# 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

**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 for Master of Science in Cybersecurity (M.S.-Cybersecurity) program
- Researching network intrusion detection systems (NIDS), brain-computer interfaces, and blockchain

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

- Led the project for developing new machine learning (ML) 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: CyberDefense**
  - 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

**Data Analyst** | Part-time *May 2021–Sept. 2021*
*EVO-IN-MOTION Technology* Richmond, BC
- Analyzed data from circuit simulations and experiments

**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

## TEACHING EXPERIENCE

**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)
  - Delivered lectures as needed; Designed and graded assignments and exams; Guided students with their projects using ns-3 and Riverbed Modeler
- **ENSC 220 Electric Circuits I**, 4 terms (undergraduate level)
  - Held lab sessions with both practical exercises and LTspice simulations: Kirchhoff's voltage and current laws, operational amplifiers, and RLC circuits; Graded assignments and exams
- **ENSC 120 Introduction to Electronics Laboratory Instruments Operation and Measurement Techniques**, 2 terms (undergraduate level)
  - Held lab sessions for operating electronics laboratory instrumentation such as linear power supply, digital multi-meter, function generator, and oscilloscope; Graded exams
- **ENSC 252 Fundamentals of Digital Logic and Design**, 2 terms (undergraduate level)
  - Held lab sessions for designing digital systems using VHDL on a FPGA; Proctored exams
- **ENSC 180 Introduction to Engineering Analysis**, 1 term (undergraduate level)
  - Helped design a lab assignment using MATLAB: Red Bull Stratos Jump; Proctored exams

**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

## 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

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

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

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

**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*)
- International Conference on E-Business and Internet: Member (ICEBI 2022)

**Reviewer**

- 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 (*2020–2022)*; 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*. (Early Access), to be published. (IF: 9.03)
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: 13.081)

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. 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.
7. **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.
8. 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.*, Sevilla, Spain, Oct. 2020.
9. **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.
10. 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.
11. **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.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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.
17. **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.
18. 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.
19. **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

**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).