Marcel Kieren Goh (吴麒仁)

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Personal and Contact Information

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Education

M.Sc. Mathematics — **May 2021 – present**
McGill University — *Montréal, QC, Canada*
Supervisor: Luc Devroye.

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 – 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

Analysis of random discrete structures, analysis and design of algorithms, enumerative combinatorics, additive combinatorics, algebra.

Submitted Papers

S1. (with Anna M. Brandenberger and Luc Devroye) Root estimation in Galton-Watson trees. *arXiv preprint 2007.05681*. Submitted July 2020.

S2. (with Rosie Y. Zhao) Arithmetic subsequences in a random ordering of an additive set. *arXiv preprint 2012.12339*. Submitted December 2020.

Reports

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

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

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

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

Research Experience

Probabilistic analysis of branching processes — **May 2020 – present**
Research group — *McGill University*

Ongoing research on branching processes, headed by Luc Devroye. Studied estimation problems on Galton-Watson trees. Attended informal seminars over the year, discussing various topics related to branching processes. (Gave a presentation at five of these: one on root estimation in Galton-Watson trees, two on generating functions and elementary analytic combinatorics, and two on graph regularity.) [S1]

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. [R3]

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. [R2]

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. [R1]

Work and Volunteer Experience

First responder **October 2017 – present**
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. Attend team training sessions twice a month to keep first-aid skills up-to-date. Most recent first responder certification: September 2021.

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*

Hold twice-weekly office hours to tutor students in a variety of undergraduate courses. Topics covered include 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.

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.

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

- Scored 10/120 on the William Lowell Putnam Mathematical Competition in 2019 (the median score that year was 2/120).
- Recipient of 0x$3.40 in Knuth reward cheques.
- Contributed sequences A335562, A338550, A338993, A339941, A339942, and A341822 to the On-line Encyclopedia of Integer Sequences.