
Jieung Kim

Assistant professor
Yonsei University

Address: Engineering Hall #4 - D724, 50 Yonsei-ro, Seodaemun-gu, Seoul, South Korea
(Postal Code: 03722)
Phone: +82 (2) 2123-2719
Email: jieungkim@yonsei.ac.kr

Research Interest

- Reliability in system software (distributed system, blockchain, hypervisor, operating systems, computational storage)
- Reliability in neural network (framework & model reliability)
- Programming language design & theory
- Formal verification (theories, tools, and automation)
- AI for SE (proof auto generation, LLM assisted transaction system)
- SE for AI (Neural network modularization, data integrity)

Current Active Projects

VeriFlexDIR: Intermediate Representation (IR) for Verifiable & Flexible Distributed Systems, and Distributed System Development with the IR

- Build a certified program model for multiple consensus algorithms to adapt to several distributed environments. (In collaboration with Yale and Northeastern)
- Develop and formally verify a program model capable of expressing various non-transactional distributed system consistencies. (In collaboration with Northeastern and KAIST)
- Formally verify distributed systems in Go and C using the proposed model, and establish verification frameworks for them — including Go-Cris, a verification framework for Go implementations. (Partially in collaboration with SNU)
- Extend the model toward flexible transaction patterns (e.g., Saga) with formally verified, built-in security policies for trustworthy collaboration among dynamically changing edge agents.

Building a Fundamental Technology for Modular Neural Network Verification

- Develop a logical system to define the correctness criteria for neural networks.
- Develop a framework to decompose, compose, and modularly verify neural networks. (Partially in collaboration with the University of Seoul)
- Modularization of neural networks for efficient deployment: extract only the required functionality (classes) from a large model and deploy it on edge devices while preserving

the original model's decisions, treating decomposability as a property that requires both semantic preservation and structural separation.

Safe Data Collection for Edge Learning

- Develop data poisoning detection techniques that filter malicious data from real-time learning streams before it is absorbed into the model, preserving clean data while pre-emptively blocking poison in online/continual learning settings.

Large-Scale Automated Proof Generation

- Develop techniques to automatically generate formal proofs at scale, removing the biggest cost bottleneck in program verification (e.g., seL4's ~11 person-years).
- Combine the automation with a multi-language verification framework to enable complete program proofs for frequently changing, multi-language implementations.

Other Active Projects

- Computational storage verification
 - Build a domain-specific language and automated verification framework. (In collaboration with the University of Copenhagen)
 - Provide safety and liveness guarantees.
- Practical multi-language formal verification tools
 - Build modular formal verification tools for programs written in C, Go, and Rust.
 - Integrate multiple formal verification engines together for better usability.

Work Experience

Assistant Professor	09/2024 ~
• Department of Computer Science and Engineering, Yonsei University	
Assistant Professor	09/2022 ~ 08/2024
• Department of Computer Engineering, Inha University	
Software Engineer	02/2022 ~ 08/2022
• Core ML, Model Optimization Team, 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, KAIST

EDUCATION

Ph.D. in Computer Science

09/2012 ~ 05/2019

- Department of Computer Science, Yale University
 - Advisor: *Zhong Shao*
 - Thesis: *Modular and Compositional Development of Certified Concurrent Software Systems*

M.S. in Computer Science

09/2009 ~ 08/2011

- Department of Computer Science, KAIST
 - Advisor: *Sukyoung Ryu*
 - Thesis: *Proving FFMM Type Safety Using Coq*

B.S. in Engineering

03/2002 ~ 08/2009

- Department of Computer Engineering, Sungkyunkwan University
- Scholarships: *Full scholarships for 3 semesters & 1 half scholarship*

PUBLICATIONS

International Journal

- **Jieung Kim**, Jérémie Koenig, Hao Chen, Ronghui Gu, and Zhong Shao, ThreadAbs: A Template for Building Verified Thread-local Interfaces with Software Scheduler Abstractions, *Journal of Systems Architecture*, Volume 147, Article 103046, February 2024.
- **Jieung Kim**, Ronghui Gu, and Zhong Shao, SimplMM: A Simplified and Abstract Multicore Hardware Model for Large Scale System Software Formal Verification, *Journal of Systems Architecture*, Volume 147, Article 103046, February 2024.
- 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.

International Conference

- Yonghee Kim, Taeyoung Yoon, Sanghyun Yi, Jaehyung Lee, Soonwon Moon, Yeji Han, Seonho Lee, Taeyoung Rhee, Yujin Im, Donghyun Nam, **Jieung Kim**, and Chung-Kil Hur, CRIS: The Power of Imagination in Hybrid Verification, *Proceedings of the 2026 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'26)*, June 2026.
- Kezhi Xiong, Soonwon Moon, Joshua Kang, Bryant Curto, **Jieung Kim**, and Ji-Yong Shin, ReCraft: Self-Contained Split, Merge, and Membership Change of Raft Protocol, *The 55th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN'25)*, June 2025.
- Longfei Qiu, Yoonseung Kim, Ji-Yong Shin, **Jieung Kim**, Wolf Honore, and Zhong Shao, LiDO: Linearizable Byzantine Distributed Objects with Refinement-Based Liveness Proofs,

Proceedings of 2024 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'24), June 2024.

- Wolf Honore, Longfei Qiu, Yoonseung Kim, Ji-Yong Shin, **Jieung Kim**, and Zhong Shao, AdoB: Bridging Benign and Byzantine Consensus with Atomic Distributed Objects, *Proceedings of 2024 ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA'24)*, October 2024.
- 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 (PLDI'22)*, 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 2021 ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA'21)*, October 2021. (*: **both equally contribute to this work**)
- 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, Jeremie 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.

Domestic Journal & Conference

- 김지응, 정형 검증을 통한 동시성 소프트웨어의 추상화 명세 제공 (Provide abstracted specifications for concurrent software with formal verification), 정보과학회지 제41권 제6호(통권 제409호), June 2023.

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, Cog Mechanization of Featherweight Basic Core Fortress for Type Soundness, **Technical Report** (ROSAEC-2011-011), May 2011.

Teaching Experiences

Lecturer (Department of Computer Science & Engineering, Yonsei University)

- [CAS2103.03-00] Data Structure Spring 2026
- [CAS3106] Software Engineering Fall 2025
- [CSI6556.01-00] Neural Netowrk Reliability Verification Fall 2025
- [CAS2103.03-00] Data Structure Spring 2025
- [CSI4104.01-00] Compiler Design Fall 2024
- [CSI6556.01-00] Neural Netowrk Reliability Verification Fall 2024

Lecturer (Department of Computer Engineering, Inha University)

- [CSE4232] Programming Language Theory Spring 2024
- [CSE4312] Compiler Spring 2024
- [CSE3210] Open-Source Application Programming Fall 2023
- [CSE2015] Computational Linear Algebra in Computer Science Fall 2023
- [CSE4313] Computer Security Spring 2023
- [CSE4312] Compiler Spring 2023
- [CSE2015] Computational Linear Algebra in Computer Science Fall 2022

Teaching Assistant (Department of Computer Science, Yale University)

- [CS458] Automatic Decision Systems (Lecturer: Stephen Slade) Fall 2016
- [CS424] Parallel Programming Techniques (Lecturer: Andrew Sherman) Spring 2016
- [CS201] Introduction to Computer Science (Lecturer: Stephen Slade) Fall 2015
- [CS201] Introduction to Computer Science (Lecturer: Dana Angluin) Spring 2015
- [CS201] Introduction to Computer Science (Lecturer: Holly Rushmeier) Fall 2014
- [CS112] Introduction to Programming (Lecturer: Yang Yang) Spring 2014
- [CS112] Introduction to Programming (Lecturer: Drew McDermott) Fall 2013

Teaching Assistant

- T.A. for Undergraduate Research Project (URP) Program @ KAIST Spring 2011
 - Topic: Bigraph Library in Coq
 - Grand Prix at 2011 Winter / Spring Semester URP Competition

RESEARCH GRANTS

Korea Model Optimization Program, Google Korea

09/2023 ~ 08/2024

- Proposal title: *Formal approaches to achieve accuracy of quantized neural network*

Samsung Future Tech Fostering Project (삼성미래기술육성재단)

12/2023 ~

11/2026

- Proposal title: *A Fundamental Technology for Modular Neural Network Verification*
(신경망 분해/통합 검증을 위한 원천 기술 연구)

National Research Foundation (우수신진연구/한국연구재단),

03/2025 ~ 02/2027

- A Flexible and Scalable Modular Development and Verification Methodology for Distributed Systems Based on Compositional Consensus Algorithms (통합 합의 알고리즘 기반 분산 시스템을 위한 유연하고 확장 가능한 모듈화 개발 및 검증 방법론)

위탁과제(ETRI),

03/2025 ~ 02/2027

- 광 컴퓨팅 연산기 지원 딥러닝 컴파일러 설계 및 프로토타입 개발

Institute of Information & Communications Technology Planning & Evaluation

(IITP, 정보통신기획평가원),

04/2026 ~ 12/2029

- Development of Industry-Specific Physical AI Foundation Models and Cultivation of Next-Generation Convergence Talent (산업 특화 Physical AI 파운데이션 모델 개발 및 차세대 융합형 인재양성)
- Consortium led by Lotte Innovate
- PI of the Yonsei University subproject, carried out jointly with two other research groups at Yonsei)

AWARDS

Robert Willets Carle Scholarship Fund #2

01/2015

- Department of Computer Science, Yale University

Doctoral Fellowship

09/2012 ~ 08/2013

- Department of Computer Science, Yale University

An Outstanding MS Thesis

02/2012

- Department of Computer Science, KAIST

ACTIVITIES

Organizer

- GDG AI for Science, Korea (2025~)

Organizational committee members for international conferences and workshops

- PLDI 2025 (Co-local chair)

Program committee (PC) members for international conferences and workshops

- APLAS 2023, APSEC 2023, ANT 2025, ICSA 2025, OOPSLA 2026, ATVA 2026

Contributions to Domestic Research Societies

- Vice President, SiGPL 2025
- General chair of SiGPL summer school 2026
- Korean Institute of Information Scientists and Engineers (정보과학회) newsletter editorial committee member (뉴스레터 편집위원) 2025

- Korean Institute of Information Scientists and Engineers (정보과학회) public relations committee member (홍보위원) 2025
- SIGPL Korea committee member 2024
- PC chair of SIGPL summer school 2023
- PC of SIGPL winter school 2023

Invited speaker/lecturer

- Neural network modular verification, 삼성미래기술육성재단 annual forum, November 2024
- Compiler overview, Startup Reading Class @ Daejeon, October 2024
- Formal Verification: The Key to High-Assurance Computing and AI, Samsung Research Technical Exchange, July 2024
- 하계 구글 개발자 특강, 충남대학교, August 2023 and August 2022.
- 동시성 프로그램의 추상화와 정형검증, 2023 한국컴퓨터종합학술대회 (KCC) 신진연구자세션, June 2023.
- Google techs for developers, For Solution Challenger, Asia-Pacific Region Google Developer Student Clubs, January 2023.
- CS496 Seminar<Programming and Tech Interview> @ KAIST, Winter 2022.
- Large-scale operating & distributed system formal verification using Coq, Software Disaster Research Center, October 2022.
- 증명 보조기를 사용한 소프트웨어 정형 검증 기법 및 예시, 2022 한국소프트웨어종합학술대회 (KSC) Tutorial, December 2022.
- End-to-end Formal Verification on pKVM, SigPL Winter School 2022, South Korea, February 2022.
- Verification of Security-focused Hypervisor Using RUSC Framework, Computer System Society Winter Conference, South Korea, February 2021.
- 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.
- (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.
- Coq Mechanization of Featherweight Fortress with Multiple Dispatch and Multiple Inheritance, SIGPL Korea 2011 Conference, September 2011.
- Coq Summer Workshop @ KAIST, June 2011.

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

12/2009 ~ 06/2012

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

OTHER ACTIVITIES

Board Member of the Korean Graduate Student Association at Yale (Yale University)

- Director 09/2014 ~ 08/2015
- President 09/2013 ~ 08/2014

Board Member of Graduate Student Council (Department of Computer Science, KAIST)

- President 01/2010 ~ 12/2010

Lifeguard 06/2005 ~ 08/2005

- Pool lifeguard at Camp Long and Eagle of U.S. Army in the 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 (Ph.D. advisor)

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

Ji-Yong Shin (Academic collaborator)

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

Andrew Ferraiuolo (Collaborator @ Google & Academic collaborator)

- Senior Researcher
- Certora
- Email: andrewferraiuolo@gmail.com

Sukyoung Ryu (Master advisor)

- Professor
- School of Computing

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