

RUNCHAO HAN

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EDUCATION

Monash University and CSIRO-Data61

February 2019 - Present

Doctor of Philosophy

Supervisors: Jiangshan Yu, Joseph Liu and Shiping Chen

Faculty of Information Technology and Distributed Systems Security group

The University of Manchester

August 2017 - September 2018

MSc Advanced Computer Science (with Distinction)

Supervisor: Christos Kotselidis

School of Computer Science

Overall Percentage: 82/100

Beijing University of Posts and Telecommunications

September 2013 - July 2017

BSc E-Commerce Engineering with Law

Overall Percentage: 83/100

RESEARCH AND IMPACT

I'm broadly interested in distributed system security. Currently, I'm focusing on designing secure and scalable Blockchains and decentralised protocols (e.g., Decentralised Randomness Beacon). My research applies techniques from Cryptography and Distributed Computing.

My research has led to real-world impacts and media coverage. For example,

- I invented RANDCHAIN [HYL20], a new family of Decentralised Randomness Beacon protocols that are simple, secure and scalable. This research is featured in [VDF Research](#) and was presented at [Decrypto seminar series](#).
- My paper analysing *shard allocation* (a key component and a missing abstraction in sharded blockchains) [HYZ20] is selected as "[Paper of the Week](#)" (Issue #68) by ZK Capital.
- I studied two overlooked 51% attacks on PoW-based blockchains [HSY+20]. Three large-scale 51% attacks on Ethereum Classic (1,2,3) happened within a month are likely to be our analysed attacks.
- I identified and formalised an overlooked design flaw of the Atomic Swap protocol [HLY19]. The flaw allows the swap initiator to arbitrage, making the protocol unfair. Our proposed fixes are standardised as an Ethereum Improvement Proposal ([EIP-2266](#)). This research is covered by [CryptoNews](#) and [Monash University](#), and was presented at [Peep an EIP series #23](#).
- I conducted the first performance analysis on memory-hard cryptocurrency mining algorithms [HFK19]. This research is covered by [Horizon Fintex](#).

PUBLICATIONS

Publication list can also be found at [DBLP](#) and [Google Scholar](#). All of my papers are available online, and most of them are hosted on [IACR ePrint](#).

[HYL20](#) RANDCHAIN: Decentralised Randomness Beacon from Sequential Proof-of-Work. Runchao Han, Haoyu Lin, Jiangshan Yu. **In submission.**

[HYZ20](#) Analysing and Improving Shard Allocation Protocols for Sharded Blockchains. Runchao Han, Jiangshan Yu, Ren Zhang. **In submission.**

[HYL+20](#) On the Security and Performance of Blockchain Sharding. Runchao Han, Jiangshan Yu, Haoyu Lin, Shiping Chen, Paulo Esteves-Verissimo. **In submission.**

- LHY20** Bank run Payment Channel Networks. Zhichun Lu, Runchao Han, Jiangshan Yu. **In submission.**
- HSY+20** Fact and Fiction: Challenging the honest majority assumption of permissionless blockchains. Runchao Han, Zhimei Sui, Jiangshan Yu, Joseph Liu, Shiping Chen. The 16th ACM ASIA Conference on Computer and Communications Security (**AsiaCCS'21**).
- HYL20a** VRF-based mining: Simple Non-outsourcable Cryptocurrency Mining. Runchao Han, Haoyu Lin, Jiangshan Yu. The 4th International Workshop on Cryptocurrencies and Blockchain Technology, in conjunction with the 25th European Symposium on Research in Computer Security (**CBT@ESORICS'20**).
- HLI19** On the optionality and fairness of Atomic Swaps. Runchao Han, Haoyu Lin, Jiangshan Yu. ACM Conference on Advances in Financial Technologies (**AFT'19**).
- HF19** Demystifying Crypto Mining: Performance Analysis and Optimizations of PoW Algorithms. Runchao Han, Nikolaos Foutris, Christos Kotselidis. IEEE International Symposium on Performance Analysis of Systems and Software (**ISPASS'19, best paper nominee**).
- HGX19** On the performance of distributed ledgers for internet of things. Runchao Han, Gary Shapiro, Vincent Gramoli, Xiwei Xu. Internet of Things; Engineering Cyber Physical Human Systems (**Elsevier IoT'19**).
- HYL18** Evaluating CryptoNote-Style Blockchains. Runchao Han, Jiangshan Yu, Joseph Liu, Peng Zhang. International Conference on Information Security and Cryptology (**Inscrypt'18**).
- HGX18** Evaluating Blockchains for IoT. Runchao Han, Vincent Gramoli, Xiwei Xu. The 9th IFIP International Conference on New Technologies, Mobility and Security (**NTMS'18**).

TALKS

- RandChain: Decentralised Randomness Beacon from Sequential Proof-of-Work. Seminar at Decrypto. November, 2020.
- VRF-Based Mining: Simple Non-Outsourceable Cryptocurrency Mining. CBT@ESORICS workshop. September, 2020.
- Demystifying Crypto-Mining: Analysis and Optimizations of Memory-Hard PoW Algorithms. Seminar at Huawei Noah's Ark Lab. July, 2020.
- On the optionality and fairness of Atomic Swaps.
 - Peep an EIP #23: EIP-2266. February, 2021.
 - AFT conference at Zurich. October, 2019.

TEACHING

- Teaching associate for FIT 5214 Blockchain, Monash University. 2019 Fall.

PROFESSIONAL SERVICES

(External) reviewer

- 2021: DSN, ICBC
- 2020: AFT, ICDCS, SRDS, ACNS, AsiaCCS, TrustCom, ACISP, ICBC, TDSC, The Computer Journal, IEEE IoT Journal, IEEE Software Journal, IEEE Transaction of Service Computing
- 2019: Indocrypt, TrustCom, Future Generation Computing System

WORK EXPERIENCE

Bytom Blockchain

Intern Blockchain Engineer

September 2018 - January 2019

Hangzhou, China

CNIC, Chinese Academy of Sciences

Intern Researcher

June 2017 - July 2017

Beijing, China

ADDITIONAL INFORMATION

Membership

Association for Computing Machinery (ACM, student member)

Institute of Electrical and Electronics Engineers (IEEE, student member)

USENIX Association (USENIX)

International Association for Cryptologic Research (IACR)

LinkedIn

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Github

SebastianElvis

Wechat

elvisage

References

Available upon request