JAY P. LIM

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RESEARCH INTERESTS

My research interests lie in generating and verifying low-level systems including, but are not limited to, math libraries, compilers, and cryptography libraries. I am especially interested in developing foundational techniques to automatically generate and verify these systems with minimal user intervention.

In my current research, I am developing novel approaches to create efficient and correctly rounded implementations of elementary functions in math libraries for several representations and rounding modes.

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

2021-present	**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

INVITED TALKS AND CONFERENCE PRESENTATIONS

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 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 THESIS SUPERVISION

Fall 2022	Lee Chen - Senior Thesis Project
Fall 2022	Kaitlyn Sandor - Senior Thesis Project
Spring 2021	Masayuki Nagase - Senior Thesis Project

PROGRAM COMMITTEE MEMBER

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

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.