Kirshanthan Sundararajah

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RESEARCH INTERESTS

- Compilers, Programming Languages and High-Performance Computing

EDUCATION

Purdue University, West Lafayette, IN.   Aug 21, 2015 - Aug 04, 2023
    Ph.D. in Electrical and Computer Engineering   Aug 04, 2023

- Dissertation: *Composable, Sound Transformations of Nested Recursion and Loops.*
- Adviser: Milind Kulkarni

    M.S. in Electrical and Computer Engineering   Aug 05, 2022

University of Moratuwa, Katubedda, Sri Lanka.   Jul 21, 2009 - Mar 01, 2014
    B.Sc.(Hons) in Electronics and Telecommunication Engineering   Aug 28, 2014

PROFESSIONAL EXPERIENCE

- **Assistant Professor of Computer Science** @*Virginia Tech*   Aug 10, 2023 - Present

- **Graduate Research Assistant** @*Purdue University*   Aug 21, 2015 - Jul 28, 2023
  PLCL Group

  - **(Poly/Uni)Rec**: Framework for composing irregular program transformations.[PLDI'19, OOPSLA'22]
  - **SparseLNR**: Framework for accelerating sparse tensor computation.[ICS'22]
  - **DARM/HyBF**: Framework for melding similar control-flow graphs.[CGO'22, CC'23]
  - **HACCLE**: Ecosystem for *Secure Multi-Party Computations*.[GPCE'21]
  - **TreeFuser/Grafter**: Framework for fusing general recursive traversals. [OOPSLA'17, PLDI'19]
  - **Treelogy**: Benchmark suite for tree traversals.[ISPASS'17]
  - **Recursion Twisting**: Optimizing nested recursive traversals.[ASPLOS'17]

- **Software Engineering Intern** @*Nvidia*   Sep 21, 2020 - Dec 18, 2020
  GPU Compiler Group

  - **Diesel Compiler**: Warp specialization and pipelining for GPU kernels.

- **Software Engineering Intern** @*Reservoir Labs (Now Qualcomm AI Research)*   Jun 01, 2020 - Aug 28, 2020
  R-Stream Compiler Group

  - **ParSEC Backend**: A task-based runtime backend for *R-Stream* polyhedral compiler.

- **Research Intern** @*Microsoft Research*   Jun 11, 2018 - Sep 14, 2018
  RiSE Group

  - **Parallelizing Word2Vec**: Parallelizing and scaling *Word2Vec* training to execute on many cores.

- **Research Assistant** @*University of Moratuwa* Mar 02, 2014 - Jul 25, 2015
  Department of CSE

  – **Vectorization**: Model-based Input-adaptive Vectorization

- **Associate Electronic Engineer** @*Zone24x7 Inc.* May 14, 2012 - Oct 12, 2012
  Signs24x7 Group

  – **Image Compression Algorithm**: Implementation of memory efficient image compression algorithm, supposed to perform decompression on an *STM32 microcontroller* based system.
  – **Clock Synchronization Algorithm**: Implementation of real-time clock synchronization algorithm, deployed on an *ARM microprocessor* runs *embedded Linux*.
  – **Hardware Abstraction Layer**: Implementation of *Hardware Abstraction Layer (HAL)* for radio communication protocol stack of *Electronic Paper Display(EPD)*, driven by an *STM32 microcontroller*.

AWARDS

- *Best Paper Award* at International Conference on Supercomputing (ICS) 2022.

- *Bilsland Dissertation Fellowship 2021-2022*, Purdue University.

- *Silver Medal* in ACM Student Research Competition at *SPLASH 2018*.

- *Electrical and Computer Engineering Fellowship 2015-2016*, Purdue University.

- *V. K. Samaranayake Research Assistantship 2014-2015*, University of Moratuwa.

- *Mahapola Merit Scholarship 2009-2014*, University of Moratuwa.

REFEREED PUBLICATIONS

- V. Sinhal, L. Sakka, **K. Sundararajah**, R.R. Newton, and M. Kulkarni. "Orchard: Heterogeneous Parallelism and Fine-grained Fusion for Complex Tree Traversals" in *Transactions on Architecture and Code Optimization* (TACO 2024). [ACM DL]

- R. C. O. Rocha, C. Saumya, **K. Sundararajah**, P. Petoumenos, M. Kulkarni, and M. F. P. O'Boyle "HyBF: A Hybrid Branch Fusion Strategy for Code Size Reduction" in *International Conference on Compiler Construction*, CC 2023. [ACM DL]

- **K. Sundararajah**, C. Saumya, and M. Kulkarni "UniRec: A Unimodular-Like Framework for Nested Recursions and Loops" in *Object-Oriented Programming, Systems, Languages, and Applications*, OOPSLA 2022. [ACM DL]

- A. Dias, **K. Sundararajah**, C. Saumya, and M. Kulkarni "SparseLNR: Accelerating Sparse Tensor Computations Using Loop Nest Restructuring" in *ACM International Conference on Supercomputing*, ICS 2022. [ACM DL] 🏆 **Best Paper Award**

- C. Saumya, **K. Sundararajah**, and M. Kulkarni "DARM: Control-Flow Melding for SIMT Thread Divergence Reduction" in *IEEE Symposium on Code Generation and Optimization*, CGO 2022. [IEEE Xplore]

- Y. Bao*, **K Sundararajah***, R. Malik, Q. Ye, C. Wagner, N. Jaber, F. Wang, M. H. Ameri, D. Lu, A. Seto, B. Delaware, R. Samanta, A. Kate, C. Garman, J. Blocki, P. Letourneau, B. Meister, J. Springer, T. Rompf, and M. Kulkarni "HACCLE: Metaprogramming for Secure Multi-Party Computation" in *International Conference on Generative Programming: Concepts and Experiences*, GPCE 2021. [ACM DL]

- **K. Sundararajah** and M. Kulkarni "Composable, Sound Transformations of Nested Recursion and Loops" in *ACM SIGPLAN Conference on Programming Languages, Design and Implementation*, PLDI 2019. [ACM DL]

- L. Sakka, **K. Sundararajah**, R. R. Newton, and M. Kulkarni "Sound, Fine-Grained Traversal Fusion for Heterogeneous Trees" in *ACM SIGPLAN Conference on Programming Languages, Design and Implementation*, PLDI 2019. [ACM DL]

- L. Sakka, **K. Sundararajah** and M. Kulkarni "TreeFuser: A Framework for Analyzing and Fusing General Recursive Tree Traversals" in *Object-Oriented Programming, Systems, Languages, and Applications*, OOPSLA 2017. [ACM DL]

- N. Hegde, J. Liu, **K. Sundararajah**, and M. Kulkarni "Treelogy: A Benchmark Suite for Tree Traversals" in *IEEE International Symposium on Performance Analysis of Systems and Software*, ISPASS 2017. [IEEE Xplore]

- **K. Sundararajah**, L. Sakka, and M. Kulkarni "Locality Transformations for Nested Recursive Iteration Spaces" in *ACM International Conference on Architectural Support for Programming Languages and Operating Systems*, ASPLOS 2017. [ACM DL]

- **K. Sundararajah** and S. Jayasena, "Model-based Input-adaptive Vectorization" in *Moratuwa Engineering Research Conference*, MERCon 2016. [IEEE Xplore]

- **K. Sundararajah**, L. Logeswaran, P. N. D. Panagoda, L. P. Wijesinghe, D. V. S. X. De Silva, and A. A. Pasqual, "Layered Depth Image Based HEVC Multi-view Codec" in *Advances in Visual Computing: Proceedings of the International Symposium on Visual Computing*, ISVC 2014. [Springer]

TEACHING EXPERIENCE

- CS 5134 Programming Languages @*Virginia Tech*   Fall 2024
- CS 6304 Advanced Topics in Language and Translator Design @*Virginia Tech*   Spring 2024
- CS 4304/5304 Compiler Design @*Virginia Tech*   Fall 2023
- ECE 368 Data Structures @*Purdue University*   Summer 2021 and Summer 2022
- ECE 295 Introduction to Data Science [TA] @*Purdue University*   Summer 2019, Fall 2020, and Summer 2023
- CS 1032 Programming Fundamentals [TA] @*University of Moratuwa*   Mar 2014 - Jun 2015

SERVICE

- **Organizing**

  - Registration Chair for PPoPP 2023.
  - Member of Project for Inclusion in ECE (PIECE) Committee 2022.
  - Student volunteer for PLDI 2016, SPLASH 2018, PLDI 2019, and SPLASH 2021.
  - Co-organizer of PurPL weekly seminar (Fall 2017 - Spring 2021) and volunteer for PurPL Fest 2019.

- **Reviewing**

  - Member of Program Committee (PC) for CGO 2025, PPoPP 2025, and PLDI 2025
  - Member of Program Committee (PC) for PLDI 2024 Student Research Competition and CC 2024.
  - Member of External Review Committee (ERC) for OOPSLA 2022.

- – Member of Artifact Evaluation Committee (AEC) for OOPSLA 2022.
- – Member of Artifact Evaluation Committee (AEC) for PLDI 2020.
- – Member of Program Committee (PC) for Doctoral Symposium at ECOOP 2019.
- – External collaborative reviewer for POPL 2019.

- **Mentoring**

  - – Yuze Li (PhD @VT)   Sep 2023 - Present
    Compilation Techniques for Tiered Memory Systems
  - – Srinivasan Ramachandra Sharma (MS @VT)   Jan 2024 - Present
    Compiler Transformations for Improving Branch Prediction
  - – Vidush Singhal (UG @Purdue → PhD @Purdue)   Aug 2020 - Jul 2021
    Building LLVM Compiler Backend for SoCET Processor

ACHIEVEMENTS

- **Grants**

  - – ACM Travel Grant to Attend *PLDI 2019*, *SPLASH 2018*, *ASPLOS 2017*, *PLDI 2016*, and *CGO 2015*.

- **Competitions**

  - – Placed 25th, 34th, 29th, and 45th in *IEEExtreme 7.0, 6.0, 5.0 and 4.0*, respectively.
  - – Placed 4th in *Sri Lanka Robot Competition (SLRC) 2012*.
  - – Champions of *Inter-University Statistics Quiz Competition 2010*, University of Colombo, Sri Lanka.
  - – Participated at *International Mathematics Olympiad Competition(IMO) 2009*, Bremen, Germany