

# Kartik Lakshminarasimhan

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## Skills

Languages	C++, Python, Bash, Chisel
Hardware	Verilog, VHDL, Cadence Virtuoso
Libraries	STL, pthreads
Tools	Intel Pin, RISC-V Spike, LLVM(tablegen, libc)
Platforms	Xilinx Alveo u250, Zedboard
Simulators	SST, Sparta, Sniper, Chipyard, Firesim

## Relevant Experience

### Researcher

Sep'23 - Present

Compute System Architecture unit, imec  
Modelling Tensor Processing Unit in cycle accurate simulators, Analytical modeling of Systolic array style architectures for Superconducting technology. GPU System-level Power modeling and calibration with AMD and NVIDIA GPUs

### Research intern

August'22 - February'23

Compute System Architecture unit, imec  
Working on adapting systolic-array based accelerators for superconducting technologies targeted at AI/HPC applications

### Graduate Research Assistant

Fall'17 - August'23

Performance Lab, Ghent University

### Graduate Technical Intern

May'16 - December'16

Microarchitecture Research Labs, Intel, Bangalore, India  
Developed a visualization tool(in python and C++) aiding the analysis to find performance bottlenecks and improving IPC gains. Workload characterization using VTune Amplifier

### Graduate Research Assistant

Fall'14 - Spring'16

Computer Architecture Group, University of Connecticut

## Education

### Ghent University

Fall'17 - Summer'23

Doctor of Philosophy, Computer Science and Engineering  
Graduate Courses: VLSI Technology, FPGA Design, Physics of MRI imaging, Statistics using python

### University of Connecticut

August '14 - December'16

Master of Science, Electrical and Computer Engineering  
GPA : 3.4/4  
Graduate Courses (Applied Probability and Stochastic Process, Advanced Storage Systems, Neural Computing, Computer Architecture, Advanced Computer Architecture, Machine Learning[Coursera])  
Thesis: WCET Analysis for Concurrent Execution of Multiple Applications on Safety Critical Embedded Multicores

### Anna University, Chennai

August '10 - May'14

Bachelor of Engineering, Electronics and Communication  
First Class  
Relevant coursework : VLSI Design (Theory and Laboratory), Digital Design (Theory and Laboratory), Data Structures and Object Oriented Design, Microprocessors and Microcontrollers

## Patents

**CPU with multiple instruction queues**, ECKHOUT, Lieven, **Kartik LAKSHMINARASIMHAN**, and Ajeya NAITHANI. U.S. Patent Application 18/029,232, filed November 9, 2023.

<b>Publications</b>	Superconducting Array of Arrays for Acceleration of Transformers, Manu Perumkunnil, <b>Kartik Lakshminarasimhan</b> , Quentin Herr, Anna Herr, et al. 16th workshop on Low Temperature Electronics, IEEE WOLTE 2016	
	The Forward Slice Core: A High-Performance, Yet Low-Complexity Microarchitecture. <b>Kartik Lakshminarasimhan</b> , Ajeya Naithani, Josu Feliu, and Lieven Eeckhout. ACM Trans. Archit. Code Optim. 19, 2, Article 17 (June 2022), 25 pages. <a href="https://doi.org/10.1145/3499424">https://doi.org/10.1145/3499424</a> (TACO'22)	
	The Forward Slice Core Microarchitecture, <b>K. Lakshminarasimhan</b> , A. Naithani, J. Feliu Perez, and L. Eeckhout, International Conference on Parallel Architectures and Compilation Techniques (PACT), Oct 2020	
	A Lightweight Spatio-temporally Partitioned Multicore Architecture for Concurrent Execution of Safety Critical Workloads, Q.Shi, <b>K.Lakshminarasimhan</b> ,C. Noll, E. Scholte, O.Khan SAE 2016 Aerospace Systems and Technology Conference(ASTC), September,2016	
	Efficient Parallelization of Path Planning Workload on Single-chip Shared-memory Multicores M. Ahmad, <b>K. Lakshminarasimhan</b> , O. Khan, IEEE High Performance Extreme Computing Conference, (HPEC'15), September 2015	
<b>Projects</b>	Performance and Energy Efficient Cache System Design : Simultaneous Execution of Multiple Applications across Heterogeneous Cores, Venkateswaran Nagarajan, <b>K.Lakshminarasimhan</b> , et al. presented at IEEE Symposium on VLSI(ISVLSI'13), Natal, Brazil	
	<b>Shift Register Design for LCoS micro-display</b>	Spring'22
	Schematic and layout design of a 5-bit Shift Register in ON semiconductor 0.35 $\mu\text{m}$ process using Cadence Virtuoso	
	<b>Optimizing CNN Kernels on FPGA</b>	Fall'21
	FPGA Synthesis and timing simulation of CNN kernels (written in VHDL)	
	<b>TinyMLPerf Benchmark suite</b>	Summer, Fall'20
	Part of the TinyMLPerf working group as a benchmark developer . Contributing code to the Keyword Spotting benchmark in TF2.0 using DS-CNN. (Python/TF2/Keras)	
	<b>Complexity-effective microarchitectures</b>	Fall17 - Present
	Exploring the performance gap between in-order and OOO cores by adding simple structures on top of an in-order cores (Simulators used : Sniper, Chipyard, Firesim)	
	<b>Multiprogram support for Graphite Many-core Simulator</b>	Fall14 ,Summer'15
<b>References</b>	Part of a team to implement multiprogram support in the lite (no memory/system call emulation) mode of Graphite simulator. Studied the multiprogramming methodology in Dynamic Binary Translation(DBT) based simulators of ZSim(uses PIN and system calls) and Sniper(uses PinPoint and PinPlay and Unix Pipes).	
	<b>Partitioning Shared Resources in a Multicore</b>	Summer'15, Fall'15
	Implemented Way-Partitioning in shared last level cache, spatial and temporal partitioning of shared memory controllers.	
	<b>Parallel Support Vector Machines Training using Pthreads</b>	Spring'16
	Implemented scalable serial and parallel versions of : Kernel trick in SVM and simplified version of Sequential Minimization Optimization Algorithm.	
<b>References</b>	<b>ARM Bus Architecture Design</b>	December'13 - April'14
	Bachelors' project : FPGA implementation of AXI-APB bridge architecture in AMBA 3.0 using Bluespec System Verilog.	
<b>References</b>	Prof.Lieven Eeckhout	
	Professor, Department of Electronics and Information Systems, Ghent University lieven.eeckhout@ugent.be	