Marcel Kieren Goh (吴麒仁) August 24, 2023

Personal and Contact Information

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Education

Ph.D. Mathematics **September 2023 – present**
McGill University *Montréal, QC, Canada*
Supervisors: Andrew Granville and Hamed Hatami.

M.Sc. Mathematics **May 2021 – present**
McGill University *Montréal, QC, Canada*
Supervisor: Luc Devroye. CGPA: 4.00/4. Thesis: Structural properties of conditional Galton–Watson trees.

B.Sc. Joint Honours Mathematics and Computer Science **September 2017 – April 2021**
McGill University *Montréal, QC, Canada*
Minor: Linguistics. CGPA: 3.84/4.

Exchange semester **February – June 2019**
Faculty of Mathematics and Physics, Charles University *Prague, Czech Republic*
Grade: 1 on all courses (highest score attainable).

Awards and Funding

NSERC Canada Graduate Scholarship – Doctoral ($105,000) **September 2023 – August 2026**
FRQNT Bourse de doctorat en recherche ($100,000) **[Declined]**
NSERC Canada Graduate Scholarship – Master's ($17,500) **May 2021 – April 2022**
NSERC Undergraduate Student Research Award ($7,125) **May – August 2020**
Governor General's Academic Medal – Bronze **June 2015**

Research Interests

Additive combinatorics, analytic number theory, random trees, analysis of algorithms.

Papers

P5. (with Jad Hamdan and Jonah Saks) The lattice of arithmetic progressions. *Australasian Journal of Combinatorics* **84**,3 (2022), 357–374. [arXiv:2106.05949]

P4. (with Luc Devroye and Rosie Y. Zhao) On the peel number and the leaf-height of a Galton–Watson tree. *Combinatorics, Probability and Computing* **32**,1 (2023), 68–90. [arXiv:2106.14389]

P3. (with Anna M. Brandenberger, Luc Devroye, and Rosie Y. Zhao) Leaf multiplicity in a Bienaymé–Galton–Watson tree. *Discrete Mathematics and Theoretical Computer Science* **24**,1 (2022), #7, 16 pp. [arXiv:2105.12046]

P2. (with Anna M. Brandenberger and Luc Devroye) Root estimation in Galton–Watson trees. *Random Structures and Algorithms* **61**,3 (2022), 520–542. [arXiv:2007.05681]

P1. (with Rosie Y. Zhao) Arithmetic subsequences in a random ordering of an additive set. *Integers: Electronic Journal of Combinatorial Number Theory* **21** (2021), #A89, 19 pp. [arXiv:2012.12339]

Submitted Papers

- An uncertainty principle for Möbius inversion on posets. *arXiv:2302.02466* (2023), 7 pp.
- (with Jonah Saks) On the homology of several number-theoretic set families. *arXiv:2206.12535* (2022), 16 pp.

Reports

R5. Structural properties of conditional Galton–Watson trees. M.Sc. thesis, McGill University (Montréal, Québec, August 2022), vi + 75 pp.

R4. Finding regularity in Tlingit verb prefixes. Semester project report, McGill University (Montréal, Québec, April 2021), 7 pp.

R3. Grid-building algorithms on manifolds. Summer research report, McGill University (Montréal, Québec, August 2020), 10 pp.

R2. Typechecking proof scripts: making interactive proof assistants robust. Honours project report, McGill University (Montréal, Québec, December 2019), 10 pp.

R1. The OPythn programming language. Software project report, Charles University (Prague, Czech Republic, June 2019), 10 pp.

Research Experience

Probabilistic analysis of branching processes **May 2020 – June 2022**
Research group *McGill University*

Research on branching processes, headed by Luc Devroye. Studied estimation problems on Galton-Watson trees. Attended informal seminars, discussing various topics related to branching processes and other topics in probability and combinatorics. (Gave a presentation at six of these: one on root estimation in Galton-Watson trees, two on generating functions and elementary analytic combinatorics, two on graph regularity, and one concerning two of Erdős's proofs on prime numbers.)

Sorting algorithms on manifolds **May – August 2020**
Summer research project *McGill University*

Research project under the supervision of Michael Lipnowski. Studied algorithms that investigate the topology of group actions on locally symmetric spaces. Work involved writing of code in OCaml and PostScript that generates illustrations of certain quotient spaces, in various models of hyperbolic geometry.

Interactive proofs **September – December 2019**
Honours research project *McGill University*

Semester-long research project in the Computation and Logic Group, supervised by Brigitte Pientka. Proved a theorem in constructive logic concerning the formal verification of the interactive proof assistant Harpoon and wrote OCaml code as part of ongoing work on the functional programming language Beluga.

Bytecode compiler and interpreter **February – June 2019**
Individual software project *Charles University*

Semester-long individual software project under the supervision of Adam Dingle. Created OPythn, a bytecode compiler and virtual machine for a subset of Python. OPythn includes support for lists, dictionaries, named and anonymous functions, objects, and classes. It is implemented in OCaml using Ocamllex for lexing and Menhir for parsing.

Work and Volunteer Experience (∗ indicates a paid position)

∗**Teaching assistant** **September 2021 – present**
McGill University *Montréal, QC, Canada*

Teaching assistant in the following courses. Duties include giving tutorials, holding office hours, and grading assignments and exams.

- Fall 2023: MATH 240 Discrete Structures
- Fall 2021: COMP 690 Probabilistic Analysis of Algorithms

∗**After school care supervisor** **January – June 2023**
Suzuki Charter School *Edmonton, AB, Canada*

Supervised and facilitated activities (e.g., arts and crafts, soccer, board games, drawing/colouring, movie days) for children in grades 1 through 6.

*Software developer **January – May 2023**
Levven *Edmonton, AB, Canada*

Developed firmware for the manufacture and function of in-home IoT gateways, smart switches, and related electronic products. Code primarily in C and Python. Contributed to the open-source Mongoose OS codebase.

*Visiting teaching assistant **July 2022**
Bocconi University *Como, CO, Italy*

Teaching assistant for a two-week summer school on random structures and combinatorial statistics, which was organised by Bocconi University in collaboration with Oxford University and Imperial College London. Led problem sessions in the afternoons, with around forty graduate-level students were in attendance.

Mentor **January – April 2022**
Department of Mathematics and Statistics, McGill University *Montréal, QC, Canada*

Met with two undergraduate students as part of the Directed Reading Program on a weekly basis to give them an introduction to research-level mathematics in a casual setting. Focused on topics in extremal combinatorics related to the increasing triples problem, as well as topics related to Khovanskii's theorem.

First responder **October 2017 – September 2021**
McGill Student Emergency Response Team *Montréal, QC, Canada*

On call on a weekly basis to provide emergency medical care at campus residences overnight as well as at university events such as frosh, sports games, and formals. Attended team training sessions twice a month to keep first-aid skills up-to-date. Most recent first responder certification: September 2020.

*Grader **September 2019 – April 2021**
Department of Mathematics and Statistics, McGill University *Montréal, QC, Canada*

Grading of assignments in the following courses:

- Winter 2021: MATH 457 Honours Algebra 4
- Fall 2020: MATH 323 Probability, MATH 456 Honours Algebra 3
- Winter 2020: MATH 240 Discrete Structures
- Fall 2019: MATH 235 Algebra 1

*Helpdesk tutor **September 2018 – April 2021**
Computer Science Undergraduate Society Helpdesk *Montréal, QC, Canada*

Held twice-weekly office hours to tutor students in a variety of undergraduate courses. Topics covered included elementary data structures and algorithms, command-line scripting, and functional programming. Recipient of the Tomlinson Engagement Award for Mentoring.

Vice President, Academic **May 2019 – January 2020**
Society of Undergraduate Mathematics Students *Montréal, QC, Canada*

Oversaw academic affairs within SUMS council and acted as liaison between the undergraduate community and mathematics faculty. Duties included representing the student body at department meetings, organising midterm and final review sessions, and helping students with academic concerns.

*Painter **May – August 2018**
Bakir Contracting Corp. *Edmonton, AB, Canada*

Exterior painting (siding, decks, fences, trim, etc.) for residential clients.

*Infantryman **August 2015 – August 2017**
Singapore Armed Forces *Singapore*

Held appointment of machine-gun team commander in the 3rd Battalion, Singapore Infantry Regiment. Led a six-person team consisting of a medic, signaller, sensor, and two-machine gunners within a rifle platoon. Most recent reserve training: December 2022.

*__Tutor__ **September 2014 – June 2015**
École Secondaire Beaumont Composite High School *Beaumont, AB, Canada*

Tutored various students in grades 4 through 11 in chemistry, physics, math, and French.

*__Summer camp counsellor__ **June – August 2014**
YoWoChAs Outdoor Education Centre *Fallis, AB, Canada*

Led children aged 4–15 through various activities (e.g. archery, canoeing, zipline) at a sleepaway camp.

Published Short Fiction

F3. "Senang Diri," *Existere* **42**,2 (2023), 17–25.

F2. "The Vigil," *Ricepaper Magazine* (2023), online.

F1. "Mountain Pass," *Prairie Journal of Canadian Literature* **79** (2023), 48–55.

Skills

Programming Languages
C, OCaml, Python, Java, PostScript, Haskell, Scheme Lisp, Standard ML, `CWEB`, `MIXAL`, MIPS Assembly.

Technologies
UNIX, Vim, TEX, Git.

Languages
Fluent: English, French. Proficient: Mandarin, Italian.

Other

- Recipient of 0x$3.40 in Knuth reward cheques.
- Contributed sequences A335562, A338550, A338993, A339941, A339942, A341822, A347580, A355145–A355147, and A360285 to the On-line Encyclopedia of Integer Sequences.