

# Mohammed A. Al Farhan

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## Interests

High-Performance Computing (HPC), Computational Fluid Dynamics (CFD), Unstructured and irregular computations, Fast Multipole Method (FMM), Thread- and data-level parallelism, Vectorization and SIMDization, Performance modeling, engineering, and optimizations, Benchmarking, Many- and multi-core emerging architectures, Scientific software engineering, System Programming, Distributed systems, Parallel programming, and Message Passing Interface (MPI)

## Education

**King Abdullah University of Science and Technology**, Saudi Arabia 2014 - Present  
Ph.D., Computer Science. Advisor: Prof. David E. Keyes  
THESIS – Unstructured Computations on Emerging Architectures

**King Abdullah University of Science and Technology**, Saudi Arabia 2012 - 2013  
M.Sc., Computer Science.  
COURSEWORK – Algorithm analysis and design, Parallel programming paradigms (Message Passing Interface (MPI)), Programming languages (Ruby, Haskell, GO, and Python), Combinatorial machine learning, High-performance computing I and II (algorithms, architectures, and applications), Computing systems and concurrency (Advanced Operating Systems), Data analytics (artificial intelligence, data mining, and machine learning), and GPU and GPGPU Programming (OpenGL and CUDA)

**King Faisal University**, Saudi Arabia 2007 - 2012  
B.Sc., Computer Science.  
SENIOR PROJECT – RFID-based Smart Authentication Distributed System

## Research

- Optimizing Unstructured Computations on Emerging, Energy-austere HPC Architectures*  
**Mohammed A. Al Farhan** and David E. Keyes  
To be submitted, SPAA 2019
- 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), 2018 [under review]  
SOFTWARE RELEASE – <https://ecrc.github.io/BEMFMM/>
- 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
- 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), 2018
- Unstructured Computational Aerodynamics on Many Integrated Core Architecture*  
**Mohammed A. Al Farhan**, Dinesh K. Kaushik, and David E. Keyes  
Parallel Computing Journal (PARCO), 2016
- 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

## Experience

**RoboCrop Systems**<sup>1</sup>, Saudi Arabia. Co-founder Sep 2017 - Present  
Robotics software engineer, Full stack developer, and business development co-leader

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<sup>1</sup> Top 13 TAQADAM Startup Accelerator (<https://innovation.kaust.edu.sa/taqadam/>) finalists (2nd Cohort) – Awarded \$20,000

**Saudi Electricity Company**, Saudi Arabia. Software Engineer May 2012 - Aug 2012  
Developed a distributed system based on intelligent algorithms that monitors and detects anomalies such as malfunctions, tampers, and manipulations in the reading meters of customers

**Saudi Aramco**, Saudi Arabia. Software Engineer Intern Summer 2011  
Developed a distributed and scalable key-value store system that keeps track of all IT incidents, problems, and infrastructure change requests. Then, it updates the concerned parties on the current status of the said problems, automatically effectively reducing managerial bottlenecks

**Saudi Aramco**, Saudi Arabia. Software Engineer Intern Summer 2010  
Developed a database system that collects reports on IT problems and logs them into a unified disk-based repository where they can always be recalled for further processing with ease

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

- King Abdullah University of Science and Technology Fall 2014 - 2018
- Saudi Arabian Oil Company (Saudi Aramco) Fall 2018
- Blue Waters Online Courses (<https://bw-course.ncsa.illinois.edu/>) Fall 2016

**Talks**

1. *Optimizing Unstructured Computations on Emerging, Energy-austere HPC Architectures*  
**Mohammed A. Al Farhan** and David E. Keyes  
SIAM Conference on Computational Science and Engineering, 2019. Spokane, Washington, USA
2. *Optimizations of Unstructured Aerodynamics Computations for Intel Knights Landing Architecture*  
**Mohammed A. Al Farhan** and David E. Keyes  
Intel eXtreme Computing User Group (IXPUG), 2018. KAUST, Thuwal, KSA
3. *Optimizations of Unstructured Aerodynamics Computations for Many-core Architectures*  
**Mohammed A. Al Farhan** and David E. Keyes  
SIAM Conference on Parallel Processing for Scientific Computing, 2018. Tokyo, Japan
4. *Optimizations of Implicit Unstructured Aerodynamics Computations for Emerging HPC Architectures*  
**Mohammed A. Al Farhan** and David E. Keyes  
Intel HPC Developer Conference, 2017. Denver, Colorado, USA
5. *Implicit Unstructured Aerodynamics on Intel Knights Landing Architecture*  
**Mohammed A. Al Farhan** and David E. Keyes  
Fully Predictive Complex Computational Fluid Dynamics, 2017. KAUST, Thuwal, KSA
6. *Implicit Unstructured Aerodynamics on Emerging Multi- and Many-Core HPC Architectures<sup>2</sup>*  
**Mohammed A. Al Farhan**, Dinesh K. Kaushik, and David E. Keyes  
High Performance Computing Saudi Arabia (HPC Saudi), 2017. KAUST, Thuwal, KSA
7. *Implicit Unstructured Aerodynamics on Emerging Multi- and Many-Core HPC Architectures*  
**Mohammed A. Al Farhan**, Dinesh K. Kaushik, and David E. Keyes  
SIAM Conference on Computational Science and Engineering, 2017. Atlanta, Georgia, USA
8. *Unstructured Computational Aerodynamics on Many Integrated Core Architecture*  
**Mohammed A. Al Farhan**, Dinesh K. Kaushik, and David E. Keyes  
Scalable Hierarchical Algorithms for eXtreme Computing (SHAXC), 2017. KAUST, Thuwal, KSA
9. *Implicit Unstructured Computational Aerodynamics on Many-Integrated Core Architecture*  
**Mohammed A. Al Farhan** and David E. Keyes  
International Conference on Parallel Computational Fluid Dynamics, 2014. Trondheim, Norway
10. *Implicit Unstructured Computational Aerodynamics on Many-Integrated Core Architecture*  
**Mohammed A. Al Farhan** and David E. Keyes  
Scalable Hierarchical Algorithms for eXtreme Computing (SHAXC), 2014. KAUST, Thuwal, KSA

**Skills** PROGRAMMING LANGUAGES – C/C++, Java, Python, Shell, and JavaScript  
PROGRAMMING MODELS – Intrinsic, CUDA, MPI, OpenMP, pThreads, and TBB

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<sup>2</sup> Received Best Poster Award.