Di Zhu

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Research Interests

My current research focuses on developing systems to enable in-network computations for AI/ML applications in modern datacenter networks. I'm also interested in building in-network computing systems using heterogeneous hardware such as programmable switches, FPGA, and photonic devices.

Education

University of Virginia	Charlottesville, VA, USA
Ph.D. in Computer Science	*Aug. 2022 – May 2027 (Expected)*
Advisor: Prof. Hyojoon Kim	
College of William and Mary	Williamsburg, VA, USA
Ph.D. in Computer Science	*Attended Aug. 2020 – June 2022*
Boston University	Boston, MA, USA
Master of Science in Computer Science	*Aug. 2018 – Jan. 2020*
Sichuan University	Chengdu, Sichuan, China
Bachelor of Engineering in Computer Science	*Aug. 2014 – June 2018*

Publications

- **Zhu, Di**, and Hyojoon Kim. "Automating Distributed In-network Classification with Runtime Programmability." In Proceedings of the CoNEXT on Student Workshop 2024, pp. 27-28. 2024.

- Islam, Md Khairul, **Di Zhu**, Yingzheng Liu, Andrej Erkelens, Nick Daniello, and Judy Fox. "Interpreting County Level COVID-19 Infection and Feature Sensitivity using Deep Learning Time Series Models." arXiv preprint arXiv:2210.03258 (2022).

Projects

In-network Inference with Photonic Hardware   Apr. 2024 – Present
- Built a physical testbed with one laser source, two modulators, one photodetector, one FPGA, and other necessary components.
- Currently learning how to program the FPGA to control the photonic testbed with Xilinx Vivado and Verilog programs.

Automating Distributed In-network Classification with Runtime Programmability   Apr. 2024 – Present
- Designed a procedure that converts Python Scikit-learn ML models to table representations, reconstructs Lucid subprograms, and deploy tables on Intel Tofino switches without interrupting normal networking function.
- Implementing mechanisms to automatically optimize table deployment plans.
- Wrote a paper titled "Automating Distributed In-network Classification with Runtime Programmability" and published it on ACM CoNEXT 2024 Student Workshop.

Synthetic System Log Generation   Mar. 2023 – Oct. 2023
- Performed empirical study to prove the negative impact of data imbalance on ML/DL-based anomaly intrusion detection systems.
- Performed system entity abstraction for subjects based on process names, and for objects based on paths, IP addresses and port numbers, and classified system entities into finer-grained categories.
- Constructed a WGAN-based model to generate synthetic subject entities as well as synthetic relevant edges based on features extracted from k-hop neighbors of existing subject nodes.

County Level COVID-19 Infection Forecasting and Interpretation   Feb. 2022 – Jan. 2023
- Modeled COVID-19 infection using Temporal Fusion Transformer from 02/2020 to 11/2021 and predicted COVID-19 cases from 12/2021 to 05/2022.
- Extended the Morris Method for multidimensional spatial-temporal data and studied individual feature sensitivity using the Morris Method.
- Stratified county-level population from socioeconomic and health data, and studied sensitivity for each population groups.
- Wrote a paper titled "Interpreting County Level COVID-19 Infection and Feature Sensitivity using Deep Learning Time Series Models" and published it on arXiv.

EXPERIENCE

University of Virginia
Graduate Teaching Assistant - CS/ECE 7457 Advanced Computer Networks   *Fall 2024*
Graduate Teaching Assistant - CS/ECE 4457 Computer Networks   *Spring 2024*
Graduate Teaching Assistant - CS 4630 Defense Against the Dark Arts   *Fall 2023*
William & Mary
Graduate Teaching Assistant - CSCI 303 Algorithms   *Spring 2022*
Graduate Teaching Assistant - CSCI 140 Programming for Data Science   *Fall 2021*
Graduate Teaching Assistant - CSCI 303 Algorithms   *Spring 2021*
Graduate Teaching Assistant - CSCI 303 Algorithms, CSCI 435 Software Engineering   *Fall 2020*
Boston University
Grader - CAS CS 440 Artificial Intelligence   *Spring 2019*
Grader - CAS CS 330 Introduction to Analysis of Algorithms   *Fall 2019*

AWARDS

Travel Grant, CoNEXT 2024
Second-class Scholarship, Sichuan University 2017
Third-class Scholarship, Sichuan University 2016
National Scholarship, Sichuan University 2015
First-class Scholarship, Sichuan University 2015

TECHNICAL SKILLS

Software Defined Networks: P4-16 (TNA), Intel P4 Studio, Barefoot Runtime Interface, Tofino-Model, Lucid
Artificial Intelligence: Python, PyTorch, Tensorflow, Scikit-learn, NumPy, Pandas
Other: Java, C++
Learning: Xilinx FPGA, Vivado, Verilog, Photonic Device