Lawrence Tang

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Research Interests: Hardware-Software Co-Design, Domain-specific ML/AI/DSP Accelerators/Algorithms, Hardware Design Tools, Compute-in-Memory, VLSI Design, High Performance Computing

Education

Carnegie Mellon University | Pittsburgh, PA *2020 - Mar 2026 (Expected)*
Ph.D. Candidate in Electrical and Computer Engineering
Advisors: Prof. Franz Franchetti & Prof. Ken Mai
Thesis Topic: *Design Paradigms and Tools for Modern Fourier Transform Hardware*

Carnegie Mellon University | Pittsburgh, PA *2020 - 2022*
M.S. Electrical and Computer Engineering
GPA: 4.00

Cornell University | Ithaca, NY *2016 - 2020*
B.S. Electrical and Computer Engineering
GPA: 3.99

Awards and Honors

Apple PhD Fellowship in Integrated Systems *2023*
Carnegie Institute of Technology Dean's Fellow *2020*
Cornell Engineering Undergraduate Research Grant *2018 and 2019*
Tau Beta Pi Engineering Honor Society *2018*
IEEE-Eta Kappa Nu *2018*

Research Experience

Carnegie Mellon University | Pittsburgh, PA *2020 – Present*
Graduate Student Researcher, Advisors: Prof. Franz Franchetti & Prof. Ken Mai

- Currently working on: performance modeling for hardware accelerated applications in signal/radar processing, fast convolutions in ML/AI, and spectral methods in HPC workloads; a RISC-V SoC tapeout in a 16nm process
- Designed a flexible and programmable FFT architecture for general-size FFT problems and a software stack co-designed as a drop-in replacement
- Developed a design automation framework to build and integrate FFT-based accelerators with HPC application software
- Designed microarchitecture and physical implementation of three prototype ASIC testchips in a 28nm process; built custom PCBs and evaluated testchips running up to ∼1.2GHz clock; supports a variety of FFT algorithms

VLSI Information Processing Group | Cornell University *2017 – 2020*
Undergraduate Research Assistant, Advisor: Prof. Christoph Studer

- Implemented hardware efficient algorithms for wireless localization with the approximate nearest neighbor search
- Designed new neural network based methods for unsupervised localization in Hamming space

Professional Experience

Apple | Austin, TX *2023*
Physical Design CAD Intern

- Analysis and optimization of routines for repeater insertion in the top-level PNR flow

MITRE | Bedford, MA *2018 – 2019*
Intern in Positioning, Navigation, and Timing

- Modeling and simulation of GNSS signal processing/navigational techniques to assess future satellite capabilities

Publications

Conference Proceedings

1. **L. Tang**, V. Kumar, M. Ngaw, S. Singh, D. Nadkarni, L. Tummuala, K. Mai, F. Franchetti, "Towards an Algorithm-based Approach for Soft Error Tolerance using Interval Arithmetic," *Under Review.*
2. Y. Lan, **L. Tang**, N. Zhang, Y. Eum, J. C. Hoe, F. Franchetti, "A RISC-V Vector Extension for Multi-Word Arithmetic," *Under Review.*
3. S. Rao, **L. Tang**, F. Franchetti, "LibraryX-ASIC: A First Look," Workshop on High-Level Parallel Programming Models and Supportive Environments (HIPS), IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW), June 2025
4. **L. Tang**, S. Chen, K. Harisrikanth, G. Xu, F. Franchetti and K. Mai, "A 1.19GHz 9.52Gsamples/sec Radix-8 FFT Hardware Accelerator in 28nm," IEEE Hot Chips 36 Symposium (HCS), Aug. 2024
5. A. Shah, **L. Tang**, P. H. Chou, Y. Y. Zheng, Z. Ge and B. Raj, "An Approach to Ontological Learning from Weak Labels," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), June 2023
6. **L. Tang**, S. Chen, K. Harisrikanth, G. Xu, K. Mai and F. Franchetti, "A High Throughput Hardware Accelerator for FFTW Codelets: A First Look," IEEE High Performance Extreme Computing Conference (HPEC), Sept. 2022
7. **L. Tang**, R. Ghods, C. Studer, "Reducing the Complexity of Fingerprinting-Based Positioning using Locality-Sensitive Hashing," Asilomar Conference on Signals, Systems, and Computers, Nov. 2019

Extended Abstracts/Posters/Preprints

1. Y. Eum, N. Zhang, **L. Tang**, F. Franchetti, "Towards a RISC-V Instruction Set Extension for Multi-word Arithmetic", IEEE High Performance Extreme Computing Conference (HPEC), 2024, Poster with extended abstract
2. **L. Tang**, P.H. Chou, Y.Y. Zheng, Z. Ge, A. Shah, B. Raj, "Ontological Learning from Weak Labels", arXiv preprint arXiv:2203.02483
3. Z. Gong, N. Zhu, M. Ngaw, J. Rivera, **L. Tang**, E. Tang, H. Mankad, F. Franchetti, "Interval Arithmetic-based FFT for Large Integer Multiplication", IEEE High Performance Extreme Computing Conference (HPEC), 2022, Poster with extended abstract
4. **L. Tang**, R. Ghods, C. Studer, "Fingerprinting-Based Positioning using Locality-Sensitive Hashing," ELI Undergraduate Research Poster Session, Ithaca, NY, May 2019

Teaching Experience

Graduate Teaching Assistant | Carnegie Mellon University

- 18-726: Projects in Integrated Circuit Design: First Silicon *Fall 2024*
- 18-725: Advanced Digital Integrated Circuit Design *Spring 2023, 2024, 2025*
- 18-622: Digital Integrated Circuit Design *Fall 2022, 2023*

Undergraduate Teaching Assistant | Cornell University

- ECE 3150: Introduction to Microelectronics *Spring 2020*
- CS 4780: Machine Learning for Intelligent Systems *Fall 2019*
- ECE 2300: Digital Logic and Computer Organization *Spring 2019*

Skills

Software: Python, C, C++, TCL, Scala, MATLAB, PyTorch, TensorFlow

Hardware: SystemVerilog, Verilog, Cadence Genus/Innovus/Virtuoso/Voltus, Calibre, Vivado