

Suhyeon Lee

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PERSONAL PROFILE

As a PhD researcher specializing in Cybersecurity and Blockchain, I had honorably finished military duty as an Army Captain. I am currently working as a security researcher at Tokamak Network. I have developed a wealth of knowledge and experience in these fields. With earlier experience at the Cyber Operations Command, ROK, and the Agency for Defense Development (ADD), my expertise is in cybersecurity practice, and my research emphasis is on consensus mechanisms in blockchain. I am enthusiastic about contributing to the advancement of these fields and collaborating with others to develop innovative solutions to real-world problems.

RESEARCH INTERESTS & KEY ACHIEVEMENTS

The primary focus of my research contains the security of network security, including distributed systems (blockchain) and military systems, but not limited to those topics. My previous works studied the security of the consensus mechanism of blockchains (INFOCOM workshop, MOBICOM workshop, DefCon, CPE, AFT), defense mechanisms against ransomware (C&EE), and optimal strategies for honeypot deception (MILCOM). I am now exploring cybersecurity issues using game theory.

In the military, I have various experiences in the research and development of cyber weapon systems. I developed “*A system for collecting and processing cyber threat intelligence*” with an advanced honeypot scheme, “*Secure Real-Time Operating System (RTOS) with Evaluation Assurance Level (EAL) level 4+*” at Agency for Defense Development which is the primary R&D institution in defense technology in Korea. After that, I led a project to develop a defense operation system and was involved into various military systems for technical review and advice in Cyber Operations Command of South Korea.

EDUCATION

Sep. 2017 – Feb. 2023 **Ph.D. in Cybersecurity**
Department of Information Security, School of Cybersecurity, **Korea University**
Supervisor: Prof. Seungjoo Kim (skim71@korea.ac.kr)
Thesis: **Revisiting Conventional Wisdom in PoW and PoS-based Blockchains**

Mar. 2012 – Feb. 2016 **B.Eng. in Cyber Defense**
Department of Cyber Defense, **Korea University**
Supervisor: Prof. Jong In Lim (jilim@korea.ac.kr)

PROFESSIONAL EXPERIENCE

June. 2023 – **Security Researcher**
Tokamak Network

- Security research focusing on Layer 2 blockchain systems

Jan. 2023 – May. 2023 **AI Technology Research Officer** / Army Captain
ROK Cyber Operations Command

- Led cyber defense research using AI technologies

Jan. 2021 – Dec. 2022 **Defense System Development Officer** / Army Captain
ROK Cyber Operations Command

- Led cyber defense system design and development.
- Completed cyber active defense training focusing on infiltration.

Jul. 2019 – Dec. 2020 **Cryptography Technology Research Officer** / Army Captain
ROK Cyber Operations Command

- Participated in Korea-US joint military exercises.
- Worked for cooperation with relevant security agencies.
- Planned multiple cyber defense projects to support cyber operations.

Jul. 2016 – Jul. 2019 **Researcher** / Army Lieutenant
2nd R&D Institute, Agency for Defense Development (ADD)

- Participated in R&D for collecting and processing Cyber Threat Intelligence (CTI).
- Participated in R&D for development of secure Real Time Operation System (RTOS) for weapon systems with high security verification ($EAL \geq 4$).

PUBLICATIONS - INTERNATIONAL CONFERENCES

(To be submitted) **S. Lee**, E. Jee, J. Lee, “Implementation of cost-effective verification for Pietrzak's verifiable delay function in Ethereum smart contracts,” International Conference on *ACM Advances in Financial Technologies (AFT '24)*

(To be submitted) **S. Lee**, E. Jee, J. Lee, “Auctionable Exit: Fast but reasonable withdrawal in rollups,” International Conference on *ACM Advances in Financial Technologies (AFT '24)*

Edited on 2024-03-31

H. Yang, **S. Lee**, and S. Kim, “**A Tip for IOTA Privacy: IOTA Light Node Deanonimization via Tip Selection**,” In Proceedings of the International Conference on *IEEE Blockchain Conference (ICBC 2024)*, Dublin, Ireland, May 2024.

S. Lee, and S. Kim, “**Do You Really Need to Disguise Normal Servers as Honeypots?**,” In Proceedings of the 40th International Conference on *IEEE Military Communications Conference (MILCOM 2022)*, pp. 166-172, Rockville, MD, US, November 2022.

S. Lee, D. Lee, and S. Kim, “**Block Double-Submission Attack: Block Withholding Can Be Self-Destructive**,” In Proceedings of the 4th International Conference on *ACM Advances in Financial Technologies (AFT '22)*, Cambridge, MA, US, September 2022.

S. Lee and S. Kim, “**Proof-of-Stake at Stake: Predatory, Destructive Attack on PoS Cryptocurrencies**,” In Proceedings of *ACM MobiCom 2020 Workshops – the 3rd International Workshop on Cryptocurrencies and Blockchains for Distributed Systems (CryBlock '20)*, pp. 7-11, Virtual Conference, September 2020.

S. Lee and S. Kim, “**Blockchain for Cyber Defense: Will It Be as Good as You Think?**” the 28th *DEF CON Hacking Conference (DEFCON 28) – the 2nd Blockchain Village*, Virtual Conference, August 2020.

S. Lee and S. Kim, “**Countering Block Withholding Attack Efficiently**,” In Proceedings of *IEEE INFOCOM 2019 Workshops – the 2nd International Workshop on Cryptocurrencies and Blockchains for Distributed Systems (CryBlock '19)*, pp. 330-335, Paris, France, May 2019.

PUBLICATIONS – INTERNATIONAL JOURNALS

S. Lee, **S. Lee**, J. Park, K. Kim, and Lee, K, “**Hiding in the Crowd: Ransomware Protection by Adopting Camouflage and Hiding Strategy With the Link File**,” *IEEE Access (I/F 3.476)*, vol. 11, pp. 92693- 92704, 2023.

S. Lee and S. Kim, “**Shorting Attack: Predatory, Destructive Short Selling on Proof-of-Stake Cryptocurrencies**,” *Concurrency and Computation: Practice and Experience (I/F 2)*, vol. 35, Issue 16, e6585, July 2023.

S. Lee and S. Kim, “**Rethinking Selfish Mining under Pooled Mining**,” *ICT Express (I/F 4.754)*, vol. 9, Issue 3, pp. 356- 361, June 2023.

S. Lee and S. Kim, “**Blockchain as a Cyber Defense: Opportunities, Applications, and Challenges**,” *IEEE Access (I/F 3.476)*, vol. 10, pp. 2602-2618, December 2021.

S. Lee, H. K. Kim, and K. Kim, “**Ransomware Protection using the Moving Target Defense Perspective**,” *Computers & Electrical Engineering (I/F 4.152)*, vol. 78, pp. 288-299, September 2019.

TECHNICAL PAPERS

S. Lee and S. Kim, “**Short Selling Attack: a Self-Destructive but Profitable 51% Attack on PoS Blockchains**,” IACR Cryptology ePrint Archive, Paper 2020/019, January 2020.

S. Lee and S. Kim, “**Pooled Mining Makes Selfish Mining Tricky**,” IACR Cryptology ePrint Archive, Paper 2018/1230, December 2018.

PATENTS

S. Kim and **S. Lee**, “**Method for generating to tag for tracking document**,” submitted, May 2022.

H. Kim, K. Kim, and **S. Lee**, “**Ransomware damage prevention method through extension randomization, recording medium and apparatus for performing the method**,” no. 10-2316404, October 2021.

S. Kim and **S. Lee**, “**A block withholding attack detection device and its operation method**,” no. 10-2122824, June 2020.

S. Kim and **S. Lee**, “**Mining pool management server capable of suppressing selfish mining strategies of competitive mining pools and method of operation**,” no. 10-2154354, September 2019.

D. Lee, B. Ko, C. Lim, D. Kim, H. Ryu, **S. Lee**, and J. Park, “**Device and method for extracting web page information through inference and learning of html tag information**,” no. 10-2018-0137256, December 2018.

INVITED TALKS

Suhyeon Lee, “**Research and Experience in Cyber Defense**,” Capstone Project in the Department of Cyber Defense, Korea University, Seoul, April 2023.

Suhyeon Lee, “**Threat Modeling for Cybersecurity of Industrial Products**,” 78ResearchLab, Gangnam-gu, Seoul, October 2022.

Suhyeon Lee, “**Shorting Attack on Proof-of-Stake Cryptocurrencies**,” Monthly Crypto Seminar in Ripple, Virtual, July 2022.

Suhyeon Lee, “**Blockchain Technology for Military Cyber Security**,” The 28th Network Security Conference Korea (NetSec-KR), COEX, Seoul, Korea, April 2022.

Suhyeon Lee, “**K-Cyber Security Challenge Winner’s Talk**,” Conference Center of the Federation of Korean Industries, Seoul, December 2019.

LANGUAGE & ADDITIONAL SKILLS

- **Language:** Korean (native), English (proficient)
- **Programming:** C, Python (familiar)
- **Certification:** Certified Information Systems Security Professional (**CISSP**), Certification for English Mediated Instruction (Awarded by the Center for Teaching and Learning of Korea University)

AWARDS & HONORS

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| Dec. 2019 | 1st Prize in Korea Security Data Challenge (AI Section)
Granted by Korea Internet & Security Agency (KISA) |
| 2012 – 2016 | Full-tuition Military Scholarship
Granted by Ministry of National Defense, Republic of Korea |
| 2012 – 2016 | Merit-based Scholarship
Granted by Korea University, Republic of Korea |
| 2017 – 2019 | General Scholarships
Granted by Korea University, Republic of Korea |

REFERENCES

Professor. Seungjoo Kim (PhD Supervisor)

- School of Cybersecurity, Korea University, Republic of Korea
- President of Office of Digital Information, Korea University
- Member of Republic of Korea Presidential Defense Innovation Committee
- Email: skim71_at_korea.ac.kr

Professor. Huy Kang Kim

- School of Cybersecurity, Korea University, Republic of Korea
- Director of Hacking and Countermeasure Research Lab (<https://ocslab.hksecurity.net>)
- Email: cenda_at_korea.ac.kr

Chair-Professor. Jongin Lim

- School of Cybersecurity, Korea University, Republic of Korea
- Advisor of Kim & Chang Law Firm, Republic of Korea
- Former Special Advisor to the President for National Security
- Email: jilim_at_korea.ac.kr