Jieung Kim

Postdoctoral Associate
FLINT Group
Department of Computer Science
Yale University

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RESEARCH
INTEREST

- Program Verification
- Verified Operating Systems, Distributed Systems, and Compilers
- Concurrency Verification
- Programming Language Design
- Proof Assistants and Automated Proof

CURRENT
PROJECTS

ADVERT: Atomic Distributed System Verification Toolkit
· Build a verification template for quorum-based distributed systems
· Provide compositions of multiple distributed systems to form a bigger system
· Provide template-driven protocol safety proof (linearizability) for developers to enable them not to consider distributed features while writing specifications and programs in their development

CertiKOS
· Present a novel compositional approach for building certified concurrent OS kernels and develop a practical concurrent OS kernel and verify its (contextual) functional correctness in Coq.
   · It is written in 6500 lines of C and x86 assembly
   · It runs on stock x86 multicore machines
   · It is the first proof of functional correctness of a complete, general-purpose concurrent OS kernel with fine-grained locking.
· Work on extending CertiKOS in many ways:
   · CertiKOS ARM Hypervisor: verifying functional correctness d security property (integrity and confidentiality of CertiKOS hypervisor on ARM platform.
   · Concurrent Linking Framework: providing a user-friendly framework to link multiple separate instances in concurrent program verification and link CeriKOS proofs using this framework as an example.
   · User Program Linking: providing a framework to link separately developed and verified user programs with CertiKOS.

WORK
EXPERIENCE

Postdoctoral Associate	**06/2019 ∼ Current**

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**

Programming Language Research Group
Department of Computer Science
Korea Advanced Institute of Science and Technology

Education	**Ph.D Student 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
Sung Kyun Kwan 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

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	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, *Sung Kyun kwan 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	**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

Representative of Graduate Students   01/2010 ∼ 12/2010

    Department of Computer Science
    Korea Advanced Institute of Science and Technology

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

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

Sukyoung Ryu

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