Seonyeong Heo

Curriculum Vitae

Contact Information

Compiler & System Software Laboratory (COS Lab)
School of Computing
Kyung Hee University
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Education

Pohang University of Science and Technology (POSTECH), Pohang, Republic of Korea
Doctor of Philosophy in Computer Science and Engineering, March 2016 to August 2021
Dissertation: Real-time Object Detection with Adaptive Image Scaling and Network Path Scheduling
Advisors: Prof. Hanjun Kim and Prof. Jong Kim

Pohang University of Science and Technology (POSTECH), Pohang, Republic of Korea
Bachelor of Science in Computer Science and Engineering, March 2011 to February 2016

Experience

Assistant Professor, March 2023 to Present
Compiler & System Software Laboratory (COS Lab), *Kyung Hee University*, Republic of Korea

- Developing machine learning frameworks for small embedded systems (LCTES'24)
- Designing model compression techniques for deep neural networks
- Designing a compiler for tiny machine learning

Postdoctoral Researcher, July 2021 to December 2022
D-ITET Center for Project-Based Learning (PBL), *ETH Zürich*, Switzerland

- Designing dynamic neural networks for real-time systems (ECRTS'22)
- Developing and optimizing machine learning algorithms for embedded systems (ICECS'22, I2MTC'23, IEEE SENSORS'23)
- Supervising bachelor and master students for their projects

Research Assistant, March 2016 to June 2021
Compiler Research Laboratory (CoreLab), *POSTECH*, Republic of Korea

- Developing compiler techniques to improve programmability in IoT programming (IEEE MICRO 2016, LCTES'17, CC'19)
- Designing scheduling algorithms for real-time decision making in IoT systems (RTSS'17, RTAS'20)
- Developing deep neural network models for embedded systems (RTAS'20)

Visiting Researcher, July to December 2017
Department of Computer Science, *Virginia Tech*, Blacksburg, Virginia, United States

- Optimizing deep neural networks for mobile devices with heterogeneous computing
- Investigating possible concurrency bugs in OpenCL kernels

Undergraduate Research Assistant, March 2015 to February 2016
Compiler Research Laboratory (CoreLab), *POSTECH*, Pohang, Republic of Korea

- Developing a compiler framework that automatically partitions native applications for seamless mobile-cloud computing (MICRO'15)

Undergraduate Student Intern, July to August 2015
School of Computing, *National University of Singapore (NUS)*, Singapore

- Developing a program for collecting public opinions on the Internet
- Analyzing the collected data through topic modeling

Exchange Student, July to December 2014
School of Computing, *National University of Singapore (NUS)*, Singapore

- Participating in various activities in NUS such as local community service as a scholar of the TF LEaRN programme

Recognition

- Best Paper Award at the 25th ACM SIGPLAN/SIGBAD Conference on Languages, Compilers, Tools, and Theory for Embedded Systems (LCTES), June 2024
- Best Poster Award at KIISE Computer System Society Winter Workshop, February 2020
- Best Poster Award at KIISE Computer System Society Winter Workshop, January 2018
- Magna Cum Laude from POSTECH, February 2016
- Temasek Foundation Leadership Enrichment and Regional Networking (TF LEaRN) Scholarship, 2014
- The National Scholarship for Science and Engineering, Korean Student Aid Foundation, 2011 to 2015
- Honor Student Awards, Department of Computer Science and Engineering, POSTECH, 2011 to 2013

Activities

✶ **International Conference Committee**

- Organizing & Program Committee, the 26th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, Tools and Theory of Embedded Systems (LCTES), June 2025
- Organizing & Program Committee, the 30th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), August 2024
- Program Committee, the 25th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, Tools and Theory of Embedded Systems (LCTES), June 2024
- Program Committee, FHE.org Conference 2024, March 2024
- Program Committee, 2024 Design, Automation and Test in Europe Conference (DATE), March 2024
- Program Committee, the 24th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, Tools and Theory of Embedded Systems (LCTES), June 2023
- Program Committee, the 23rd ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, Tools and Theory of Embedded Systems (LCTES), June 2022
- Artifact Evaluation Committee, International Symposium on Code Generation and Optimization (CGO) 2022, April 2022

✶ **Domestic Conference Session Chair**

- Session Co-Chair, 2024 Design, Automation and Test in Europe Conference (DATE), March 2024
- Session Chair, Korea Software Congress (KSC), December 2020

✶ **Domestic Conference Organizing Assistant**

- Local Arrangements Assistant, KIISE Computer System Society Winter Workshop, January 2019
- Local Arrangements Assistant, KIISE Computer System Society Winter Workshop, January 2018
- Local Arrangements Assistant, KIISE Computer System Society Winter Workshop, January 2017

✶ **International Conference Reviewer**

– External Reviewer, The 46th International Symposium on Compiler Architecture (ISCA), 2019

Teaching

✶ **Lecturer**

– CSE301: Operating Systems, Kyung Hee University, Spring & Autumn 2023 - 2024
– CSE322: Compiler, Kyung Hee University, Spring 2023 - 2024
– 227-0085-48L: (Projects & Seminars) Introduction to Program Nao Robots for RoboCup Competition, ETH Zürich, Spring & Autumn 2022
– 173-0002-00L: Embedded Systems and Computer Programming, Ashesi University (via Ashesi-ETH Master's Programme), February 23 - March 11, 2022
– IR Optimization with LLVM, Electronics and Telecommunications Research Institute (ETRI), April 10-11, 2019

✶ **Teaching Assistant**

– 227-0124-00L: Embedded Systems, ETH Zürich, Autumn 2022 & Autumn 2021
– IR Optimization with LLVM, Samsung Electronics, November 26 and December 3, 2020
– IR Optimization with LLVM, SNU Samsung Research Center, August 21, 2020
– IR Optimization with LLVM, SNU Samsung Research Center, June 28, 2019
– CSED 423: Compiler Design, POSTECH, Spring 2017
– CSED 321: Programming Languages, POSTECH, Spring 2016

Publications

International Conference Publications

[1] Shinnung Jeong, Sungjun Cho, Yongwoo Lee, Hyunjun Park, Seonyeong Heo, Gwangsun Kim, Yongsok Kim, Hanjun Kim, "CR2: Community-aware Compressed Regular Representation for Graph Processing on a GPU," *Proceedings of the 53rd International Conference on Parallel Processing (ICPP 2024)*, August 2024.

[2] Byungchul Chae, Jiae Kim, Seonyeong Heo, "TinySeg: Model Optimizing Framework for Image Segmentation on Tiny Embedded Systems," *Proceedings of the 25th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES 2024)*, June 2024. (Received **Best Paper Award**)

[3] Liam Boyle, Nicolas Baumann,Seonyeong Heo, Michele Magno, "Enhancing Lightweight Neural Networks for Small Object Detection in IoT Applications," in *Proceedings of IEEE Sensors 2023*, October 2023.

[4] Seonyeong Heo, Nicolas Baumann, Carla Margelisch, Marco Giordano, Michele Magno, "Low-cost Smart Raven Deterrent System with Tiny Machine Learning for Smart Agriculture," in *Proceedings of 2023 IEEE International Instrumentation and Measurement Technology Conference (I2MTC)*, May 2023.

[5] Seonyeong Heo, Philipp Mayer, and Michele Magno, "Predictive Energy-Aware Adaptive Sampling with Deep Reinforcement Learning," in *Proceedings of the 29th IEEE International Conference on Electronics Circuits and Systems (ICECS)*, October 2022.

[6] Seonyeong Heo, Shinnung Jeong, and Hanjun Kim, "RTScale: Sensitivity-aware Adaptive Image Scaling for Real-time Object Detection," in *Proceedings of the 34rd Euromicro Conference on Real-Time Systems (ECRTS)*, July 2022.

[7] Yongwoo Lee, Seonyeong Heo, Seonyoung Cheon, Shinnung Jeong, Changsu Kim, Eunkyung Kim, Dongyun Lee and Hanjun Kim, "HECATE: Performance-aware Scale Optimization for Homomorphic Encryption Compiler," in *Proceedings of the 2022 International Symposium on Code Generation and Optimization (CGO)*, April 2022.

[8] Seonyeong Heo, Sungjun Cho, Youngsok Kim, and Hanjun Kim, "Real-Time Object Detection System with Multi-Path Neural Networks," in *Proceedings of the IEEE Real-Time And Embedded Technology And Applications Symposium (RTAS)*, April 2020.

[9] Seonyeong Heo, Seungbin Song, Bongjun Kim, and Hanjun Kim, "Sharing-aware Data Acquisition Scheduling for Multiple Rules in the IoT," in *Proceedings of the IEEE Real-Time And Embedded Technology And Applications Symposium (RTAS)*, April 2020.

[10] Bongjun Kim, Seonyeong Heo, Gyeongmin Lee, Seungbin Song, Jong Kim, and Hanjun Kim, "Spinal Code: Automatic Code Extraction for Near-User Computation in Fogs," in *Proceedings of the 28th International Conference on Compiler Construction (CC)*, February 2019.

[11] Seonyeong Heo, Seungbin Song, Jong Kim, and Hanjun Kim, "RT-IFTTT: Real-Time IoT Framework with Trigger Condition-aware Flexible Polling Intervals," in *Proceedings of the IEEE Real-time Systems Symposium (RTSS)*, December 2017.

[12] Gyeongmin Lee, Seonyeong Heo, Bongjun Kim, Jong Kim, and Hanjun Kim, "Rapid prototyping of IoT applications with Esperanto compiler," in *Proceedings of the 28th International Symposium on Rapid System Prototyping (RSP)*, October 2017. Invited.

[13] Gyeongmin Lee, Seonyeong Heo, Bongjun Kim, Jong Kim, and Hanjun Kim, "Integrated IoT Programming with Selective Abstraction," in *Proceedings of the 18th ACM SIGPLAN/SIGBAD Conference on Languages, Compilers, Tools, and Theory for Embedded Systems (LCTES)*, June 2017.

[14] Gwangmu Lee, Hyunjoon Park, Seonyeong Heo, Kyung-Ah Chang, Hyogun Lee, and Hanjun Kim, "Architecture-aware Automatic Computation Offload for Native Applications," in *Proceedings of the 48th IEEE/ACM International Symposium on Microarchitecture (MICRO)*, December 2015.

International Journal Publications

[15] Liam Boyle, Julian Moosmann, Nicolas Baumann,Seonyeong Heo, Michele Magno, "DSORT-MCU: Detecting Small Objects in Real-Time on Microcontroller Units," in *IEEE Sensors Journal*, December 2024.
IF=4.3, Q1 (JCR 2023)

[16] Byungchul Chae and Seonyeong Heo, "TinyMo: Graph-level Memory Optimizer for Tiny Machine Learning," *IEEE Embedded Systems Letters (Early Access)*, October 2024.
IF=1.7, Q3 (JCR 2023)

[17] Gyeongmin Lee, Bongjun Kim, Seungbin Song, Seonyeong Heo, and Hanjun Kim, "ComFlex: Composable and Flexible Resource Management for the IoT," in *IEEE Internet of Things Journal*, November 2021.
IF=9.936, Q1 (JCR 2019)

[18] Bongjun Kim, Seonyeong Heo, Jaeho Lee, Shinnung Jeong, Yongwoo Lee, and Hanjun Kim, "Compiler-assisted Semantic-aware Encryption for Efficient and Secure Serverless Computing," in *IEEE Internet of Things Journal*, April 2021.
IF=9.936, Q1 (JCR 2019)

[19] Bongjun Kim, Seonyeong Heo, Gyeongmin Lee, Soyeon Park, Hanjun Kim, and Jong Kim, "Heterogeneous Distributed Shared Memory for Lightweight Internet-of-Things Devices," in *IEEE Micro*, November 2016.
IF=1.933, Q2 (JCR 2016)

International Conference Posters

[20] Shenghui Song, Jan-Nico Jaech, and Seonyeong Heo, "One-Shot Sparse Neural Architecture Search for Resource-Constrained Devices," in *The 30th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2024)*, August 2024.

[21] Byungchul Chae, Jiae Kim, Seonyeong Heo, "TinySeg: Memory-Efficient Image Segmentation for Small Embedded Systems," in *2024 Design Automation Conference (DAC)*, June 2024.

Patents

[22] Hanjun Kim, Seonyeong Heo, Jong Kim, and Bongjun Kim, "Write Control Method and Disk Controller for Automated Backup and Recovery," KR Patent Number 10-21896070000, December 2019.

[23] Hye-Yeon Chung, Hanjun Kim, Jong-Won Lee, Changsu Kim, Seonyeong Heo, Jun-Mo Park, and Jong-Hee Yoon, “A Method of Compiling a Program,” US Patent Number 10,372,430, August 2019.

[24] Bongjun Kim, Jong Kim, Soyeon Park, Hanjun Kim, Seonyeong Heo, and Gyeongmin Lee, “Heterogeneous Distributed Shared Memory For IoT Devices,” KR Patent Number 10-18579070000, February 2017.