

Kirshanthan Sundararajah

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RESEARCH INTERESTS

- Compilers, Programming Languages and High-Performance Computing

EDUCATION

Purdue University, West Lafayette, IN.

Aug 2015 - May 2023

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**
PLCL Group

Aug 2015 - Dec 2022

- **(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**
GPU Compiler Group

Sep 2020 - Dec 2020

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

- **Software Engineering Intern @Reservoir Labs (Now Qualcomm AI Research)**
R-Stream Compiler Group

June 2020 - Aug 2020

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

- **Research Intern @Microsoft Research**
RiSE Group

June 2018 - Sep 2018

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

- **Associate Electronic Engineer @Zone24x7 Inc.**
Signs24x7 Group

May 2012 - Oct 2012

- **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

- 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

- 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 → 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 *IEEEExtreme 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

REFERENCES

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|---|---------------------------|
| • Professor Milind Kulkarni @Purdue University | milind@purdue.edu |
| • Professor Benjamin Delaware @Purdue University | bendy@purdue.edu |
| • Professor Xiaokang Qiu @Purdue University | xkqiu@purdue.edu |
| • Professor Zachary Kincaid @Princeton University | zkincaid@cs.princeton.edu |