SEULBAE KIM

Assistant Professor

Department of Computer Science and Engineering

Pohang University of Science and Technology (POSTECH)

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INTERESTS

Cyber-physical systems security (drones, self-driving vehicles, robotic systems, IoT devices); System and software security

EDUCATION

Georgia Institute of Technology *Aug 2018 - Dec 2023*
Ph.D. in Computer Science, College of Computing
Thesis: Fortifying Cyber-Physical Systems through Comprehensive Bug-finding and Mitigation
Advisor: Dr. Taesoo Kim

Korea University *Mar 2016 - Aug 2018*
M.S. in Computer Science and Engineering
Thesis: Scalable Approach for Code Clone Detection and its Application in Practice
Advisor: Dr. Heejo Lee

Korea University *Mar 2010 - Feb 2016*
B.S. in Computer Science and Engineering
(On leave for 2 years: mandatory military service)

Goyang Foreign Language High School *Mar 2007 - Feb 2010*
Major: English
Track: Natural Sciences

EMPLOYMENT HISTORY

Department of Computer Science and Engineering, POSTECH *Feb 2024 - Present*
Assistant Professor *Pohang, Korea*

- Leading Computer Security Lab

Data Science and System Security Team, NEC Labs America *May 2020 - Aug 2020*
Research Intern *Princeton, NJ, USA*

- Project: Finding misbehaviors of autonomous driving systems through feedback-driven fuzzing
- Product: AutoFuzzer (published as DriveFuzz **[C1]**)

Center for Software Security and Assurance (CSSA) *Nov 2015 - Feb 2018*
Core Researcher & Developer *Seoul, Korea*

- Led a project on the development of vulnerability discovery technologies for IoT software security.
- Product: IoTcube [T8], a platform for automated vulnerability testing (https://iotcube.net)

Cylab, Carnegie Mellon University *Jan 2017 - Feb 2017*
Visiting Researcher *Pittsburgh, PA, USA*

- Worked on the automated attack-vector analysis for IoT firmware.

Republic of Korea Army *Sep 2011 - Jun 2013*
Radio & computer systems operator *Paju-si, Gyeonggi-do, South Korea*

- Served in the RoK Army as an active duty soldier.

PUBLICATIONS - CONFERENCE

In top-tier venues:
2 in *security* (CCS **[C1]**, S&P **[C5]**), 2 in *software engineering* (FSE **[C2]**, ICSE **[C3]**), and 1 in *systems* (SOSP **[C4]**).

[C1] DriveFuzz: Discovering Autonomous Driving Bugs through Driving Quality-Guided Fuzzing
Seulbae Kim, Major Liu, Junghwan Rhee, Yuseok Jeon, Yonghwi Kwon, and Chung Hwan Kim.
In Proceedings of the 2022 ACM SIGSAC Conference on Computer and Communications Security (CCS 2022),
Los Angeles, USA, November 2022. (acceptance rate: 22.4% = 218/971) [pdf] [code]

[C2] RoboFuzz: Fuzzing Robotic Systems over Robot Operating System (ROS) for Finding Correctness Bugs
Seulbae Kim, and Taesoo Kim.
In Proceedings of the 30th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2022),
Singapore, November 2022. (acceptance rate: 21.1% = 99/469) [pdf] [code]

[C3] CENTRIS: A Precise and Scalable Approach for Identifying Modified Open-Source Software Reuse.
Seunghoon Woo, Sunghan Park, Seulbae Kim, Heejo Lee, and Hakjoo Oh.
In Proceedings of the 43rd International Conference on Software Engineering (ICSE 2021),
Virtual, May 2021. (acceptance rate: 22.4% = 138/615) [pdf] [code]

[C4] Finding Semantic Bugs in File Systems with an Extensible Fuzzing Framework.
Seulbae Kim, Meng Xu, Sanidhya Kashyap, Jungyeon Yoon, Wen Xu, and Taesoo Kim.
In Proceedings of the 27th ACM Symposium on Operating Systems Principles (SOSP 2019),
Ontario, Canada, October 2019. (acceptance rate: 13.8% = 38/276) [pdf] [code]

[C5] VUDDY: A Scalable Approach for Vulnerable Code Clone Discovery.
Seulbae Kim, Seunghoon Woo, Heejo Lee and Hakjoo Oh.
In Proceedings of the 38th IEEE Symposium on Security and Privacy (S&P 2017),
San Hose, CA, May 2017. (acceptance rate: 13.3% = 60/450) [pdf] [code]

[C6] SIGMATA: Storage Integrity Guaranteeing Mechanism against Tampering Attempts for Video Event Data Recorders.
Hyuckmin Kwon, Seulbae Kim and Heejo Lee.
In Proceedings of the 7th International Multi-Conference on Complexity, Informatics and Cybernetics (IMCIC 2016),
Orlando, FL, March 2016. (won the session's best paper award) [pdf]

PUBLICATIONS - JOURNAL

[J1] Riding the IoT Wave with VFuzz: Discovering Security Flaws in Smart Home
Carlos Nkuba, Seulbae Kim, Sven Dietrich, and Heejo Lee.
IEEE Access, Volume 10, pp. 1775-1789, December 2021. [pdf] [code] [CVE summary]

[J2] Finding Bugs in File Systems with an Extensible Fuzzing Framework
Seulbae Kim, Meng Xu, Sanidhya Kashyap, Jungyeon Yoon, Wen Xu, and Taesoo Kim.
ACM Transactions on Storage, Volume 16, Issue 2, May 2020. [pdf]

[J3] Software systems at risk: An empirical study of cloned vulnerabilities in practice.
Seulbae Kim and Heejo Lee.
Computers & Security, Volume 77, pp. 720-736, August 2018. [pdf]

PATENTS

[P1] Heejo Lee and Seulbae Kim. **Apparatus and Method for Detecting Code Cloning of Software**, US 10146532 B2, December 2018.

[P2] Heejo Lee and Seulbae Kim. **Apparatus and Method for Detecting Code Cloning of Software**, KR 10-1780233, September 2017.

TALKS AND PRESENTATIONS

[T1] "RoboFuzz: Fuzzing Robotic Systems over Robot Operating System (ROS) for Finding Correctness Bugs," Paper presentation at the 30th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2022), November 2022.

[T2] "DriveFuzz: Discovering Autonomous Driving Bugs through Driving Quality-Guided Fuzzing," Paper presentation at the 29th ACM Conference on Computer and Communications Security (CCS 2022), November 2022.

[T3] "Revamping Bug Detection Methodology for Cyber-Physical Systems," 2022 Summer AI/CSE Seminar Series at Pohang University of Science and Technology (POSTECH), Aug 2022.

[T4] "Finding Semantic Bugs in File Systems with an Extensible Fuzzing Framework," Paper presentation at the 27th ACM Symposium on Operating Systems Principles (SOSP 2019), October 2019.

[T5] "Automated Vulnerable Code Clone Detection in Open Source, and its Best Practice," Invited talk at Viterbi School of Engineering, University of Southern California, November 2017.

[T6] "Case Study and Exercise on Software Vulnerability Analysis," Lecture and training session at the 3rd Korea Institute of Information Security and Cryptography (KIISC) Short-term Seminar, September 2017.

[T7] "VUDDY: A Scalable Approach for Vulnerable Code Clone Discovery," Paper presentation at the 38th IEEE Symposium on Security and Privacy, May 2017.

[T8] "IoTcube: An Automated Analysis Platform for Finding Security Vulnerabilities," Poster presentation at the 38th IEEE Symposium on Security and Privacy, May 2017.

[T9] "SIGMATA: Storage Integrity Guaranteeing Mechanism against Tampering Attempts for Video Event Data Recorders," Paper presention at the 7th Multi-Conference on Complexity, Informatics and Cybernatics, March 2016.

TEACHING

2024∼

- **CSED415: Computer Security**, POSTECH *Feb 2024 - Present*

Before POSTECH

- **CS6265: Information Security Lab**, Georgia Institute of Technology *Aug 2023 - Dec 2023*
  Teaching Assistant
- **CS6265: Information Security Lab**, Georgia Institute of Technology *Aug 2022 - Dec 2022*
  Teaching Assistant
- **CS6265: Information Security Lab**, Georgia Institute of Technology *Aug 2021 - Dec 2021*
  Teaching Assistant
- **CS6265: Information Security Lab**, Georgia Institute of Technology *Jan 2020 - Apr 2020*
  Teaching Assistant
- **CS6265: Information Security Lab**, Georgia Institute of Technology *Aug 2019 - Dec 2019*
  Teaching Assistant - Managed the Capture The Flag (CTF) game infrastructure, on which students connect to, solve hacking challenges, and submit flags; Held recitation sessions twice a week, teaching and guiding students about various hacking skills required throughout the semester.
  Student evaluation - overall effectiveness: 4.9/5.0
- **CRE642: Trusted Computing**, Korea University *Sep 2016 - Dec 2016*
  Teaching Assistant - Covered the concurrent issues associated with promoting a secure computing environment; Scored the assignments and the presentations of 20 graduate students.
- **CNCE220: Theory of Computation**, Korea University *Mar 2016 - June 2016*
  Teaching Assistant - Covered the basics of the Theory of Computation, such as finite automata, context-free grammars, regular languages, and regular expressions; Set and managed assignments of 93 undergraduate students, had office hours every week, answered questions in person and on-line, marked assignments, and proctored exams.

AWARDS & SCHOLARSHIPS

Thank a Teacher Program Award (CS6265 TA)	Georgia Tech	Dec, 2022
NSA Codebreaker Challenge High Performer	The National Security Agency	Dec, 2021
Thank a Teacher Program Award (CS6265 TA)	Georgia Tech	May, 2020
Thank a Teacher Program Award (CS6265 TA)	Georgia Tech	Dec, 2019
DEFCON 27 CTF finals, #8 as r00timentary	Las Vegas, NV	Aug, 2019
Honors Scholarship	Korea University	2015