

# Advancements in Parallel Computing and Benchmarking Techniques.

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December 19, 2024


# Overview of Workshop Initiative

- ▶ Organized workshops and minisymposia for FFT developers and users over 8 years.
- ▶ Gathered FFT experts to discuss challenges, best practices, and advancements.

# Data Repository at [fft.report](http://fft.report)

- ▶ All workshop presentation materials and discussions stored at [fft.report](http://fft.report).
- ▶ Repository contains valuable insights, benchmarking results, and optimization strategies.

# Publication 1

-  Rogowski, M., Aseeri, S. A., Keyes, D. E., & Dalcin, L. (2022). MPI4py.futures: MPI-based asynchronous task execution for Python. *IEEE Transactions on Parallel and Distributed Systems*, 1-12.
- ▶ Introduction of MPI4py.futures, a Python package for MPI-based asynchronous task execution.
  - ▶ Performance comparison with Dask, another Python parallel computing package.

## Publication 2



Leu, B., Aseeri, S., & Muite, B. (2021, January). A Comparison of Parallel Profiling Tools for Programs utilizing the FFT. In Proceedings of the IXPUG'21 Workshop at HPCAsia'21.

- ▶ Comparison of parallel profiling tools for programs using the Fast Fourier Transform (FFT).
- ▶ Presented at the IXPUG'21 Workshop at HPCAsia'21.

## Publication 3



Aseeri, S., Chatterjee, A., Verma, M., & Keyes, D. (2021). A scheduling policy to improve 10% of communication time in parallel FFT. In Proceedings of CUG 2020. Concurrency and Computation: Practice and Experience (CCPE) (to appear).

- ▶ Proposal of a scheduling policy to improve communication time in parallel Fast Fourier Transform (FFT) computations.
- ▶ Part of the Proceedings of CUG 2020 and will be published in Concurrency and Computation: Practice and Experience (CCPE).


## Publication 4



Muite, B. K., & Aseeri, S. (2020). Benchmarking solvers for the one-dimensional cubic nonlinear Klein Gordon equation on a single core. In W. Gao, J. Zhan, G. Fox, X. Lu, & D. Stanzione (Eds.), *Bench 2019: Benchmarking, Measuring, and Optimizing* (pp. 172-184). Springer.

- ▶ Focus on benchmarking solvers for the one-dimensional cubic nonlinear Klein Gordon equation on a single core.
- ▶ Part of the book "Bench 2019: Benchmarking, Measuring, and Optimizing" edited by W. Gao, J. Zhan, G. Fox, X. Lu, & D. Stanzione.

## Publication 5

-  Aseeri, S., & Muite, B. K. (2020). Benchmarking in the datacenter (BID) 2020: workshop summary. In Proceedings of the Workshop on Benchmarking in the Datacenter (BID '20) (Article 1). ACM.
- ▶ Summary of the Benchmarking in the Datacenter (BID) 2020 workshop.
  - ▶ Part of the Proceedings of the Workshop on Benchmarking in the Datacenter (BID '20).



## Publication 6



Aseeri, S., Muite, B. K., & Takahashi, D. (2019). Reproducibility in Benchmarking Parallel Fast Fourier Transform based Applications. In Companion of the 2019 ACM/SPEC International Conference on Performance Engineering - ICPE'19 (pp. 5-8). ACM.

- ▶ Discussion on the importance of reproducibility in benchmarking parallel Fast Fourier Transform (FFT) based applications.
- ▶ Presented at the Companion of the 2019 ACM/SPEC International Conference on Performance Engineering - ICPE'19.

# Publication 7



Aseeri, S., et al. (2015, April). Solving the Klein-Gordon equation using Fourier spectral methods: A benchmark test for computer performance. In Proceedings of the 23rd High Performance Computing Symposium (HPC 2015) (pp. 1-8). ACM.

- ▶ Presentation of a benchmark test for computer performance in solving the Klein-Gordon equation using Fourier spectral methods.
- ▶ Presented at the 23rd High Performance Computing Symposium (HPC 2015).

# Workshop Announcement

- ▶ Workshop: Benchmarking in the Data Center: Expanding to the Cloud
- ▶ Location: York University, Toronto, Canada, UK (co-located with ICPE 2025)
- ▶ Dates: May 5-9, 2025
- ▶ Organizers: Awais Khan ( Oak Ridge National Laboratory, USA), Kaushik Velusamy ( Argonne National Laboratory, USA)
- ▶ Brief Description: Explore evaluating HPC benefits for businesses and benchmarking performance in cloud environments.
- ▶ This workshop is held in conjunction with ICPE 2025: the 16th ACM/SPEC International Conference on Performance Engineering 2025.