

Lawrence Tang

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Research Interests: Hardware-Software Co-Design, Domain-specific ML/AI/DSP Accelerators, 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