MOHAMMED ALFARHAN

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Education

King Abdullah University of Science and Technology 2014-2019
PhD, Computer Science
Topic: Unstructured Computations on Emerging Architectures
Advisor: David E. Keyes

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

King Faisal University 2007-2012
BSc, Computer Science

Research Experience

Postdoctoral Researcher, The University of Tennessee, Knoxville 2019-Present
Developing software libraries for solving linear algebra problems at scale [with Jack Dongarra]
- SLATE: Software for Linear Algebra Targeting Exascale
- MAGMA: Matrix Algebra on GPU and Multicore Architectures

PhD Student, King Abdullah University of Science and Technology 2013-2019
Developed performance-centric algorithms for high performance computing [with David E. Keyes]

Directed Research, King Abdullah University of Science and Technology 2012-2013
Developed combinatorial algorithms for multi-pruning of decision trees [with Mikhail Moshkov]

Industrial Experience

Co-founder and Software Consultant, RoboCrop Systems 2017-2019
Worked as a robotics software engineer and full stack developer for a robotics solutions startup

Software Engineer, Saudi Electricity Company 2012
Developed distributed systems to monitor and detect anomalies in the reading meters

Software Engineer Intern, Saudi Aramco Summer 2011
Developed a distributed key-value store system to monitor IT incidents and changes requests

Software Engineer Intern, Saudi Aramco Summer 2010
Developed a database system to store reports on IT problems for further processing with ease

Teaching Experience

Teaching Assistant, King Abdullah University of Science and Technology 2014-2018
Worked as a TA for High Performance Computing (AMCS 312) course [with David E. Keyes]
- KAUST: 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)

Publications

Journal Articles
- **Mohammed A. Al Farhan**, Ali Charara, Mark Gates, Asim YarKhan, Dalal Sukkari, Jakub Kurzak, and Jack Dongarra. *GPU-Optimized Banded Dense Matrix Computations at Scale*. Under review, SISC 2020
- Ali Charara, **Mohammed A. Al Farhan**, Mark Gates, Asim YarKhan, Dalal Sukkari, Jakub Kurzak, and Jack Dongarra. *Object-Oriented Framework for Scaling Up Dense Matrix Computations on Distributed Heterogeneous Hardware*. Under review, IEEE TPDS 2020
- **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*, IJHPCA 2020
- 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*, SISC 2019 [`Code: https://ecrc.github.io/bemfmm/`]
- **Mohammed A. Al Farhan** and David E. Keyes. *Optimizations of Unstructured Aerodynamics Computations for Many-core Architectures*, IEEE TPDS 2018 [`Code: https://ecrc.github.io/kfun3d/`]
- **Mohammed A. Al Farhan**, Dinesh K. Kaushik, and David E. Keyes. *Unstructured Computational Aerodynamics on Many Integrated Core Architecture*, Parallel Computing 2016

Conference Papers

- **Mohammed A. Al Farhan**, Mustafa Abduljabbar, Hakan Bagci, and David E. Keyes. *ExaBEM: Exascale Boundary Element Method Solver for Acoustic Simulation*. To be submitted, ACM PASC 2021
- **Mohammed A. Al Farhan** and David E. Keyes. *GPU-Optimized Unstructured Computations*. To be submitted, ACM PPoPP 2021
- Mustafa Abduljabbar, **Mohammed A. Al Farhan**, Rio Yokota, and David E. Keyes. *Performance Evaluation of Computation and Communication Kernels of the Fast Multipole Method on Intel Manycore Architecture*, Euro-Par 2017
- Hassan AbouEisha, **Mohammed A. Al Farhan**, Igor Chikalov, and Mikhail Moshkov. *An Algorithm for Reduct Cardinality Minimization*, IEEE GrC 2013 [`Code: https://farhanma.github.io/MinReduct/`]

Technical Reports

- Mark Gates, **Mohammed A. Al Farhan**, Dalal Sukkari, Asim YarKhan, and Jack Dongarra. *SLATE Working Note 15: Implementing Generalized Hermitian Eigenvalue Solvers*, Innovative Computing Laboratory Technical Report ICL-UT-20-02, 2020
- Mark Gates, Ali Charara, Asim YarKhan, Dalal Sukkari, **Mohammed A. Al Farhan**, and Jack Dongarra. *SLATE Working Note 14: Performance Tuning SLATE*, Innovative Computing Laboratory Technical Report ICL-UT-20-01, 2020
- Ali Charara, Mark Gates, Jakub Kurzak, Asim YarKhan, **Mohammed A. Al Farhan**, and Jack Dongarra. *SLATE Working Note 11: SLATE Developers' Guide*, Innovative Computing Laboratory Technical Report ICL-UT-19-02, 2020

Oral/Poster Presentations

- 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

- **Program Committee:** ICCS 2020
- **Reviewer:** ACM/IEEE SC 2015, Euro-Par 2016, IEEE Cluster 2016, PLOS One 2018, IJHPCA 2018, IEEE IPDSPS 2019, ACM TOPC 2019, Parallel Computing 2019, and ACM PASC 2020
- **Artifact Evaluator:** ACM PPoPP 2016
- **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)
- **Lecturer:** Gave several tutorials on: Python Programming (Spring 2014 and 2015), Fundamentals of High Performance Computing (Summer 2014 and 2015), PETSc: Portable, Extensible Toolkit for Scientific Computation (Summer 2016), and Version Control using Git (Fall 2020)

Programming

- **Languages:** C/C++, Python, Java, Unix Shell, MATLAB, LaTeX
- **Models:** MPI, OpenMP, CUDA, pThreads, TBB, Intrinsics
- **Tools:** Make, CMake, Autotools, perf, Valgrind, gdb, git