ZHIDA LI

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EDUCATION

Ph.D. Engineering Science *Sept. 2015–Apr. 2022*
Simon Fraser University, Canada

- Dissertation: Machine Learning for Classifying Anomalies and Intrusions in Communication Networks
  Keywords: Cybersecurity, communication networks, machine learning, intrusion detection systems

M.Eng.Sc. (thesis-based) Electrical and Electronic Engineering *Feb. 2013–Sept. 2015*
University College Cork, Ireland

M.Eng.Sc. (course-based) Microelectronic Engineering *Sept. 2011–Feb. 2013*
University College Cork, Ireland

B.E. (Hons.) Electrical and Electronic Engineering *Sept. 2009–Sept. 2011*
University College Cork, Ireland

B.E. Microelectronics *Sept. 2007–Sept. 2009*
Guilin University of Electronic Technology, China

TECHNICAL SKILLS

Programming Languages: Python, MATLAB, MySQL, JavaScript, Octave, C#, LaTeX

Machine Learning Libraries and Data Science Tools: PyTorch, Keras, Scikit-learn, NumPy, SciPy, Pandas, Matplotlib, Google Colab, Weka

Web Application Development: Flask, AWS Elastic Beanstalk

Certification: Cisco Certified Network Associate (CCNA)

RESEARCH AND WORK EXPERIENCE

Assistant Professor *Jan. 2023–Present*
Department of Computer Science, New York Institute of Technology Vancouver, BC

- **Teaching Responsibilities for the Master of Science in Cybersecurity (M.S.-Cybersecurity) Program**
  - Core courses: **CSCI 651** Algorithm Concepts; **INCS 615** Advanced Network and Internet Security; **INCS 775** Data Center Security; **INCS 870** Project I
  - Elective course: **CSCI 690** Computer Networks
- **Curriculum Development for Online Education**
  - **CSCI 760** Database Systems for the New York Campus
- **Research Involvement**
  - Network intrusion detection systems (NIDS): Developing a real-time machine learning (ML) system for the detection of network anomalies; Focusing on fast ML algorithms in cybersecurity
  - Brain-computer interfaces (BCI): Analyzing electroencephalogram (EEG) signals and developing ML classification models for BCI data

Postdoctoral Fellow *June 2022–Dec. 2022*
Faculty of Applied Sciences, Simon Fraser University Burnaby, BC

- Led the project for developing new machine learning algorithms based on echo state networks
- Explored applications of graph neural networks based on network topologies

Research Assistant *(Advisor: Prof. Ljiljana Trajković)* *Sept. 2015–Apr. 2022*
Faculty of Applied Sciences, Simon Fraser University Burnaby, BC

- **Applications of Machine Learning Techniques for Classifying Network Anomalies**
  - Processed the raw network data: BGP data from RIPE and Route Views
  - Analyzed and implemented various ML algorithms as well as employing feature selection
  - Performed experiments (cross-validation and testing) using a supercomputer managed by Compute Canada
- **Development of Novel Machine Learning Algorithms: VFBLS, VCFBLS**
  - Developed two fast BLS-based algorithms: variable features BLS algorithms without and with cascades
  - Developed generalized models based on various subsets of input data based on selected features and expanded the network structure
- **Development of Tool for Detecting Network Anomalies: BGPGuard**
  - The tool consists of multiple modules: real-time data retrieval, feature extraction, label refinement, data partition, data processing, ML algorithms, parameter selection, ML models, and classification
  - Integrated various stages of the anomaly detection process
  - Detected BGP anomalies based on routing records collected worldwide from major Internet exchange points
  - Facilitated creating new machine learning models based on historical BGP anomalous events

Teaching Assistant *Sept. 2015–Apr. 2022*
Faculty of Applied Sciences, Simon Fraser University Burnaby, BC

- **ENSC 427/894 Communication Networks**, 6 terms (undergraduate and graduate levels)
- **ENSC 220 Electric Circuits I**, 4 terms (undergraduate level)
- **ENSC 120 Introduction to Electronics Laboratory Instruments Operation and Measurement Techniques**, 2 terms (undergraduate level)
- **ENSC 252 Fundamentals of Digital Logic and Design**, 2 terms (undergraduate level)
- **ENSC 180 Introduction to Engineering Analysis**, 1 term (undergraduate level)

Data Analyst | Part-time *May 2021–Sept. 2021*
EVO-IN-MOTION Technology Richmond, BC

- Analyzed data from circuit simulations and experiments

Teaching Assistant *June 12, 2021*
IEEE SMC Society Summer School Tokyo, Japan (virtual)

- TA for Lecture 4: Data mining and machine learning for detecting traffic anomalies and intrusions
- Designed and presented a demo of anomaly detection (Slammer worm) with Python on Colab

Research Assistant *(Advisor: Prof. Peter Kennedy)* *Oct. 2011–Jan. 2015*
Tyndall National Institute Cork, Ireland

- Designed nonlinearity-tolerant requantizer architectures for fractional-*N* frequency synthesizers

Electrical Engineer | Internship *May 2010–Aug. 2010*
Dell EMC Cork, Ireland

- Supplied details of failure return to the suppliers and involved in customer service

AWARDS

- IEEE Outstanding Leadership Award *Dec. 2022*
  - Publicity Chair of the 2022 IEEE International Conference on Digital Twin as a part of the 2022 IEEE Smart World Congress
- Graduate Fellowship Award, SFU *Fall 2017, Fall 2019*
- Faculty of Applied Sciences Graduate Fellowship Award, SFU *Summer 2016, Fall 2016*
- Travel and Minor Research Award, SFU *Summer 2016*

EXTERNAL SERVICE AND EVIDENCE OF IMPACT

Leading Guest Editor *June 2024–Present*
Electronics: Special Issue on Enhancing Cybersecurity: Attack Detection and Defense Techniques

Secretary *Feb. 2022–Present*
Membership Development Committee, IEEE Canada

Secretary *Jan. 2024–Present*
IEEE Vancouver Section

Chair/Treasurer *June 2023–Present/ Jan. 2018–June 2023*
IEEE Circuits and Systems Society joint Chapter of the Vancouver/Victoria Sections

Counselor *July 2023–Present*
IEEE NYIT-Vancouver Student Branch

Chair/ Secretary *Sept. 2020–Oct. 2021/ Sept. 2019–Sept. 2020*
IEEE SFU Student Branch

Mentor, Organizer of Hosting Institutes *Apr. 2024*
Virtual BR41N.IO Hackathon, Spring School 2024

- Mentored NYIT and NTNU teams:
  - Data Analysis Projects: Team SpatialTemporal Explorers and Team Brainwave. Focused on EEG analysis, this project aimed to filter noise from EEG data, partition the data, and develop various deep learning models (CNN, GAN) to classify brainwave signals.

Jury Member and Mentor, Organizer of Hosting Institutes *Apr. 2023*
Virtual BR41N.IO Hackathon, Spring School 2023

- Assessed various projects: data analysis, gaming, and programming/art
- Mentored NYIT teams:
  - Data Analysis Project: Focused on EEG analysis, this project aimed to filter noise from EEG data, partition the data, and develop various machine learning models to classify brainwave signals
  - Gaming Project: Developed using Unity 3D and the Unicorn C# API, this project features a game that leverages P300 signals reflecting the player's attention to specific stimuli to control the music, creating a unique gaming experience

Technical Program Committee Membership

- IEEE International Conference on High Performance Computing and Communications: Member (*HPCC-2022*); Member and Session Chair (*HPCC-2020*)
- IEEE International Conference on Cyber, Physical and Social Computing: Member and Publicity Chair (*CPSCom-2022*); Member and Session Chair (*CPSCom-2020*)
- IEEE International Conference on Parallel and Distributed Systems (*ICPADS 2023*)

- IEEE International Conference on Geoinformation Science and Communication Technology (*GSCT 2025*)
- International Conference on Cryptography, Security and Privacy (*CSP 2024, 2025*)
- International Conference on E-Business and Internet: Member (*ICEBI 2022*)
- International Conference on Intelligent Sensing and Industrial Automation (*ISIA 2023*)

Reviewer for Refereed Journal and Conference Papers

- IEEE Journal on Selected Areas in Communications (J-SAC) (*2022*); Computers & Security (*2022)*; IEEE Transactions on Neural Networks and Learning Systems (*2021, 2022)*; Neural Networks (*2020–2022)*; IEEE International Symposium on Circuits and Systems *(2022)*; IEEE International Conference on Systems, Man, and Cybernetics (*2020–2024)*; Concurrency and Computation: Practice and Experience (*2021*); IEEE Transactions on Emerging Topics in Computational Intelligence (*2019*, *2021*); IEEE Access (*2019*, *2020*)

PUBLICATIONS [Google Scholar]

Book Chapters:

1. Q. Ding, **Z. Li**, S. Haeri, and Lj. Trajković, "Application of machine learning techniques to detecting anomalies in communication networks: datasets and feature selection algorithms," in *Cyber Threat Intelligence*, A. Dehghantanha, M. Conti, T. Dargahi, Eds., Berlin: Springer, pp. 47–70, 2018.
2. **Z. Li**, Q. Ding, S. Haeri, and Lj. Trajković, "Application of machine learning techniques to detecting anomalies in communication networks: classification algorithms," in *Cyber Threat Intelligence*, A. Dehghantanha, M. Conti, T. Dargahi, Eds., Berlin: Springer, pp. 71–92, 2018.

Refereed Journals:

3. **Z. Li**, A. L. G. Rios, and Lj. Trajković, "Machine learning for detecting the WestRock ransomware attack using BGP routing records," *IEEE Commun. Mag*., vol. 61, no. 3, pp. 20–26, Mar. 2023. (IF: 8.3)
4. **Z. Li**, A. L. G. Rios, and Lj. Trajković, "Machine learning for detecting anomalies and intrusions in communication networks," *IEEE Journal on Selected Areas in Communications (JSAC),* vol. 39, no. 7, pp. 2254–2264, July 2021. (IF: 13.8)
5. M. P. Kennedy, **Z. Li**, and Z. Huang, "Programmable analog frequency divider based on p-switching," *Nonlinear Theory and Its Applications, IEICE,* vol. 4, no. 4, pp. 389–399, Oct. 2013.

Publications in Refereed Conference Proceedings:

6. Z. Alomari, **Z. Li**, A. Makanju, "Lightweight machine learning-based IDS for IoT environments," *IEEE Cyber Security in Networking Conference (CSNet)*, Paris, France, Dec. 2024, to be published.
7. **Z. Li**, W. Han, Y. Shao, and A. Makanju, "Enhancing cybersecurity through fast machine learning algorithms," *IEEE Canadian Conf. Elect. Comput. Eng. (CCECE)*, Kingston, ON, Canada, Aug. 2024, 905–909.
8. Wong. W, Z. Alomari, H. Lai, **Z. Li**, and A. Ullah, "An analysis of non-elliptic curve based primality tests," in *Proc. IEEE Int. Conf. Cryptography, Security, and Privacy (CSP)*, Osaka, Japan, Apr. 2024, pp. 53–58.
9. **Z. Li** and Lj. Trajković, "Enhancing cyber defense: using machine learning algorithms for detection of network anomalies," in *Proc. IEEE Int. Conf. Syst., Man, Cybern*., Honolulu, USA, Oct. 2023, pp. 1658–1663.
10. T. Sharma, K. Patni, **Z. Li**, and Lj. Trajković, "Deep echo state networks for detecting Internet worm and ransomware attacks," in *Proc. IEEE Int. Symp. Circuits Syst.*, Monterey, USA, May 2023.
11. **Z. Li**, A. L. G. Rios, and Lj. Trajković, "Classifying denial of service attacks using fast machine learning algorithms," in *Proc. IEEE Int. Conf. Syst., Man, Cybern*., Melbourne, Australia, Oct. 2021, pp. 1221–1226.
12. **Z. Li**, A. L. G. Rios, and Lj. Trajković, "Detecting Internet worms, ransomware, and blackouts using recurrent neural networks," in *Proc. IEEE Int. Conf. Syst., Man, Cybern.*, Toronto, Canada, Oct. 2020, pp. 2165–2172.
13. A. L. G. Rios, **Z. Li**, K. Bekshentayeva, and Lj. Trajković, "Detection of denial of service attacks in communication networks," in *Proc. IEEE Int. Symp. Circuits Syst.*, Seville, Spain, Oct. 2020.

14. **Z. Li**, A. L. G. Rios, G. Xu, and Lj. Trajković, "Machine learning techniques for classifying network anomalies and intrusions," in *Proc. IEEE Int. Symp. Circuits Syst.*, Sapporo, Japan, May 2019, pp. 1–5.
15. A. L. G. Rios, **Z. Li**, G. Xu, A. Diaz Alonso, and Lj. Trajković, "Detecting network anomalies and intrusions in communication networks," in *Proc. 23rd IEEE Int. Conf. Intell. Eng. Syst.*, Hungary, Apr. 2019, pp. 29–34.
16. **Z. Li**, P. Batta, and Lj. Trajković, "Comparison of machine learning algorithms for detection of network intrusions," in *Proc. IEEE Int. Conf. Syst., Man, Cybern.*, Miyazaki, Japan, Oct. 2018, pp. 4248–4253.
17. P. Batta, M. Singh, **Z. Li**, Q. Ding, and Lj. Trajković, "Evaluation of support vector machine kernels for detecting network anomalies," in *Proc. IEEE Int. Symp. Circuits Syst.*, Florence, Italy, May 2018, pp. 1–4.
18. H. B. Yedder, Q. Ding, U. Zakia, **Z. Li**, S. Haeri, and Lj. Trajković, "Comparison of virtualization algorithms and topologies for data center networks," in *Proc. 26th Int. Conf. Comput. Commun. Netw., 2nd Workshop Netw. Security. Analytics Autom.*, Vancouver, Canada, Aug. 2017.
19. Q. Ding, **Z. Li**, P. Batta, and Lj. Trajković, "Detecting BGP anomalies using machine learning techniques," in *Proc. IEEE Int. Conf. Syst., Man, Cybern.*, Budapest, Hungary, Oct. 2016, pp. 3352–3355.
20. S. Haeri, Q. Ding, **Z. Li**, and Lj. Trajković, "Global resource capacity algorithm with path splitting for virtual network embedding," in *Proc. IEEE Int. Symp. Circuits Syst.*, Montreal, Canada, May 2016, pp. 666-669.
21. M. P. Kennedy, H. Mo, **Z. Li**, G. Hu, P. Scognamiglio, E. Napoli, "The noise and spur delusion in fractional-N frequency synthesizer design," in *Proc. IEEE Int. Symp. Circuits Syst.*, Lisbon, Portugal, May 2015.
22. **Z. Li**, H. Mo, and M. P. Kennedy, "Comparative spur performance of a fractional-N frequency synthesizer with a nested MASH-SQ3 divider controller in the presence of memoryless piecewise-linear and polynomial nonlinearities", in *Proc. 25th IET Irish Signals Syst. Conf.*, Limerick, Ireland, June 2014, pp. 374–379.
23. M. P. Kennedy, **Z. Li**, and H. Mo, "How to eliminate integer boundary spurs in fractional-N frequency synthesizers", in *Proc. 17th RIA/URSI Research Colloquium Commun. Radio Sci. into the 21st Century*, Dublin, Ireland, May 2014, pp. 1–4.
24. **Z. Li** and M.P. Kennedy, "The switched injection-locked oscillator (SILO) concept," in *Proc. Int. Symp. Nonlinear Theory and Its Applications (NOLTA)*, Palma, Mallorca, October 2012, pp. 868–871.

TALKS

DRDC ORC Seminar Series 2024:

- Zhida Li, "Machine Learning and Data Transformation for Detecting Network Anomalies and Intrusions," DRDC ORC Seminar Series, Defence Research and Development (DRDC), DRDC Ottawa Research Centre, Canada, Dec. 4, 2024 (virtual).

UNM ME Seminar Series 2022:

- Zhida Li, "Machine Learning for Classifying Anomalies and Intrusions in Communication Networks," Mechanical Engineering Seminar Series (UNM ME Seminar Series), University of New Mexico, Albuquerque, USA, Dec. 2, 2022 (virtual).