FUCHEN MA

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Research Interests

My research focuses on **Assured Decentralization**, which aims at making decentralized systems secure, robust, and dependable in practice. My long-term objective is an edge-to-chain ecosystem in which data generated at **end devices** is trustworthy, propagated through reliable **storage and consensus** across decentralized clusters, and securely accessed and processed by **decentralized applications**. Over the past several years, I have been pursuing this goal by advancing *security assurance* for **end devices**, **cluster systems**, and **decentralized applications**.

From the end devices perspective, I employ protocol-level testing to detect the attack surfaces in IP cameras and NICs. From the cluster systems perspective, I conduct system fuzzing and chaos testing to improve the security and robustness of blockchain and distributed file systems. Besides, I also perform fuzzing on cryptographic implementations. From the decentralized applications perspective, I use techniques like datalog analysis and symbolic execution to improve the quality of smart contracts.

Education & Experience

Tsinghua University **08/2024 - present**

Postdoctoral Researcher (Shuimu-Scholar)
Advisor: Prof. Yu Jiang

Tsinghua University **09/2019 - 06/2024**

Ph.D. in Software Engineering
Advisor: Prof. Jiaguang Sun

- ***Thesis**: Detection and Reproduction of Vulnerabilities in Blockchain Consensus Protocols*
  Excellent Doctoral Dissertation of 2024 by the China Institute of Electronics

Beijing University of Posts and Telecommunications **09/2015 - 06/2019**

B.S. in Software Engineering

Representative Research

My five most representative publications are highlighted in the publication list below. From the end devices perspective, my research has uncovered new attack surfaces in IoT devices like Security Cameras, that may lead to video freezes and surveillance failures (IEEE S&P 2026). In **blockchain cluster systems**, I introduced the first *masquerading-node* approach to test consensus and P2P stacks from within (NDSS 2023) and built a context-sensitive chaos framework for end-to-end fault orchestration and reproducible bug exposure (CCS 2023). At the **storage** layer, I characterized metadata inconsistency bugs in distributed file systems and designed a cross-node workload fuzzer to detect them (USENIX Security 2025). For **decentralized applications**, I developed a symbolic-execution engine that closes gaps in detecting vulnerabilities arising from inter-contract calls (TSE 2021).

Full Publication List

★ indicates my five most representative publications.
🌱 indicates the first-author publications of my mentees.

28. ★ Camveil: Unveiling Security Camera Vulnerabilities through Multi-Protocol Coordinated Fuzzing.
Fuchen Ma, Yuqiao Yang, Yuanliang Chen, Yanyang Zhao, Ting Chen, and Yu Jiang.
In 47th IEEE Symposium on Security and Privacy (**IEEE S&P**), 2026.

27. 🌱 DualFuzz: Detecting Vulnerability in Wi-Fi NICs through Dual-Directional Fuzzing.
Yuanliang Chen, **Fuchen Ma**, Yanyang Zhao, Yuanyi Li, and Yu Jiang.
In 40th IEEE/ACM International Conference on Automated Software Engineering (**ASE**), 2025.
🏆 Distinguished Paper Award.

26. DNAFuzz: Descriptor-Aware Fuzzing for USB Driver.
Zhengshu Wang, Peng He, **Fuchen Ma**, Yuanliang Chen, Shuoshuo Duan, Yiyuan Bai, and Yu Jiang
In 40th IEEE/ACM International Conference on Automated Software Engineering (**ASE**), 2025.

25. 🌱 CAFault: Enhance Fault Injection Technique in Practical Distributed Systems via Abundant Fault-Dependent Configurations.
Yuanliang Chen, **Fuchen Ma**, Yuanhang Zhou, Zhen Yan, and Yu Jiang.
In 2025 USENIX Annual Technical Conference (**USENIX ATC**), 2025.

24. 🌱 CMFuzz: Parallel Fuzzing of IoT Protocols by Configuration Model Identification and Scheduling.
Qi Xu, **Fuchen Ma**, Yuanliang Chen, Wanli Chen, Feifan Wu, Yanyang Zhao, Heyuan Shi, and Yu Jiang.
In 2025 62nd ACM/IEEE Design Automation Conference (**DAC**), 2025.

23. ★ Finding Metadata Inconsistencies in Distributed File Systems via Cross-Node Operation Modeling.
Fuchen Ma, Yuanliang Chen, Yuanhang Zhou, Zhen Yan, Hao Sun, and Yu Jiang.
In 34th USENIX Security Symposium (**USENIX Security**), 2025.

22. 🌱 Themis: Finding Imbalance Failures in Distributed File Systems via a Load Variance Model.
Yuanliang Chen, **Fuchen Ma**, Yuanhang Zhou, Zhen Yan, Qing Liao, and Yu Jiang.
In 20th edition of the European Conference on Computer Systems (**EuroSys**), 2025.

21. 🌱 Chord: Towards a Unified Detection of Blockchain Transaction Parallelism Bugs.
Yuanhang Zhou, Zhen Yan, Yuanliang Chen, **Fuchen Ma**, Ting Chen, and Yu Jiang.
In 47th International Conference on Software Engineering (**ICSE**), 2025.

20. When Fuzzing Meets LLMs: Challenges and Opportunities.
Yu Jiang, Yuanliang Chen, **Fuchen Ma**, Jie Liang, Mingzhe Wang, et al.
In the ACM International Conference on the Foundations of Software Engineering (**FSE**), 2024.

19. Stop Pulling my Rug: Exposing Rug Pull Risks in Crypto Token to Investors.
Yuanhang Zhou, Jingxuan Sun, **Fuchen Ma**, Yuanliang Chen, Zhen Yan, and Yu Jiang.
In 46th International Conference on Software Engineering (**ICSE**), 2024.

18. Chronos: Finding Timeout Bugs in Practical Distributed Systems by Deep-Priority Fuzzing with Transient Delay.
Yuanliang Chen, **Fuchen Ma**, Yuanhang Zhou, Ming Gu, Qing Liao, and Yu Jiang.
In 45th IEEE Symposium on Security and Privacy (**IEEE S&P**), 2024.

17. CLFuzz: Vulnerability Detection of Cryptographic Algorithm Implementation via Semantic-Aware Fuzzing.
Yuanhang Zhou, **Fuchen Ma**, Yuanliang Chen, Meng Ren, and Yu Jiang.
In ACM Transactions on Software Engineering and Methodology (**TOSEM**), 2023.

16. ★ Phoenix: Detect and Locate Resilience Issues in Blockchain via Context-Sensitive Chaos Submission.
Fuchen Ma, Yuanliang Chen, Yuanhang Zhou, Jingxuan Sun, Yu Jiang, Jiaguang Sun, and Huizhong Li.
In the ACM Conference on Computer and Communications Security (**CCS**), 2023.

15. ★ LOKI: State-Aware Fuzzing Framework for the Implementation of Blockchain Consensus Protocols.
Fuchen Ma, Yuanliang Chen, Meng Ren, Yuanhang Zhou, Yu Jiang, Ting Chen, Huizhong Li, and Jiaguang Sun.
In the Network and Distributed System Security Symposium (**NDSS**), 2023.

14. Tyr: Finding Consensus Failure Bugs in Blockchain System with Behaviour Divergent Model.
Yuanliang Chen, **Fuchen Ma**, Yuanhang Zhou, Yu Jiang, Ting Chen, Jiaguang Sun.
In 44th IEEE Symposium on Security and Privacy (**IEEE S&P**), 2023.

13. Pied-Piper: Revealing the Backdoor Threats in Ethereum ERC Token Contracts.
Fuchen Ma, Meng Ren, Lerong Ouyang, Yuanliang Chen, Juan Zhu, Ting Chen, Xiao Dai, Yu Jiang, Jiaguang Sun.
In ACM Transactions on Software Engineering and Methodology (**TOSEM**), 2022.

12. Scanner++: Enhanced Vulnerability Detection of Web Applications with Attack Intent Synchronization.
Zijing Yin, Yiwen Xu, **Fuchen Ma**, Haohao Gao, Lei Qiao, Yu Jiang.
In ACM Transactions on Software Engineering and Methodology (**TOSEM**), 2022.

11. V-Gas: Generating High Gas Consumption Inputs to Avoid Out-of-Gas Vulnerability.
Fuchen Ma, Ying Fu, Meng Ren, Wanting Sun, Houbing Song, Heyuan Shi, Yu Jiang, Huizhong Li.
In ACM Transactions on Internet Technology (**TOIT**), 2022.

10. ★ Pluto: Exposing Vulnerabilities in Inter-Contract Scenarios.
Fuchen Ma, Zhenyang Xu, Meng Ren, Zijing Yin, Yuanliang Chen, Lei Qiao, Bin Gu, Huizhong Li, Yu Jiang and Jiaguang Sun.
In IEEE Transactions on Software Engineering (**TSE**), 2021.

9. Making Smart Contract Development More Secure and Easier.
Meng Ren, **Fuchen Ma**, Zijing Yin, Huizhong Li, Ying Fu, Ting Chen, and Yu Jiang.
In the ACM International Conference on the Foundations of Software Engineering (**FSE**), 2021.

8. SCStudio: A Secure and Efficient Integrated Development Environment for Smart Contracts.
Meng Ren, **Fuchen Ma**, Zijing Yin, Huizhong Li, Ying Fu, Ting Chen, and Yu Jiang.
In the 30th ACM SIGSOFT International Symposium on Software Testing and Analysis (**ISSTA**), 2021.

7. Empirical Evaluation of Smart Contract Testing: What Is the Best Choice?
Meng Ren, Zijing Yin, **Fuchen Ma**, Zhenyang Xu, Yu Jiang, Chengnian Sun, Huizhong Li, and Yan Cai.
In the 30th ACM SIGSOFT International Symposium on Software Testing and Analysis (**ISSTA**), 2021.

6. Security Reinforcement for Ethereum Virtual Machine.
Fuchen Ma, Meng Ren, Ying Fu, Mingzhe Wang, Huizhong Li, Houbing Song, and Yu Jiang.
In Information Processing & Management (**IPM**), 2021.

5. IntelliGen: Automatic Driver Synthesis for Fuzz Testing.
Mingrui Zhang, Jianzhong Liu, **Fuchen Ma**, Huafeng Zhang, and Yu Jiang.
In 43rd International Conference on Software Engineering (**ICSE**), 2021.

4. Poster: Fuzz Testing of Quantum Program.
Jiyuan Wang, **Fuchen Ma**, and Yu Jiang.
In IEEE International Conference on Software Testing, Verification and Validation (**ICST**), 2021.


Best Paper Award.

3. EVMFuzzer: Detect EVM Vulnerabilities via Fuzz Testing.
   Ying Fu, Meng Ren, **Fuchen Ma**, Heyuan Shi, Xin Yang, Yu Jiang, Huizhong Li, and Xiang Shi.
   In the ACM International Conference on the Foundations of Software Engineering (**FSE**), 2019.

2. EVM*: From Offline Detection to Online Reinforcement for Ethereum Virtual Machine.
   Fuchen Ma, Ying Fu, Meng Ren, Mingzhe Wang, Yu Jiang, et al.
   In 26th edition of the IEEE International Conference on Software Analysis, Evolution and Reengineering (**SANER**), 2019.

1. EnFuzz: Ensemble Fuzzing with Seed Synchronization among Diverse Fuzzers.
   Yuanliang Chen, Yu Jiang, **Fuchen Ma**, Jie Liang, Mingzhe Wang, Chijin Zhou, Xun Jiao, and Zhuo Su.
   In 28th USENIX Security Symposium (**USENIX Security**), 2019.

Industrial Recognitions

- 🎗 Grant from Aptos Foundation, 05/2025.
- 🎗 MVP of the Year by FISCO BCOS Community, 12/2021.
- 🎗 Tencent Rhino-Bird Elite, 08/2021.

Awards

- 🏆 **Excellent Doctoral Dissertation of 2024**, China Institute of Electronics, 03/2025.
- 🏆 **First Prize for Technical Invention**, China Computer Federation, 10/2024
  Secure and high-performance blockchain platform
  *Yu Jiang, Huizhong Li, **Fuchen Ma**, Xiang Shi, Yuanliang Chen, and Xingqiang Bai.*
- 🏆 **First Prize of the Beijing Science and Technology Progress Award**, 05/2025
- 🏆 **Outstanding Graduate of Beijing**, 06/2024

Grants & Funding

- Distributed System Fuzzing based on Multi-dimension Input Generation.
  Young Scientists Fund (C Class), National Natural Science Foundation of China
  Grant No. 62502254. **PI, RMB 300,000 (˜USD 41k)**. *Active.*
- Consistency and resilience bugs detection and reproduction in distributed systems.
  General Program, China Postdoctoral Science Foundation
  Grant No. 2024M761690. **PI, RMB 80,000 (˜USD 11k)**. *Active.*
- Consensus fuzzer integration.
  Grant, Aptos Foundation
  PI, USD 34k. *Active.*

Student Mentorship

- Yuanliang Chen, 3rd-year Ph.D. candidate at Tsinghua University.
  Homepage: https://scholar.google.com/citations?user=TaG_k80AAAAJ
  Research Topic: Blockchain and distributed systems security.
  Outputs: three first-author publications in **ASE 2025, ATC 2025, and Eurosys 2025**.
- Yuanhang Zhou, Master graduated from Tsinghua University; Now at Alibaba
  Homepage: https://sites.google.com/view/yuanhangzhou

Research Topic: Cryptographic libraries testing and blockchain.
Outputs: one first-author publication in **ICSE 2025**.

- Qi Xu, 3rd-year master candidate at Tsinghua University; Google intern.
  Research Topic: Protocol fuzzing.
  Outputs: one first-author publication in **DAC 2025**.
- Zhen Yan, 2nd-year master candidate at Tsinghua University.
  Research Topic: Blockchain security and hardware security.
  Outputs: one working paper on blockchain configuration testing.
- Zongkang Ding, 2nd-year master candidate at Tsinghua University.
  Research Topic: Protocol fuzzing.
- Zhensheng Xian, 2nd-year master candidate at Tsinghua University.
  Research Topic: Cryptographic libraries testing.
  Outputs: one working paper on FHE libraries testing.
- Qingpeng Du, 1st-year master candidate at Tsinghua University.
  Research Topic: Protocol fuzzing.
  Outputs: one working paper on RFC information extracted using LLM.
- Yuqiao Yang, research intern at Tsinghua University; 3rd-year master candidate at UESTC.
  Research Topic: Firmware testing.
  Outputs: one working paper on UDS bug detection.
- Juanen Li, undergraduate at BNU; about to be a Ph.D candidate in Tsinghua in 2026.
  Research Topic: Blockchain security.
  Outputs: one paper on smart contract testing got major-revision decision.

Teaching Experience

- Teaching Assistant: *Fundamentals of Computer Programming.* Tsinghua University, 2019, 2021.
- Teaching Assistant: *Calculus.* Tsinghua University, 2020.

Academic Services

- **Program Committee:**
  ICST PC, 2026
  Eurosys shadow PC, 2026.
- **Reviewers:**
  IEEE Transactions on Dependable and Secure Computing (TDSC), 2025
  IEEE Transactions on Software Engineering (TSE), 2025