Mohammed A. Al Farhan

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modafarhan.com
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Interests

High Performance Computing (HPC), Computational Fluid Dynamics (CFD), Partial Differential Equations (PDE), Unstructured grids, Irregular computations, Sparse linear algebra, Fast Multipole Method (FMM), Structured grids, Thread- and data-level parallelism, Performance engineering of software systems, Parallel and distributed systems, and Computer and system architecture

Education

King Abdullah University of Science and Technology, Saudi Arabia — Aug 2014 – May 2019
Ph.D., Computer Science. Advisor: David E. Keyes
Dissertation – Unstructured Computations on Emerging Architectures

King Abdullah University of Science and Technology, Saudi Arabia — Aug 2012 – Dec 2013
M.Sc., Computer Science.
Coursework – Parallel programming paradigms (MPI), Data analytics (artificial intelligence, data mining, and machine learning), Programming languages (Ruby, Haskell, GO (https://modafarhan.com/CS242GObyGo/), and Python), Combinatorial machine learning, High performance computing I and II (algorithms, architectures, and applications), Computing systems and concurrency (Advanced operating systems), GPU and GPGPU Programming (OpenGL and CUDA), Scientific visualization (OpenGL), and Algorithm analysis and design (https://modafarhan.com/CS260SequenceAlignment/)

King Faisal University, Saudi Arabia — Aug 2007 – Feb 2012
B.Sc., Computer Science.
Senior Project – An RFID-based Distributed System for Smart Authentication

Experience

University of Tennessee, Knoxville, US. Postdoctoral Research Associate — Jun 2019 - Present
Director: Jack Dongarra
Research on developing numerical software libraries for solving linear algebra problems at scale

RoboCrop Systems, Saudi Arabia. Co-Founder — Oct 2017 - Feb 2019
Worked (part time) as a Software Engineer for robotics, and business Analyst

Saudi Electricity Company, Saudi Arabia. Software Engineer — May 2012 - Aug 2012
Developed distributed systems to monitor and detect anomalies in the reading meters

Saudi Aramco, Saudi Arabia. Software Engineer Intern — Summer 2011
Developed a distributed key-value store system to monitor IT incidents and infrastructure change requests

Saudi Aramco, Saudi Arabia. Software Engineer Intern — Summer 2010
Developed a database system to collect and log reports on IT problems for further processing with ease

Research

1. *ExaBEMFMM: Exascale Boundary Element Method Solver for Acoustic Simulation, Accelerated by the Fast Multipole Method*
   Mohammed A. Al Farhan, Mustafa Abduljabbar, Noha Al-Harthi, Rui Chen, Rio Yokota, Hakan Bagci, and David E. Keyes
   To be submitted, SC 2020 [ACM Gordon Bell Prize]
   https://ecrc.github.io/ExaBEMFMM/
2. *KFUN3D: Unstructured Computations on Emerging Architectures*
   Mohammed A. Al Farhan and David E. Keyes
   To be submitted, TPDS 2019
   https://ecrc.github.io/KFUN3D/
3. *Extreme Scale FMM-accelerated Boundary Integral Equation Solver for Wave Scattering*
   Mustafa Abduljabbar, **Mohammed A. Al Farhan**, Noha Al-Harthi, Rui Chen, Rio Yokota, Hakan Bagci, and David E. Keyes

SIAM Journal on Scientific Computing (SISC), 2019 [In press]
`https://ecrc.github.io/BEMFMM/`

4. *Optimizations of Unstructured Aerodynamics Computations for Many-core Architectures*
Mohammed A. Al Farhan and David E. Keyes
IEEE Transactions on Parallel and Distributed Systems (TPDS), 2018
5. *Performance Evaluation of Computation and Communication Kernels of the Fast Multipole Method on Intel Manycore Architecture*
Mustafa Abduljabbar, **Mohammed A. Al Farhan**, Rio Yokota, and David E. Keyes
International European Conference on Parallel and Distributed Computing (Euro-Par), 2017
6. *Unstructured Computational Aerodynamics on Many Integrated Core Architecture*
Mohammed A. Al Farhan, Dinesh K. Kaushik, and David E. Keyes
Elsevier Parallel Computing Journal (PARCO), 2016
7. *An Algorithm for Reduct Cardinality Minimization*
Hassan AbouEisha, **Mohammed A. Al Farhan**, Igor Chikalov, and Mikhail Moshkov
IEEE International Conference on Granular Computing (GrC), 2013
`https://modafarhan.com/MinReduct/`

Services

Served as a peer reviewer for the *ACM Transactions on Parallel Computing (TOPC) 2019, PLOS One 2018, International Journal of High Performance Computing Applications (IJHPCA) 2018, IEEE Cluster 2016, and IEEE International Parallel & Distributed Processing Symposium (IPDSPS) 2019*

Teaching

AMCS 312: High Performance Computing. Teaching Assistant (TA) for David E. Keyes

- King Abdullah University of Science and Technology, Saudi Arabia
  - Fall 2014, Fall 2015, Fall 2016, Fall 2017, and Fall 2018
- Saudi Aramco, Saudi Arabia
  - Fall 2018
- Blue Waters Online Courses
  - Fall 2016 [Introduction to High Performance Computing]
- KAUST Visualization and Supercomputing Summer School, Saudi Arabia
  - Summer 2016 [Introduction to Portable, Extensible Toolkit for Scientific Computation (PETSc)]

Talks

Slides available at `https://speakerdeck.com/farhanma`

1. *Unstructured Computations on Emerging Architectures*
   (a) SIAM Conference on Computational Science and Engineering, 2019. Spokane, Washington, USA
2. *BEMFMM: An Extreme Scale FMM-Accelerated BIE Solver for Wave Scattering*
   (a) SIAM Conference on Computational Science and Engineering, 2019. Spokane, Washington, USA
   (b) Intel eXtreme Computing User Group (IXPUG) Meeting, 2018. KAUST, KSA
   (c) SIAM Conference on Parallel Processing for Scientific Computing, 2018. Tokyo, Japan
3. *Optimizations of Unstructured Aerodynamics Computations for Intel Knights Landing Architecture*
   (a) Intel eXtreme Computing User Group (IXPUG) Meeting, 2018. KAUST, KSA
   (b) SIAM Conference on Parallel Processing for Scientific Computing, 2018. Tokyo, Japan
   (c) Intel HPC Developer Conference, 2017. Denver, Colorado, USA
   (d) Fully Predictive Complex Computational Fluid Dynamics Workshop, 2017. KAUST, KSA
   (e) High Performance Computing Saudi Arabia (HPC Saudi) Conference, 2017. KAUST, KSA
   Received best poster award
   (f) SIAM Conference on Computational Science and Engineering, 2017. Atlanta, Georgia, USA
   (g) Scalable Hierarchical Algorithms for eXtreme Computing Workshop, 2017. KAUST, KSA

4. *Performance Evaluation of Fast Multipole Method on Intel Manycore Architecture*
   (a) International European Conference on Parallel and Distributed Computing (Euro-Par), 2017
   (b) HPC in Asia Poster Competition, International Supercomputing Conference (ISC), 2017
5. *Implicit Unstructured Computational Aerodynamics on Many-Integrated Core Architecture*
   (a) International Conference on Parallel Computational Fluid Dynamics, 2014. Trondheim, Norway
   (b) Scalable Hierarchical Algorithms for eXtreme Computing workshop, 2014. KAUST, KSA

Programming

LANGUAGES – C/C++, Python, Java, Shell Script, and LaTeX
MODELS – x86 Compiler Intrinsics, OpenMP, pThreads, TBB, CUDA, and MPI
TOOLS – Make, CMake, Autotools, perf tools, and Valgrind