

JEFFREY KAM

hykam@uwaterloo.ca

INTERESTS

I am interested in graph theory and would like to work on topics related to graph algorithms, graph colouring, and structural graph theory. In addition, I am also keen on topics related to discrete optimization.

EDUCATION

University of Waterloo

Sep 2017 - Present

Currently in term 4A

- Candidate for BMath. Combinatorics & Optimization and Computer Science
- Minor in Pure Mathematics
- Term Dean's Honours List

Relevant Courses

Taken already / Expected before Summer 2021.

E = Expected

- Graph-theoretic Algorithms - CS762
- Algorithms for Graph Minors - CO749
- Algebraic Graph Theory - CO444 [E]
- Network Flow Theory - CO351
- Introduction to Graph Theory - CO342
- Coding Theory - CO331 [E]
- Introduction to Optimization - CO250

Relevant Projects

- **Bounded queue-number in planar graphs (CS762)** - [Project Page](#)

I explored a recent proof by Dujmović et al [1] for a 20-year old conjecture on whether the queue-number of planar graphs is bounded. I also wrote lecture notes and made a lecture video on the topic.

- **Deciding tangles with weighted vertex sets (CO749)** - [Project Page](#)

I wrote a report on Elbracht et al.'s fractional solution [2] to an open problem about finding a vertex subset X that characterizes a tangle by checking which side of a separation has more vertices in X . In addition, we also looked at Oum and Seymour's paper [3] on certifying large branch-width in polynomial time with tangle-kits.

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>

RESEARCH EXPERIENCE

University of Waterloo - Symbolic Computation Group

May 2020 - Sep 2020

Undergraduate Research Assistant

Supervised by Armin Jamshidpey

Waterloo, Canada

- Researched different methods to find Smith Normal Form over \mathbb{Z}_{p^2} efficiently, such as experimenting with probabilistic algorithms and utilizing J -ideal
- Investigate new efficient methods of finding normal bases in \mathbb{F}_{p^n} and revisited various topics in abstract algebra and Galois theory

BlackBerry - Security Research Group

January 2020 - April 2020

Security Research Intern

Supervised by Shay Berkovich and 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
- Designed a universal import framework for Anchore Engine to extend our scanning capabilities
- Researched on utilizing machine learning for fuzzing algorithmic complexity vulnerabilities (ACV) by reading multiple security-related journals and conference papers
- Presented to the security research group on current developments of ML-based fuzzing and fuzzing techniques for ACVs, along with potential problems, experiments, and optimizations

WORK EXPERIENCE

GTS

Sep 2020 - Present

Software Engineering Intern

New York, US

- Working on performant C++ and Python code for the core trading engine

Zenefits

May 2019 - Aug 2019

Software Engineering Intern

Vancouver, Canada

- Developed new permission services in Python to guard against unauthorized review editing
- Designed a sequential document update service using a distributed message queue system

Horizon

May 2018 - Aug 2018

Software Developer Intern

Toronto, Canada

- Wrote automation scripts in Python to scrape data from files and database into JSON files
- Learned foundational object-oriented programming concepts, such as factory and observer pattern

AWARDS

- First place in HackSeq 2017 bioinformatics competition in UBC
- Honourable mention in Canadian Computing Competition Hong Kong 2017

TECHNICAL SKILLS

Programming

Python, C++, SAGE, Scheme

Tools

Git, C++ tools (i.e. GCC, GDB, Valgrind), Docker, Linux, Jupyter

References

- [1] Vida Dujmovic et al. “Planar Graphs have Bounded Queue-Number”. In: *2019 IEEE 60th Annual Symposium on Foundations of Computer Science (FOCS)* (2019). DOI: [10.1109/focs.2019.00056](https://doi.org/10.1109/focs.2019.00056).
- [2] Christian Elbracht, Jakob Kneip, and Maximilian Teegen. “Tangles are Decided by Weighted Vertex Sets”. In: *Advances in Combinatorics* (July 2020). DOI: [10.19086/aic.13691](https://doi.org/10.19086/aic.13691).
- [3] Sang-il Oum and Paul Seymour. “Certifying Large Branch-Width”. In: *Proceedings of the Seventeenth Annual ACM-SIAM Symposium on Discrete Algorithm*. SODA '06. Miami, Florida: Society for Industrial and Applied Mathematics, 2006, pp. 810–813. ISBN: 0898716055.