

Kenneth Brezinski, PhD

Cybersecurity, Complexity Analysis, Deep Learning

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👤 [kbrezinski.github.io](https://github.com/kbrezinski)

Education

08/18-08/24

Doctor of Philosophy, *University of Manitoba*, Winnipeg, MB.

Electrical and Computer Engineering

Dissertation: Complexity-Based Graph Attention Network for Metamorphic Malware Detection

01/16-09/18

Master of Science, *University of Manitoba*, Winnipeg, MB.

Civil Engineering

Dissertation: High Performance Chromatography as a Natural Organic Matter Property Indicator in Ion-Exchange Applications

08/10-08/15

Bachelor of Science, *University of Winnipeg*, Winnipeg, MB.

Chemistry

Dissertation: Monitoring the Natural Organic Matter Composition throughout Manitoba Water Treatment Plants using Solid Phase Extraction

Professional Experience

Since 09/24

Post Doctoral Fellow, *University of Manitoba*, Winnipeg, Canada

- Carry out research on the application of Chaos Theory and Fractal Complexity analysis towards improving machine learning and deep learning frameworks.
- Improve host-based intrusion detection systems for an industry partner, Canadian Tire Corp.
- Supervised MSc Summer Student on classification of Microsoft Security Information and Event Management events.

Since 05/23

Instrumentation and Controls Engineer, *WSP Canada*, Winnipeg, Canada

- Carrying out water and wastewater treatment plant assessments, investigations, and process design & system optimization; including SCADA and PLC cabinet designs for electrical and signal cabling requirements.
- Develop OT networking architecture, perform cyber security audits; configure and install firewall, switches, routers, and intrusion detection systems.

09/22-12/22

Visiting Researcher, *National Institute for Informatics*, Tokyo, Japan

- Develop a graph autoencoder to detect network anomalies from backbone network traffic connecting Japanese Academic institutions to North America.
- Automate firewall rule generation using node embeddings, GNNExplainer and explainable AI and scale the application to billions of network packets daily.

05/22-08/22

Data Scientist Intern, *Microsoft*, Redmond, WA

- Worked with the Windows Defender for Endpoint Team on developing detectors to alert customers in the early stages of an exfiltration or ransomware attack.
- Leveraged PySpark and cross-product telemetry to improve the signal-noise-ratio of the detector to 80% and to scale to billions of live customer events.
- Coordinate with Security Engineers and Threat Researchers on identifying the most important precursors to malicious network connections.

05/21-08/21

Applied Research Scientist II Intern, *Amazon Web Services*, New York, NY

- Worked with the Amazon GuardDuty threat detection research team on developing novel semi-supervised techniques to apply weak labelling to Linux binaries.
- Established a working group of Security Engineers and SWE to coordinate and consult on the ongoing project.

10/19-10/22

Research Intern Lead, *Canadian Tire Corp.*, Winnipeg, MB

- First-authored six publications in close collaboration with an industry collaboration with Canadian Tire executives with a focus on Malware detection of enterprise security threats.

Journal and Book Publications

Deep Learning, Cybersecurity, Complexity

Logistic Dropout: A Soft Dropout Mechanism via the Logistic Map, [Brezinski, K.](#), Ferens, K., Kinsner, W., 2025. *Int J Data Sci Anal* 22, 27 (2026). <https://doi.org/10.1007/s41060-025-00984-9>

Graph-Ensemble Methods for Detecting Metamorphic Malware, [Brezinski, K.](#), Ferens, K., 2023. *Cybersecurity: Cyber Defense, Privacy and Cyber Warfare*. De Gruyter (book); accepted, in press

Metamorphic Malware and Obfuscation - A Survey of Techniques, Variants and Generation Kits, [Brezinski, K.](#), Ferens, K., 2023. *Security and Communications* (journal); DOI: 10.1155/2023/8227751

Incorporating Topological Complexity into a Multilayer Perceptron, [Brezinski, K.](#), Ferens, K., 2022. *Transactions on Computational Science & Computational Intelligence*. Springer Nature (book); accepted, in press

Classifying SARS-CoV-2 and Common Co-infections from Genome Assemblies, Mohaimen Rahman, [Brezinski, K.](#), Ferens, K., 2022. *Transactions on Computational Science & Computational Intelligence*. Springer Nature (book); accepted, in press

Transformers – Malware in Disguise, [Brezinski, K.](#), Ferens, K., 2021. *Advances in Security, Networks, and Internet of Things*, In book: *Transactions on Computational Science & Computational Intelligence Chapter*. Springer Nature (book); accepted, in press

Sandy Toolbox: A Framework for Dynamic Malware Analysis and Model Development, [Brezinski, K.](#), Ferens, K., 2021. *Security & Management (SAM'21) Advances in Security, Networks, and Internet of Things*. Springer Nature (book); accepted, in press

An Adaptive Tribal Topology for Particle Swarm Optimization, [Brezinski, K.](#), Ferens, K., 2020. *Advances in Artificial Intelligence and Applied Cognitive Computing*. Springer Nature (book); DOI: 10.4018/IJSSCI.2020040105

Population Based Equilibrium in Hybrid SA/PSO for Combinatorial Optimization, [Brezinski, K.](#), Ferens, K., 2020. *International Journal of Software Science and Computational Intelligence* (journal); DOI: 10.4018/IJSSCI.2020040105

Cognitive Hybrid PSO/SA Combinatorial Optimization, [Brezinski, K.](#), Ferens, K., 2020. *Advances in Security, Networks, and Internet of Things*. Springer Nature (book); DOI: 10.1109/ICCICC46617.2019.9146062

Environmental Engineering, Chemistry

Ozonation of natural organic matter and aquatic humic substances: the effects of ozone on the structural characteristics and subsequent trihalomethane formation potential, Mehrnaz Sadnourmohamadi, [Ken Brezinski](#), Beata Gorczyca, 2020. *Water Quality Research Journal of Canada* (journal); DOI: <https://doi.org/10.2166/wqrj.2020.011>

Multi-spectral characterization of natural organic matter (NOM) from Manitoba surface waters using high performance size exclusion chromatography (HPSEC), [Ken Brezinski](#), Beata Gorczyca, 2019. *Chemosphere* (journal); DOI: <https://doi.org/10.1016/j.chemosphere.2019.02.176>

An overview of the uses of high-performance size exclusion chromatography (HPSEC) in the characterization of natural organic matter (NOM) in potable water, and ion-exchange applications, [Ken Brezinski](#), Beata Gorczyca, 2018. *Chemosphere* (journal); DOI: <https://doi.org/10.1016/j.chemosphere.2018.10.028>

Ion-Exchange for Trihalomethane control in potable water treatment – A municipal water treatment case study in Rainy River, Ontario, Canada, [Ken Brezinski](#), Mehrnaz Sadrnourmohamadi, Beata Gorczyca, 2018. *Water Quality Research Journal of Canada* (journal); DOI: <https://doi.org/10.2166/wqrj.2018.134>

Effect of total organic carbon and aquatic humic substances on the occurrence of lead at the tap, Lisa Winning, Beata Gorczyca, [Ken Brezinski](#), 2017. *Water Quality Research Journal of Canada* (journal); DOI: [10.2166/wqrc.2017.028](https://doi.org/10.2166/wqrc.2017.028)

Conference Publications

Harnessing Deterministic Chaos for Adaptive Gradient Optimization, [Brezinski, K.](#), Ferens, K., Kinsner, W. 2025. *9th International Conference on Applied Cognitive Computing* (proceedings); IEEE. DOI: [10.13140/RG.2.2.16820.16002](https://doi.org/10.13140/RG.2.2.16820.16002); accepted, in press

Complexity-Based Lambda Layer for Time Series Prediction, [Brezinski, K.](#), Ferens, K., 2021. *IEEE Congress on Evolutionary Computation* (proceedings); IEEE. DOI: [10.1109/CEC45853.2021.9504995](https://doi.org/10.1109/CEC45853.2021.9504995)

Complexity-Based Convolutional Neural Network for Malware Classification, [Brezinski, K.](#), Ferens, K., 2020. *International Conference on Computational Science and Computational Intelligence* (proceedings); IEEE. DOI: [10.1109/CSCI51800.2020.00008](https://doi.org/10.1109/CSCI51800.2020.00008)

Teaching Experience

09/16-05/22

Teacher's Assistant, *University of Manitoba, Winnipeg, Canada*

Worked as a Teacher Assistant for the following courses over 20+ appointments:

CHEM 1300 – Chemistry

CHEM 1122 – Introduction to Chemistry Techniques for Engineering 1

CHEM 1126 - Introduction to Chemistry Techniques for Engineering 2

ENG 3000 - Engineering Economics

ECE 3740 - Systems Engineering Principles 1

CIVL 3700 - Environmental Engineering Design

MECH 4860 - Engineering Design

CIVL 3690 - Environmental Engineering Analysis

CIVL 4100 - Engineering Management and the Environment

ENG 2040 - Engineering Communication: Strategies, Practice and Design

ENG 2030 - Engineering Communication: Strategies for the Profession

08/17-04/18

Engineering Graduate Student Tutor, *University of Manitoba, Winnipeg, Canada*

- Proofread manuscripts, thesis dissertations, award applications and course deliverables for graduate students in the department of Biosystems, Civil, Electrical and Computer Engineering.

Professional Memberships

EGBC	Professional Engineer (PEng) , Engineers and Geoscientists BC
EngGeoMB	Professional Engineer (PEng) , Engineers Geoscientists Manitoba
ISA	Member , Industrial Society for Automation
ASTTBC	Certified Technician (C.Tech.) , Applied Science Technologists & Technicians of BC
CTTAM	Certified Technician (C.Tech.) , Certified Technicians & Tech. Association of MB
PMI	Project Management Professional (PMP) , Project Management Institute
CompTIA	Security+ , Computing Technology Industry Association
CompTIA	Network+ , Computing Technology Industry Association
ACPA	Chemist in Training (C.I.T.) , Association of the Chemical Profession of Alberta
WCW	Member , Western Canada Water

Fellowships and Awards

2026	Mitacs Globalink
2024-2026	Mitacs Accelerate – Post Doctorate
2023	Research Completion Scholarship
2022	Emily and Lynette Hain Graduate Engineering Scholarship
2021-2022	University of Manitoba Graduate Fellowship
2021-2022	Edward R. Toporeck Graduate Fellowship in Engineering
2021	Mitacs Globalink - JSPS
2020	A. Keith Dixon Graduate Scholarship in Engineering
2021-2022	Philip and Marjorie Eckman Scholarship in Engineering
2019-2022	Mitacs Accelerate – Ph. D
2019	NSERC – CGS M
2016	Mitacs Accelerate – M.Sc.

Students Supervised

exp. 01/26	Akfaq Rahman, MSc. Co-advisor Dept. of Computer Engineering, University of Manitoba
2025	Sahej Garg, MSc. Summer Student Advisor Dept. of Computer Engineering, University of Manitoba
2024	Gabriel Barnabe, BSc. Summer Student Advisor Dept. of Computer Science, University of Manitoba
2019	Michael Guevarra, BSc. Summer Student Advisor Dept. of Computer Engineering, University of Manitoba

Academic and Volunteer Service

since 10/24	Member , ISA99 Committee and 62443 standards
since 05/20	Reviewer , International Journal of Software Science and Computational Engineering
11/17-01/21	Reviewer , Journal of Desalination and Water Treatment
04/17-01/21	Reviewer , Journal of Water Science and Technology
09/18-05/21	Student Peer Mentor , University of Manitoba Students' Union
01/19-01/21	Language Partner Volunteer , English Language Center

09/19-09/20 **Faculty of Science Mentor**, Faculty of Science
04/19-12/19 **Language Exchange Program Volunteer**, International Center
06/19-01/21 **President and Founder**, University of Manitoba Engineering Masters (UMEM)
06/20-06/23 **Personal Disaster Response Volunteer**, Canadian Red Cross
11/16-11/17 **Vice-President**, University of Manitoba Water and Environmental Foundation (UMWEF)