

Woosuk Lee

Assistant Professor
Department of Computer Science and Engineering
College of Computing
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Education

Computer Science and Engineering, Seoul National University Mar 2009 – Feb 2016
Doctor of Philosophy in Computer Science and Engineering
Thesis: Improving the Usability of Static Analyzers
Advisor: Prof. Kwangkeun Yi

Computer Science and Engineering, Seoul National University Mar 2005 – Feb 2009
Bachelor of Science in Computer Science

Research Interests

My research interest spans all aspects of programming systems with the goal of improving software quality and programmer productivity by combining ideas in the fields of programming languages, software engineering, compilers, and security.

My current focus concerns developing scalable techniques to automatically synthesize programs to make it easier for programmers to construct more efficient and safe software. I am also interested in developing program analysis and repair tools for detecting and fixing software bugs.

Employment

Hanyang University ERICA Sep 2018 – present
Department of Computer Science and Engineering
College of Computing
Assistant Professor

University of Pennsylvania Jan 2017 – Aug 2018
Post-doctoral Researcher
Advisor: Prof. Mayur Naik

Georgia Institute of Technology Mar 2016 – Jan 2017
Post-doctoral Researcher
Advisor: Prof. Mayur Naik

Visiting Positions

University of California, Berkeley Jul 2012 – Nov 2012
Visiting Student

Advisor: Prof. Dawn Song

Publications

Published papers on programming languages, software engineering, and security in top conferences and journals such as **PLDI** (2023, 2020, 2018, 2012), **POPL** (2023, 2021), **FSE** (2021, 2018), **CCS** (2023, 2018), and **TOPLAS** (2017, 2014).

In recent five years (2018 – 2023), I have published **8** top-conference papers (BK Computer Science IF = 4) (CCS'23, PLDI'23, POPL'23, POPL'21, PLDI'20, PLDI'18, FSE'18, CCS'18) as the main author (1st/corresponding authorship).

Note: Author names annotated * and † indicate co-first and corresponding authorship, respectively.

1. *Simplifying Mixed Boolean-Arithmetic Obfuscation by Program Synthesis and Term Rewriting.*
Jaehyung Lee, and Woosuk Lee.
CCS 2023: 2023 ACM SIGSAC Conference on Computer and Communications Security.
(BK Computer Science IF = 4)
2. *Inductive program synthesis via iterative forward-backward abstract interpretation.*
Yongho Yoon, **Woosuk Lee**[†], and Kwangkeun Yi.
PLDI 2023: 44th ACM SIGPLAN Conference on Programming Language Design and Implementation.
(BK Computer Science IF = 4)
3. *Madusa: mobile application demo generation based on usage scenarios*
Jaehyung Lee, Hangeol Cho, and **Woosuk Lee**[†].
Journal of Automated Software Engineering 2023.
4. *Inductive synthesis of structurally recursive functional programs from non-recursive expressions.*
Woosuk Lee[†], and Hangeol Cho.
POPL 2023: 50th ACM SIGPLAN Symposium on Principles of Programming Languages.
(BK Computer Science IF = 4)
5. *Optimizing homomorphic evaluation circuits by program synthesis and time-bounded exhaustive search.*
DongKwon Lee, **Woosuk Lee**[†], Hakjoo Oh, and Kwangkeun Yi.
TOPLAS: ACM Transactions on Programming Languages and Systems, 2023. (to appear)
6. *Datalog static analysis in secrecy*
Mojgan Kouhounestani, and **Woosuk Lee**[†].
IEEE Access, 2022.
7. *Context-aware and data-driven feedback generation for programming assignments.*
Dowon Song, **Woosuk Lee**, and Hakjoo Oh.
ESEC/FSE 2021: ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering.
(BK Computer Science IF = 4)
8. *Combining the top-down propagation and bottom-up enumeration for inductive program synthesis.*
Woosuk Lee[†].
POPL 2021: 48th ACM SIGPLAN Symposium on Principles of Programming Languages.

(First single-authored POPL paper from Korea)
(BK Computer Science IF = 4)

9. *Optimizing homomorphic evaluation circuits by program synthesis and term rewriting.*
DongKwon Lee, **Woosuk Lee**[†], Hakjoo Oh, and Kwangkeun Yi.
PLDI 2020: 41st ACM SIGPLAN Conference on Programming Language Design and Implementation.
(BK Computer Science IF = 4)
10. *Accelerating search-based program synthesis using learned probabilistic models.*
Woosuk Lee, Kihong Heo, Rajeev Alur, and Mayur Naik.
PLDI 2018: 39th ACM SIGPLAN Conference on Programming Language Design and Implementation.
(BK Computer Science IF = 4)
11. *Effective program debloating via reinforcement learning.*
Kihong Heo, **Woosuk Lee**^{*}, Pardis Pashakhanloo, and Mayur Naik.
CCS 2018: 2018 ACM SIGSAC Conference on Computer and Communications Security.
(BK Computer Science IF = 4)
12. *Syntax-guided synthesis of datalog programs.*
Xujie Si, **Woosuk Lee**^{*}, Richard Zhang, Aws Albarghouthi, Paraschos Koutris, and Mayur Naik.
ESEC/FSE 2018: 26th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering.
(BK Computer Science IF = 4)
13. *Beyond deductive methods in program analysis.*
Sulekha Kulkarni, Richard Zhang, Ximing Si, Kihong Heo, **Woosuk Lee**, and Mayur Naik.
ML4P: 1st Workshop on Machine Learning for Programming, 2018.
14. *Sound non-statistical clustering of static analysis alarms.*
Woosuk Lee, Wonchan Lee, Dongok Kang, Kihong Heo, Hakjoo Oh, and Kwangkeun Yi.
TOPLAS: ACM Transactions on Programming Languages and Systems, 39(4):16:1–16:35, August 2017.
15. *Static analysis with set-closure in secrecy.*
Woosuk Lee, Hyunsook Hong, Kwangkeun Yi, and Jung Hee Cheon.
SAS 2015: 22nd International Static Analysis Symposium.
(BK Computer Science IF = 1)
16. *A progress bar for static analyzers.*
Woosuk Lee, Hakjoo Oh, and Kwangkeun Yi.
SAS 2014: 21st International Static Analysis Symposium.
(BK Computer Science IF = 1)
17. *Global sparse analysis framework.*
Hakjoo Oh, Kihong Heo, Wonchan Lee, **Woosuk Lee**, Daejun Park, Jeehoon Kang, and Kwangkeun Yi.
TOPLAS: ACM Transactions on Programming Languages and Systems, 36(3):8:1–8:44, September 2014.
18. *Design and implementation of sparse global analyses for c-like languages.*
Hakjoo Oh, Kihong Heo, Wonchan Lee, **Woosuk Lee**, and Kwangkeun Yi.
PLDI 2012: 33rd ACM SIGPLAN Conference on Programming Language Design and Implementation.
(BK Computer Science IF = 4)

19. *Sound non-statistical clustering of static analysis alarms.*
Woosuk Lee, Wonchan Lee, and Kwangkeun Yi.
 VMCAI 2012: 13th International Conference on Verification, Model Checking, and Abstract Interpretation.

Grants and Contracts

- ▶ (Co-PI) Software Disaster Research Center, National Research Foundation of Korea (NRF) (No. 2021R1A5A1021944), KRW 15,855,000,000, June 2021 (7 years)
- ▶ (Co-PI) Automated Reliable Source Code Generation from Natural Language Descriptions, Institute for Information & communications Technology Promotion (IITP) (No. 2022-0-00995), KRW 14,000,000,000, April 2021 (8 years).
- ▶ (Co-PI) Development of Automated Program Repair Technology by Combining Code Analysis and Mining, Institute for Information & communications Technology Promotion (IITP) (No. 2021-0-00758), KRW 2,100,000,000, April 2021 (2 years).
- ▶ (PI) Self-evolving Compilers for Emerging Programming Languages by Automatically Learning to Optimize Programs, National Research Foundation of Korea (NRF) (No. 2020R1C1C1014518), KRW 360,000,000, March 2020 (3 years).
- ▶ (PI) Automated Generation of Unit Test Cases for Database Applications, Sparrow, Co., Ltd., KRW 50,000,000, July 2020 (1 year).
- ▶ (PI) Effective Program Generation via User Interactions, S-Core, Co., Ltd., KRW 50,000,000, Jan 2019 (1 year).
- ▶ (PI) Effective Program Generation using Learned Probabilistic Models, National Research Foundation of Korea (NRF) (No. 2019R1G1A1100293), KRW 30,000,000, Sep 2019 (1 year).

Teaching

At Hanyang University, I have opened the following 3 courses for undergraduate and 2 courses for graduate students.

CSE2016 Programming Methodology (Korean)	2022, 2021, 2020, 2019, 2018 Fall
CLU1091 Programming Methodology Basics (Korean)	2022, 2021, 2020 Fall, 2020 Spring
ENE4014 Programming Languages (English)	2023, 2021, 2020, 2019 Spring
CSE6049 Program Analysis (English)	2023, 2021, 2019 Spring
CSE9116 Program Synthesis (English)	2022 Spring

At the University of Pennsylvania, I have served as a guest lecturer for the following course.

- ▶ CIS 700: Software Analysis and Testing (University of Pennsylvania), 2017 Fall

Awards

- ▶ Outstanding Lecturer Award (강의 우수 교수), Hanyang University

2019

Patents

- ▶ Apparatus and method for synthesizing programs (Patent No. (date): 10-2483261 (12/27/2022))
- ▶ Techniques for automatically generating recursive call functions from input-output examples (Application No. (date): 10-2022-0174383 (12/14/2022))
- ▶ Datalog static analysis in secrecy (Application No. (date): 10-2022-0066415 (05/31/2022))
- ▶ Apparatus and method of creating program for demonstration (Application No. (date): 10-2021-0177194 (12/13/2021))
- ▶ Electronic apparatus for determining whether program comprises malicious code and method for controlling thereof (Application No. (date): 10-2015-0055481 (04/20/2015))
- ▶ Copyright information inserting system and method (Registration No. (date): 1010971040000 (12/15/2011))

Academic Activities

I have served as a Program Committee (PC) member in top conferences in the fields of programming languages and software engineering.

Conference Program Committee

- ▶ PC, PLDI 2024: 45th ACM SIGPLAN Conference on Programming Language Design and Implementation
- ▶ PC, APLAS 2023: 21st Asian Symposium on Programming Languages and Systems
- ▶ PC and SRC (Student Research Competition Selection Committee) member, POPL 2022: 49th ACM SIGPLAN Symposium on Principles of Programming Languages
- ▶ PC member, PLDI 2021: 42th ACM SIGPLAN Conference on Programming Language Design and Implementation
- ▶ PC member, ICSE 2020 (Software Engineering in Practice track): 42nd International Conference on Software Engineering
- ▶ PC member, ESOP 2020: European Symposium on Programming
- ▶ PC member, TAPAS 2020: 11th Workshop on Tools for Automatic Program Analysis
- ▶ PC member, PLDI 2019: 40th ACM SIGPLAN Conference on Programming Language Design and Implementation

Journal Reviewing

- ▶ IEEE Transactions on Software Engineering
- ▶ ACM Transactions on Programming Languages and Systems

- ▶ Journal of Artificial Intelligence Research

Students

Current

- ▶ Jehyung Lee, 2020 – present (Ph.D candidate)
- ▶ Hangeyol Cho, 2020 – present (Ph.D candidate)
- ▶ Jinsang Kim, 2023 – present (MS candidate)
- ▶ Wang Ao, 2023 – present (MS candidate)

Presentations

Invited Talk

- ▶ Program Synthesis-based Program Deobfuscation
 - March 14 2023 @ National Security Research Institute.
 - March 15 2023 @ Chungnam National University.
- ▶ Combining the Top-Down Propagation and Bottom-Up Enumeration for Inductive Program Synthesis.
 - Oct 1 2021 @ KAIST.
 - Oct 30 2020 @ Seoul National University.
- ▶ Gentle Introduction to Program Synthesis.
 - March 19 2021 @ Chungnam National University.
- ▶ Optimizing homomorphic evaluation circuits by program synthesis and term rewriting.
 - Dec 1 2020 @ Graduate School of Information Security at KAIST.
- ▶ Effective Program Generation using Learned Probabilistic Models.
 - Jun 27 2019 @ Korea Computer Congress 2019.
 - Dec 11 2019 @ UNIST.
 - May 7 2019 @ Korea University.
 - Sep 18 2018 @ Codemind Co., Ltd.

Tutorial

- ▶ Introduction to Program Synthesis.
 - July 13 and 20 2021 @ Korean Software Engineering Society.
 - <http://sigsoft.or.kr/category/소사이어티-행사/단기-전문-강좌/>

References

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