

# Jieung Kim

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## Software engineer, Google (Seoul)

**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 & 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: *Sukyong 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, Wilhelm 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, *proceedings 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**, Sukeyoung 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 Sukeyoung 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 Sukeyoung 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: *Biograph Library in Coq*  
(Grand Prix at 2011 Winter / Spring Semester URP Competition)

AWARDS & CERTIFICATE	<b>Robert Willets Carle Scholarship Fund #2</b>	<b>01/2015</b>
	Department of Computer Science, Yale University	
	<b>Doctoral Fellowship</b>	<b>Fall 2012 - Spring 2013</b>
	Department of Computer Science, Yale University	
	<b>An Outstanding MS Thesis</b>	<b>02/2012</b>
	Department of Computer Science, Korea Advanced Institute of Science and Technology	
	<b>Machine Learning</b>	<b>06/2019</b>
	Coursera Credential ID: PBYMZG62TC97	
ACTIVITIES	<b>Summer School Participant</b>	<b>07/2017</b>
	1st DeepSpec Summer School, University of Pennsylvania	
	<b>Korean Translation Team Member</b>	<b>09/2010</b>
	Racket IDE with Jae sung Chung, Yujeong Cho, and Sung-Gyeong Bae	
	<b>Summer School Participant</b>	<b>06/2010</b>
	10th Annual Oregon Programming Languages Summer School, University of Oregon	
	<b>Mobile Text Viewer Development Team Member</b>	<b>01/2009 ~ 03/2009</b>
	Project name: [LG Electronics] Mobile Text Viewer Winter of Code 2008, Openmaru	
OTHER ACTIVITIES	<b>Director</b>	<b>09/2014 ~ 08/2015</b>
	Korean Graduate Student Association at Yale Yale University	
	<b>President</b>	<b>09/2013 ~ 08/2014</b>
	Korean Graduate Student Association at Yale Yale University	
	<b>Representative Member (President) of Graduate Students</b>	<b>01/2010 ~ 12/2010</b>
	Department of Computer Science Korea Advanced Institute of Science and Technology	
	<b>Lifeguard</b>	<b>06/2005 ~ 08/2005</b>
	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

**Sukyong Ryu**

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