

# Yousun Ko

## Curriculum Vitae

December 25, 2020

COMPUTER LABORATORY  
UNIVERSITY OF CAMBRIDGE  
CAMBRIDGE, UNITED KINGDOM

EMAIL: Yousun.Ko@cl.cam.ac.uk  
PHONE: +44 0 1223 7 63535

---

## Research Interests

**Compilers:** code optimization techniques for embedded systems. **Security:** secure and performant compiler support for novel computer architectures. **Machine learning:** software support for energy efficient machine learning. **Concurrency:** stream-program orchestration on multicore architectures, concurrency models, speculative parallelization.

## Experience

10/2016–present    Research Associate, The Computer Laboratory, University of Cambridge.

## Education

03/2011–08/2016    PhD in Computer Science, PhD degree program jointly offered by Yonsei University & the University of Sydney (Cotutelle),  
“Semantic-Preserving Transformations for Stream Program Orchestration on Multicore Architectures”.

03/2009–02/2011    MS in Computer Science, Yonsei University,  
“A Generic Framework for Profiling and Code-Generation of Stream Programs on Multicore Architectures”.

03/2005–02/2009    BS in Computer Science, Yonsei University.

## Scholarship

03/2011–02/2013    Global PhD Fellowship from the National Research Foundation of Korea (NRF).

## Publications

### Journals

- [1] **Yousun Ko**, Alex Chadwick, Daniel Bates and Robert Mullins. Lane Compression: A Lightweight Lossless Compression Method for Machine Learning on Embedded Systems. To appear in *ACM Transactions on Embedded Computing Systems*, 2021.
- [2] **Yousun Ko**, Minyoung Jung, Yo-Sub Han and Bernd Burgstaller. A Speculative Parallel DFA Membership Test for Multicore, SIMD and Cloud Computing Environments. In *International Journal of Parallel Programming*, Vol. 42 (3), 456–489, Springer, June 2014.

### Refereed International Conference Publications

- [3] **Yousun Ko**, Bernd Burgstaller and Bernhard Scholz. LaminarIR: Compile-time Queues for Structured Streams. In *Proceedings of the 36th annual ACM SIGPLAN conference on Programming Language Design and Implementation (PLDI)*, 2015.
- [4] **Yousun Ko**, Bernd Burgstaller and Bernhard Scholz. Parallel from the Beginning: The Case for Multicore Programming in the Computer Science Undergraduate Curriculum. In *Proceedings of the ACM Special Interest Group on Computer Science Education (SIGCSE)*, 2013.
- [5] S. M. Farhad, **Yousun Ko**, Bernd Burgstaller and Bernhard Scholz. Profile-Guided Deployment of Stream Programs on Multicores. In *Proceedings of the ACM SIGPLAN/SIGBED 2012 Conference on Languages, Compilers, Tools and Theory for Embedded Systems (LCTES)*, 2012.
- [6] Beorn Faccini, **Yousun Ko**, Min-Young Jung and Bernd Burgstaller. GPGPU DFA Membership Tests. In *Proceedings of the 23rd IASTED International Conference on Parallel and Distributed Computing Systems (PDCS)*, 2011.
- [7] S. M. Farhad, **Yousun Ko**, Bernd Burgstaller and Bernhard Scholz. Orchestration by Approximation: Mapping Stream Programs onto Multicore Architectures. In *Proceedings of the 16th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 2011.
- [8] Kirak Hong, Jiin Park, Taekhoon Kim, Sungho Kim, Hwangho Kim, **Yousun Ko**, Jongtae Park, Bernd Burgstaller and Bernhard Scholz. Poster Abstract: TinyVM, an Efficient Virtual Machine Infrastructure for Sensor Networks. In *Proceedings of the 7th ACM Conference on Embedded Networked Sensor Systems (SenSys)*, 2009.
- [9] Taek-hoon Kim, Sungho Kim, Kirak Hong, Hwangho Kim, Jiin Park, **Yousun Ko**, Bernd Burgstaller and Bernhard Scholz. An Efficient Mixed-mode Execution Environment for C on Mobile Phone Platforms. In *Proceedings of the Communications & Mobile Computing Symposium of the 2009 World Congress on Computer Science and Information Engineering*, 2009.
- [10] Hwangho Kim, Kirak Hong, Sungho Kim, Taekhoon Kim, Jiin Park, **Yousun Ko**, Bernd Burgstaller and Bernhard Scholz. Billy get your guns: fast barrel-shift decoding for in-place execution of Huffman-encoded bytecode streams. In *Proceedings of the 3rd International Conference on Ubiquitous Information Technologies and Applications*, 2008.  
**Best presentation award**, out of 150 presentations.

## Refereed Domestic Conference Publications

- [11] **Yousun Ko** and Bernd Burgstaller. Profiling and Data-Communication Support for Multimedia Stream Programs on Multicore Architectures In *Proceedings of the Korea Multimedia Society Conference*, Seoul, Korea, November 2010.  
**Best paper award**, among top 12 out of 89 papers.
- [12] Taekhoon Kim, Jiin Park, Hwangho Kim, Jongtae Park, **Yousun Ko**, Kirak Hong and Bernd Burgstaller. Enhancing WIPI-C with a fast scripting engine for mobile game development. In *Proceedings of the Institute of Embedded Engineering of Korea*, Jeju Island, Korea, November 2009.  
**Best presentation award**, among top 17 out of 122 presentations.

## Patent Applications

- [1] U. S. Patent Application No. 17/088,771: “Neural Network Method and Apparatus,” filed on November 4, 2020.  
Inventors: **Yousun Ko**, Alex Chadwick, Daniel Bates, Robert Mullins (University of Cambridge)
- [2] Chinese Patent Application No. 202011214414.6: “Method and Apparatus for Processing Data of Neural Network,” filed on November 4, 2020.  
Inventors: **Yousun Ko**, Alex Chadwick, Daniel Bates, Robert Mullins (University of Cambridge)
- [3] European Patent Application No. 20205334.4: “Neural Network Method and Apparatus,” filed on November 3, 2020.  
Inventors: **Yousun Ko**, Alex Chadwick, Daniel Bates, Robert Mullins (University of Cambridge)
- [4] Korean Patent Application No. 10-2020-0136124: “Lane Compression,” filed on October 20, 2020.  
Inventors: **Yousun Ko**, Alex Chadwick, Daniel Bates, Robert Mullins (University of Cambridge)
- [5] U. S. Provisional Patent Application No. 62/930,029: “Lane Compression,” Provisional filed on November 4, 2019.  
Inventors: **Yousun Ko**, Alex Chadwick, Daniel Bates, Robert Mullins (University of Cambridge)

## Talks and Presentations

- 2019 **Yousun Ko**, “Introduction to Machine Learning for Research Application.” In SIG-IT tutorial, The Korean Scientists and Engineers Association in the UK (KSEAUK), University of Southampton, UK, December 07, 2019.
- 2017 **Yousun Ko**, “Hardware/Software Co-refinement for Next-Generation Computer Accelerators.” In Women@CL Talklet, Computer Lab., University of Cambridge, UK, November 24, 2017.
- 2016 **Yousun Ko**, “Compilers and the Multicore Era.” In *Special Session for Women’s Committee in Korea Computer Congress (KCC) 2016*, Jeju Island, Korea, June 30, 2016.
- Yousun Ko**, “Program Transformation of the Synchronous Data Flow Programming Model.” In *Special Interest Group for Programming Languages (SIGPL) Winter Workshop 2016*, Chonbuk National University, Korea, February 19, 2016.
- 2015 **Yousun Ko**, “Performance Analysis on the Intel Xeon Phi.” In *Intel Xeon Phi Boot Camp*, Intel Korea, Korea, July 17, 2015.
- 2014 **Yousun Ko**, “Performance Analysis on the Intel Xeon Phi.” In *Intel Software Optimisation Seminar*, Intel Korea, Korea, September 26, 2014.
- 2013 **Yousun Ko**, “A Speculative Parallel DFA Membership Test For Multicore, SIMD and Cloud Computing Environments.” In *HKUST and Yonsei University Joint Workshop*, Hong Kong University of Science and Technology (HKUST), China, February 28, 2013.
- 2012 **Yousun Ko**, “A Speculative Parallel DFA Membership Test For Multicore, SIMD and Cloud Computing Environments.” In *Sydney Area Programming Language Interest Group (SAPLING)*, Australia National University (ANU), Australia, November 23, 2012.
- Yousun Ko**, “Orchestration by Approximation: Stream Program Orchestration on Multicore Architectures.” In *Workshop on Program Analysis, Languages, and Compilation Techniques for Heterogeneous Multicore Architectures*, Vienna University of Technology (TU Wien), Austria, February 15, 2012.

## **Research Project Participation**

- 05/2020–present “RISC-V Compiler Techniques for Security,” supported by lowRISC C. I. C.
- 05/2018–04/2020 “Neuromorphic Processor Capable of On-device Learning,” supported by Samsung Advanced Institute of Technology.
- 10/2016–05/2018 “Specialisable, Programmable, Efficient and Robust Microprocessors,” supported by the European Research Council (ERC) under project reference ID 306386.
- 11/2012–10/2015 “Static Analysis and Just-in-Time Compilation Support for Heterogeneous Multicore Architectures,” jointly supported by the NRF and the Austrian Science Foundation (FWF) under contract No. 2012K2A1A9054713.
- 05/2010–04/2013 “Just-in-Time Compilation and Intelligent Run-time Support for Heterogeneous Multicore Architectures,” supported by the NRF under contract No. 2010-0005234.

## **Experience as Supervisor (University of Cambridge)**

- 2016–17, 2019–20 Computer Design (Part IB)
- 2018 Concepts in Programming Languages (Part IB)
- 2018, 2019 Comparative Architectures (Part II)
- 2019, 2020 Optimising Compilers (Part II)

## **Experience as Teaching Assistant (Yonsei University)**

- 2013–2015 CSI2100 Computer Programming (undergraduate)
- 2008–2011 CSI2110 Multicore Programming Practice (undergraduate)
- 2010–2015 CSI4104 Compiler Design (undergraduate)
- 2010 CSI3109 Automata and Formal Languages (undergraduate)
- 2009–2010 CSI6521 Programming Languages (graduate)
- 2010–2011 CSI6522 Advanced Compiler Design (graduate)