Jeffrey Kam

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INTERESTS

I am mainly interested in graph theory and its algorithmic implications in areas such as algorithm design, coding theory, and quantum computing. 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.

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.

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.
- Researched on utilizing machine learning for fuzzing algorithmic complexity vulnerabilities.

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).

RELEVANT PROJECTS AND PRESENTATIONS

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

· An alternative graph-theoretic proof 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 (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 network, and some results on the computational complexity and network capacity.

Bounding queue-number in planar graphs (23 pages)

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

Deciding tangles with weighted vertex sets and certifying large branchwidth (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 (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.

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.

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