Jeffrey Kam

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INTERESTS

I am mainly interested in graph theory and its algorithmic implications in areas such as algorithm design 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 Honours List

Relevant Courses

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

RESEARCH EXPERIENCE

University of Waterloo - Softwre REBELs   May 2021 - present
Undergraduate Research Fellow
Supervised by Prof. Shane McIntosh   *Waterloo, Canada*

· Designing a new architecture for extracting preprocessor definitions and augmenting CMAKE dependency graph using Python, ANTLR, and Neo4j.
· Working with Clang abstract syntax tree to extract function dependency information in C++ code.

University of Waterloo - Symbolic Computation Group   May 2020 - Apr 2021
Undergraduate Research Assisstant (Part-time)
Supervised by Dr. Armin Jamshidpey   *Waterloo, Canada*

· Understanding various methods on 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 $\mathbb{Z}_{p^2}$ efficiently, such as experimenting with J-ideal.

RELEVANT PROJECTS AND PRESENTATIONS

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.

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.

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.

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.

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).

· **bioSyntax: Syntax Highlighting For Computational Biology**,
with A. Babaian, et al.
Published in BMC Bioinformatics 19, 303 (2018).

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.

BlackBerry - Security Research Group   Janurary 2020 - April 2020
Security Researcher Intern
Supervised by Shay Berkovich and Dr. Glenn Wurster   *Waterloo, Canada*

· Researched and designed a universal benchmark to quantitatively measure the effectiveness and accuracy of container image scanners.
· Analyzed techniques of image inspection and vulnerability scanning through open source technologies.

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, LaTeX
Tools	Git, C++ tools (GCC, GDB), Docker, Linux, PLY, ANTLR