JEFFREY KAM

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INTERESTS

I am interested in graph theory and would like to work on topics related to graph algorithms 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 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, network flow theory, coding theory, introduction to graph theory, introduction to optimization, algorithms

Relevant Projects

- **Bounded queue-number in planar graphs (CS762)**
  I explored a recent proof by Dujmović et al [1] for a 20-year old conjectjure 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)**
  I wrote a report on Elbracht et al.'s fractional solution [2] to an open problem about finding a vertex subset that characterizes a tangle by a majority vote. In addition, I also explored 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 - present
Undergraduate Research Assisstant
Supervised by Armin Jamshidpey *Waterloo, Canada*

- Investigate new efficient methods of finding normal bases in $\mathbb{F}_{p^n}$ and revisited various topics in abstract algebra and Galois theory

· Researched different methods to find Smith Normal Form over $\mathbb{Z}_{p^2}$ efficiently, such as experimenting with probabilistic algorithms and utilizing J-ideal

BlackBerry - Security Research Group Janurary 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 - Dec 2020
Software Engineering Intern *New York, US*

· Worked on high-performance C++ and Python code for the core trading engine (Confidential)

Zenefits May 2019 - Aug 2019
Software Engineering Intern *Vancouver, Canada*

· Developed new permission services in Python to guard against unauthorized review editing
· Designed a sequeitial document update service using a distributed messsage queue system

Horizn 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 AND SCHOLARSHIPS

· **Frank Lun Scholarship for Excellence**, awarded by the University of Waterloo on the basis of academic performance and leadership abilities
· **HackSeq 2017**, Winning Team, bioinformatics competiton in UBC
· **Canadian Computing Competition Hong Kong 2017**, Honourable Mention, organized by University of Waterloo and University of Hong Kong

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.

[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.

[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.