Milinda Fernando

Contact

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Education

2021 - Ph.D., Scientific Computing, The University of Utah, UT.
- Dissertation: *"Scalable spacetime adaptivity for computational general relativity"*

2015 - B.Sc., Computer Science and Engineering, University of Moratuwa, Sri Lanka.
- Dissertation: *"Auto-tuning the Java virtual machine using OpenTuner framework"*

Work Experience

- **Aug. 2026 - present** : Assistant Professor, Department of Scientific Computing, Florida State University, Tallahassee, FL.
- Sep. 2023 - Aug. 2026 : Research Associate, Oden Institute, The University of Texas at Austin, TX.
- Jun. 2021 - Sep. 2023 : Peter O'Donnell, Jr. Postdoctoral Fellow, Oden Institute, The University of Texas at Austin, TX.

Honors and Awards

- ACM Gordon Bell Prize, 2025
- Peter O'Donnell, Jr. Postdoctoral Fellowship, 2021
- ACM-IEEE CS George Michael Memorial HPC Fellowship, 2019
- The University of Utah Graduate Research Fellowship, 2019

Research Interests

- Massively parallel large-scale computations, parallel algorithms, scientific computing, high performance computing, numerical analysis, scientific machine learning.
- Adaptive discretizations, scalable AMR, Parallel in time methods.
- Boltzmann transport equation, computational plasma physics, computational fluid dynamics, numerical relativity, relativistic Boltzmann transport equation

Submitted Papers

1. **Fernando, M.**, Almgren-Bell, J., Oliver, T., Moser, R., Varghese, P., Raja, L. and Biros, G., 2025. Boltzsim: A fast solver for the 1D-space electron Boltzmann equation with applications to radio-frequency glow discharge plasmas. arXiv preprint arXiv:2502.16555

2. **Fernando, M.**, Oliver, T., Moser, R., Varghese, P., Raja, L. and Biros, G., 2024. A batched electron-Boltzmann solver for low-temperature plasmas (submitted to Computer Physics Communications).

Publications

1. **Fernando, M.**, Bochkov, D., Almgren-Bell, J., Oliver, T., Moser, R., Varghese, P., Raja, L. and Biros, G., 2026. An efficient solver for the spatially homogeneous electron Boltzmann equation for weakly ionized collisional plasmas. Journal of Computational Physics, p.115131.

2. Henneking, S., Venkat, S., Dobrev, V., Camier, J., Kolev, T., **Fernando, M.**, Gabriel, A.A. and Ghattas, O., 2025, November. Real-time Bayesian inference at extreme scale: A digital twin for tsunami early warning applied to the Cascadia subduction zone. In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'25**)(pp. 60-71).

3. Venkat, S., **Fernando, M.**, Henneking, S. and Ghattas, O., 2025. Fast and scalable FFT-based GPU-accelerated algorithms for block-triangular Toeplitz matrices with application to linear inverse problems governed by autonomous dynamical systems. SIAM Journal on Scientific Computing, 47(5), pp.B1201-B1226.

4. Black, W.K., Neilsen, D., Hirschmann, E.W., Van Komen, D.F. and **Fernando, M.**, 2025. Nyquist-resolving gravitational waves via orbital frequency-based refinement. Physical Review D, 111(12), p.124001.

5. Ruys, W., Lee, H., You, B., Talati, S., Park, J., Almgren-Bell, J., Yan, Y., **Fernando, M.**, Biros, G., Erez, M. and Burtscher, M., 2024, May. A Deep Dive into Task-Based Parallelism in Python. In 2024 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW) (pp. 1147-1149). IEEE.

6. **Fernando, M.**, Neilsen, D., Zlochower, Y., Hirschmann, E.W. and Sundar, H., 2023. Massively parallel simulations of binary black holes with adaptive wavelet multiresolution. Physical Review D, 107(6), p.064035.

7. **Fernando, M.**, Neilsen, D., Hirschmann, E., Zlochower, Y., Sundar, H., Ghattas, O. and Biros, G., 2022, November. A GPU-accelerated AMR solver for gravitational wave propagation. In SC22: International Conference for High Performance Compu-ting, Networking, Storage and Analysis (**SC'22**) (pp. 1-15). IEEE.

8. Khanwale, M.A., Saurabh, K., **Fernando, M.**, Calo, V.M., Sundar, H., Rossmanith, J.A. and Ganapath-ysubramanian, B., 2022. A fully-coupled framework for solving Cahn-Hilliard Navier-Stokes equations: Second-order, energy-stable numerical met-hods on adaptive octree based meshes. Computer Physics Communications, 280, p.108501.

9. Xu, S., Zhu, Q., **Fernando, M.** and Sundar, H., 2022. A finite element level set method based on adaptive octree meshes for thermal free-surface flows. International Journal for Numerical Methods in Engineering, 123(22), pp.5500-5516.

10. Tran, H.D., **Fernando, M.**, Saurabh, K., Ganapathysubramanian, B., Kirby, R.M. and Sundar, H., 2022, May. A scalable adaptive-matrix spmv for heterogene-ous architectures. In 2022 IEEE International Parallel and Distributed Processing Symposium (**IPDPS'22**) (pp. 13-24). IEEE.

11. **Fernando, M.**. and Sundar, H., 2022. Scalable Local Timestepping on Octree Grids. SIAM Journal on Scientific Computing, 44(2), (**SIAM SISC**), pp.C156-C183.

12. Saurabh, K., Ishii, M., **Fernando, M.**, Gao, B., Tan, K., Hsu, M.C., Krishnamur-thy, A., Sundar, H. and Ganapathysubramanian, B., 2021, November. Scalable adaptive PDE solvers in arbitrary domains. In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'21**) (pp. 1-15)

13. Saurabh, K., Gao, B., **Fernando, M.**, Xu, S., Khanwale, M.A., Khara, B., Hsu, M.C., Krishnamurthy, A., Sundar, H. and Ganapathysubramanian, B., 2021. Industrial scale Large Eddy Simulations with adaptive octree meshes using immer-sogeometric analysis. Computers & Mathematics with Applications, 97, pp.28-44.

14. Xu, S., Gao, B., Lofquist, A., **Fernando, M.**, Hsu, M.C., Sundar, H. and Ganapath-ysubramanian, B., 2021. An octree-based immersogeometric approach for modeling inertial migration of particles in channels. Computers & Fluids, 214, p.104764.

15. Ishii, M., **Fernando, M.**, Saurabh, K., Khara, B., Ganapathysubramanian, B. and Sundar, H., 2019, November. Solving PDEs in space-time: 4D tree-based adaptivity, mesh-free and matrix-free approaches. In Proceedings of the Internatio-nal Conference for High Performance Computing, Networking, Storage and Analysis (**SC'19**) (pp. 1-61).

16. **Fernando, M**., Neilsen, D., Lim, H., Hirschmann, E. and Sundar, H., 2018. Massively Parallel Simulations of Binary Black Hole Intermediate-Mass-Ratio In-spirals,SIAM Journal on Scientific Computing, 41(2), (**SIAM SISC**), pp.C97-C138.

17. **Fernando, M.**, Neilsen, D., Hirschmann, E.W. and Sundar, H., 2019, June. A scalable framework for adaptive computational general relativity on heterogeneous clusters. In Proceedings of the ACM International Conference on Supercomputing (**ICS'19**) (pp. 1-12).

18. **Fernando, M.**, Duplyakin, D. and Sundar, H., 2017, June. Machine and applicati-on aware partitioning for adaptive mesh refinement applications. In Proceedings of the 26th International Symposium on High-Performance Parallel and Distributed Computing (**HPDPS'19**) (pp. 231-242). ACM.

19. Fernando, I.D., Jayasena, S., **Fernando, M.** and Sundar, H., 2017, August. A Scalable Hierarchical Semi-Separable Library for Heterogeneous Clusters. In 2017 46th International Conference on Parallel Processing (**ICPP'17**) (pp. 513-522). IEEE.

Service

- **Activities organized**
  - Mini-symposium on "Kinetic Equation Solvers for Plasmas", SIAM Conference on Parallel Processing for Scientific Computing (PP24), (with James Almgren-Bell, George Biros).
  - Mini-symposium on ""Digital Twins for Large-Scale Complex Systems" SIAM Conference on Computational Science and Engineering (CSE25), (organized with Omar Ghattas, Stefan Henneking, Sreeram Venkat).
  - Mini-symposium on "Digital Twins for Large-Scale Complex Systems", SIAM Conference on Parallel Processing for Scientific Computing (PP24), (organized with Omar Ghattas, Stefan Henneking, Sreeram Venkat).
- **Peer-review activities**

- Reproducibility program committee member, International Conference for High Performance Computing, Networking, Storage, and AnalysisInternational Conference for High Performance Computing, Networking, Storage, and Analysis
- IEEE International Parallel & Distributed Processing Symposium
- The International Conference for High Performance Computing, Networking, Storage, and Analysis
- Journal of Parallel and Distributed Computing
- The Journal of Supercomputing

Teaching and Mentoring Experiences

- I have worked closely with two Ph.D. students at Oden Institute,
  - To develop a particle-in-cell direct simulation Monte-Carlo (PIC-DSMC) method for solving electron Boltzmann transport equation for low-temperature plasmas.
  - Designing a parallel algorithm that exploit Block-Toeplitz structure of the operator to enable fast Hessian evaluations.
- Spring 2017, Teaching Assistant, Parallel and High Performance Computing, The University of Utah.
- Fall 2015, Teaching Assistant, Big Data Computer Systems, The University of Utah.

Conference and Seminar Presentations

- Jun. 2025 - North American Einstein Toolkit Workshop 2025, Austin, TX.
- Jun. 2024 - North American Einstein Toolkit Workshop 2024, Baton Rouge, LA.
- Apr. 2024 - 18th Copper Mountain Conference On Iterative and Multigrid Methods, CO.
- Mar. 2024 - SIAM Conference on Parallel Processing for Scientific Computing (PP24), Baltimore, MD.
- Dec. 2023 - Numerical Relativity group seminar, Rochester Institute of Technology (RIT) (Virtual).
- Dec. 2022 - Babuška Forum, Oden Institute, Austin, TX.
- Nov. 2022 - The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'22), Dallas, TX.
- Jun. 2019 - ACM International Conference on Supercomputing, Phoenix, AZ.
- Jun. 2018 - 2018 North American Einstein Toolkit Workshop, Atlanta, GA.
- Jun. 2017 - ACM Symposium on High-Performance Parallel and Distributed Computing (HPDC), Washington D.C.