

# MAHESH LAKSHMINARASIMHAN

maheshl@cs.utah.edu  $\diamond$  www.cs.utah.edu/~maheshl  $\diamond$  github.com/Mahesh-Lak

## EDUCATION

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**Ph.D. Computer Science, University of Utah, USA** *Aug 2019 - Dec 2024 (Expected)*

*Advisors:* Dr. Mary W. Hall, Dr. P. (Saday) Sadayappan

*Thesis:* Compiler-Driven Data Layout Optimizations for Tensor Programs

**M.S. Computer Science, Boise State University, ID, USA** *Aug 2017 - May 2019*

*Advisor:* Dr. Catherine Olschanowsky

*Thesis:* Application-Specific Memory Subsystem Benchmarking, *CGPA:* 3.8/4

**B.E. Computer Science, Anna University, Chennai, India** *Aug 2012 - May 2016*

*Thesis:* An Autonomous Crop Weed Detection System Using Fuzzy Real Time Classifier

## WORK EXPERIENCE

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**University of Utah** Salt Lake City, UT  
*Graduate Research Assistant* *August 2019 - Present*

High-performance code generation and data movement optimizations for deep learning and scientific computing applications on CPUs and GPUs.

**Pacific Northwest National Laboratory** Richland, WA  
*PhD Research Intern [Supervisor: Gokcen Kestor]* *January 2022 - May 2022*

Compiler optimizations in MLIR for tensor contractions in quantum chemistry targeted at GPU-accelerated systems.

**Lawrence Berkeley National Laboratory** Berkeley, CA  
*Research Intern [Supervisor: Samuel Williams]* *May 2019 - August 2019*

Kernel optimizations and memory traffic reduction for Ordinary Differential Equation (ODE) solvers in Adaptive Mesh Refinement (AMR) on GPUs.

**Works Applications Co., Ltd.** Chennai, India  
*Research Software Engineer* *June 2016 - July 2017*

Parallelization and optimization of clustering algorithms in AI-enabled Enterprise Resource Planning (ERP) software packages.

## RESEARCH INTERESTS

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High-Performance Machine Learning, Compiler Optimizations, Parallel Programming Models, Performance Portability, Modeling and Analysis, and Algorithm-Architecture Co-design.

## TECHNICAL SKILLS

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<b>Programming</b>	C++, Python, MATLAB, Fortran
<b>HPC Tools</b>	CUDA, OpenMP, MPI, HIP, SYCL
<b>Compilers</b>	MLIR, LLVM, Polyhedral Compilation

## SELECTED PUBLICATIONS

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- *Graph-Level Optimizations for DNN with Fine-Grain Data Layouts on GPUs*  
**Mahesh Lakshminarasimhan**, Mary Hall, Samuel Williams, Oscar Antepará, in *International Conference on Parallel Processing (ICPP) 2024* .

- *Performance-Portable Code Generation for Tensor Transpositions in MLIR*  
**Mahesh Lakshminarasimhan**, Mahesh Ravishankar, Mary Hall, P. Sadayappan,  
*Languages and Compilers for Parallel Computing (LCPC) 2023 (Best Paper Candidate)*
- *Bricks: A High-Performance Portability Layer for Computations on Block-Structured Grids*  
**Mahesh Lakshminarasimhan**, Oscar Antepara, Tuowen Zhao, Benjamin Sepanski, Protonu Basu, Hans Johansen, Mary Hall, Samuel Williams. In *IJHPCA 2024*
- *Co-iteration and Auto-parallelization of Sparse Tensor Contractions with Polyhedral Compilation*  
 Tuowen Zhao\*, **Mahesh Lakshminarasimhan\***, Mary Hall, Michelle Strout, Cathie Olschanowsky  
*ACM TACO 2023*.
- *Optimizing Data Layout Transformations in MLIR*  
**Mahesh Lakshminarasimhan**, Mahesh Ravishankar, Mary Hall, P. Sadayappan,  
*LLVM-HPC Workshop at SC 2021 and Tech Talk at LLVM Dev Meeting 2021*
- *PASTA: A Sparse Tensor Algorithm Benchmark Suite on CPUs and GPUs*  
 Jiajia Li, **Mahesh Lakshminarasimhan**, Xiaolong Wu, Ang Li, Cathie Olschanowsky, Kevin Barker, *IISWC 2020 and PPOPP 2020 (ACM SRC)*.

## SELECTED HONORS

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- *Ph.D. Fellowship*, School of Computing, University of Utah, 2019-20.
- *Outstanding Undergraduate Thesis*, Computer Science, Anna University, Chennai, India, 2016.
- *Best Student Paper Award* at IEEE ICACT 2016 and ICSEC 2016.
- *Best Paper Candidate* at LCPC Workshop, 2023.
- *Travel Awards:*  
 Students@SC Travel Grant 2023 & 2024; NSF Travel Award, ICPP 2024  
 Graduate Student Travel Assistance Award, University of Utah, 2023  
 Utah ASUU Travel Scholarship 2019, 2021, 2023.

## PROFESSIONAL SERVICE

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- *Reproducibility Committee:* SC 2024; PLDI 2024; CGO 2021, 2022; CC 2024.
- *Conference Program Committee:* IEEE VIS 2020 (Technology Committee); LLVM Dev Meeting 2021, 2022 (Reviewer); ACM SIGPLAN-M 2022-2023 (Operations Committee).
- *Student Volunteer:* SC 2020-2024;
- Student Chair, Graduate Student Advisory Committee (GradSAC), University of Utah, 2020-Present.