Insu Yun

Associate Professor (Untenured)
School of Electrical Engineering,
Korea Advanced Institute of Science and Technology (KAIST)

Email: insuyun@kaist.ac.kr
Web: https://insuyun.github.io

Research Interests

System security, software security, binary analysis, fuzzing, and applied cryptography.

Education

Georgia Institute of Technology   Aug. 2015 – Dec. 2020
  Ph.D. in Computer Science
  Advisor: Dr. Taesoo Kim

Korea Advanced Institute of Science and Technology (KAIST)   Sep. 2008 – Feb. 2015
  B.S. in Computer Science & Mathematics

Work Experience

KAIST, Daejeon, South Korea   Feb. 2021 –
  Assistant Professor

Microsoft Research, Research Intern, Seattle, WA   May. 2017 – Aug. 2017
  Contributed to REPT, a system that utilizes Intel Processor Trace to diagnose production failures
  Mentor: Weidong Cui

Georgia Tech, Research Assistant, Atlanta, GA   Aug. 2015 – Dec. 2020
Korean Cyber Command, Software Developer, Seoul, Korea   Apr. 2012 – Jan. 2014
  Served for the mandatory military service

Publications

International Conferences (Top-tier and others)

1. **FirmState: Bringing Cellular Protocol States to Shannon Baseband Emulation (to appear)**
   Suhwan Jeong, Beomseok Oh, Kwangmin Kim, **Insu Yun**, Yongdae Kim, and CheolJun Park
   Proceedings of the 18th ACM Conference on Security and Privacy in Wireless and Mobile Networks (WiSec 2025)
   Arlington, VA, June 2025

2. **Automated Attack Synthesis for Constant Product Market Makers (to appear)**
   Sujin Han, Jinseo Kim, Sung-Ju Lee, and **Insu Yun**
   Proceedings of the ACM SIGSOFT International Symposium on Software Testing and Analysis 2025 (ISSTA 2025)
   Trondheim, Norway, June 2025

3. **Bridging the Gap between Real-World and Formal Binary Lifting through Filtered-Simulation (to appear)**
   Jihee Park, **Insu Yun**, and Sukyoung Ryu
   Proceedings of the ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications 2025 (OOPSLA 2025)
   Singapore, October 2025

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4. **RGFuzz: Rule-Guided Fuzzer for WebAssembly Runtimes (to appear)**
Junyoung Park, Yunho Kim, and **Insu Yun**
Proceedings of the 46th IEEE Symposium on Security and Privacy (Oakland 2025)
San Francisco, CA, May 2025

5. **BaseComp: A Comparative Analysis for Integrity Protection in Cellular Baseband Software**
Eunsoo Kim*, Min Woo Baek*, CheolJun Park, Dongkwan Kim, Yongdae Kim, and **Insu Yun**
Proceedings of the 32nd USENIX Security Symposium (Security 2023)
Anaheim, CA, August 2023

6. **QueryX: Symbolic Query on Decompiled Code for Finding Bugs in COTS Binaries**
HyungSeok Han, JeongOh Kyea, Yonghwi Jin, Jinoh Kang, Brian Park, and **Insu Yun**
Proceedings of the 44th IEEE Symposium on Security and Privacy (Oakland 2023)
San Francisco, CA, May 2023

7. **Fuzzing@Home: Distributed Fuzzing on Untrusted Heterogeneous Clients**
Daehee Jang, Ammar Askar, **Insu Yun**, Stephen Tong, Yiqin Cai, and Taesoo Kim
Proceedings of the 2022 International Symposium on Research in Attacks, Intrusions and Defenses (RAID 2022)
October 2022

8. **DoLTEst: In-depth Downlink Negative Testing Framework for LTE Devices**
CheolJun Park*, Sangwook Bae*, BeomSeok Oh, Jiho Lee, Eunkyu Lee, **Insu Yun**, and Yongdae Kim
Proceedings of the 31th USENIX Security Symposium (Security 2022)
Boston, MA, August 2022
(Acceptance rates: 18%, 256/1414)

9. **HardsHeap: A Universal and Extensible Framework for Evaluating Secure Allocators**
Insu Yun, Woosun Song, Seunggi Min, and Taesoo Kim
Proceedings of the 28th ACM Conference on Computer and Communications Security (CCS 2021)
Seoul, South Korea, November 2021
(Acceptance rates: 22%, 196/880)

10. **Preventing Use-After-Free Attacks with Fast Forward Allocation**
Brian Wickman, Hong Hu, **Insu Yun**, Daehee Jang, JungWon Lim, Sanidhya Kashyap, and Taesoo Kim
Proceedings of the 30th USENIX Security Symposium (Security 2021)
Vancouver, B.C., Canada, August 2021
(Acceptance rates: 19%, 246/1316)

11. **BaseSpec: Comparative Analysis of Baseband Software and Cellular Specifications for L3 Protocols**
Eunsoo Kim*, Dongkwan Kim*, Cheoljun Park, **Insu Yun**, and Yongdae Kim
Proceedings of the 2021 Annual Network and Distributed System Security Symposium (NDSS 2021)
February 2021
(Acceptance rates: 15%, 87/578)

12. **Automatic Techniques to Systematically Discover New Heap Exploitation Primitives**
Insu Yun, Dhaval Kapil, and Taesoo Kim
Proceedings of the 29th USENIX Security Symposium (Security 2020)
Boston, MA, August 2020
(Acceptance rates: 16%, 157/977)

13. **Fuzzing JavaScript Engines with Aspect-preserving Mutation**
Soyeon Park, Wen Xu, **Insu Yun**, Daehee Jang, and Taesoo Kim
Proceedings of the 41st IEEE Symposium on Security and Privacy (Oakland 2020)
San Francisco, CA, May 2020

(Acceptance rates: 12%, 104/841)

Nominated as a finalist in CSAW Best Applied Research Paper Award 2020

14. **REPT: Reverse Debugging of Failures in Deployed Software**
Weidong Cui, Xinyang Ge, Baris Kasikci, Ben Niu, Upamanyu Sharma, Ruoyu Wang, and **Insu Yun** (alphabetical)
Proceedings of the 13th USENIX Symposium on Operating Systems Design and Implementation (OSDI 2018)
Carlsbad, CA, October 2018
(Acceptance rates: 18%, 47/257)
Jay Lepreau Best Paper Award (3 out of 257 submissions)

15. **QSYM: A Practical Concolic Execution Engine Tailored for Hybrid Fuzzing**
Insu Yun, Sangho Lee, Meng Xu, Yeongjin Jang, and Taesoo Kim
Proceedings of the 27th USENIX Security Symposium (Security 2018)
Baltimore, MD, August 2018
(Acceptance rates: 19%, 100/524)
Distinguished Paper Award (5 out of 524 submissions)

16. **CAB-Fuzz: Practical Concolic Testing Techniques for COTS Operating Systems**
Su Yong Kim, Sangho Lee, **Insu Yun**, Wen Xu, Byoungyoung Lee, Youngtae Yun, and Taesoo Kim
Proceedings of the 2017 USENIX Annual Technical Conference (ATC 2017)
Santa Clara, CA, July 2017
(Acceptance rates: 21%, 60/283)

17. **APISan: Sanitizing API Usages through Semantic Cross-checking**
Insu Yun, Changwoo Min, Xujie Si, Yeongjin Jang, Taesoo Kim, and Mayur Naik
Proceedings of the 25th USENIX Security Symposium (Security 2016)
Austin, TX, August 2016
(Acceptance rates: 16%, 72/463)
Nominated as a finalist in CSAW Best Applied Research Paper Award 2016

18. **HDFI: Hardware-Assisted Data-Fow Isolation**
Chengyu Song, Hyungon Moon, Monjur Alam, **Insu Yun**, Byoungyoung Lee, Taesoo Kim, Wenke Lee, and Yunheung Paek
Proceedings of the 37th IEEE Symposium on Security and Privacy (Oakland 2016)
San Jose, CA, May 2016
(Acceptance rates: 13%, 55/413)

19. **Analyzing Security of Korean USIM-based PKI Certificate Service**
Shinjo Park, Suwan Park, **Insu Yun**, Dongkwan Kim, and Yongdae Kim
Proceedings of the 15th International Workshop on Information Security Applications (WISA 2014)
Jeju Island, Korea, August 2014

20. **Kargus: A Highly-scalable Software-based Intrusion Detection System**
Muhammad Jamshed, Jihyung Lee, Sangwoo Moon, **Insu Yun**, Deokjin Kim, Sungryoul Lee, Yung Yi, and KyoungSoo Park
Proceedings of the 19th ACM Conference on Computer and Communications Security (CCS 2012)
Raleigh, NC, October 2012
(Acceptance rates: 19%, 81/426)

International Journal

21. **Scalable and Secure Virtualization of HSM with ScaleTrust**
Juhyeng Han, **Insu Yun**, Seongmin Kim, Taesoo Kim, Sooel Son, and Dongsu Han
IEEE/ACM Transactions on Networking (ToN)
November 2022

Other Refereed Materials

22. **From the Vulnerability to the Victory: A Chrome Renderer 1-Day Exploit's Journey to v8CTF Glory**
    Haein Lee, and **Insu Yun**
    TyphoonCon 2024
    Seoul, Korea, May 2024

23. **One shot, Triple kill: Pwning all three Google kernelCTF instances with a single 1-day Linux vulnerability**
    Dongok Kim, Seunghyun Lee, and **Insu Yun**
    POC 2023
    Seoul, Korea, November 2023

24. **Compromising the macOS kernel through Safari by chaining six vulnerabilities**
    Yonghwi Jin, Jungwon Lim, **Insu Yun**, and Taesoo Kim
    Black Hat USA Briefings (Black Hat USA 2020)
    Las Vegas, NV, August 2020

25. **AVPASS: Leaking and Bypassing Antivirus Detection Model Automatically**
    Jinho Jung, Chanil Jeon, Max Wolotsky, **Insu Yun**, and Taesoo Kim
    Black Hat USA Briefings (Black Hat USA 2017)
    Las Vegas, NV, July 2017

Thesis

26. **Concolic Execution Tailored for Hybrid Fuzzing**
    Insu Yun
    Ph.D. thesis, Georgia Institute of Technology
    Atlanta, GA, December 2020

Professional Activities

Technical Program Committee (International)

Program Committee, *The International Conference on Cryptology and Network Security (CANS)*, 2025

Program Committee, *Network and Distributed System Security Symposium (NDSS)*, 2025

Program Committee, *Network and Distributed System Security Symposium (NDSS)*, 2024

Program Committee, *IEEE Symposium on Security and Privacy (Oakland)*, 2024

Program Committee, *ACM Conference on Security and Privacy in Wireless and Mobile Networks (WiSec)*, 2023

Program Committee, *ACM Conference on Security and Privacy in Wireless and Mobile Networks (WiSec)*, 2022

Journal Editor (International)

Associate Editor, *ACM Transaction on Storage (ToS)*, 2024

Others (International)

Organization Committee, *ACM Conference on Security and Privacy in Wireless and Mobile Networks (WiSec)*, 2024

Artifact Evaluation Committee, *ACM Conference on Computer and Communications Security (CCS)*, 2023

Artifact Evaluation Committee, *USENIX Security Symposium (Security)*, 2023

Organization Committee, *ACM Conference on Computer and Communications Security (CCS)*, 2021

Domestic Activities

Advisory Boards, *HackTheon Sejong*, 2024

Organization Committee, *Conference on Information Security and Cryptography Summer (CISC-S)*, 2021

Teaching Experience

Advanced Programming Techniques for Electrical Engineering (EE309 at KAIST)	Fall 2024
Information Security Laboratory (IS521 at KAIST)	Fall 2024
Software Hacking Theory and Practice (EE517 at KAIST)	Spring 2024

- Evaluation – Average: 4.92 / 5

Advanced Programming Techniques for Electrical Engineering (EE309 at KAIST)	Fall 2023

- Evaluation – Average: 4.57 / 5

Software Hacking Theory and Practice (EE517 at KAIST)	Spring 2023

- Evaluation – Average: 4.54 / 5

Programming Structures for Electronical Engineering (EE209 at KAIST)	Fall 2022

- Evaluation – Average: 4.65 / 5

Software development environment and tools practice (EE485-A at KAIST)	Fall 2022

- Evaluation – Average: 4.43 / 5

Software Security (EE595-B at KAIST)	Spring 2022

- Evaluation – Average: 5 / 5

Programming Structures for Electronical Engineering (EE209 at KAIST)	Fall 2021

- Evaluation – Average: 4.34 / 5

Software development environment and tools practice (EE485-A at KAIST)	Fall 2021

- Evaluation – Average: 4.34 / 5

Software Security (EE595-B at KAIST)	Spring 2021

- Evaluation – Average: 4.9 / 5

Honors & Awards

Academic awards

Song-Am Future Researcher Award	KAIST Feb. 2025
Technology Innovation Awards, KAIST College of Engineering	Dec. 2024
Best Teaching Award, KAIST Electrical Engineering	Oct. 2024
Prize for Excellence in Teaching, KAIST	Feb. 2024
Frontiers of Science Award, The First International Congress of Basic Science (ICBS)	July. 2023
Best Teaching Award, KAIST Electrical Engineering	Sep. 2021
Jay Lepreau Best Paper Award, USENIX OSDI 2018	Aug. 2018
Distinguished Paper Award, USENIX Security 2018	Aug. 2018

Hacking competitions

DEFCON 26 CTF, 1st place (Team DEFKOR00T)	Aug. 2018
DEFCON 24 CTF, 3rd place (Team DEFKOR)	Aug. 2016
DARPA Cyber Grand Challenge (Team Disekt)	Aug. 2016
DEFCON 23 CTF, 1st place (Team DEFKOR)	Aug. 2015
Whitehat contest 2014, 1st place (Team SysSec)	Nov. 2014
DEFCON 22 CTF, 10th place (Team GoN)	Aug. 2014
SECCON CTF 2014, 1st place (TOEFL Beginner)	Feb. 2014
Codegate CTF 2012, 3rd place (Team GoN)	Apr. 2012
Secuinside CTF, 3rd place (Team GoN)	Oct. 2011
ISEC CTF, 1st place (Team GoN)	Sep. 2011
DEFCON 18 CTF, 3rd place (Team GoN)	Aug. 2010
Codegate CTF 2010, 5th place (Team GoN)	Apr. 2010
KISA HDCON, Gold Medal, 2nd place (Team GoN)	May 2009
Codegate CTF 2009, 4th place (Team GoN)	Apr. 2009

Scholarships

National Research Foundation of Korea Scholarship for Undergraduate   Mar. 2008 – Dec. 2013

Others

Cyber Security Challenge, 2nd place (Team HackingLab), $400K research grant   2023

KISA Bug Bounty Program's Hall of Fame   2013

Vulnerability Discovery Reward (aka Bug bounty)

To summarize, $244.6K (by my students) and $92.8K (by myself) bug bounties are awarded so far.

By my students

Pwn2Own - Microsoft Edge and Google Chrome ($145K), ZDI, by SeunHyun Lee   Mar. 2024

v8CTF - CVE-2023-6702 ($10K), Google, by Haein Lee   Jan. 2024

kernelCTF - CVE-2023-3390 ($67.8K), Google, by Dongok Kim and SeunHyun Lee   Oct. 2023

Type confusion in V8 ($7K), Google, by Haein Lee   Mar. 2023

NAS authentication bypass in Exynos ($14.8K), Samsung Electronics, by Eunsoo Kim and CheolJun Park   Feb. 2022

By myself

PSV-2021-0304: afpd auth bypass ($300), NETGEAR   Mar. 2021

Pwn2Own Apple Safari with a kernel privilege escalation ($70K), ZDI, with Yonghwi Jin and Jungwon Lim   Mar. 2020

Apple Safari sandbox escape ($20K), Apple   Dec. 2019

Three integer overflow vulnerabilities in PHP ($1.5K), the Internet Bug Bounty   Jun. 2016

An Integer Overflow in Python zipimport ($1K), the Internet Bug Bounty   Apr. 2016

Patents

International

2. **Security analysis system and method based on negative testing for protocol implementation of LTE device (Pending)**

    Inventors: Yongdae Kim, Cheoljun Park, Sangwook Bae, Beomseok Oh, Jiho Lee, Mincheol Son, Insu Yun

    Application date: 2022.10.05

    Application number: 17960246

    Country: US

1. **Reverse debugging of software failures**

    Inventors: Weidong Cui, Xinyang Ge, Baris Kasikci, Cengiz Can, Ben Niu, Ruoyu Wang, Insu Yun

    Registration date: 10565511

    Patent number: 2020.02.18

    Country: US

Domestic

3. **Security analysis system and method based on negative testing for protocol implementation of LTE device**

    Inventors: Yongdae Kim, CheolJun Park, Sangwook Bae, BeomSeok Oh, Jiho Lee, Eunkyu Lee, Insu Yun

    Registration date: 10-2514797-0000

    Patent number: 2023.03.23

Country: Korea

2. **Method and system for automatically analyzing bugs in cellular baseband software using comparative analysis based on cellular specifications**
    Inventors: Yongdae Kim, Eunsoo Kim, Dongkwan Kim, CheolJun Park, Insu Yun
    Registration date: 10-2546946-0000
    Patent number: 2023.06.20
    Country: Korea

1. **Methods and systems for key management service provision (Pending)**
    Inventors: Dongsoo Han, JuHyeng Han, Insu Yun
    Application date: 10-2021-0154174
    Application number: 2021.11.10
    Country: Korea

Invited Talks

International

Title: How to build Skynet — a system that hacks systems	
Keynote speech at TyphoonCon, Seoul, Korea	Jun. 2023
Title: HardsHeap: A Universal and Extensible Framework for Evaluating Secure Allocators	
Presented at ACM CCS 2021, Online	Nov. 2021
Title: Automatic Techniques to Systematically Discover New Heap Exploitation Primitives	
Presented at USENIX Security 2020, Online	Aug. 2020
Title: QSYM: A Practical Concolic Execution Engine Tailored for Hybrid Fuzzing	
Presented at USENIX Security 2018, Baltimore, MD	Aug. 2018
Title: APISan: Sanitizing API Usages through Semantic Cross-checking	
Presented at USENIX Security 2016, Austin, TX	Aug. 2016

Domestic

Title: AIxCC: The Future of Cybersecurity with LLMs	
Seminar at ETRI, Daejeon, Korea	Nov. 2024
Seminar at Moon Sool Graduate School of Future Strategy, Daejeon, Korea	Nov. 2024
Seminar at Future Security Tech Forum, Jeju, Korea	Nov. 2024
Seminar at National Security Research Institute (NSRI), Daejeon, Korea	Sep. 2024
Title: 2024 Security Strategy: Polarization	
Seminar at Defense Counterintelligence Command, Gwacheon, Korea	May. 2024
Title: Building Automated Hacking Systems	
Seminar at POSTECH, Pohang, Korea	Nov. 2023
Title: Trends in Security Vulnerabilities of Low Earth Orbit Satellites	
Presented at ETRI, Daejeon, Korea	Aug. 2023
Title: Academic Research from Offensive Research	
Presented at Samsung, Seoul, Korea	Aug. 2023
Title: Human-friendly binary analysis	
Presented at ETRI, Daejeon, Korea	Nov. 2023
Presented at Korea Computer Congress (KCC), Seoul, Korea	Jun. 2023
Title: Exploit in the wild	
Presented at ETRI, Daejeon	Jun. 2023
Title: Hacking 101	
Presented at WISC, Seoul	Sep. 2022
Title: Attack and Defenses for Heap Vulnerabilities in 2022	

Seminar at ETRI, Daejeon	Apr. 2022

Title: Comparative Analysis of Baseband Software and Cellular Specifications for Finding Vulnerabilities

Seminar at UNIST, Ulsan	May. 2023
Seminar at Security@KAIST, Online	Jun. 2022
Seminar at Cyber Operations Command, Seoul	Jun. 2022

Title: Scalable and Automatic Vulnerability Discovery Beyond Random Testing

Seminar at Seoul National University, Seoul, Korea, Mar. 2019

Title: Memory Allocator Security

Presented at Best of Best (BoB), Seoul	Feb. 2023
Presented at Computer System Society Conference (CSC), Pyeongchang	Feb. 2023
Seminar at UNIST, Online	May. 2022
Seminar at Yonsei university, Online	Apr. 2022
Seminar at Sungkyunkwan university, Online	Apr. 2022
Seminar at ETRI, Daejeon	Jan. 2022
Seminar at National Security Research Institute (NSRI), Daejeon	Dec. 2021
Seminar at Securty@KAIST, Online	Nov. 2021
Seminar at KAIST GSIS, Online	Nov. 2021

Title: Browser Security: Hacking & Research

Presented at Open Theori Research Seminar #6, Online	Dec. 2021
Seminar at Hanyang University, Online	Nov. 2021
Presented at KR Becks Meetup #1 by LINE, Online	Aug. 2021
Seminar at Security@KAIST, Online	Jun. 2021

Grants

To summarize, $2 million is awarded, and my portion is $1.42 million. Please note that I have accounted for the exchange rate of 1,000 won to one dollar.

Research on building an open source kernel security model 24.04 – 24.10
    Agency/Company: NRF
    Money: $54.5K
    Role: PI

Research on cybersecurity technologies for the future 24.03 – 24.12
    Agency/Company: Future science academy
    Money: $140K
    Role: PI

Revisiting IoT threat models for smart cities and developing a vulnerability analysis system based on these models 24.01 – 25.12
    Agency/Company: IITP
    Money: $400k
    Role: PI

Building a system to assist variant analysis for browsers 23.06 – 24.05
    Agency/Company: NRF
    Money: $65K
    Role: PI

Generating a security model based on JavaScript intermediate language 23.04 – 23.10
    Agency/Company: NSRI
    Money: $54.5K
    Role: PI

Verifying security threats in open-source operating systems 23.04 – 23.10

Agency/Company: NSRI

Money: $54.5K

Role: PI

An automated framework that generates exploit for multi-type kernel bugs   23.02 – 23.11

Agency/Company: CISC

Money: $100K

Role: PI

Browser fuzzing with formal verification for cross architectures   22.09 – 23.09

Agency/Company: NRF

Money: $110K

Role: PI

Building test suites for validating vulnerability detection   22.08 – 22.11

Agency/Company: ETRI

Money: $27.3K

Role: PI

Generating a security model based on JavaScript security analysis   22.04 – 22.10

Agency/Company: NSRI

Money: $54.5K

Role: PI

Developing techniques for collection and integrated analysis of automotive systems through event-based experimental systems   22.04 – 23.12

Agency/Company: Dankook university

Money: $300K × 0.5

Role: PI working with Prof. Yujip Won

6G security   21.08 – 23.09

Agency/Company: Samsung Electronics

Money: $200K × 0.2

Role: Co-PI with Prof. Yongdae Kim

DRAM security   21.07 – 24.06

Agency/Company: Samsung Electronics

Money: $180K × 0.2

Role: Co-PI with Prof. Yongdae Kim

Systematic and precise transformation of the Qualcomm Hexagon architecture into intermediate representations for binary analysis   21.06 – 22.05

Agency/Company: NRF

Money: $46.7K

Role: PI

Automatically generating a security model for discovering web browser vulnerabilities   21.04 – 21.10

Agency/Company: NSRI

Money: $54.5K

Role: PI

Developing a scalable cyber reasoning system (Start-up)   21.02 – 24.12

Agency/Company: KAIST

Money: $150K

Role: PI

Advising and Mentoring

Ph.D. Students

- Eunkyu Lee   Fall 2023

- Minwoo Baek	Spring 2024
- Junyeong Park	Spring 2024

Ph.D./M.S Students

- Haein Lee	Spring 2022

M.S. Students

- Dongok Kim	Spring 2023
- Seunggi Min	Fall 2023
- Donguk Kim	Spring 2024
- Donghyeon Kim	Spring 2024
- Wonyoung Kim	Spring 2024
- Hyeon Heo	Spring 2024

Alumni

- Wonyeong Jung, 78ResearchLab	M.S. in Fall 2024
- Hyunsik Jeong (Co-advising with Yongdae Kim), S2W	M.S. in Fall 2021
- Hyungseok Han (Co-advising with Yongdae Kim), Postdoc at Georgia Tech	Ph.D. in Fall 2022