Dongkwan Kim

Postdoctoral Fellow, SSLab School of Cybersecurity and Privacy Georgia Institute of Technology

SUMMARY

I am a security engineer and researcher specializing in uncovering novel, cross-domain security threats across AI, IoT, cellular networks, and cyber-physical systems. I have a proven track record of identifying and developing practical security solutions at scale, from AI-based automated vulnerability discovery to securing enterprise-level AI infrastructures. As a DARPA AIxCC finalist, I demonstrated expertise in building LLM-powered exploit generation agents and advancing autonomous security analysis. At Samsung SDS, I drove Red Team operations to proactively mitigate threats against global products and services. Recognized through 5x DEFCON finals, 9 top-tier publications (USENIX Security, CCS, NDSS, TSE, TMC), 7 patents, and 17+ industry/government projects. Passionate about bridging cutting-edge research with real-world impact to secure large-scale systems and services.

WORK EXPERIENCE

Georgia Tech, Postdoctoral Fellow, Atlanta, GA

Feb. 2025 - Present

Email: 0xdkay@gmail.com

Homepage: https://0xdkay.me

Led design and implementation of LLM-powered exploit generation and fuzzing agents, significantly improving team productivity and analysis throughput through robust automation and tooling.

Manager: Prof. Taesoo Kim

Samsung Security Center, Samsung SDS, Senior Engineer, South Korea Aug. 2022 – Dec. 2024

Drove Red Team efforts to proactively identify and mitigate security threats across all Samsung affiliates' products and services, including AI-integrated systems, IoT/embedded devices, Android applications, and kernel-level mitigations.

KAIST, Postdoctoral Researcher, South Korea

Mar. 2022 - Jul. 2022

Conducted advanced research on smartphone baseband authentication bypass, acoustic and EMI signal injection attacks against drone sensors, and recovery techniques for spoofed signals.

Manager: Prof. Yongdae Kim

Pinion Industries, Research Intern, South Korea

Dec. 2013 - Feb. 2014

An automotive software and security startup. I analyzed and exploited in-vehicle components (network systems, AVN, telematics, smart keys, ECUs), including achieving remote code execution on AVN systems and investigating smart key cloning for potential theft scenarios.

KAIST CERT, Student Senior, South Korea

Sep. 2010 – Aug. 2012

Investigated and analyzed security incidents, including identifying and attributing an attack that led to the apprehension of the perpetrator by law enforcement.

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST), South Korea

Ph.D. in School of Electrical Engineering

Mar. 2016 - Feb. 2022

Thesis Title: Improving Large-Scale Vulnerability Analysis of IoT Devices with Heuristics and Binary Code Similarity

Advisor: Prof. Yongdae Kim

M.S. in School of Electrical Engineering

Mar. 2014 - Feb. 2016

Thesis Title: Dissecting VoLTE: Exploiting Free Data Channels and Security Problems

Advisor: Prof. Yongdae Kim

B.S. in School of Computing

Feb. 2010 - Feb. 2014

EURECOM, France

Visiting Scholar in Software and System Security

Jun. 2014 - Jul. 2014

(Team SysSec) Nov. 2014

Learned embedded device analysis techniques, particularly for debugging interfaces

Advisor: Prof. Aurélien Francillon

HONORS & AWARDS

Hacking Contests (i.e., Capture-the-flag, CTF)

Finalist, DEFCON 27 CTF (Team KaisHack GoN) Aug. 2019

Finalist, DEFCON 26 CTF (Team KaisHack+PLUS+GoN) Aug. 2018

1st place (\$20,000), HDCON CTF (Team maxlen) Nov. 2017

1st place (\$30,000), Whitehat Contest (Team Old GoatskiN) Nov. 2017

3rd place (\$5,000), Codegate CTF (Team Old GoatskiN) Apr. 2017

Finalist, DEFCON 24 CTF (Team KaisHack GoN) Aug. 2016

1st place (\$20,000), Whitehat Contest Finalist, DEFCON 22 CTF (Team KAIST GoN) Aug. 2014

Silver prize (\$2,000), HDCON CTF (Team GoN) Dec. 2013

1st place (\$20,000), Whitehat Contest (Team KAIST GoN) Oct. 2013

Finalist, DEFCON 20 CTF (Team KAIST GoN) Jul. 2012

Silver prize (\$2,000), HDCON CTF (Team KAIST GoN) Jul. 2012

3rd place (\$5,000), Codegate CTF 2012 (Team KAIST GoN) Apr. 2012 1st place (\$10,000), ISEC CTF (Team GoN) Sep. 2011

1st place (\$1,000), PADOCON CTF (Team GoN) Jan. 2011

Academic Awards

Best Paper Award, CISC-W Nov. 2020

Title: Standard-based User Identifier Mapping Attack Prevention Method for LTE Network

Best Presentation Award, A3 Security Workshop Feb. 2016

Title: Breaking and Fixing VoLTE: Exploiting Hidden Data Channels and Mis-implementations

Best Paper Award, WISA Aug. 2015

Title: BurnFit: Analyzing and Exploiting Wearable Devices

Reported Security Vulnerabilities

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m CVE} ext{-}2015 ext{-}6614,$ Android telephony privilege escalation, Google

Oct. 2015

Certificates

Engineer Information Security (i.e., 정보보안기사), South Korea Jun. 2016

Engineer Information Processing (i.e., 정보처리기사), South Korea May 2013

Scholarships

National Scholarship (Science and Engineering), Korea Student Aid Foundation Feb. 2010 - Feb. 2020

PATENTS

International Registrations

US 10111120 Oct. 2018

Method and Apparatus for Checking Problem in Mobile Communication Network

Damastia	Demistrations	Conth	T/ ones
Domestic	Registrations.	South	-Korea

KR 10-2514809 Mar. 2023 VIDEO IDENTIFICATION METHOD IN LTE NETWORKS AND THE SYSTEM THEREOF KR 10-2418212 ARCHITECTURE-INDEPENDENT SIMILARITY MEASURING METHOD FOR PROGRAM FUNC-TION KR 10-2415494 Jun. 2022 Emulation based security analysis method for embedded devices KR 10-2333866 Nov. 2021 Method and Apparatus for Checking Problem in Mobile Communication Network KR 10-1972825 Apr. 2019 Method and apparatus for automatically analyzing vulnerable point of embedded appliance by using hybrid analysis technology, and computer program for executing the method KR 10-1868836 Jun. 2018 A method to attack commercial drones using the resonance effect of gyroscopes by sound waves **Applications** KR 10-2022-0132964 Oct. 2022 ANTI-DRONE SYSTEM THROUGH COMMUNICATION DISTORTION BETWEEN SENSOR AND CONTROL UNIT AND ITS OPERATION METHOD KR 10-2021-0168382 Nov. 2021 Method and System for Automatically Analyzing Bugs in Cellular Baseband Software using Comparative Analysis based on Cellular Specifications KR 10-2021-0136352 Oct. 2021 METHOD FOR PREVENTING MAPPING OF USER IDENTIFIERS IN MOBILE COMMUNICATION SYSTEM AND THE SYSTEM THEREOF

KR 10-2021-0040795 Mar. 2021

ANALYSIS SYSTEM FOR DETECTION OF SIP IN VOLTE AND THE METHOD THEREOF

KR 10-2020-0177062 Dec. 2020

Analysis method for detection of SIP implementation vulnerability in VoLTE

KR 10-2020-0133926 Oct. 2020

Method to prevent mapping of user identifiers in mobile communication system

KR 10-2020-0133925 Oct. 2020

APPARATUS AND METHOD FOR VIDEO TITLE IDENTIFICATION OF MOBILE COMMUNICATION NETWORK USING ENCRYPTED TRAFFIC MONITORING

KR 10-2019-0005131 Jan. 2019

Large-scale honeypot system IoT botnet analysis

KR 10-2018-0036403 Mar. 2018

Dynamic analysis method for malicious embedded firmware detection

KR 10-2018-0036055 Mar. 2018

Emulation based security analysis method for embedded devices

KR 10-2018-0037291 Mar. 2018

Binary-Level Virtual Function Call Protection Method by Saving Type Information

KR 10-2018-0034616 Mar. 2018

ARCHITECTURE-INDEPENDENT SIMILARITY MEASURING METHOD FOR PROGRAM FUNCTION

PUBLICATIONS (INTERNATIONAL)

(*: co-first authors)

9 papers in top-tier conferences and journals (USENIX Security, CCS, NDSS, TSE, TMC)

1. BaseComp: A Comparative Analysis for Integrity Protection in Cellular Baseband Software

Eunsoo Kim*, Min Woo Baek*, Cheol Jun Park,
 $\underline{\textbf{Dongkwan Kim}},$ Yongdae Kim, and Insu Yun

Proceedings of the 32nd USENIX Security Symposium (Security'23)

Acceptance rate: $29.22\%~(422~\text{of}~1,\!444)$

Aug. 2023

2. Un-Rocking Drones: Foundations of Acoustic Injection Attacks and Recovery Thereof

Jinseob Jung, Dongkwan Kim, Joonha Jang, Juhwan Noh, Changhun Song, and Yongdae Kim

Proceedings of the 2023 Annual Network and Distributed System Security Symposium (NDSS'23)

Acceptance rate: 16.18% (94 of 581) Mar. 2023

3. Paralyzing Drones via EMI Signal Injection on Sensory Communication Channels

Junha Jang, ManGi Cho, Jaehoon Kim, **Dongkwan Kim**, and Yongdae Kim

Proceedings of the 2023 Annual Network and Distributed System Security Symposium (NDSS'23)

Acceptance rate: 16.18% (94 of 581)

4. Watching the Watchers: Practical Video Identification Attack in LTE Networks

Sangwook Bae, Mincheol Son, $\underline{\mathbf{Dongkwan\ Kim}}$, Cheol Jun Park, Jiho Lee, Soo
el Son, and Yongdae Kim

Proceedings of the 31st USENIX Security Symposium (Security'22)

Acceptance rate: 18.10% (256 of 1,414)

Aug. 2022

Mar. 2023

5. Revisiting Binary Code Similarity Analysis using Interpretable Feature Engineering and Lessons Learned

Dongkwan Kim, Eunsoo Kim, Sang Kil Cha, Sooel Son, and Yongdae Kim

IEEE Transactions on Software Engineering (TSE'22)

Jul. 2022

6. Improving Large-Scale Vulnerability Analysis of IoT Devices with Heuristics and Binary Code Similarity

Dongkwan Kim

Ph.D. Thesis, KAIST

Daejeon, South Korea, Feb. 2022

7. Enabling the Large-Scale Emulation of Internet of Things Firmware With Heuristic Workarounds

Dongkwan Kim, Eunsoo Kim, Mingeun Kim, Yeongjin Jang, and Yongdae Kim

IEEE Security & Privacy

May 2021

8. BaseSpec: Comparative Analysis of Baseband Software and Cellular Specifications for L3 Protocols

Dongkwan Kim*, Eunsoo Kim*, CheolJun Park, Insu Yun, and Yongdae Kim

Proceedings of the 2021 Annual Network and Distributed System Security Symposium (NDSS'21)

Acceptance rate: 15.18% (87 of 573)

Virtual, Feb. 2021

9. FirmAE: Towards Large-Scale Emulation of IoT Firmware for Dynamic Analysis

Mingeun Kim, $\underline{\mathbf{Dongkwan\ Kim}},$ Eunsoo Kim, Suryeon Kim, Yeongjin Jang, and Yongdae Kim

Proceedings of the 2020 Annual Computer Security Applications Conference (ACSAC'20)

Acceptance rate: 23.18% (70 of 302) Virtual, Dec. 2020

10. Who Spent My EOS? On the (In)Security of Resource Management of EOS.IO

Sangsup Lee, Daejun Kim, Dongkwan Kim, Sooel Son, and Yongdae Kim

Proceedings of the 13th USENIX Workshop on Offensive Technologies

(WOOT'19) Santa Clara, CA, Aug. 2019

11. Peeking over the Cellular Walled Gardens - A Method for Closed Network Diagnosis

Byeongdo Hong, Shinjo Park, Hongil Kim, <u>Dongkwan Kim</u>, Hyunwook Hong, Hyunwoo Choi, Jean-Pierre Seifert, Sung-Ju Lee, and Yongdae Kim

IEEE Transactions on Mobile Computing (TMC'18)

Feb. 2018

12. When Cellular Networks Met IPv6: Security Problems of Middleboxes in IPv6 Cellular Networks

Hyunwook Hong, Hyunwoo Choi, <u>Dongkwan Kim</u>, Hongil Kim, Byeongdo Hong, Jiseong Noh, and Yongdae Kim

Proceedings of the 2nd IEEE European Symposium on Security and Privacy (EuroS&P'17)

Acceptance rate: 19.58% (38 of 194)

Paris, France, Apr. 2017

13. Pay As You Want: Bypassing Charging System in Operational Cellular Networks

Hyunwook Hong, Hongil Kim, Byeongdo Hong, **Dongkwan Kim**, Hyunwoo Choi, Eunkyu Lee, and Yongdae Kim

 ${\bf Proceedings~of~the~17th~International~Workshop~on~Information~Security~Applications}$

(WISA'16)

Jeju, South Korea, Aug. 2016

14. Dissecting VoLTE: Exploiting Free Data Channels and Security Problems Dongkwan Kim

M.S. Thesis, KAIST

Daejeon, South Korea, Feb. 2016

15. Breaking and Fixing VoLTE: Exploiting Hidden Data Channels and Mis-implementations

 $\underline{\mathbf{Dongkwan}\ \mathbf{Kim}^*}$, Hongil Kim * , Minhee Kwon, Hyungseok Han, Yeongjin Jang, Dongsu Han, Taesoo Kim, and Yongdae Kim

Proceedings of the 22nd ACM Conference on Computer and Communications Security (CCS'15)

Acceptance rate: 19.81% (128 of 646)

Denver, CO, Oct. 2015

16. BurnFit: Analyzing and Exploiting Wearable Devices

Dongkwan Kim, Suwan Park, Kibum Choi, and Yongdae Kim

Proceedings of the 16th International Workshop on Information Security Applications (WISA'15)

Best Paper Award

Jeju, South Korea, Aug. 2015

17. Rocking Drones with Intentional Sound Noise on Gyroscopic Sensors

Yunmok Son, Hocheol Shin, <u>Dongkwan Kim</u>, Youngseok Park, Juhwan Noh, Kibum Choi, Jungwoo Choi, and Yongdae Kim

Proceedings of the 24th USENIX Security Symposium (Security'15)

Acceptance rate: 15.73% (67 of 426)

Austin, TX, Aug. 2015

18. Analyzing Security of Korean USIM-based PKI Certificate Service

Shinjo Park, Suwan Park, Insu Yun, <u>Dongkwan Kim</u>, and Yongdae Kim

Proceedings of the 15th International Workshop on Information Security Applications

(WISA'14)

Jeju, South Korea, Aug. 2014

19. High-speed Automatic Segmentation of Intravascular Stent Struts in Optical Coherence Tomography Images

Myounghee Han, Dongkwan Kim, Wang-Yuhl Oh, and Sukyoung Ryu

Proceedings of SPIE Biomedical Optics, Photonics West 2013 (BiOS'13) San Francisco, CA, Feb. 2013

PUBLICATIONS (DOMESTIC, SOUTH KOREA)

1. Video Service Identification Attack in LTE by Monitoring Encrypted Traffic

Mincheol Son, Sangwook Bae, <u>Dongkwan Kim</u>, Jiho Lee, CheolJun Park, BeomSeok Oh, Sooel Son, and Yongdae Kim

Proceedings of Symposium of the Korean Institute of Communications and Information Sciences (KCIS'21)

Virtual, Jun. 2021

2. Standard-based User Identifier Mapping Attack Prevention Method for LTE Network

CheolJun Park, Sangwook Bae, Jiho Lee, Mincheol Son, <u>Dongkwan Kim</u>, Sooel Son, and Yongdae Kim Conference on Information Security and Cryptography Winter (CISC-W'20)

Best Paper Award South Korea, Nov. 2020

3. VolteFuzz: Framework for Comprehensive Analysis of SIP in Volte

Seokbin Yun, Sangwook Bae, Mincheol Son, <u>Dongkwan Kim</u>, Jiho Lee, CheolJun Park, Yeongbin Hwang, and Yongdae Kim

Conference on Information Security and Cryptography Winter (CISC-W'20) South Korea, Nov. 2020

4. Firm-Pot: Large-scale Firmware Honey-Pot for Malware Analysis

Minguen Kim, Eunsoo Kim, Dongkwan Kim, and Yongdae Kim

Conference on Information Security and Cryptography Winter (CISC-W'18) South Korea, Dec. 2018

5. TVT: Typed Virtual Table for Mitigating VTable Hijacking

Jeongoh Kyea, Eunsoo Kim, Dongkwan Kim, and Yongdae Kim

Conference on Information Security and Cryptography Winter (CISC-W'17) South Korea, Dec. 2017

6. Design and Implementation of GPS Spoofer Software

Juhwan Noh, Dongkwan Kim, and Yongdae Kim

Conference on Information Security and Cryptography Summer (CISC-S'15) South Korea, Jun. 2015

7. Security Analysis of USIM-based certificate service in Korea

Shinjo Park, Suwan Park, Insu Yun, **Dongkwan Kim**, and Yongdae Kim

Conference on Information Security and Cryptography Summer (CISC-S'14) South Korea, Jun. 2014

8. Security Analysis of Femtocells in Korea

Eunsoo Kim, Dongkwan Kim, Youjin Lee, Shinjo Park, and Yongdae Kim

Conference on Information Security and Cryptography Summer (CISC-S'14) South Korea, Jun. 2014

INVITED TALKS

AI Security Primer: Red Team Perspectives on Navigating New Threats and Safeguard	ing
AI Frontier	

Hyundai Motors Group Security Center	Seoul, South Korea, Jan. 2025
AI Security Lecture for the SK Telecom Information Security Team	Seoul, South Korea, Jul. 2024
.HACK Conference by Theori	Seoul, South Korea, May. 2024

Scaling up Vulnerability Analysis of IoT Devices with Heuristics and Binary Code Similarity

Technology Exchange Meeting between Samsung Mobile Security Team and Hyundai Motor Company Vehicle
Cyber Security Team
Seoul, South Korea, Jul. 2024
Colloquium at School of Cybersecurity, Korea University
Seoul, South Korea, Oct. 2023

Peeking over Industry's Patch Gap: Case Study of Samsung SmartTV's Web Browser

KAIST-Samsung SDS Tech Seminar Daejeon, South Korea, Mar. 2023

BaseSpec: Comparative Analysis of Baseband Software and Cellular Specifications for L3 Protocols

Annual Network and Distributed System Security Symposium	Virtual, Feb. 2021
KAIST-CISPA Workshop	Seoul, South Korea, Aug. 2019

Breaking and Fixing VoLTE: Exploiting Hidden Data Channels and Mis-implementations A.k.a. Dissecting VoLTE: Exploiting Free Data Channels and Security Problems

GSMA RCS/VoLTE Security Regulatory workshop	Toronto, Canada, Sep. 2016
A3 Foresight Program Annual Workshop	Okinawa, Japan, Feb. 2016
Chaos Communication Congress (CCC) Conference (32C3)	Hamburg, Germany, Dec. 2015
National Security Research	Daejeon, South Korea, Nov. 2015
Power of Community (PoC) Conference	Seoul, South Korea, Nov. 2015
ACM Conference on Computer and Communications Security (CCS)	Denver, CO, Oct. 2015
Seminar at the Georgia Institute of Technology	Atlanta, GA, Oct. 2015

BurnFit: Analyzing and Exploiting Wearable Devices

16th WISA Jeju, South Korea, Aug. 2015

International CTF Challenge Solving

NetSec-KR Seoul, South Korea, Apr. 2013

PROFESSIONAL ACTIVITIES

Secondary Reviewer (Security)

IEEE Symposium on Security and Privacy (Oakland)	2021
USENIX Security Symposium (Security)	2019 - 2021
Network and Distributed System Security Symposium (NDSS)	$2017-2018,\ 2020-2021$
ACM Conference on Computer and Communications Security (CCS)	$2017,\ 2019-2021$
IEEE European Symposium on Security and Privacy (EuroS&P)	2016,2018,2020
ACM ASIA Conference on Computer and Communications Security (ASIACCS)	2016-2017,2019-2020
The WEB Conference (WWW)	2018, 2020
International Symposium on Research in Attacks, Intrusions and Defenses (RAID	2017
IEEE Symposium on Privacy-Aware Computing (PAC)	2017

Secondary Reviewer (System)

ACM Symposium on Operating Systems Principles (SOSP) 2019

A Study on the Security Analysis and Response Method of LTE Networks

External Security Consultant

KAIST Computer Emergency Response Team

A Security Analysis of Samsung SmartTV 2014

National Security Research (NSR)

 $^*\mathcal{A}$ Study on the Android-based Security Analysis Technology

Sep. 2010 – Feb. 2022

Aug. 2015 – Apr. 2016

Feb. $2014 - Dec.\ 2015$

May 2020 - Dec. 2020

PARTICIPATED PROJECTS

(*: participated as a project leader)

Industrial Projects

An Industry-academia Task with Samsung Electronics Device Solutions Business	s Jun. 2020 – Aug. 2020
Samsung Electronics	
*Organizing 2018 Samsung Capture-the-flag (SCTF)	Apr. 2018 – Oct. 2018
Samsung Electronics	
*Organizing 2017 Samsung Capture-the-flag (SCTF)	Dec. 2016 – Dec. 2017
Samsung Electronics	
A Study on the Security Vulnerability Analysis and Response Method of LTE	
Networks	Aug. 2016 – Jul. 2017
SK Telecom	
A Security Vulnerability Analysis of Smartcar Core Modules	Jul. 2016 – Jun. 2017
Hyundai NGV	

International Projects

Samsung Electronics

SK Telecom

*Cyber Physical Analysis of System Software Survivability by Stimulating Sensors	
on Drones	Jun. 2020 – Feb. 2022
Air Force Office of Scientific Research (AFOSR), Air Force Research	
Laboratory (AFRL)	

Governmental Projects

Jul. 2017 – Jun. 2019
May 2017 – Oct. 2017
Apr. 2016 – Dec. 2018
Apr. 2016 – Dec. 2016
Apr. 2015 – Nov. 2015
Sep. 2013 – Jan. 2014

A Study on the Analysis and Response Method of Vulnerabilities in Network

Devices Mar. 2013 – Dec. 2013

NSR

A Study on the Vulnerability Analysis of Network Devices Apr. 2011 – Oct. 2011

NSR

OTHER ACTIVITIES

Teaching Assistant, Introduction to Electronics Design Lab. (EE305), KAIST	Fall 2019
Teaching Assistant, Discrete Methods for Electrical Engineering (EE213), KAIST	Spring 2017
Teaching Assistant, Network Programming (EE324), KAIST	Fall 2016
Teaching Assistant, Cryptography Engineering (EE817/IS893), KAIST	Spring 2016
Teaching Assistant, Security 101: Think Like an Adversary (EE515/IS523), KAIST	Fall 2015
Student Representative of School of Computing, KAIST	Feb. 2011 – Dec. 2013
Head Instructor, Information Security 101 for Freshmen (HSS062), KAIST	Sep. 2011 – Feb. 2013
Teaching Assistant, Information Security 101 for Freshmen (HSS062), KAIST	Sep. 2010 – Aug. 2011

LIST OF REFERENCES

Dr. Yongdae Kim

Director, Cyber Security Research Center (CSRC), KAIST

Professor, School of Electrical Engineering and Graduate School of Information Security, KAIST

Email: yongdaek@kaist.ac.kr

Homepage: https://syssec.kaist.ac.kr/~yongdaek/

Dr. Taesoo Kim

Professor, School of Cybersecurity and Privacy (SCP) and Computer Science (SCS), Georgia Tech

Email: taesoo@gatech.edu

Homepage: https://taesoo.kim/

Dr. Sang Kil Cha

Director, Cyber Security Research Center (CSRC), KAIST

Associate Professor, School of Computing and Graduate School of Information Security, KAIST

Email: sangkilc@kaist.ac.kr

Homepage: https://softsec.kaist.ac.kr/~sangkilc/

Dr. Sooel Son

Associate Professor, School of Computing and Graduate School of Information Security, KAIST

Email: sl.son@kaist.ac.kr

Homepage: https://sites.google.com/site/ssonkaist/

Dr. Yeongjin Jang

Principal Software Engineer, Samsung Research America

Email: y.jang1@samsung.com

Homepage: https://www.unexploitable.systems/

Dr. Insu Yun

Associate Professor, School of Electrical Engineering, KAIST

Email: insuyun@kaist.ac.kr

Homepage: https://insuyun.github.io/