



# Zhiying Xu

zhiyingxu@g.harvard.edu   
http://xuzhiying9510.github.io   
(+1)857-253-8842  
Room 136, 33 Oxford St,  
Cambridge, MA 02138



## EDUCATION

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|---|-------------------------------|
| <b>Harvard University</b><br>Ph.D. in Computer Science, Advisor: Minlan Yu              | Cambridge, US<br>2018–Current |
| <b>Shanghai Jiao Tong University</b><br>B.S. in Information Engineering, GPA: 3.85/4.00 | Shanghai, CN<br>2014–2018     |

## RESEARCH EXPERIENCE

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| <b>Harvard University</b><br><b>Proactive DDoS Detection with Auxiliary Signals</b><br>Auxiliary signals in DDoS attack development, such as spoofed or blacklisted sources, or previous attacks, proactively forecast DDoS attacks. We collect 10-day auxiliary signals and propose a multi-timescale LSTM framework to capture their short-term details and long-term overview. Experiments show earlier detection than Arbor with 7.9 minutes on average.<br>(In submission.)   | Cambridge, US<br>Jan. 2019 –Current  |
| <b>Dynamic Attack Detection with Graph Neural Networks</b><br>We build graphs of network traffic for each time step with edge and node features, and apply a graph neural networks along with an LSTM to capture both spatial (within graph) and temporal (across time) changes for attack detection. Our design has higher accuracy in evaluations on different attack detections including DDoS attacks, botnet and BGP hijacking.<br>(Partial results of botnet detection are presented in ML4net workshop  ; Standard and easy-to-use dataset are uploaded in Zenodo  .) | Sept. 2018 –Current                  |
| <b>Shanghai Jiao Tong University</b><br><b>Determining Source-Destination Connectivity in Uncertain Networks</b><br>Given a network with uncertain source-destination connectivity, we prove the NP-hardness for the sequential order of edge connectivity tests with least expected test cost in determining source-destination connectivity.<br>(Accepted in [3], [5])   | Shanghai, CN<br>Jan. 2016 –Jan. 2017 |

## PUBLICATIONS

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- [1] J. Zhou, **Z. Xu**, A. M. Rush, and M. Yu, “Automating botnet detection with graph neural networks”, *arXiv preprint arXiv:2003.06344*, 2020.
- [2] 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.
- [3] 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.

- [4] 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.
- [5] 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.
- [6] 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

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

## GRADUATE COURSES

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

## TEACHING

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

## AWARDS

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