




# Hyeonmin Lee

Postdoctoral Research Associate | University of Virginia (UVA)

 hyeonminlee1110  
 hyeonmin-lee.github.io/  
 frv9vh@virginia.edu

## RESEARCH INTERESTS

- **Network security:** Data-driven security research on Internet infrastructure, leveraging Internet measurement.
- **Key topics:** Protocols such as Domain Name System (DNS), Transport Layer Security (TLS), Public Key Infrastructure (PKI), and Email, as well as their deployment, management, and security.

## PROFESSIONAL EXPERIENCE

- Postdoctoral Research Associate**, Dept. of Computer Science **Oct 2023 — Present**  
*University of Virginia* *Charlottesville, VA, United States*
- [DNS-Web] Analyze the ecosystem of DNS HTTPS records, focusing on their deployment and management (Pub. [C7])
  - [TLS-PKI] Investigate the mutual TLS ecosystem, with emphasis on privacy leakage through certificates (Pub. [C6])
- Postdoctoral Researcher**, Dept. of Computer Science and Engineering **Apr 2022 — Sep 2023**  
*Seoul National University* *Seoul, South Korea*
- [TLS-DNS] Analyzed key material distribution in DNS to reduce TLS handshake time (Pub. [C4])
  - [DDoS-DNS] Developed a puzzle-based DDoS defense mechanism leveraging DNS for puzzle distribution (Pub. [C5])
- Visiting Student**, The Center for Cybersecurity **May 2019 — Aug 2019**  
*Rochester Institute of Technology* *Rochester, NY, United States*
- [Email-DNS] Analyzed DANE to measure its deployment in the real world (Pub. [C2])

## EDUCATION

- Ph.D., Computer Science and Engineering**, *Seoul National University*, (Seoul, South Korea) **Mar 2016 — Feb 2022**
- [Ph.D. Thesis] “Understanding the DANE Ecosystem in Email: How Is It Deployed and Managed?”
  - [Advisors] Prof. Taekyoung “Ted” Kwon (*Seoul National University*), Prof. Taejoong “Tijay” Chung (*Virginia Tech*)
- B.S., Computer Science and Engineering**, *Seoul National University*, (Seoul, South Korea) **Mar 2011 — Feb 2016**
- Visiting Student, Information Technology**, *Uppsala University*, (Uppsala, Sweden) **Fall 2014**

## PUBLICATIONS (C: CONFERENCE | J: JOURNAL | P: POSTER)

- [C8] PAVE: Information Flow Control for Privacy-preserving Online Data Processing Services (*to appear*) **ASPLOS’25**  
Minkyung Park, Jaeseung Choi, **Hyeonmin Lee**, and Taekyoung Kwon **Top Conference**  
*In Proceedings of the 30th ACM International Conference on Architectural Support for Programming Languages and Operating Systems*, Rotterdam, Netherlands, Mar 2025
- [C7] Exploring the Ecosystem of DNS HTTPS Resource Records: An End-to-End Perspective **IMC’24**  
Hongying Dong, Yizhe Zhang, **Hyeonmin Lee**, Shumon Huque, and Yixin Sun **Top Conference**  
*In Proceedings of the 2024 ACM Internet Measurement Conference*, Madrid, Spain, Nov 2024  
- Acceptance rate: 21.3% (54 papers/253 submissions)
- [C6] Mutual TLS in Practice: A Deep Dive into Certificate Configurations and Privacy Issues **IMC’24**  
Hongying Dong, Yizhe Zhang, **Hyeonmin Lee**, Kevin Du, Guancheng Tu, and Yixin Sun **Top Conference**  
*In Proceedings of the 2024 ACM Internet Measurement Conference*, Madrid, Spain, Nov 2024  
- Acceptance rate: 21.3% (54 papers/253 submissions)
- [C5] DDD: A DNS-based DDoS Defense Scheme Using Puzzles **ICCCN’24**  
**Hyeonmin Lee**, Taehyun Kang, Sukhun Yang, Jinyong Jun, and Taekyoung Kwon  
*In Proceedings of the 33rd International Conference on Computer Communications and Networks*, Big Island, Hawaii, United States, Jul 2024

- [C4] ZTLS: A DNS-based Approach to Zero Round Trip in TLS handshake **TheWebConf (WWW)'23**  
Top Conference  
Sangwon Lim, Hyeonmin Lee, Hyunsoo Kim, Hyunwoo Lee, and Ted “Taekyoung” Kwon  
*In Proceedings of the ACM Web Conference 2023 (formerly WWW)*, Austin, United States, Apr 2023  
- Acceptance rate: 19.3% (365 papers/1,891 submissions)
- [C3] Under the Hood of DANE Mismanagement in SMTP **USENIX Security'22**  
Top Conference  
Hyeonmin Lee, Md. Ishtiaq Ashiq, Moritz Müller, Roland van Rijswijk-Deij, Taekyoung “Ted” Kwon, and Taejoong Chung  
*In Proceedings of the 31st USENIX Security Symposium*, Boston, United States, Aug 2022  
- Acceptance rate: 18.1% (256 papers/1,414 submissions)
- [C2] A Longitudinal and Comprehensive Study of the DANE Ecosystem in Email **USENIX Security'20**  
Top Conference  
Hyeonmin Lee, Aniketh Gireesh, Roland van Rijswijk-Deij, Taekyoung “Ted” Kwon, and Taejoong Chung  
*In Proceedings of the 29th USENIX Security Symposium*, Boston, United States, Aug 2020  
- Acceptance rate: 16.1% (157 papers/977 submissions)
- [C1] Development of Cellular Core Network Enabling Network Function Virtualization **JCCI'18**  
Hyeonmin Lee, and Junghwan Song  
*The 28th Joint Conference on Communication and Information*, Yeosu, Korea, May 2018
- [J1] TwinPeaks: An Approach for Certificateless Public Key Distribution for the Internet and Internet of Things **Computer Networks**  
Eunsang Cho, Jeongnyeo Kim, Minkyung Park, Hyeonmin Lee, Chorom Hamm, Soobin Park, Sungmin Sohn, Minhyeok Kang, and Ted “Taekyoung” Kwon  
*Elsevier Computer Networks (SCI-E)*, Jul 2020
- [P1] A Longitudinal and Comprehensive Study of the DANE Ecosystem in Email **USENIX Security'22**  
Hyeonmin Lee, Md. Ishtiaq Ashiq, Moritz Müller, Roland van Rijswijk-Deij, Taekyoung “Ted” Kwon, and Taejoong Chung  
*Poster Session in the 31st USENIX Security Symposium*, Boston, United States, Aug 2022

## GRANT

### A Study for the Future-oriented DANE-based Web Architecture to Solve Problems in the Current TLS-based Web Ecosystem

Primary Investigator / Researcher

Sep 2022 — Aug 2023

(Funded by Basic Science Research Program - National Research Foundation of Korea, ₩60,000,000 ≈ \$46,000)

- [Goal] This project aimed to investigate the potential challenges (e.g., delay) and impacts of adopting the DANE protocol for peer authentication within the Web ecosystem.
- [Keywords] Web, Transport Layer Security (TLS), Authentication, DANE

## PATENTS

### Homomorphic Cryptographic Parallel Computation Method and Computing Device Performing the Same Method

- Taekyoung Kwon, Minkyung Park, Minhyeok Kang, Selin Chun, Hyeonmin Lee
- Registration No. 10-2513552, South Korea, Mar 2023

### Method for Performing Mutual Authentication in Communication using Locator ID Separation Protocol, Apparatus, and System for Performing the Same

- Taekyoung Kwon, Hyeonmin Lee, Hyunwoo Lee
- Registration No. 10-2476081, South Korea, Dec 2022

### Network System and Method for Performing Message Security Thereof

- Taekyoung Kwon, Hyunwoo Lee, Myungchul Kwak, Hyeonmin Lee, Junghwan Lim, Yoojung Shin
- Registration No. 10-2265611, South Korea, Jun 2021

### Communication Method Based on Integrated Flat ID and System

- Taekyoung Kwon, Hyunwoo Lee, Myungchul Kwak, Hyeonmin Lee, Dongjun Lee, Hyunchul Oh
- Registration No. 10-2023115, South Korea, Sep 2019

## TALKS & PRESENTATIONS

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| APNIC Blog, Online post, “Under the hood of DANE mismanagement in SMTP”                          | Sep 2022 |
| USENIX Security, Boston, MA “Under the Hood of DANE Mismanagement in SMTP”                       | Aug 2022 |
| USENIX Security, Online, “A Longitudinal and Comprehensive Study of the DANE Ecosystem in Email” | Aug 2020 |

## PROFESSIONAL SERVICES

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### Reviewer

- IEEE/ACM Transactions on Networking, 2024
- IEEE Transactions on Network and Service Management, 2024
- IEEE Network, 2024
- Journal of Communications and Networks (JCN), 2025

### External Reviewer

- Network and Distributed System Security Symposium (NDSS), 2025

## TEACHING EXPERIENCE

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Teaching Assistant, Engineering Frontiers and Leadership (M2177.000600), Seoul National University, Spring 2016

## MISCELLANEOUS

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### Technical Research Personnel\*

**Mar 2019 — Feb 2022**

*Seoul National University*

*Seoul, South Korea*

\*Technical Research Personnel is a form of military service (a combination of military service with a Ph.D. program) in which the service is fulfilled by carrying out research on technology. While fulfilling the service, I participated in or led several research projects; Please note that I had not been involved in any military-related projects.

## RESEARCH PROJECT EXPERIENCE (COMPLETE LIST)

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### **A Study for the Future-oriented DANE-based Web Architecture to Solve Problems in the Current TLS-based Web Ecosystem**

(Funded by *Post-Doctoral Domestic and Overseas Training Program - National Research Foundation of Korea*)

Sep 2022 — Aug 2023

- [Goal] Aimed to investigate the potential challenges (e.g., delay) and impacts of adopting the DANE protocol for peer authentication within the Web ecosystem.
- [Role] Primary Investigator / Researcher

### **Research on Secure DNS and Privacy aware Packet Filtering Technology**

Aug 2022 — Jul 2023

(Funded by *Samsung Electronics*)

- [Goal] Aimed to design a secure DNS environment for mobile devices, which includes analyzing the performance of DoT/DoH in the mobile environment and designing a packet filtering mechanism based on DNS packets.
- [Role] System Designer / Programmer

### **Abnormal Detection and Forensic Techniques using IoT Network Traffic Analysis**

Mar 2021 — Nov 2021

(Funded by *Korea Institute of Information Security & Cryptology (KIISC)*)

- [Goal] Aimed to develop a system that detects anomalies (or attacks) in IoT networks and generates evidence for digital forensics by collecting IoT network traffic.
- [Role] Project Manager (Lab.) / System Designer / Programmer

### **Versatile Network System Architecture for Multi-dimensional Diversity**

Apr 2016 — Dec 2020

(Funded by *Institute for Information and Communication Technology Promotion (IITP)*)

- [Goal] Aimed to design a network architecture that covers diverse network devices, services, or resources, especially, in the edge network.
- [Role] Project Manager (Lab.) / System Designer / Programmer

### **Research on GPU Acceleration for Fully Homomorphic Encryption**

Feb 2020 — Nov 2020

(Funded by *Korea Institute of Information Security & Cryptology (KIISC)*)

- [Goal] Aimed to accelerate Fully Homomorphic Encryption (FHE) techniques using GPUs, including research that reduces CPU-GPU interaction and CPU-to-GPU memory dependencies.
- [Role] Programmer

### **Research on Distributed Web Structure and Counterplan**

Aug 2019 — Nov 2019

(Funded by *Korea Internet and Security Agency (KISA)*)

- [Goal] Aimed to analyze trends in the Distributed Web and draw a blueprint for applying it to the domestic web ecosystem.
- [Role] Researcher

### **Research on Trust and Security Scheme for Interconnection of Heterogeneous Networks**

Sep 2018 — Nov 2018

(Funded by *Electronics and Telecommunications Research Institute (ETRI)*)

- [Goal] Aimed to analyze the authentication and networking methods of diverse IoT products and to propose a new framework to solve problems arising in heterogeneous network environments.
- [Role] Researcher

### **Research and Development of Open 5G Reference Model**

Aug 2016 — Feb 2019

(Funded by *Giga KOREA Foundation*)

- [Goal] Aimed to develop an open-source 5G reference model and implement a simulator to test it.
- [Role] System Designer / Programmer

### **Development of Network Security Acceleration for Next-generation Low-power SoC**

Jul 2015 — Dec 2015

(Funded by *Samsung Electronics*)

- [Goal] Aimed to design a system that reduces the overhead of the TLS handshake by delegating the communication processes among low-power devices.
- [Role] Programmer