Zuchao Ma

PERSONAL DATA

ADDRESS: KOWLOON HUNG HOM WHAMPOA BUILDING BLOCK A, 2G BULKELEY STREET
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RESEARCH INTERESTS: Blockchain security / IoT security
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EDUCATION

2021 – Present **Pursuing Doctor of Philosophy**
Department of Computing
The Hong Kong Polytechnic University, Hong Kong
Supervised by Professor. Daniel Xiapu Luo
GPA: 3.49

2018 – 2021 **Master of Computer Science and Technology**
College of Computer Science and Technology,
Nanjing University of Aeronautics and Astronautics (NUAA), China
Supervised by Associate Professor. Liang Liu and Assistant Professor. Weizhi Meng (Technical University of Denmark)
GPA: 90.4/100.0, Ranking A (Top 15%)

2014 – 2018 **Bachelor of Computer Science and Technology**
College of Computer Science and Technology,
Nanjing University of Aeronautics and Astronautics (NUAA), China
GPA: 4.0/5.0, Ranking 6/110

SELECTED AWARDS AND HONOURS

Sep. 2023- Aug. 2024	The Most Appreciated Teaching Assistant Award of COMP PolyU (Recognition Award)
Sep. 2022- Aug. 2023	The Most Appreciated Teaching Assistant Award of COMP PolyU (Merit Award)
Sep. 2021- Aug. 2022	The Most Appreciated Teaching Assistant Award of COMP PolyU (Bronze Medal)
Nov. 2020	**Postgraduate National Scholarship (2020) (CNY 20,000)**
Oct. 2019- Nov. 2020	Advanced individual in research and innovation of NUAA (2018-2020)
Oct. 2019- Nov. 2020	Advanced postgraduate award of NUAA (2018-2020)
Sep. 2018- Sep. 2020	First Class Scholarship for Graduate Students of NUAA (2018-2020) (CNY 10,000/year)
Dec. 2016- Dec. 2018	Second Class Scholarship for Undergraduates of NUAA (2015-2018) (CNY 2,500/year)
May. 2018	Third Class Study Scholarship for Undergraduates of NUAA (2017-2018)
Apr. 2017	First Class Study Scholarship for Undergraduates of NUAA (2016-2017)
Nov. 2015	Third Class Scholarship for Undergraduates of NUAA (2014-2015) (CNY 1,500/year)

PUBLICATIONS

Journal Paper:

- **Zuchao Ma**, Muhui Jiang, Xiapu Luo, Haoyu Wang and Yajin Zhou, "Uncovering NFT Domain-Specific Defects on Smart Contract Bytecode" in **IEEE Transactions on Dependable and Secure Computing (TDSC)**. DOI 10.1109/TDSC.2025.3556285. [CCF-A, SCI-Q2, IF 7]

- **Zuchao Ma**, Liang Liu and Weizhi Meng, "Towards Multiple-Mix-Attack Detection via Consensus-based Trust Management in IoT Networks" in **Computer & Security (COSE)**, ELSEVIER. Volume 96, September 2020, 101898. [CCF-B, SCI-Q2, IF 3.579]
- **Zuchao Ma**, Liang Liu, Weizhi Meng, Xiapu Luo, Lisong Wang and Wenjuan Li, "ADCL: Towards An Adaptive Network Intrusion Detection System Using Collaborative Learning in IoT Networks" in **IEEE Internet of Things Journal (IOTJ)**. [CCF-C, SCI-Q1, IF 8.2]
- Liang Liu, **Zuchao Ma** and Weizhi Meng, "Detection of multiple-mix-attack malicious nodes using perceptron-based trust in IoT networks" in **Future Generation Computer Systems (FGCS)**, ELSEVIER. Volume 101, December 2019, Pages 865-879. [CCF-C, SCI-Q1, IF 6.125]
- Lei Yang, Liang Liu, **Zuchao Ma** and Youwei Ding, "Detection of selective-edge packet attack based on edge reputation in IoT networks" in **Computer Networks (CN)**. [CCF-B, SCI-Q3, IF 3.111]
- Muhui Jiang, Jinan Jiang, Tao Wu, **Zuchao Ma**, Xiapu Luo and Yajin Zhou, "Understanding Vulnerability Inducing Commits of the Linux Kernel" in **ACM Transactions on Software Engineering and Methodology (TOSEM)**. [CCF-A, SCI-Q1, IF 5.5].
- Liang Liu, Xiangyu Xu, Yulei Liu, **Zuchao Ma**, Jianfei Peng, "A detection framework against CPMA attack based on trust evaluation and machine learning in IoT network" in **IEEE Internet of Things Journal (IOTJ)**. [CCF-C, SCI-Q1, IF 8.2]

Conference Paper:

- **Zuchao Ma**, Muhui Jiang, Feng Luo, Xiapu Luo and Yajin Zhou, "Surviving in Dark Forest: Towards Evading the Attacks from Front-Running Bots in Application Layer" in **34th Usenix Security Symposium (USENIX SEC 2025)**. [CCF-A]
- **Zuchao Ma**, Liang Liu and Weizhi Meng, "ELD: Adaptive Detection of Malicious Nodes under Mix-Energy-Depleting-Attacks Using Edge Learning in IoT Networks" in **23rd Information Security Conference (ISC 2020)**. Grand Mirage Resort & Thalasso, Bali, Indonesia, 16-20 Dec 2020. **Best Paper Award.** [CCF-C, Accept Rate 23%]
- **Zuchao Ma**, Liang Liu and Weizhi Meng, "DCONST: Detection of Multiple-Mix-Attack Malicious Nodes Using Consensus-based Trust in IoT Networks" in **25th Australasian Conference on Information Security and Privacy (ACISP 2020)**. Perth, Australia, 15-17 July 2020. **Best Student Paper Award.** [CCF-C, Accept Rate 20%]
- Shanshan Sun, **Zuchao Ma** and Liang Liu, "Detection of malicious nodes in drone ad-hoc network based on supervised learning and clustering algorithms" in **16th International Conference on Mobility, Sensing and Networking (MSN 2020)**. Tokyo, Japan, 17–19 December 2020. [CCF-C]

RESEARCH EXPERIENCE

Oct 2023 – Oct 2024 **Doctor of Philosophy Research**
The Hong Kong Polytechnic University, Hong Kong
Supervisor: Professor. Daniel Xiapu Luo

- **Topic: Security Analysis of Defending Front-Running Attacks in Blockchain Applications**
- Designing **EVScope**, the first binary framework to detect strategies adopted by blockchain applications to defend front-running attacks, by leveraging dynamic taint analysis to collect defense trace for supporting datalog and machine learning analysis. (2023-2024, published in conference **USENIX SEC 2025 [CCF-A]**)

Dec 2021 – Jan 2023 **Doctor of Philosophy Research**
The Hong Kong Polytechnic University, Hong Kong
Supervisor: Professor. Daniel Xiapu Luo

- **Topic: Security Analysis of Non-Fungible-Token Smart Contracts**

- Proposing **Emerium**, the first binary framework to uncover **NFT-domain-specific defects** in smart contract bytecode, by recovering NFT-domain-specific data in bytecode and leveraging path reachability to inspect real semantics of contracts. (2021-2023, published in journal **IEEE Transactions on Dependable and Secure Computing (TDSC) [CCF-A]**)

Oct 2018 – Sep 2021 **Master Research**

Applied Security and Cryptography Research Laboratory (ASC)
Nanjing University of Aeronautics and Astronautics (NUAA)
Supervisor: Associate Professor. Liang Liu and Assistant Professor. Weizhi Meng

- **Topic: Malicious Nodes Detection Schemes in IoT networks**
- Proposing **perceptron-based model** to detect **multiple-mix-attack** consisting of tamper attack, drop attack and replay attack with uncertain probabilities, by tracking the **routes** for conducting **the regression of attack nodes**. (2018-2019, published in journal **Future Generation Computer Systems (FGCS) [CCF-C]**)
- Conducting **consensus-based model (DCONST)** to detect **multiple-mix-attack**, which enables IoT nodes to evaluate node **trustworthiness** by sharing **cognition information** in networks. DCONST is equipped with the ability to detect malicious nodes as well as **identify their concrete attack behaviours**. (2019-2020, published in journal **Computer & Security (COSE) [CCF-B]** and conference **ACISP 2020 [CCF-C, Best Student Paper Award]**)
- Proposing **edge-based model (ELD)** to detect **energy-exhausting-attack** consisting of carousel attack, flooding attack and replay attack with uncertain probabilities, by collecting **traffic logs** to build **intrusion graphs** to locate malicious nodes. (2020, published in conference **ISC 2020 [CCF-C, Best Paper Award]**)
- Designing an **adaptive network intrusion detection framework** to detect existing **IoT network attacks**, by combining the capabilities of various models trained under different networks, which enables the framework to adaptively detect unknown attacks. (2021, published in journal **IEEE Internet of Things Journal [CCF-C]**)

Jun 2018 – Sep 2018 **Bachelor Project**

Institute of Data Management and Knowledge Engineering
Nanjing University of Aeronautics and Astronautics (NUAA)
Supervisor: Associate Professor. Liang Liu

- **Topic: The Application of Cloud Platform in Computer Teaching Experiments of College**
- Developing **Teaching Experiment Cloud (TEC)**, for providing virtual machines (VM) for students/lecturers to conduct experiments.
- Proposing a scheduling scheme **EGAPT** for the planned cloud task of TEC, which utilizes teaching plans to optimize the schedule of virtual machines, maintaining the load balance of physical machines and reducing the energy consumption.

ADDITIONAL SKILLS

- Solid programming skills in android application development (Second Prize of Training Camp of App Development of NUAA) and J2EE development.
- Full stack development skills: Front-end [Vue.js, React.js] + Http-Interface Server [Vert.x, Java servlet] + Database [MySQL, SQL Server].