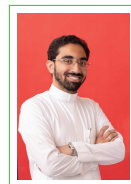# MOHAMMED ALFARHAN

Postdoctoral Research Associate, Innovative Computing Laboratory
The University of Tennessee, Knoxville

1122 Volunteer Blvd
Knoxville, TN 37996
☏ +966 (0) 556168331
✉ farhan@icl.utk.edu
🖥 farhanma.github.io
⌨ github.com/farhanma

Education

2014-2019	**PhD, Computer Science**, *King Abdullah University of Science and Technology*, Thuwal, Saudi Arabia. Dissertation: Unstructured Computations on Emerging Architectures. Advisor: David E. Keyes.
2012-2013	**MSc, Computer Science**, *King Abdullah University of Science and Technology*, Thuwal, Saudi Arabia.
2007-2012	**BSc, Computer Science**, *King Faisal University*, Hofuf, Saudi Arabia.

Experience

Research

2019-Present	**Postdoctoral Research Associate**, *The University of Tennessee, Knoxville*, Tennessee, United States. Research on developing numerical software libraries for solving linear algebra problems at scale. PI: Jack Dongarra. ○ *SLATE: Software for Linear Algebra Targeting Exascale*. Co-PI: Mark Gates and Jakub Kurzak. ○ *MAGMA: Matrix Algebra on GPU and Multicore Architectures*. Co-PI: Stanimire Tomov.
2013-2019	**Graduate Research Assistant**, *King Abdullah University of Science and Technology*, Thuwal, Saudi Arabia. Developed performance-centric algorithms for high performance computing architectures. PI: David E. Keyes.
2012-2013	**Directed Research**, *King Abdullah University of Science and Technology*, Thuwal, Saudi Arabia. Developed a dynamic programming combinatorial algorithm for multi-pruning of decision trees. PI: Mikhail Moshkov.

Industry

2017-2019	**Co-founder and Software Consultant**, *RoboCrop Systems*, Thuwal, Saudi Arabia. Worked as a robotics software engineer and full stack developer for a robotics solutions startup.
2012	**Software Engineer**, *Saudi Electricity Company*, Riyadh, Saudi Arabia. Developed distributed systems to monitor and detect anomalies in the reading meters.
Summer 2011	**Software Engineer Intern**, *Saudi Aramco*, Dhahran, Saudi Arabia. Developed a distributed key-value store system to monitor IT incidents and infrastructure change requests.
Summer 2010	**Software Engineer Intern**, *Saudi Aramco*, Dhahran, Saudi Arabia. Developed a database system to collect and log reports on IT problems for further processing with ease.

Teaching

2014-2018	**Teaching Assistant**, *King Abdullah University of Science and Technology*, Thuwal, Saudi Arabia.
	Worked as a TA for High Performance Computing (AMCS 312) course. Instructor: David E. Keyes.
	○ KAUST CEMSE Division: Fall 2014, Fall 2015, Fall 2016, Fall 2017, Fall 2018.
	○ Saudi Aramco: Fall 2018.
	○ Blue Waters Online Courses: Fall 2016 (Introduction to High Performance Computing).
	○ High Perforamce Computing Short Courses at KAUST:
	  – Summer 2016 (KAUST Visualization and Supercomputing Summer School).
	  – Summer 2015 (KAUST Gifted Student Program).
	  – Summer 2014 (KAUST Saudi Research Science Institute).

Research

Preprints and Working Papers

[1] **Mohammed A. Al Farhan**. *Demystifying the Parallel and Distributed Dense Linear Algebra Algorithms for High Perforamce Computing*. To be submitted, CSUR 2021.

[2] **Mohammed A. Al Farhan**, Hakan Bagci, and David E. Keyes. *ExaBEM: Exascale Boundary Element Method Solver for Acoustic Simulation*. To be submitted, SC 2021.

[3] **Mohammed A. Al Farhan** and David E. Keyes. *GPU-Optimized Unstructured Computations*. To be submitted, TPDS 2021.
https://ecrc.github.io/kfun3d/.

[4] **Mohammed A. Al Farhan**, Ali Charara, Mark Gates, Asim YarKhan, Dalal Sukkari, Jakub Kurzak, and Jack Dongarra. *Object-Oriented Framework for Scalable Dense Linear Solvers Targeting Accelerator-Driven Supercomputing*. To be submitted, TOMS 2020.

[5] **Mohammed A. Al Farhan**, Ali Charara, Mark Gates, Asim YarKhan, Dalal Sukkari, Jakub Kurzak, and Jack Dongarra. *Dense Linear Algebra Solvers at Scale*. To be submitted, SC 2020.

Conference and Journal Articles

[6] **Mohammed A. Al Farhan**, Ahmad Abdelfattah, Stanimire Tomov, Mark Gates, Dalal Sukkari, Azzam Haidar, Robert Rosenberg, and Jack Dongarra. *MAGMA Templates for Scalable Linear Algebra on Emerging Architectures*. The International Journal of High Performance Computing Applications, 2019. (Under review.)

[7] Mustafa Abduljabbar, **Mohammed A. Al Farhan**, Noha Al-Harthi, Rui Chen, Rio Yokota, Hakan Bagci, and David E. Keyes. *Extreme Scale FMM-accelerated Boundary Integral Equation Solver for Wave Scattering*. SIAM Journal on Scientific Computing (SISC), 2019.
https://ecrc.github.io/bemfmm/.

[8] **Mohammed A. Al Farhan** and David E. Keyes. *Optimizations of Unstructured Aerodynamics Computations for Many-core Architectures*. IEEE Transactions on Parallel and Distributed Systems (TPDS), 2018.

[9] Mustafa Abduljabbar, **Mohammed A. Al Farhan**, Rio Yokota, and David E. Keyes. *Performance Evaluation of Computation and Communication Kernels of the Fast Multipol Method on Intel Manycore Architecture*. International European Conference on Parallel and Distributed Computing (Euro-Par), 2017.

[10] **Mohammed A. Al Farhan**, Dinesh K. Kaushik, and David E. Keyes. *Unstructured Computational Aerodynamics on Many Integrated Core Architecture*. Elsevier Parallel Computing Journal (PARCO), 2016.

[11] Hassan AbouEisha, **Mohammed A. Al Farhan**, Igor Chikalov, and Mikhail Moshkov. *An Algorithm for Reduct Cardinality Minimization*. IEEE International Conference on Granular Computing (GrC), 2013.
https://farhanma.github.io/MinReduct/.

Services

Reviwer   The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC) 2015, International European Conference on Parallel and Distributed Computing (Euro-Par) 2016, Symposium on Principles and Practice of Parallel Programming (PPoPP) 2016 [Artifact Evaluator], IEEE Cluster 2016, PLOS One 2018, International Journal of High Performance Computing Applications (IJHPCA) 2018, IEEE International Parallel & Distributed Processing Symposium (IPDSPS) 2019, ACM Transactions on Parallel Computing (TOPC) 2019, Elsevier Parallel Computing (PARCO) 2019.

Member   KAUST IEEE student chapter (2012-2013), KAUST graduate council (2012-2014), KAUST ACM/SIAM student chapter (2012-2019), and KAUST code clinic (2014-2019).

Co-organizer   Python programming tutorials (2013-2015).

Talks

[1] **Unstructured Computations on Emerging Architectures**.
- SIAM Conference on Computational Science and Engineering (CSE), 2019, Spokane, Washington.

[2] **BEMFMM: An Extreme Scale FMM-Accelerated BIE Solver for Wave Scattering**.
- SIAM Conference on Computational Science and Engineering (CSE), 2019, Spokane, Washington.
- Intel eXtreme Computing User Group (IXPUG) Meeting, 2018, KAUST, Thuwal.
- SIAM Conference on Parallel Processing for Scientific Computing (PP), 2018, Tokyo, Japan.

[3] **Optimizations of Unstructured Aerodynamics Computations for Intel Knights Landing Architecture**.
- Intel eXtreme Computing User Group (IXPUG) Meeting, 2018, KAUST, Thuwal.
- SIAM Conference on Parallel Processing for Scientific Computing (PP), 2018, Tokyo, Japan.
- Intel HPC Developer Conference (DevCon), 2017, Denver, Colorado.
- Fully Predictive Complex Computational Fluid Dynamics Workshop, 2017, KAUST, Thuwal.
- High Performance Computing Saudi Arabia Conference (HPC Saudi), 2017, KAUST, Thuwal.
  - Best Poster Award.
- SIAM Conference on Computational Science and Engineering (CSE), 2017, Atlanta, Georgia.
- Scalable Hierarchical Algorithms for eXtreme Computing Workshop (SHAXC), 2017, KAUST, Thuwal.

[4] **Performance Evaluation of Fast Multipole Method on Intel Manycore Architecture**.
- International European Conference on Parallel and Distributed Computing (Euro-Par), 2017, Galicia, Spain.
- HPC in Asia Poster Competition, International Supercomputing Conference (ISC), 2017, Frankfurt, Germany.

[5] **Implicit Unstructured Computational Aerodynamics on Many-Integrated Core Architecture**.
- International Conference on Parallel Computational Fluid Dynamics, 2014, Trondheim, Norway.
- Scalable Hierarchical Algorithms for eXtreme Computing Workshop (SHAXC), 2014, KAUST, Thuwal.

Programming

Languages   C/C++, Python, Java, Unix Shell, MATLAB, LaTeX.

Models   Intrinsics, MPI, OpenMP, pThreads, CUDA, TBB, HIP, ROCm, SYCL, OpenCL, Cilk.

Tools   Make, CMake, Autotools, perf tools, Valgrind, GDB, Git, Tracing and profiling for performance optimization.