Kirshanthan Sundararajah

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RESEARCH INTERESTS

- Compilers, Programming Languages and High-Performance Computing

EDUCATION

Purdue University, West Lafayette, IN. Aug 2015 - Dec 2022
Ph.D. in Electrical and Computer Engineering

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

M.S. in Electrical and Computer Engineering

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

PROFESSIONAL EXPERIENCE

- **Graduate Research Assistant** @*Purdue University* Aug 2015 - Dec 2022
  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**: Framework for melding similar control-flow graphs. `[CGO'22]`
  - **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 2020 - Dec 2020
  GPU Compiler Group
  - **Diesel Compiler**: Warp specialization and pipelining for GPU kernels.
- **Software Engineering Intern** @*Reservoir Labs (Now Qualcomm AI Research)* June 2020 - Aug 2020
  R-Stream Compiler Group
  - **ParSEC Backend**: A task-based runtime backend for *R-Stream* polyhedral compiler.
- **Research Intern** @*Microsoft Research* June 2018 - Sep 2018
  RiSE Group
  - **Parallelizing Word2Vec**: Parallelizing and scaling *Word2Vec* training to execute on many cores.

- **Associate Electronic Engineer** @*Zone24x7 Inc.* May 2012 - Oct 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

- **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 *International Conference on Supercomputing*, ICS 2022.
  🏆 **Best Paper Award** [ACM DL]
- C. Saumya, **K. Sundararajah**, and M. Kulkarni "DARM: Control-Flow Melding for SIMT Thread Divergence Reduction" in *International Conference 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 *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 *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 *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

- ECE 368 Data Structures [Primary Instructor] @*Purdue University* Summer 2021 and Summer 2022
- ECE 295 Introduction to Data Science [TA] @*Purdue University* Summer 2019 and Fall 2020
- 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 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**
  - Vidush Singhal (UG @Purdue $\rightarrow$ 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 25^{th}, 34^{th}, 29^{th}, and 45^{th} in *IEEExtreme 7.0, 6.0, 5.0 and 4.0*, respectively.
  - Placed 4^{th} 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