

Mohammed Al Farhan

King Abdullah Petroleum Studies and Research Center
Airport Road
Riyadh 11672, Saudi Arabia

Phone: +966 (0) 55-616-8331
Email: mohammed.farhan@kapsarc.org
Homepage: farhanma.github.io

Education

King Abdullah University of Science and Technology, PhD in Computer Science, 2014 — 2019
Dissertation: Unstructured Computations on Emerging Architectures
Committee: David E. Keyes, Mikhail Moshkov, Hakan Bagci, Markus Hadwiger, and Edmond Chow

King Abdullah University of Science and Technology, MSc in Computer Science, 2012 — 2013

King Faisal University, BSc in Computer Science, 2007 — 2012

Experience

King Abdullah Petroleum Studies and Research Center, Senior Data Engineer, 2022 —
Develop production-ready data analytics solutions for energy, economy, and climate models

King Abdullah University of Science and Technology, Postdoctoral Researcher, 2020 — 2022
Research on scalable algorithms exploiting data sparsity (with David E. Keyes)

University of Tennessee, Knoxville, Postdoctoral Researcher, 2019 — 2021
Research on distributed, GPU-accelerated dense linear algebra (with Jack Dongarra)

RoboCrop Startup Initiative, Cofounder, 2017 — 2019
Developed farming solutions for robot control and automation

King Abdullah University of Science and Technology, Graduate Researcher, 2012 — 2019
Research on unstructured grids PDEs and fast multipole method (with David E. Keyes)

King Abdullah University of Science and Technology, Directed Research, Summer 2013
Research on combinatorial machine learning (with Mikhail Moshkov)

Saudi Electricity Company, Software Engineer, 2012
Developed a smart system to detect anomalies in the reading meters

Saudi Aramco, Software Engineer Intern, Summer 2011
Developed a distributed key-value store system to track IT change requests

Saudi Aramco, Software Engineer Intern, Summer 2010
Developed a database management system to log IT reported incidents

Publication

Journal Articles

1. **M. Al Farhan**, H. Ltaief, K. Akbudak, R. Alomairy, Y. Hong, H. Ibeid, L. Gattineau, D. Keyes. HiCMA: Design of a Modern Distributed and GPU-Accelerated Tile Low-Rank Linear Algebra Framework, *ACM TOMS* 2022
2. **M. Al Farhan**, A. Abdelfattah, S. Tomov, M. Gates, D. Sukkari, A. Haidar, R. Rosenberg, and J. Dongarra. MAGMA Templates for Scalable Linear Algebra on Emerging Architectures, *IJHPCA* 2020

3. M. Abduljabbar, **M. Al Farhan**, N. Al-Harthi, R. Chen, R. Yokota, H. Bagci, and D. Keyes. Extreme Scale FMM-Accelerated Boundary Integral Equation Solver for Wave Scattering, *SISC 2019*
4. **M. Al Farhan** and D. Keyes. Optimizations of Unstructured Aerodynamics Computations for Many-core Architectures, *IEEE TPDS 2018*
5. **M. Al Farhan**, D. Kaushik, and D. Keyes. Unstructured Computational Aerodynamics on Many Integrated Core Architecture, *Parallel Computing 2016*

Conference Papers

6. M. Abduljabbar, **M. Al Farhan**, R. Yokota, and D. Keyes. Performance Evaluation of Computation and Communication Kernels of the Fast Multipole Method on Intel Manycore Architecture, *Euro-Par 2017*
7. H. AbouEisha, **M. Al Farhan**, I. Chikalov, and M. Moshkov. An Algorithm for Reduct Cardinality Minimization, *IEEE GrC 2013*

Technical Reports

8. A. Abdelfattah, **M. Al Farhan**, C. Brown, M. Gates, D. Sukkari, A. YarKhan, and J. Dongarra. SLATE port to AMD and Intel platforms, SWAN No. 16 (ICL-UT-21-01), *ICL, UTK*, Apr 2021
9. A. YarKhan, **M. Al Farhan**, D. Sukkari, M. Gates, and J. Dongarra. SLATE Performance Report: Updates to Cholesky and LU Factorizations (ICL-UT-20-14), *ICL, UTK*, Oct 2020
10. A. Charara, M. Gates, J. Kurzak, A. YarKhan, **M. Al Farhan**, D. Sukkari, and J. Dongarra. SLATE Developers' Guide, SWAN No. 11 (ICL-UT-19-02), *ICL, UTK*, Aug 2020
11. M. Gates, A. Charara, J. Kurzak, A. YarKhan, **M. Al Farhan**, D. Sukkari, and J. Dongarra. SLATE Users' Guide, SWAN No. 10 (ICL-UT-19-01), *ICL, UTK*, Jul 2020
12. M. Gates, **M. Al Farhan**, A. Charara, J. Kurzak, D. Sukkari, A. YarKhan, and J. Dongarra. SLATE Working Note 13: Implementing Singular Value and Symmetric/Hermitian Eigenvalue Solvers (ICL-UT-19-07), *ICL, UTK*, Apr 2020
13. M. Gates, A. Charara, A. YarKhan, D. Sukkari, **M. Al Farhan**, and J. Dongarra. SLATE Working Note 14 Performance Tuning SLATE (ICL-UT-20-01), *ICL, UTK*, Jan 2020

Programming Skills

Languages: C/C++, Python, Java, Go, POSIX Shell, Perl, MATLAB, SQL, \LaTeX

Technologies: MPI, OpenMP, CUDA, Git, POSIX Threads, ROCm/HIP, SYCL, PostgreSQL, Redis

DevOps: Make, CMake, Autotools, Docker, Airflow, Jenkins, Sphinx, Doxygen

Teaching Assistantship

AMCS 312 High Performance Computing course (with David E. Keyes)

Fall 2013, Fall 2014, Fall 2015, Fall 2016, Fall 2017, Fall 2018, Fall 2019 (KAUST)

Fall 2016 (Blue Waters online courses, funded by US NSF at UIUC)

Fall 2018 (Saudi Aramco EXPEC Advanced Research Center)

Oral/Poster Presentations

HiCMA: Hierarchical Computations on Manycore Architectures

oneAPI Developer Summit at SC 2021, St. Louis, MO

Intel IXPUG Annual Conference 2021, Austin, TX

Tile Low-Rank Matrix-Vector Multiplication for Scientific Applications

oneAPI Developer Summit at SC 2021, St. Louis, MO

Intel IXPUG Annual Conference 2021, Austin, TX
 SLATE: Software for Linear Algebra Targeting Exascale
 ECP Annual Meeting 2020, Houston, TX
 Unstructured Computations on Emerging Architectures
 SIAM CSE 2019, Spokane, Washington
 BEMFMM: An Extreme Scale FMM-Accelerated BIE Solver for Wave Scattering
 SIAM CSE 2019, Spokane, Washington
 Intel IXPUG 2018, KAUST
 SIAM PP 2018, Tokyo, Japan
 Optimizations of Unstructured Aerodynamics Computations for Intel KNL Hardware
 Intel IXPUG 2018, KAUST
 SIAM PP 2018, Tokyo, Japan
 Intel HPC Developer Conference 2017, Denver, Colorado
 PCCFD Workshop 2017, KAUST
 HPC Saudi Conference 2017, KAUST [best poster award]
 SIAM CSE 2017, Atlanta, Georgia
 SHAXC-3 Workshop 2017, KAUST
 Performance Evaluation of Fast Multipole Method on Intel Manycore Architecture
 Euro-Par 2017, Santiago de Compostela, Spain
 ISC 2017, Frankfurt, Germany
 Implicit Unstructured Computational Aerodynamics on MIC Architecture
 ParCFD 2014, Trondheim, Norway
 SHAXC-2 Workshop 2014, KAUST

Service and Outreach

Reviewer: ACM/IEEE SC 2015 and 2021, ACM PPOPP 2016, Euro-Par 2016 and 2021, IEEE Cluster 2016, 2021, and 2022, PLOS One 2018, IJHPCA 2018, IEEE IPDSPS 2019, ACM TOPC 2019, Parallel Computing 2019 and 2020, ACM PASC 2020, ICCS 2021

Artifact Evaluator: ACM PPOPP 2016, ACM/IEEE SC 2021

Vice president: KAUST IEEE Student Chapter (2012 — 2013), KAUST ACM Student Chapter (2012 — 2015), and KAUST SIAM Student Chapter (2012 — 2017)

Treasurer: KAUST SIAM/ACM Student Chapter (2017 — 2019)

Member: KAUST Graduate Council: Academic and Research Committee (2012 — 2013) and University Relation Committee (2013 — 2014)

Co-organizer: KAUST Code Clinic (2014 — 2019), Python Programming Camp (Spring 2014, Spring 2015, and Summer 2022), and Scientific Software Engineering Lecture Series: Fundamentals of High Performance Computing (Summer 2014 and Summer 2015), PETSc: Portable, Extensible Toolkit for Scientific Computation (Summer 2016), and Version Control using Git (Fall 2017, Fall 2020, and Summer 2022), and Data Version Control using Dolt (Summer 2022)