Zhiying Xu

zhiyingxu@g.harvard.edu
http://xuzhiying9510.github.io
(+1)857-253-8842
SEC 4.429, 150 Western Ave,
Boston, MA 02134

Education

Harvard University — Cambridge, US
Ph.D. in Computer Science, Advisor: Minlan Yu — 2018–Current

Shanghai Jiao Tong University — Shanghai, CN
B.S. in Information Engineering, GPA: 3.85/4.00 — 2014–2018

Research Experience

Harvard University — Cambridge, US

Robust Traffic Engineering on large networks with deep Learning — Oct 2020 –Current
In traffic engineering, machine learning is a natural fit for the uncertainty in traffic demands and link availability, and its inference time also scales on large networks. We are developing a deep learning approach with a hypergraph neural network for traffic engineering for robust Traffic Engineering on large networks.

Robust Traffic Engineering on large networks with Reinforcement Learning — Oct 2020 –Current
Auxiliary signals in DDoS attack development, such as the presence of spoofed traffic or blocklisted sources, and the history of prior attacks, help boost DDoS detection. We leverage a multi-timescale LSTM framework and survival analysis to learn when these weak auxiliary signals represent an imminent attack. Our evaluations on a large network provider show up to 54% additional anomalous traffic captured and 4–9.5 minutes earlier than commercial detection systems.
(In submission.)

Boost DDoS Detection Using Auxiliary Signals — Sept 2018 –Current
Both spatial changes and temporal changes in network traffic occurs before a network attack. We build graphs of network traffic for each time step with edge and node features and apply a graph neural network along with an LSTM to capture the two changes for attack detection. Our design has higher accuracy in evaluations on different attack detections including DDoS attacks, botnet, and BGP hijacking.
(Partial results of botnet detection are presented in Ml4net workshop; Standard and easy-to-use datasets are uploaded in Zenodo.)

Shanghai Jiao Tong University — Shanghai, CN

Determining Source-Destination Connectivity in Uncertain Networks — Jan 2016 –Jan 2017
Given a network with uncertain source-destination connectivity, we prove the NP-hardness for the sequential order of edge connectivity tests with the least expected test cost in determining source-destination connectivity.
(Accepted in [4], [6])

Publications

[1] L. Fu, J. Xu, S. Qu, **Z. Xu**, X. Wang, and G. Chen, "Seeking the truth in a decentralized manner", *IEEE/ACM Transactions on Networking*, 2021.

[2] J. Zhou, **Z. Xu**, A. M. Rush, and M. Yu, "Automating botnet detection with graph neural networks", *arXiv preprint arXiv:2003.06344*, 2020.

[3] L. Fu, X. Fu, Z. Zhang, **Z. Xu**, X. Wu, X. Wang, and S. Lu, "Joint optimization of multicast energy in delay-constrained mobile wireless networks", *IEEE/ACM Transactions on Networking*, vol. 26, no. 1, pp. 633–646, 2018.

[4] L. Fu, X. Fu, **Z. Xu**, Q. Peng, X. Wang, and S. Lu, "Determining source–destination connectivity in uncertain networks: Modeling and solutions", *IEEE/ACM Transactions on Networking*, vol. 25, no. 6, pp. 3237–3252, 2017.

[5] X. Fu, Z. Hu, **Z. Xu**, L. Fu, and X. Wang, "De-anonymization of networks with communities: When quantifications meet algorithms", in *GLOBECOM 2017-2017 IEEE Global Communications Conference*, IEEE, 2017, pp. 1–6.

[6] X. Fu, **Z. Xu**, Q. Peng, L. Fu, and X. Wang, "Complexity vs. optimality: Unraveling source-destination connection in uncertain graphs", in *IEEE INFOCOM 2017-IEEE Conference on Computer Communications*, IEEE, 2017, pp. 1–9.

[7] X. Fu, **Z. Xu**, Q. Peng, J. You, L. Fu, X. Wang, and S. Lu, "Conmap: A novel framework for optimizing multicast energy in delay-constrained mobile wireless networks", in *Proceedings of the 18th ACM International Symposium on Mobile Ad Hoc Networking and Computing*, 2017, pp. 1–10.

Skills

- **Programming:** C/C++, Python, Verilog, VHDL.
- **Tools:** Pytorch, TensorFlow, CUDA, OpenFlow, Xilinx ISE, FPGA, Cortex-M, MATLAB, LaTeX

Graduate Courses

Machine Learning, Decision Theory, Advanced Computer Networks, Cloud Networking and Computing, Algorithms at the Ends of the Wire, Systems Development for Computational Science

Teaching

- **Teaching Assistant** at Harvard University — Spring 2020
  Computing Foundations for Computational Science (CS205)
  Instructor: Ignacio M. Llorente, David Sondak

Awards

- Outstanding Graduates in Shanghai — 2018
- China Computer Federation(CCF) Outstanding Undergraduate Award — 2017
- National Scholarship(top 0.2%, nationwide) — 2015, 2017