

Xuhang Ying

EDUCATION

University of Washington (Seattle, WA): PhD *in EE*; GPA: 3.96/4.00 Sep. 2013 - June 2018

- PhD Thesis: Crowdsourcing and Resource Allocation in Shared Spectrum

Advisors: Profs Sumit Roy and Radha Poovendran.

Chinese Univ. of Hong Kong: B.Eng. *in Information Engineering*; GPA: 3.70/4.00 Sep. 2009 - June 2013

University College London (London, UK): *Exchange*; GPA: 3.85/4.00 Jan. 2012 - June 2012

PROFESSIONAL EXPERIENCE

Network Security Lab (NSL), University of Washington (UW). (Seattle, WA) July 2018 – Current
Postdoctoral Research Associate

- Leading automotive cybersecurity research and UW-Boeing collaboration on GPS security at NSL.

Dept. of Electrical and Computer Engineering, UW. (Seattle, WA) Sep - Dec 2017, 2018
Instructor

- Instructed a 400-level course of 30+ undergraduate students; prepared lectures and homework.
- Designed course projects: IDSs for CAN bus and DNN-based network IDS (MATLAB/Python).

Nokia Bell Labs. (Murray Hill, NJ) June – Aug 2016
Summer Research Intern

- Studied channel assignment with channel contiguity constraints in the 3.5 GHz (CBRS) shared bands.
- Implemented in Java/MATLAB; presented work to Bell Labs president; published two papers.

Nokia Networks. (Arlington Heights, IL) June – Sep. 2015
Summer Intern

- Implemented Wi-Fi/LTE aggregation in the PDCP layer using OpenAirInterface.

RESEARCH AND PROJECT EXPERIENCE

Automotive CPS Security - Controller Area Network (CAN) June 2017 - Current

- Proposed the cloaking attack against clock skew-based IDSs on CAN bus; formally modeled its attack success probability; experimental evaluation with real vehicles showed a prediction error less than 5.7%.
- Developed timing-based and storage-based covert channels that allow ECUs to transmit authentication messages for detecting masquerade attacks without modifying CAN protocol or introduce overheads.

Wireless Security - GPS, ADS-B Jan. 2018 - Current

- Developed robust GPS spoofing detector for commercial off-the-shelf GPS receivers.
- Developed a DNN-based classifier that detects ADS-B spoofing attacks with an accuracy of 96.66%.

Crowdsensing and Resource Allocation in Shared Spectrum Sep. 2013 – June 2018

- Developed auction-based and pricing-based incentive mechanisms that motivate crowdsourcing users to contribute spectrum data for constructing Radio Environment Maps using spatial statistics (Kriging).
- Developed coexistence-aware channel assignment algorithms with channel availability and contiguity constraints based on graph theory for PAL and GAA layers in the CBRS band.

TV White Space (WS) 2012 - 2016

- Conducted first large-scale measurement of outdoor and indoor TV spectrum occupancy at 30+ diverse locations in a typical metropolis Hong Kong; confirmed abundant TVWS resources.

- Developed White-Space Indoor Spectrum EnhanceR (WISER) to identify indoor WS in a building; our results showed that WISER identifies 30%-50% more indoor WS with negligible false alarms.
- Analyzed the outdoor/indoor white/gray space availability based on path loss models in MATLAB.

SELECTED AWARDS:

- Travel Grants for IEEE DySPAN 2015, IEEE/ACM ICCPS 2018
- Mainland Student Scholarship, New Asia College, CUHK, 2012-2013
- Dragon Crowd SCHIESSER scholarship 2011-2012; HSBC Scholarship, 2010-2011

SELECTED PUBLICATIONS*:

- [J1] **X. Ying**, S. U. Sagong, A. Clark, L. Bushnell, and R. Poovendran, "Shape of the Cloak: Formal Analysis of Clock Skew-Based Intrusion Detection System in Controller Area Networks". IEEE TIFS (Accepted).
- [J2] **X. Ying**, R. Poovendran, and S. Roy, "SAS-Assisted Coexistence-Aware Dynamic Channel Assignment for 3.5GHz Shared Spectrum". IEEE Trans. On Wireless Comm. (TWC), Vol 17, Issue 9, Sep. 2018.
- [J3] **X. Ying**, R. Poovendran, and S. Roy, "Pricing Mechanisms for Crowd-Sensed Spatial-Statistics-Based Radio Mapping". IEEE Trans. On Cognitive Comm. and Networking (TCCN), Vol 3, Issue 2, June 2017.
- [J4] **X. Ying**, J. Zhang, L. Yan, Y. Chen, G. Zhang, M. Chen, and R. Chandran. "Exploring Indoor White Spaces in Metropolises". ACM Trans. On Intelligent Sys. and Tech. (TIST), Vol 9 Issue 1, Sep. 2017.
- [C1] **X. Ying**, J. Mazer, G. Bernieri, M. Conti, L. Bushnell, and R. Poovendran, "Detecting ADS-B Spoofing Attacks using Deep Neural Networks". IEEE Conference on Comm. And Network Security (Submitted)
- [C2] **X. Ying**, G. Bernieri, M. Conti, and R. Poovendran, "TACAN: Transmitter Authentication through Covert Channels in Controller Area Networks". IEEE/ACM ICCPS 2019, Montreal, Canada (Accepted).
- [C3] S. U. Sagong, X. Ying, R. Poovendran, and L. Bushnell, "Exploring Attack Surfaces of Voltage-Based Intrusion Detection Systems in Controller Area Networks", ESCAR Europe 2018, Brussels, Belgium.
- [C4] S. U. Sagong, **X. Ying**, A. Clark, L. Bushnell, and R. Poovendran, "Cloaking the Clock: Emulating Clock Skew in Controller Area Networks", IEEE/ACM ICCPS 2018, Porto, Portugal. (**Best Paper Finalist**)
- [C5] **X. Ying**, M. M. Buddhikot, and S. Roy, "Coexistence-Aware Dynamic Channel Allocation for 3.5 GHz Shared Spectrum Systems". IEEE DySPAN, Baltimore, MD, March 2017.
- [C6] **X. Ying**, S. Roy and R. Poovendran, "Incentivizing Crowdsourcing for Radio Environment Mapping with Statistical Interpolation", IEEE DySPAN, Stockholm, Sweden, Sep 2015.
- [C7] **X. Ying**, J. Zhang, L. Yan, G. Zhang, M. Chen, and R. Chandra, "Exploring Indoor White Spaces in Metropolises", ACM MobiCom, Miami, Florida, USA, Sep 2013.

PROFESSIONAL & SKILLS:

- Protocols & Software: Wi-Fi, GPS, ADS-B, CAN, LTE, TCP/IP, MAC, Software Defined Radio, ns3
- Programming Languages: Python, MATLAB, C/C++, Java, R
- Languages: English (proficient); Mandarin (native); Cantonese (fluent).

ACADEMIC SERVICES:

- Reviewer for ICCPS, TMC, TWC, GLOBECOM, EUSIPCO, DySPAN
- Session Chair for IEEE/ACM ICCPS 2018.

* A complete list of publications is available at <http://students.washington.edu/xhying/>.