

Jeffrey Kam

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INTERESTS

I am mainly interested in structural and algorithmic graph theory and its applications in areas such as reconfiguration problems and coding theory. I am also keen on various topics in computer algebra.

EDUCATION

University of Waterloo Sep 2017 - Present
Currently in fourth year

- Double major in Combinatorics & Optimization and Computer Science
- Minor in Pure Mathematics
- Term Dean's Honour List, Last 2 years' average: 91%

Relevant Courses

- Graduate: graph-theoretic algorithms, algorithms for graph minors
- Undergraduate: algebraic graph theory, coding theory, graph theory, fields and galois theory, network flow theory, algebraic number theory, neural networks, computational learning theory, algorithms

RESEARCH EXPERIENCE

University of Waterloo - Software REBELS May 2021 - Present
Undergraduate Research Fellow
Supervised by Prof. Shane McIntosh Waterloo, Canada

- Designed a new architecture for extracting preprocessor definitions and augmenting CMAKE dependency graph using Python, ANTLR, and Neo4j.
- Building a new tool to extract function dependency information from C++ abstract syntax tree.

University of Waterloo - Symbolic Computation Group May 2020 - Apr 2021
Undergraduate Research Assistant
Supervised by Dr. Armin Jamshidpey Waterloo, Canada

- Understanding various methods of testing normal elements in \mathbb{F}_p^n and its connections to circulant matrices and primitive elements.
- Researching different algorithms to find Smith Normal Form over \mathbb{Z}_{p^2} , such as experimenting with J -ideals and probabilistic algorithms.

RELEVANT PROJECTS AND PRESENTATIONS

A graph-theoretic proof for an upper bound of maximum block code size (CO331, 4 pages)

- An alternative to the linear-algebraic proof for the upper bound of $A_q(n, d)$ under the restriction $d > \frac{n(q-1)}{q}$ using Turán's theorem.

Network coding, network flow, and matroid theory (CO331, 37 pages)

- A survey on the link between the study of network coding, network flow, and matroid theory to better understand the limits of network coding. It covers network coding fundamentals, network flow in multicast networks, matroidal networks, and some results on their computational complexity and network capacity.

Decide tangles with weighted vertices and certify large branchwidth (CO749, 14 pages)

- A report on Elbracht et al.'s partial solution to finding a vertex subset characterization of a tangle, and Oum and Seymour's paper on certifying large branch-width in polynomial time with tangle-kits.

Bounding queue-number in planar graphs (CS762, 23 pages)

- A written report of a recent proof by Dujmović et al. for resolving a 20-year old conjecture on the queue-number of planar graphs, accompanied by lecture videos.

Eigenvalues and Graph Bisection

(CO444, 13 pages)

- A presentation on the proof of 2 claims from Boppana’s paper ”Eigenvalues and Graph Bisection: An Average-case Analysis”, where the details are omitted by the author.

PUBLICATIONS

- **UBCIS: Ultimate Benchmark for Container Image Scanning**,
with Shay Berkovich and Glenn Wurster
Published in 13th USENIX Workshop on Cyber Security Experimentation and Test (CSET 20).
<https://www.usenix.org/conference/cset20/presentation/berkovich>
- **bioSyntax: Syntax Highlighting For Computational Biology**,
with A. Babaian, et al.
Published in BMC Bioinformatics 19, 303 (2018).
<https://doi.org/10.1186/s12859-018-2315-y>

AWARDS AND DISTINCTIONS

- **University of Waterloo** May 2021
Undergraduate Research Fellowship
· Based on academic performance and research potentials.
- **University of Waterloo** Dec 2020
Frank Lun Scholarship for Excellence
· Based on academic performance and demonstrated leadership abilities.
- **University of Hong Kong and University of Waterloo** Mar 2017
Honourable Mention in Canadian Computing Competition Hong Kong
· Based on performance in the Canadian Computing Competition.

PROFESSIONAL EXPERIENCE

- **GTS** Sep 2020 - Dec 2020
Software Engineering Intern New York, US
· Worked on the core trading engine using C++ and Python. (Confidential)
- **BlackBerry - Security Research Group** January 2020 - April 2020
Security Researcher Intern Waterloo, Canada
Supervised by Shay Berkovich and Dr. Glenn Wurster
· Researched and designed a benchmark to quantitatively measure the effectiveness and accuracy of container image scanners, such as Anchore and Trivy, that resulted in a publication.
- **Zenefits** May 2019 - Aug 2019
Software Engineering Intern Vancouver, Canada
· Developed new permission guards in Python involving distributed message queue systems.
· Designed new customer-facing features with React and integrated with the backend through GraphQL.
- **Horizn** May 2018 - Aug 2018
Software Developer Intern Toronto, Canada
· Wrote automation scripts and queries to streamline clients’ data transfer to AWS services.

TECHNICAL SKILLS

Programming	Python, C++ (Boost), SAGE, Racket, L ^A T _E X
Tools	Git, C++ tools (GCC, GDB), Docker, Linux, PLY, ANTLR