Jieung Kim

Assistant Professor, Inha University

Address: Hi Tech Center No. 1410, 100 Inha-ro, Michuhol-gu, Incheon, Korea (Postal Code : 22212)
Email: jieungkim@inha.ac.kr

Research Interest

- System software (distributed system, operating system, and hypervisor)
- Formal verification
- Concurrency and linearizability
- HW/SW abstraction and program logic
- Theorem provers, proof assistants, and automated proof
- Programming language design

Current Projects

pKVM Formal Verification (From Google with multiple academic collaborators)

· Verify pKVM, a hypervisor that will become the foundation of the future Android security.
  · Define an abstract mathematical specification and verify that the implementation is consistent with the specification within reasonable engineering cost.
  · Apply several verification theories and approaches to the real source code with academic groups and improve them.
· Participate in the project as the following roles.
  · Apply the SNU's verification framework into pKVM with SNU Ph.D students.
  · Build formal, testable, extensible, and readable specifications for pKVM.
  · Test approaches from Cambridge and MPI-SWS and discuss results with them.

ML Model Optimization (From Google)

· Build optimization on ML models with various techniques.
· Build ML framework that provides multiple methods for the optimization.

HW/SW Co-design (From Google)

· Build trustworthy and efficient ambient sensing system to the broader ecosystem.
· Work for building benchmarks and simulators for the ML workload core in the system.

ADO: Atomic Distributed Object (With Yale and Northeastern)

· Build verified and high performance distributed systems with a simple but fault-aware atomic model that covers most strongly consistent distributed protocols (e.g., Paxos, Raft, etc).
· Connect the model with the real C implementation by using multiple verification frameworks.
· Extend the basic model to cover advanced features (e.g., reconfiguration, liveness, etc) and build practical systems.

CertiKOS (With Yale)

· Present a compositional approach for building certified concurrent OS kernels, develop a practical concurrent OS kernel, and verify its (contextual) functional correctness.
· Extending and improving the software, proof framework, and proofs are in discussion.
· Writing manuscripts for multicore and multithreaded linking are in discussion.

Work Experience

Assistant Professor **09/2022 ∼**

Department of Computer Engineering
Inha University

Software Engineer **02/2022 ∼ 08/2022**

Core ML, Google

Research Engineer (Privacy & and Security) **05/2020 ∼ 01/2022**

Cerebra (Personal AI), Google Research

Postdoctoral Associate **06/2019 ∼ 04/2020**

FLINT, Department of Computer Science, Yale University

Research Assistant **07/2013 ∼ 05/2019**

FLINT, Department of Computer Science, Yale University

Research Assistant **12/2009 ∼ 06/2012**

PLRG, Department of Computer Science, Korea Advanced Institute of Science and Technology

Education

Ph.D in Computer Science **09/2012 ∼ 05/2019**

Department of Computer Science
Yale University

Thesis: *Modular and Compositional Development of Certified Concurrent Software Systems*
Advisor: *Zhong Shao*

M.S. in Computer Science **09/2009 ∼ 08/2011**

Department of Computer Science
Korea Advanced Institute of Science and Technology

Thesis: *Proving FFMM Type Safety Using Coq*
Advisor: *Sukyoung Ryu*

B.S. in Engineering **03/2002 ∼ 08/2009**

Department of Computer Engineering
School of Information and Communication Engineering
Sungkyunkwan University

Scholarships: *Full scholarships for 3 semesters and 1 half scholarship*

Publications

Journal

Ronghui Gu, Zhong Shao, Hao Chen, **Jieung Kim**, Jérémie Koenig, Xiongnan (Newman) Wu, Vilhelm Sjöberg, and David Costanzo, Building Certified Concurrent OS Kernels, *Communications of the ACM*, 62(10), pages 89-99, October 2019.

Conference

Wolf Honore, Ji-Yong Shin, **Jieung Kim**, and Zhong Shao, Adore: Atomic Distributed Objects with Certified Reconfiguration, *Proceedings of 2022 ACM SIGPLAN Conference on Programming Language Design and Implementation*, June 2022

Wolf Honore*, **Jieung Kim***, Ji-Yong Shin, and Zhong Shao, Much ADO about Failures: A Fault-Aware Model for Compositional Verification of Strongly Consistent Distributed Systems, *roceedings of the ACM on Programming Languages (PACMPL), Volume 5, Number OOPSLA, Article 97*, October 2021. (*: equally contributed)

Ji-Yong Shin, **Jieung Kim**, Wolf Honore, Hernan Vanzetto, Srihari Radhakrishnan, Mahesh Balakrishnan, and Zhong Shao, WormSpace: A Modular Foundation for Simple, Verifiable Distributed Systems, *ACM Symposium on Cloud Computing 2019 (SoCC '19)*, November 2019.

Ronghui Gu, Zhong Shao, **Jieung Kim**, Xiongnan (Newman) Wu, Jérémie Koenig, Vilhelm Sjöberg, Hao Chen, David Costanzo, and Tahina Ramananandro, Certified Concurrent Abstraction Layers, *Proceedings of 2018 ACM SIGPLAN Conference on Programming Language Design and Implementation*, June 2018.

Jieung Kim, Vilhelm Sjöberg, Ronghui Gu, and Zhong Shao, Safety and Liveness of MCS Lock—Layer by Layer, *Proceedings of the 15th Asian Symposium on Programming Languages and Systems*, November 2017.

Ronghui Gu, Zhong Shao, Hao Chen, Xiongnan (Newman) Wu, **Jieung Kim**, Vilhelm Sjöberg, and David Costanzo, CertiKOS: An Extensible Architecture for Building Certified Concurrent OS Kernels, *12th USENIX Symposium on Operating Systems Design and Implementation (OSDI 16)*, November 2016.

Jieung Kim, Sukyoung Ryu, Victor Luchangco, and Guy L. Steele Jr., Fine-Grained Function Visibility for Multiple Dispatch with Multiple Inheritance, *Proceedings of the 11th Asian Symposium on Programming Languages and Systems*, December 2013.

Jieung Kim and Sukyoung Ryu, Coq Mechanization of Featherweight Fortress with Multiple Dispatch and Multiple Inheritance, *The First International Conference on Certified Programs and Proofs*, December 2011.

Technical Report

Ji-Yong Shin, **Jieung Kim**, Wolf Honore, Hernan Vanzetto, Srihari Radhakrishnan, Mahesh Balakrishnan, and Zhong Shao, Write-Once-Registers: A Modular Foundation for Simple, Verifiable Distributed Systems, *Technical report - YALEU/DCS/TR1544*, December 2018

Jieung Kim and Sukyoung Ryu, Coq Mechanization of Featherweight Basic Core Fortress for Type Soundness, *Technical Report (ROSAEC-2011-011)*, May 2011.

Poster

Ronghui Gu, Zhong Shao, Hao Chen, Xiongnan (Newman) Wu, **Jieung Kim**, Vilhelm Sjöberg, and David Costanzo, CertiKOS: An Extensible Architecture for Building Certified Concurrent OS Kernels, *12th USENIX Symposium on Operating Systems Design and Implementation (OSDI 16)*, November 2016.

Talks

End-to-end Formal Verification on pKVM, *SigPL Winter Workshop 2022, South Korea*, February 2022.

End-to-end Formal Verification on pKVM, *Seminar @ Inha University, South Korea*, November 2021.

Verification of Security-focused Hypervisor Using RUSC Framework, *Computer System Society Winter Conference, South Korea*, February 2021.

Modular and Compositional Development of Certified Concurrent Software Systems, *Seoul National University, South Korea*, July 2019.

Concurrent CertiKOS, *2018 New England Systems Verification Day*, October 2018.

Multicore and Multithreaded Linking for Concurrent CertiKOS, *DeepSpec Workshop @ Conference on Programming Language Design and Implementation*, June 2018.

Safety and Liveness of MCS Lock—Layer by Layer, *Proceedings of the 15th Asian Symposium on Programming Languages and Systems*, November 2017.

CertiKOS: An Extensible Architecture for Building Certified Concurrent OS Kernels, *Sungkyunkwan University, South Korea*, November 2017.

CertiKOS: An Extensible Architecture for Building Certified Concurrent OS Kernels, *Electronics and Telecommunications Research Institute, South Korea*, August 2017.

(**Poster Talk**) CertiKOS: An Extensible Architecture for Building Certified Concurrent OS Kernels, *12th USENIX Symposium on Operating Systems Design and Implementation (OSDI 16)*, November 2016.

Fine-Grained Function Visibility for Multiple Dispatch with Multiple Inheritance, *Proceedings of the 11th Asian Symposium on Programming Languages and Systems*, December 2013.

Coq Mechanization of Featherweight Fortress with Multiple Dispatch and Multiple Inheritance, *The First International Conference on Certified Programs and Proofs*, December 2011.

Coq Mechanization of Featherweight Fortress with Multiple Dispatch and Multiple Inheritance, *SIGPL Korea 2011 Conference*, September 2011.

Teaching Experience

Organizer and Lecturer **08/2021**

Summer school @ CNU
Teaching for undergraduate students

Teaching Assistant (Department of Computer Science, Yale University)

[CS 458/558] Automatic Decision Systems (Lecturer: Stephen Slade)	**Fall 2016**
[CS 424/524] Parallel Programming Techniques (Lecturer: Andrew Sherman)	**Spring 2016**
[CS 201] Introduction to Computer Science (Lecturer: Stephen Slade)	**Fall 2015**
[CS 201] Introduction to Computer Science (Professor: Dana Angluin)	**Spring 2015**
[CS 201] Introduction to Computer Science (Professor: Holly Rushmeier)	**Fall 2014**
[CS 112] Introduction to Programming (Professor: Yang Yang)	**Spring 2014**
[CS 112] Introduction to Programming (Professor: Drew McDermott)	**Fall 2013**

Organizer and Lecturer **06/2011**

Coq Summer Workshop @ KAIST
Programming Language Research Group
Department of Computer Science
Korea Advanced Institute of Science and Technology

Teaching Assistant **12/2010 ∼ 05/2011**

T.A for Undergraduate Research Project (URP) Program
Department of Computer Science

Korea Advanced Institute of Science and Technology

Topic: *Bigraph Library in Coq*
(Grand Prix at 2011 Winter / Spring Semester URP Competition)

Awards & Certificate

Robert Willets Carle Scholarship Fund #2 **01/2015**

Department of Computer Science, Yale University

Doctoral Fellowship **Fall 2012 - Spring 2013**

Department of Computer Science, Yale University

An Outstanding MS Thesis **02/2012**

Department of Computer Science,
Korea Advanced Institute of Science and Technology

Machine Learning **06/2019**

Coursera
Credential ID: PBYMZG62TC97

Activities

Summer School Participant **07/2017**

1st DeepSpec Summer School, University of Pennsylvania

Korean Translation Team Member **09/2010**

Racket IDE

with Jae sung Chung, Yujeong Cho, and Sung-Gyeong Bae

Summer School Participant **06/2010**

10th Annual Oregon Programming Languages Summer School, University of Oregon

Mobile Text Viewer Development Team Member **01/2009 ~ 03/2009**

Project name: [LG Electronics] Mobile Text Viewer
Winter of Code 2008, Openmaru

Other Activities

Director **09/2014 ~ 08/2015**

Korean Graduate Student Association at Yale
Yale University

President **09/2013 ~ 08/2014**

Korean Graduate Student Association at Yale
Yale University

Representative Member (President) of Graduate Students **01/2010 ~ 12/2010**

Department of Computer Science
Korea Advanced Institute of Science and Technology

Lifeguard **06/2005 ~ 08/2005**

Pool lifeguard at Camp Long and Eagle of U.S. Army in Republic of Korea

Military Service **06/2004 ~ 06/2006**

Sergeant in AREA Platoon, Bravo Company, 304th Signal Battalion
1st Signal Brigade, 8th U.S. Army, KATUSA

Advanced Open Water Diver **02/2004**

Diver number: 0403U16850, Issued by PADI

References

Zhong Shao
Thomas L. Kempner Professor
Department of Computer Science
Yale University
Email: zhong.shao@yale.edu

Ji-Yong Shin
Assistant Professor
Khoury College of Computer Sciences
Northeastern University
Email: j.shin@northeastern.edu

Hong-Seok Kim
Engineering Director (Site Lead in Seoul Office)
Google
Email: hongseok@google.com

Sukyoung Ryu
Professor
School of Computing
Korea Advanced Institute of Science and Technology
Email: sryu.cs@kaist.ac.kr