Christopher Molloy (He/Him/His)

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Education

Queen's University Kingston, ON
Ph.D. Computing expected 2024
Relevant Coursework: Data Mining, Deep Learning, Neural and Genetic Computing, Topics in Data Analytics

Queen's University Kingston, ON
Bachelor's of Computing in Mathematics April 2020
Dean's Honor list 2019-2020
Relevant Coursework: Time Series Analysis, Statistical Inference, Data Analysis, Evolutionary Game Theory

Research Experience

Queen's University Kingston, ON
PhD Researcher September 2020 – present

- Designed neural network for clone search on zero-day malware.
- Created first two-player reinforcement learning game for adversarial malware generation and detection.
- Engineered sequence based neural network for aviation traffic anomaly detection.
- External reviewer for IJCAI conference (tier 1), KDD conference (tier 1), and WiSec conference.

Waterloo, ON
Blackberry LTD
Security Technology Research Student September 2022 – December 2022

- Independently researched, implemented, and compared various fusion methods for differing input data, such as synthetic vehicle time series data and malware features.
- Wrote survey on vehicle sensor fusion security for multi-university and industry partnership program (IDEaS).

Queen's University Kingston, ON
Undergraduate Researcher January 2020 – April 2020

- Developed image signature method from state-of-the-art.
- Matched malware families based on image signature.
- Implemented image signature method into large scale clone search system.

Employment Experience

Mitacs Internship – Lab2Market Cybersecurity Toronto, ON
Entrepreneurial Lead January 2023 – April 2023

- Conducted market research on encrypted malware detection within healthcare, finance, and government.
- Researched, developed, and validated Neural Network for detecting malware on encrypted software data.

Lunenfeld-Tanenbaum Research Institute Toronto, ON
Summer Engineer April 2019 – August 2019

- Designed php enabled website to store genome tube information.
- Created friendly user experience for lab technicians to store tube data in database without aid from engineer.

Vouchr Toronto, ON
Summer Engineer April 2018 – August 2018

J.F. Brennan Custom Homes Toronto, ON
Summer Laborer April 2017 – August 2017

Leadership Experience

Queen's University Kingston, ON
Undergraduate Thesis Team Lead: Encrypted Malware January 2023 – April 2023
- Introduced team to cybersecurity and encryption related topics.
- Lead team with SCRUM style development workflow.

Queen's University Montreal, QC
Industry University Liaison June 2022
- Queen's representative for workshop between McGill, Queen's, DRDC, and Blackberry LTD.
- Organized student research slide decks to ensure smooth transition between student and faculty presentations.

Queen's University Kingston, ON
Undergraduate Thesis Team Lead: Malware Family Detection January 2022 – April 2022
- Introduced team to cybersecurity and cyber threat response topics.
- Aided in interpreting clustering results for malware grouping.

Queen's University Kingston, ON
Malware Variant Matching Research Project Team Lead September 2021 – December 2021
- Introduced other researchers to project.
- Based on researchers' skills, delegated tasks related to project
- Met weekly to discuss project progress.

Beauty of Programming Bootcamp Toronto, ON
Lecturer July 2021 – August 2021
- Wrote curriculum to introduce high school entry students to the mathematics and logic used in programming.
- Lectured to group of young adults.
- Designed bootcamp around Covid-19 regulations.

Queen's Vertical Farming Team Kingston, ON
Software Backend Team Lead September 2020 – April 2022

Skills

Computer: Python (6 years), Git (6 years), Java (3 years), R (3 years), MySQL (4 years), C++ (2 years), C (2 years), MATLAB (1 year), HTML/CSS/JavaScript (8 years)

Language: English (fluent), Mandarin (beginner speaker)

Publications

C. Molloy, J. Banks, H. H. Steven Ding, P. Charland, A. Walenstein and L. Li, "Adversarial Variational Modality Reconstruction and Regularization for Zero-Day Malware Variants Similarity Detection," in *2022 IEEE International Conference on Data Mining (ICDM)*, Orlando, FL, USA, 2022, pp. 1131-1136, doi: 10.1109/ICDM54844.2022.00143.

C. Molloy, S. H. H. Ding, B. C. M. Fung, and P. Charland, "H4rm0ny: A Competitive Zero-Sum Two-Player Markov Game for Multi-Agent Learning on Evasive Malware Generation and Detection," in *2022 IEEE International Conference on Cyber Security and Resilience (CSR)*, 2022, pp. 22–29. doi: 10.1109/CSR54599.2022.9850345. **This paper was awarded the Best Research Paper Award by the conference chairs.**

C. Molloy, P. Charland, S. H. H. Ding, and B. C. M. Fung, "JARV1S: Phenotype Clone Search for Rapid Zero-Day Malware Triage and Functional Decomposition for Cyber Threat Intelligence," in *2022 14th International Conference on Cyber Conflict: Keep Moving! (CyCon)*, 2022, vol. 700, pp. 385–403. doi: 10.23919/CyCon55549.2022.9811078.

C. Molloy, Z. Mansour, and S. H. H. Ding, “Adversarial Learning on Malware,” in *Encyclopedia of Machine Learning and Data Science*, D. Phung, G. I. Webb, and C. Sammut, Eds. New York, NY: Springer US, 2020, pp. 1–4. doi: 10.1007/978-1-4899-7502-7_982-1.

L. Li, S. Ding, P. Charland, H. Yu, and **C. J. Molloy,** “GenTAL: Generative Denoising Skip-gram Transformer for Unsupervised Binary Code Similarity Detection.” 2022. [Online]. Available: https://openreview.net/forum?id=36SHWj0Gp1

Z. Mansour, **C. Molloy,** and S. H. Ding, “Machine Learning for Static Malware Analysis,” *Journal: Encyclopedia of Machine Learning and Data Science*, pp. 1–4, 2021.