

# Insup Lee

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## Summary

I am an AI & Security Researcher based in Abu Dhabi, UAE, working on generative models for cybersecurity and drones. Previously, I spent five years as a researcher at the Agency for Defense Development (ADD), conducting research in AI-driven cybersecurity. I am also a Ph.D. candidate in Cybersecurity at Korea University, where I earned my B.E. in Cyber Defense. My research interests lie at the **intersection of AI and cybersecurity**, focusing on generative models, AI-driven security, network security, and secure communications.

## Research Interests

- **AI for Cybersecurity:** threat intelligence using NLP/LLM, HW security (side-channel analysis), adversarial ML
- **Network and Wireless Security:** drones, robust communications, network IDS, anomaly detection
- **Generative Models:** diffusion transformers and GANs for data augmentation, LLM for vulnerability detection

## Education

**Ph.D. Candidate in Cybersecurity**, Korea University – Seoul, Republic of Korea Sep 2019 – Present

- Topic: Generative Models for Data Augmentation in Multi-Domain Cybersecurity

**B.E. in Cyber Defense**, Korea University – Seoul, Republic of Korea Mar 2014 – Feb 2018

- Studied computer science, cybersecurity, cryptography, and secure coding

## Employment History

**Lecturer**, Korea University – Seoul, Republic of Korea Sep 2025 – Present

- Taught graduate-level course "Computer Networks (SCS 302)"

**Research Intern**, Indiana University – Bloomington, Indiana, USA Mar 2025 – Jun 2025

- Researched quantification methods for ML security in autonomous vehicle systems

**Security Engineer**, Ministry of National Defense – Republic of Korea Aug 2023 – May 2025

- Collaborated with international colleagues and led AI-based security projects in the UAE
- Executed cyber defense operations and developed automation tools at the Cyber Operations Command

**Researcher**, [Agency for Defense Development \(ADD\)](#) – Seoul, Republic of Korea Jul 2018 – Jul 2023

- Carried out three AI-driven cybersecurity projects, conducting research and in-house software development
  - (1) "Detection of Nation-Sponsored Cyber Attacks Using NLP Technologies" (Apr 2021 – Jul 2023)
  - (2) "Generative Models for Cybersecurity Data Augmentation" (Jun 2019 – Oct 2020)
  - (3) "IPADS: Integrated Proactive and Adaptive Defense Systems" (Aug 2018 – May 2019)
- Published six international papers [C1, C2, J2, J3, J4, J6], four patents, and 12 domestic papers

## Technical Skills

- Frameworks/Tools: PyTorch, Keras, TensorFlow, scikit-learn, pandas, Git, Streamlit
- Programming Languages: Python, C, JavaScript, SQL
- Languages: English, Korean

## Publications

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### Under Review

- [\(Blind Review\)](#)  
Sujin Park, Daehyeon Bae, [Insup Lee](#), Jeonghyeok Kim, Haengrok Oh, Heeseok Kim and Seokhie Hong
- [LeakDiT: Diffusion Transformers for Trace-Augmented Side-Channel Analysis](#)  
[Insup Lee](#), Daehyeon Bae, Seokhie Hong, and Sangjin Lee

### Journal Articles

- J8 [Multi-Step LLM Pipeline for Enhancing TTP Extraction in Cyber Threat Intelligence](#)  
Hyoungrok Kim, Donghyeon Lee, [Insup Lee](#), Soohan Lee, and Sangjin Lee  
*IEEE Access*, 2025  
(SCI 2024 I/F Top 34.8% in Engineering, Electrical & Electronic)
- J7 [Enhancing Modulation Classification via Diffusion Transformers for Drone Video Signal Processing](#)  
[Insup Lee](#), Khalifa Alteneiji, and Mohammed Alghfeli  
*IEEE Signal Processing Letters (SPL)*, 2025  
(SCI 2024 I/F Top 31.6% in Engineering, Electrical & Electronic)
- J6 [MuCamp: Generating Cyber Campaign Variants via TTP Synonym Replacement for Group Attribution](#)  
[Insup Lee](#) and Changhee Choi  
*IEEE Transactions on Information and Forensics Security (TIFS)*, 2025  
(SCI 2024 I/F Top 7.8% in Computer Science, Theory & Methods)
- J5 [UniQGAN: Towards Improved Modulation Classification With Adversarial Robustness Using Scalable Generator Design](#)  
[Insup Lee](#) and Wonjun Lee  
*IEEE Transactions on Dependable and Secure Computing (TDSC)*, 2024  
(SCI 2023 I/F Top 4.9% in Computer Science, Software Engineering)
- J4 [Camp2Vec: Embedding Cyber Campaign With ATT&CK Framework for Attack Group Analysis](#)  
[Insup Lee](#) and Changhee Choi  
*ICT Express*, 2023  
(SCI 2023 I/F Top 23.0% in Computer Science, Information Systems)
- J3 [Exploiting TTP Co-occurrence via GloVe-Based Embedding With ATT&CK Framework](#)  
Chanho Shin, [Insup Lee](#), and Changhee Choi  
*IEEE Access*, 2023  
(SCI 2023 I/F Top 34.4% in Engineering, Electrical & Electronic)
- J2 [BAN: Predicting APT Attack Based on Bayesian Network With MITRE ATT&CK Framework](#)  
Youngjun Kim, [Insup Lee](#), Hyuk Kwon, Gyeongsik Lee, and Jiwon Yoon  
*IEEE Access*, 2023  
(SCI 2023 I/F Top 34.4% in Engineering, Electrical & Electronic)
- J1 [UniQGAN: Unified Generative Adversarial Networks for Augmented Modulation Classification](#)  
[Insup Lee](#) and Wonjun Lee  
*IEEE Communications Letters*, 2022  
(SCI 2023 I/F Top 33.2% in Telecommunications)

### Conference Proceedings

- C3 [Encrypted Malware Traffic Detection Using Incremental Learning](#)  
[Insup Lee](#), Heejun Roh, and Wonjun Lee  
*IEEE International Conference on Computer Communications (INFOCOM) - Poster Session*, 2020
- C2 [Anomaly Dataset Augmentation Using Sequence Generative Models](#)  
Sunguk Shin, [Insup Lee](#), and Changhee Choi  
*IEEE International Conference on Machine Learning and Applications (ICMLA)*, 2019
- C1 [Opcode Sequence Amplifier Using Sequence Generative Adversarial Networks](#)  
Changhee Choi, Sunguk Shin, and [Insup Lee](#)  
*International Conference on ICT Convergence (ICTC)*, 2019

## Patents

- Changhee Choi and Insup Lee, "Method for Augmentating Cyber Attack Campaign Data to Identify Attack Group, and Security," Korea Patent Application Number. 10-2024-0176082, December 2, 2024.
- Changhee Choi, Insup Lee, Chanho Shin, and Sungho Lee, "Information Identification Method and Electronic Apparatus Thereof," Korea Patent Application Number. 10-2024-0006106, January 15, 2024.
- Changhee Choi, Chanho Shin, Sunguk Shin, Seongyeon Seo, and Insup Lee, "Method for Training Attack Prediction Model and Device Therefor," U.S. Patent Application Number. 18/126,005; U.S. Patent Number. US20230308462A1, September 28, 2023.
- Changhee Choi, Sunguk Shin, and Insup Lee, "Appratus, Method, Computer-readable Storage Medium and Computer Program for Generating Operation Code," Korea Patent Application Number. 10-2019-0141865, November 07, 2019; Korea Patent Number. 10-2246797, April 30, 2021.

## Domestic Journals and Conferences (Korean)

- Hyunjun Park and Insup Lee, "Enhanced DDoS Detection via Traffic Volume-Based Labeling and Transfer Learning," *Journal of Internet Computing and Services (JICS)*, Vol. 26, No. 4, pp. 1-8, Aug. 2025.
- Kangmun Kim and Insup Lee, "User Behavior Embedding via TF-IDF-BVC for Web Shell Detection," *Journal of The Korea Institute of Information Security & Cryptology (JKIISC)*, Vol. 34, No. 6, pp. 1231-1238, Dec. 2024.
- Insup Lee, Chanho Shin, and Changhee Choi, "Mutating Cyber Camapaign With TTP Word Replacement," in *Proc. of the KIMST Annual Conference*, Jun. 2023.
- Chanho Shin, Insup Lee, and Changhee Choi, "Towards GloVe-Based TTP Embedding With ATT&CK Framework," in *Proc. of the KIMST Annual Conference*, Jun. 2023.
- Changhee Choi, Insup Lee, Chanho Shin, and Sungho Lee, "Cyber Threat Campaign Analysis Based on PEGASUS and RoBERTa Model," in *Proc. of the KIMST Annual Conference*, Jun. 2023.
- Insup Lee, Chanho Shin, Sunguk Shin, Seongyeon Seo, and Changhee Choi, "Analyzing Cyberattack Campaign Similarity via TTP Sequence Embedding," in *Proc. of the KIMST Annual Conference*, Jun. 2022.
- Sunguk Shin, Insup Lee, Chanho Shin, Seongyeon Seo, and Changhee Choi, "Cyber Campaign Analysis With TTP Embedding Using TF-IDF," in *Proc. of the KIMST Annual Conference*, Jun. 2022.
- Chanho Shin, Sunguk Shin, Insup Lee, Seongyeon Seo, and Changhee Choi, "Classifying TTP Based on CIA Labeling," in *Proc. of the KIMST Annual Conference*, Jun. 2022.
- Changhee Choi, Chanho Shin, Sunguk Shin, Seongyeon Seo, and Insup Lee, "Cyber Attack Group Classification Using Siamese LSTM," in *Proc. of the KIMST Annual Conference*, Jun. 2022.
- Chanho Shin, Sunguk Shin, Seongyeon Seo, Insup Lee, and Changhee Choi, "Embedding and Training RNN to Estimating the Goal of Cyber Attack," in *Proc. of the KIMST Fall Conference*, Nov. 2021.
- Sunguk Shin, Chanho Shin, Seongyeon Seo, Insup Lee, and Changhee Choi, "The Proposed Approach for Country Prediction With TTP-based Cyber Data Using GCN," in *Proc. of the KIMST Fall Conference*, Nov. 2021.
- Changhee Choi, Chanho Shin, Sunguk Shin, Seongyeon Seo, and Insup Lee, "Deep Learning for Estimating Next Action of Cyber Attack," in *Proc. of the KIMST Fall Conference*, Nov. 2021.
- Yongbin Park, Sunguk Shin, and Insup Lee, "A Study on Evaluation Method of NIDS Datasets in Closed Military Network," *Journal of Internet Computing and Services (JICS)*, Vol. 21, No. 2, pp. 121-130, Apr. 2020.
- Insup Lee, Jinguok Kim, and Jeongchan Park, "Analysis of Weight Setting in Incremental Learning to Improve Real-Time Intrusion Detection," in *Proc. of the KIMST Annual Conference*, Jun. 2019.

## Other Experience

### AI Cyber Challenge (AIXCC), DARPA and ARPA-H, USA

Apr 2024 – Aug 2024

- Participated in the semifinal round as a member of Team KORIA, submitting our cyber reasoning system that leverages LLMs for automated detection and patching of software vulnerabilities

### SW Outsourcing Development, KCMVP-Certified Cryptographic Module

Jun 2017 – May 2018

- Implemented a cryptographic module with 25,000 LoC in C while following secure coding conventions
- Covered the ARIA block cipher (modes: ECB, CBC, CTR), hash functions (SHA-256, SHA-512), and

HMAC-based DRBG for Windows (.dll) and Linux (.so), respectively

Awards and Honors

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|---|---------------------|
| • <a href="#">Ambassador's Commendation</a> for excellence in defense cooperation, Embassy of the Republic of Korea to the United Arab Emirates | Mar 2025            |
| • The 3rd Prize, Military Cybersecurity Experts Hackathon, Ministry of Science and ICT, Republic of Korea                                       | Dec 2023            |
| • Full Tuition Scholarship, Ministry of National Defense, Republic of Korea   | Mar 2014 – Feb 2018 |

Mentoring Experience

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|---|---------------------|
| • <b>Sujin Park</b> (Ph.D. Student at Korea University)<br>Side-channel analysis for anomaly detection  | Jun 2025 – Present  |
| • <b>Hyunjun Park</b> (Navy Lieutenant at Ministry of National Defense)<br>DDoS detection via transfer learning ( <a href="#">paper</a> published at JICS)          | Nov 2024 – Feb 2025 |
| • <b>Kangmun Kim</b> (First Lieutenant at Cyber Operations Command)<br>Web shell detection via user behavior embedding ( <a href="#">paper</a> published at JKIISC) | Jan 2024 – Sep 2024 |

Professional Service

Reviewer

- IEEE Transactions on Dependable and Secure Computing (TDSC), 2025
- IEEE Journal on Selected Areas in Communications (JSAC), 2025
- IEEE International Conference on Computer Communications (INFOCOM), 2023-2024
- IEEE Communications Letters, 2022

Teaching Experience

- Fall 2025: Computer Networks (SCS302), Korea University