical institute of the Serbian Academy of Sciences and Arts, Belgrade (online)
Return times and waiting times as entropy estimators III: Merhav–Ziv Estimator

Recent Progress in Statistical Mechanics December 3, 2023
Winter Meeting of the Canadian Mathematical Society, Montréal (Québec)
On the Ziv-Merhav theorem beyond Markovianity

Undergraduate Research Conference August 18, 2022
McGill University, Montréal (Québec)
Estimating entropic quantities using recurrences and waiting times

[1] **Graduate courses taken**. Advanced Probability Theory I (MATH 587), Stochastic Processes (MATH 547), Applied Machine Learning (COMP 551), Honours Linear Optimization (MATH 517), Mathematical Statistics I (MATH 556), Regression and Analysis of Variance (MATH 533), Topics in probability and statistics (High-Dimensional Probability, MATH 598)

Awards and Distinctions

Undergraduate Student Research Awards (USRA) 2022, 2023
Natural Sciences and Engineering Research Council of Canada (NSERC)

Supplement of USRA 2022, 2023
Fonds de Recherche Québec, Nature et Technologie (FRQNT)

Faculty of Arts Scholarship 2023
Faculty of Arts, McGill University

Dean's Honour List 2022, 2023
McGill University

MacLean Murray Scholarship 2022
Faculty of Arts, McGill University

Additional Skills

Bilingual in English and French

Programming Knowledge
Python, C++, R, Matlab (decreasing order of proficiency)

Mathematical Writing (e.g. LateX)

Other Relevant Experience

Course Assistant (Grader) Fall 2022, Fall 2023
Honours Analysis I/III (MATH 254/454) and Nonlinear Optimization (MATH 378)
McGill University, Montréal (Québec)

Tutor Fall 2020 - Winter 2021
Calculus I/II and Linear Algebra
Academic Success Center, John Abbott College, Sainte-Anne-de-Bellevue (Québec)