JAY P. LIM

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https://dongura.me

RESEARCH INTERESTS

Broadly, my research interest are in Programming Languages, compilers, and numerics. My goal is to develop techniques to verify or synthesize correct programs and low-level systems. Recently I have been focusing on analyzing numerical errors and designing techniques to create accurate and efficient programs for scientific computing. Current projects include creating correctly rounded math libraries and designing techniques to create accurate and energy-efficient signal processing implementations for Brain Computer Interface.

EDUCATION

2021 **PhD in Computer Science**
Rutgers University, New Brunswick, New Jersey
Advisor: Santosh Nagarakatte

2011 **BS in Computer Science and Mathematics**
University of Wisconsin - Madison, Madison, Wisconsin

POSITIONS HELD

2025-current **Assistant Professor**
Computer Science and Engineering, University of California, riverside

2021-2025 **Lecturer**
Department of Computer Science, Yale University

2014-2021 **Graduate Research Asssistant**
Computer Science Department, Rutgers University
- Dissertation Title: *Novel Polynomial Approximation Methods for Generating Correctly Rounded Elementary Functions*

2017 **Research Intern**
MSR Next OS Technology, Microsoft Research Redmond
- Developed generic functions for CheckedC to reduce void pointer usage.

2011-2014 **Software Developer**
Quad/Graphics Inc.
- Server back-end and web development, large databases maintenance.

HONORS AND AWARDS

2022 **John C. Reynolds Doctoral Dissertation Award**
Title: *Novel Polynomial Approximation Methods for Generating Correctly Rounded Elementary Functions*

2022 **Distinguished Paper Award at POPL 2022**
Title: *One Polynomial Approximation to Produce Correctly Rounded Results of an Elementary Function for Multiple Representations and Rounding Modes*

2021 **Distinguished Paper Award at PLDI 2021**
Title: *High Performance Correctly Rounded Libraries for 32-bit Floating Point Representations*

2019	**Rutgers University Rizvi Family Graduate Fellowship** For excellence in research
2018	**Student Research Competition Gold Medal, PLDI 2018** Title: *Automatic Verification of Assembly Implementation of Cryptographic Algorithms*

SCIENTIFIC PUBLICATIONS

PLDI 2022	*Progressive Polynomial Approximations for Fast Correctly Rounded Math Libraries.* Mridul Aanjaneya, **Jay P. Lim**, and Santosh Nagarakatte. Proceedings of the 43rd ACM SIGPLAN International Conference on Programming Language Design and Implementation (PLDI), 2022.
POPL 2022	**Distinguished paper award** *One Polynomial Approximation to Produce Correctly Rounded Results of an Elementary Function for Multiple Representations and Rounding Modes.* **Jay P. Lim** and Santosh Nagarakatte. 49th ACM SIGPLAN Symposium on Principles of Programming Languages (POPL), 2022.
PLDI 2021	**Distinguished paper award** *High Performance Correctly Rounded Math Libraries for 32-bit Floating Point Representations.* **Jay P. Lim** and Santosh Nagarakatte. Proceedings of the 42nd ACM SIGPLAN International Conference on Programming Language Design and Implementation (PLDI), 2021.
POPL 2021	*An Approach To Generate Correctly Rounded Math Libraries for New Floating Point Variants.* **Jay P. Lim**, Mridul Aanjaneya, John Gustafson, and Santosh Nagarakatte. 48th ACM SIGPLAN Symposium on Principles of Programming Languages (POPL), 2021.
CF 2020	*Approximating Trigonometric Functions for Posits Using the CORDIC Method.* **Jay P. Lim**, Matan Shachnai, and Santosh Nagarakatte. Proceedings of the 17th ACM International Conference on Computing Frontiers (CF), 2020.
PLDI 2020	*Debugging and Detecting Numerical Errors in Computation with Posits.* Sangeeta Chowdhary, **Jay P. Lim**, and Santosh Nagarakatte. Proceedings of the 41st ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2020.
CGO 2019	*Automatic Equivalence Checking for Assembly Implementations for Cryptography Libraries.* **Jay P. Lim**, and Santosh Nagarakatte. Proceedings of the International Symposium on Code Generation (CGO), 2019.
PLAS 2017	*Compiler Optimizations with Retrofitting Transformations: Is There a Semantic Mismatch?* **Jay P. Lim**, Santosh Nagarakatte, and Vinod Ganapathy. ACM SIGSAC Workshop and Programming Languages and Analysis for Security (PLAS), 2017.

TECHNICAL REPORTS

Nov. 2021	*RLibm-Prog: Progressive Polynomial Approximations for Fast Correctly Rounded Math Libraries.* Mridul Aanjaneya, **Jay P Lim**, and Santosh Nagarakatte. Department of Computer Science, Rutgers University, Technical Report DCS-TR-758

Aug. 2021	*RLIBM-ALL: A Novel Polynomial Approximation Method to Produce Correctly Rounded Results for Multiple Representations and Rounding Modes.* **Jay P. Lim** and Santosh Nagarakatte. Department of Computer Science, Rutgers University, Technical Report DCS-TR-757
Apr. 2021	*RLIBM-32: High Performance Correctly Rounded Math Libraries for 32-bit Floating Point Representations.* **Jay P. Lim** and Santosh Nagarakatte. Department of Computer Science, Rutgers University, Technical Report DCS-TR-754
Jul. 2020	*A Novel Approach to Generate Correctly Rounded Math Libraries for New Floating Point Representations.* **Jay P. Lim**, Mridul Aanjaneya, John Gustafson, and Santosh Nagarakatte. Department of Computer Science, Rutgers University, Technical Report DCS-TR-753

THESIS

Aug. 2021	*Novel Polynomial Approximation Methods for Generating Correctly Rounded Elementary Functions.* Jay P. Lim, PhD Dissertation, Rutgers, The State University of New Jersey, Supervised by Professor Santosh Nagarakatte

RESEARCH GRANTS

In Submission	*Formally Verified Collision-Processing using Low-Precision Floating-Point for Accelerating Multi-body Physics Simulations* In Submission to NSF Correctness for Scientific Computing Systems (CS2)

INVITED TALKS AND CONFERENCE PRESENTATIONS

Feb. 2023	*Towards Creating Correct Numerics* **Colloquium talk** at Yale University. Feb. 2023 Yale University
Jan. 2022	*One Polynomial Approximation to Produce Correctly Rounded Results of an Elementary Function for Multiple Representations and Rounding Modes.* **Conference presentation** at POPL 2022. January 2022 Online. (Video)
July 2021	*High Performance Correctly Rounded 32-bit Math Libraries.* **Invited talk** at FPTalks 2021. July 2021 Online. (Video)
July 2021	*High Performance Correctly Rounded Math Libraries for 32-bit Floating Point Representations.* **Conference presentation** at PLDI 2021. July 2021 Online. (Video)
Jan. 2021	*An Approach to Generate Correctly Rounded Math Libraries for New Floating Point Variants.* **Conference presentation** at POPL 2021. January 2021 Online. (Video)
Oct. 2020	*An Approach to Generate Correctly Rounded Math Libraries for New Floating Point Variants.* **Poster session** at 2020 Virtual LLVM Developers' Meeting. October 2020. Online.

Jun. 2020	*Creating Correctly Rounded Math Libraries for Real Number Approximations.* **Invited talk** at FPTalks 2020. June 2020 Online. (Video)
Jun. 2020	*Approximating Trigonometric Functions for Posits Using the CORDIC Method.* **Conference presentation** at CF 2020. June 2020 Online.
Feb. 2019	*Automatic Equivalence Checking for Assembly Implementations for Cryptography Libraries.* **Conference presentation** at CGO 2019. February 2019. Washington D.C.
Nov. 2017	*Automatic Verification of Assembly Implementation of Crypto Software.* **Invited talk** at NJ Programming Languages and Systems Seminar. November 2017. Princeton University, New Jersey.
Oct. 2017	*Compiler Optimizations with Retrofitting Transformations: Is there a Semantic Mismatch?* **Conference presentation** at PLAS 2017. October 2017. Dallas, Texas.
Aug. 2017	*Filling The Void: Extending C to Eliminate the Use of Void Pointers in Practice.* **End of the Internship Talk** at Microsoft Reesarch. August 2017. Microsoft Research Redmond, Washington.

TEACHING EXPERIENCE

Fall 2024	Lecturer at Yale University *Introduction to Systems Programming and Computer Organization* (CPSC 323) *Compilers and Interpreters* (CPSC 421 & CPSC 521)
Spring 2024	Lecturer at Yale University *Introduction to Systems Programming and Computer Organization* (CPSC 323) *C Programming Languages & Linux* (CPSC 175)
Fall 2023	Lecturer at Yale University *Introduction to Systems Programming and Computer Organization* (CPSC 323) *Compilers and Interpreters* (CPSC 421 & CPSC 521)
Spring 2023	Lecturer at Yale University *Introduction to Systems Programming and Computer Organization* (CPSC 323) *Compilers and Interpreters* (CPSC 421 & CPSC 521)
Fall 2022	Lecturer at Yale University *Introduction to Computing and Programming* (CPSC 100) *Full Stack Web Programming* (CPSC 419 & CPSC 519)
Spring 2022	Lecturer at Yale University *Introduction to Systems Programming and Computer Organization* (CPSC 323) *Compilers and Interpreters* (CPSC 421 & CPSC 521)
Fall 2021	Lecturer at Yale University *Introduction to Computing and Programming* (CPSC 100) *Introduction to Systems Programming and Computer Organization* (CPSC 323)
Fall 2020	Teaching Assistant at Rutgers University *Computer Architecture* (01:198:211)

Spring 2020	Teaching Assistant at Rutgers University *Computer Seurity* (01:198:544)
Summer 2019	Instructor at Rutgers University *Computer Architecture* (01:198:211)
Spring 2019	Co-Instructor at Rutgers University *Computer Security* (01:198:544)
Fall 2018	Teaching Assistant at Rutgers University *Computer Architecture* (01:198:211)
Spring 2018	Teaching Assistant at Rutgers University *Programming Languages and Compilers II* (01:198:516)
Summer 2015	Teaching Assistant at Rutgers University *Introduction to Discrete Structures II* (01:198:206)
Spring 2015	Teaching Assistant at Rutgers University *Principles of Programming Languages* (01:198:314)
Fall 2014	Teaching Assistant at Rutgers University *Principles of Programming Languages* (01:198:314)

UNDERGRADUATE SUPERVISION AND SENIOR THESIS ADVISING

Fall 2023 - Spring 2024	Alex Schott: Correctly Rounded Math Library
Fall 2023 - Spring 2024	Adam Zapatka: *Advancing Error Prediction and Reduction in Black Box Floating Point Functions* (Senior Thesis)
Spring 2024	Lucy Sun: *Bridging the Gap: Integrating Modern Design and Programming Techniques in Web Development in a React-Based Personal Website* (Senior Thesis)
Spring 2024	Charlie Liu: *Automated Verification of ATC Readbacks* (Senior Thesis)
Fall 2023	Jesse Chen: *On the Design and Performance of Cellular Automata Hash Functions* (Senior Thesis)
Spring 2023	Samuel Tigitsu: *Building a Motivational Twitter Bot to see what Contributes to Following* (Senior Thesis)
Spring 2023	Brihu Sundararaman: *Analytical Search For Blockchain* (Senior Thesis)
Spring 2023	Sukesh Ram: *Exploring & Mitigating Bias in Large Language Models* (Senior Thesis)
Spring 2023	Murtaza Javaid: *Automated Pitch Accent Detection in Japanese* (Senior Thesis)
Spring 2023	Matthew Cline: *CPSC 101: Research-Driven Curriculum Design* (Senior Thesis)
Fall 2022	Lee Chen: *Web Accessibility: Implementation Challenges and Automated Testing* (Senior Thesis)
Spring 2022	Masayuki Nagase: *Tunr: An App that Takes a Song and Returns the Musical Notation of Each Instrument* (Senior Thesis)

PROGRAM COMMITTEE MEMBER

2024	*ARITH'25 Review Committee* ARITH 2025 - PC member
2024	*PLDI'25 Review Committee* PLDI 2025 - PLDI Research Papers track
2022	*OOPSLA'23 Extended Review and Artifact Evaluation Committee* SPLASH 2023 - OOPSLA track
2022	*SIGCSE TS'23 Program Committee* SIGCSE 2023 Technical Symposium
2021	*OOPSLA'22 Extended Review and Artifact Evaluation Committee* SPLASH 2022 - OOPSLA track

UNIVERSITY AND DEPARTMENTAL SERVICE

Summer 2024	Camp Yale - Build Program advisor
Summer 2023	Camp Yale - Build Program advisor
2022	Yale University CS Academic Honesty Committee
Summer 2022	Camp Yale - Build Program advisor
2021	Yale University CS Academic Honesty Committee

PROFESSIONAL SOCIETIES

- ACM member since 2018.

SOFTWARE RELEASES

RLibm Project	Primary developer of the RLibm Project: A suite of techniques to generate correctly rounded elementary functions for hundreds of floating point configurations (*e.g.*, half, float, bfloat16, tesorfloat32). [Link]
CORDIC Math Library	Primary developer of the CORDIC Math Library: Implementations of trigonometric functions for the posit representation using the CORDIC method. [Link]
CheckedC	Contributor to the CheckedC project: CheckedC provides bounds checking and type safety to the C programming language. [Link]