Mohammed A. Al Farhan

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Interests

High-Performance Computing (HPC), Computational Fluid Dynamics (CFD), Unstructured grids, Irregular computations, Sparse linear algebra, Fast Multipole Method (FMM), Structured grids, Scientific computing, Thread/data-level parallelism, Performance modeling, engineering, and optimizations, Emerging architectures, Parallel and distributed systems, and Message Passing Interface (MPI)

Education

King Abdullah University of Science and Technology, Saudi Arabia 2014 – 2019
Ph.D., Computer Science. Advisor: Prof. David E. Keyes
Dissertation – 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 (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), GPU and GPGPU Programming (OpenGL and CUDA), and Scientific visualization (OpenGL)

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

Research

1. *Optimizing Unstructured Computations on Emerging, Energy-austere HPC Architectures*
   Mohammed A. Al Farhan and David E. Keyes
   To be submitted, SPAA 2019
   Software Release – `https://ecrc.github.io/kFUN3D/`
2. *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/`
3. *Optimizations of Unstructured Aerodynamics Computations for Many-core Architectures*[1]
   Mohammed A. Al Farhan and David E. Keyes
   IEEE Transactions on Parallel and Distributed Systems (TPDS), 2018
4. *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
5. *Unstructured Computational Aerodynamics on Many Integrated Core Architecture*
   Mohammed A. Al Farhan, Dinesh K. Kaushik, and David E. Keyes
   Parallel Computing Journal (PARCO), 2016
6. *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

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

[1] Highlighted in IEEE TPDS home page for the October 2018 journal issue.

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, Saudi Arabia
  - Fall 2014, Fall 2015, Fall 2016, Fall 2017, and Fall 2018
- Saudi Aramco, Saudi Arabia
  - Fall 2018
- Blue Waters Online Courses (`https://bw-course.ncsa.illinois.edu/`)
  - Fall 2016 [Introduction to High Performance Computing]
- KAUST Visualization and Supercomputing Summer School, Saudi Arabia
  - Summer 2016

Talks

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

1. *Optimizing Unstructured Computations on Emerging, Energy-austere HPC 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[2]
   (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, and Shell Script
Models – x86 Compiler Intrinsics, OpenMP, pThreads, TBB, CUDA, and MPI
Tools – Make, CMake, Autotools, perf tools, and Valgrind

[2] Received Best Poster Award