

# Mohammed A. Al Farhan

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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	<b>King Abdullah University of Science and Technology</b> , Saudi Arabia	Aug 2014 – May 2019
	Ph.D., Computer Science. Advisor: David E. Keyes DISSERTATION – Unstructured Computations on Emerging Architectures	
	<b>King Abdullah University of Science and Technology</b> , 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 ( <a href="https://modafarhan.com/CS242GObyGo/">https://modafarhan.com/CS242GObyGo/</a> ), 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 ( <a href="https://modafarhan.com/CS260SequenceAlignment/">https://modafarhan.com/CS260SequenceAlignment/</a> )	
	<b>King Faisal University</b> , Saudi Arabia	Aug 2007 – Feb 2012
	B.Sc., Computer Science. SENIOR PROJECT – An RFID-based Distributed System for Smart Authentication	
Experience	<b>University of Tennessee</b> , Knoxville, US. Postdoctoral Research Associate	Jun 2019 - Present
	Director: Jack Dongarra Research on developing numerical software libraries for solving linear algebra problems at scale	
	<b>RoboCrop Systems</b> , Saudi Arabia. Co-Founder	Oct 2017 - Feb 2019
	Worked (part time) as a Software Engineer for robotics, and business Analyst	
	<b>Saudi Electricity Company</b> , Saudi Arabia. Software Engineer	May 2012 - Aug 2012
	Developed distributed systems to monitor and detect anomalies in the reading meters	
	<b>Saudi Aramco</b> , Saudi Arabia. Software Engineer Intern	Summer 2011
	Developed a distributed key-value store system to monitor IT incidents and infrastructure change requests	
	<b>Saudi Aramco</b> , 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	<ol style="list-style-type: none"><li><i>ExaBEM: Exascale Boundary Element Method Solver for Acoustic Simulation</i> <b>Mohammed A. Al Farhan</b>, Mustafa Abduljabbar, Noha Al-Harthi, Rui Chen, Rio Yokota, Hakan Bagci, and David E. Keyes To be submitted, SC 2020 [ACM Gordon Bell Prize] <a href="https://ecrc.github.io/ExaBEM/">https://ecrc.github.io/ExaBEM/</a></li><li><i>Optimizing Unstructured Grid Computations for Emerging Architectures</i> <b>Mohammed A. Al Farhan</b> and David E. Keyes To be submitted, TPDS 2019 <a href="https://ecrc.github.io/KFUN3D/">https://ecrc.github.io/KFUN3D/</a></li><li><i>Extreme Scale FMM-accelerated Boundary Integral Equation Solver for Wave Scattering</i> Mustafa Abduljabbar, <b>Mohammed A. Al Farhan</b>, Noha Al-Harthi, Rui Chen, Rio Yokota, Hakan Bagci, and David E. Keyes SIAM Journal on Scientific Computing (SISC), 2019 [In press] <a href="https://ecrc.github.io/BEMFMM/">https://ecrc.github.io/BEMFMM/</a></li></ol>	

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 (IPDPS) 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 L<sup>A</sup>T<sub>E</sub>X

MODELS – x86 Compiler Intrinsic, OpenMP, pThreads, TBB, CUDA, and MPI

TOOLS – Make, CMake, Autotools, perf tools, and Valgrind