

# Gustavo Chávez

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COMPUTER SCIENCE PH.D.

SCALABLE SOLVERS GROUP, LAWRENCE BERKELEY NATIONAL LABORATORY

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## Research Interests

Extreme-scale simulations.

**Keywords:** Computational Science & Engineering, High-Performance Computing, Numerical linear algebra, Hierarchical matrices, Parallel computing, Performance optimization, Distributed systems, Heterogeneous architectures, Partial Differential Equations, Sparse direct methods, Preconditioning.

## Currently

[Lawrence Berkeley National Laboratory](#)

BERKELEY CA, USA

Postdoctoral researcher - HIGH-PERFORMANCE COMPUTING

JULY 2017

funded by the Department of Energy **Exascale Computing Project**

## Education

[King Abdullah University of Science and Technology](#)

THUWAL, SAUDI ARABIA

Ph.D. - COMPUTATIONAL SCIENCE & ENGINEERING

JULY 2017

THESIS: **Parallel and robust fast direct solvers and preconditioners**

ADVISOR: Professor David Keyes

Ph.D. candidate - SCIENTIFIC VISUALIZATION

**Academic Excellence Award for Outstanding Research**

THESIS: Cloud-based visualization of large-scale scientific data

ADVISOR: Professor Alyn Rockwood

[King Abdullah University of Science and Technology](#)

THUWAL, SAUDI ARABIA

M.Sc. - APPLIED MATHEMATICS

DEC 2010

**Provost Award and Dean's Award for Academic Excellence**

[Universidad Tecnológica de México](#)

MÉXICO CITY, MÉXICO

B.Eng. - COMPUTATIONAL SYSTEMS

DEC 2008

**Summa Cum Laude**

## Internships

[Saudi Arabian Oil Company](#)

DHAHRAN, SAUDI ARABIA

SOFTWARE DEVELOPMENT AT THE SIMULATION SYSTEMS DIVISION SUMMER 2013

- Big data compression of hydrocarbon reservoir simulation grids

[University of Oxford](#)

OXFORD, UNITED KINGDOM

DIRECTED-RESEARCH WITH PROF. COLIN B. MACDONALD

SUMMER 2010

- Numerical solution of partial differential equations on surfaces

## Professional Experience

[HSBC Bank plc](#)

MÉXICO CITY, MÉXICO

SPECIALIST GRADUATE PROGRAM

2009

- Software analyst in the department of information security
- Project management in the department of software quality assurance

[L'Oréal S.A.](#)

MÉXICO CITY, MÉXICO

TECHNICAL ANALYST

2007-2008

- Software analyst for the ORACLE e-commerce systems
- Software analyst of enterprise system SAP

- Publications**
- G. Chávez**, G. Turkiyyah, S. Zampini, D. Keyes “[Parallel accelerated cyclic reduction preconditioner for three-dimensional elliptic PDEs with variable coefficients](#)”. Elsevier Journal of Computational and Applied Mathematics (2017).
- G. Chávez**, G. Turkiyyah, S. Zampini, H. Ltaief, D. Keyes “[Accelerated Cyclic Reduction: A distributed-memory fast direct solver for structured linear systems](#)”. Elsevier Journal of Parallel Computing (2016).
- G. Chávez**, G. Turkiyyah, S. Zampini, H. Ltaief, D. Keyes “[A direct elliptic solver based on Hierarchically low-rank Schur complements](#)”. Domain Decomposition Methods in Science and Engineering XXIII (2015).
- G. Chávez**, A. Rockwood “[Marching Surfaces: Isosurface Approximation using G1 Multi-Sided Surfaces](#)”. arXiv:1502.02139 (2014).
- G. Chávez**, F. Avila, A. Rockwood “[Lightweight visualization for high-quality materials on WebGL](#)”. Web3D '13 Proceedings of the 18th International Conference on 3D Web Technology (2013).
- U.S. Patents**
- G. Chávez**, B. Harbi. “[Data compression of hydrocarbon reservoir simulation grids](#)”. (2017)
- G. Chávez**, J. Ruiz, A. Rockwood. “[Apparatus, system and method for 3D patch compression](#)”. (2012)
- Technical writing**
- [Book chapter](#), Computer Science Handbook 3rd edition CRC Press  
Chapter 36: Geometric primitives, Oct 2013.  
L. Staff, **G. Chávez**, A. Rockwood
- [Industrial Report](#), Lossy 3D compression  
Presented to: The Boeing Company, Dec 2011.  
Y. Cao, **G. Chávez**, A. Rockwood
- [Industrial Report](#). Car centers placement problem  
Presented to: Abdul Latif Jameel Co., Jan 2011.  
B. Aman, **G. Chávez**, L. Chen, A. Ismail, S. Jaimungal, K. Kulesza, A. Lock, F. Rashid, A. Vigneron
- [Industrial Report](#) Bandwidth consumption and invoicing models  
Presented to: Cisco Systems, Inc., Jul 2010  
**G. Chávez**, S. Costa, M. De-Decker, J. Low, E. Rodriguez, J. Rosado
- Conference Presentations**
- G. Chávez**, G. Turkiyyah, H. Ltaief, D. Keyes “[3D Parallel Direct Elliptic Solver Exploiting Hierarchical Low Rank Structure](#)”. SIAM Conference on Parallel Processing for Scientific Computing (SIAM PP16) April 12-15, 2016. Cordeliers Campus, Paris, France.
- G. Chávez**, G. Turkiyyah, H. Ltaief, D. Keyes “[Accelerated Cyclic Reduction: A Fast Direct Solver for Structured Linear Systems Based on Hierarchical Matrices](#)”. SIAM Conference on Computational Science & Engineering (SIAM CSE15) March 14-18, 2015. Salt Palace Convention Center, Salt Lake City, Utah, USA.
- G. Chávez**, F. Avila, A. Rockwood “[Lightweight Visualization for High-Quality Mate-](#)

[rials on WebGL](#)". 18th edition of ACM International Web3D Conference (Web3D 2013) June 20-22, 2013. Miramar Palace, San Sebastian, Spain.

## Posters

**G. Chávez**, G. Turkiyyah, H. Ltaief, D. Keyes "[Accelerated Cyclic Reduction: A distributed-memory fast direct solver for structured linear systems](#)" Scalable Hierarchical Algorithms for eXtreme Computing (SHAXC-3) Workshop. May 9-11, 2016. KAUST, Thuwal, Saudi Arabia.

**G. Chávez**, G. Turkiyyah, D. Keyes "[A direct elliptic solver based on Hierarchically low-rank Schur complements](#)". 2014 CBMS-NSF Conference: Fast Direct Solvers for Elliptic PDEs. June 23-29, 2014. Hanover, NH, USA.

**G. Chávez**, G. Turkiyyah, D. Keyes "[Hierarchical matrix techniques for the solution of elliptic equations](#)". Scalable Hierarchical Algorithms for eXtreme Computing (SHAXC-2) Workshop. May 4-6, 2014. KAUST, Thuwal, Saudi Arabia.

## Teaching Experience

[Teaching Assistant](#) Numerical Linear Algebra (KAUST AMCS 251)  
INSTRUCTOR: Professor Alyn Rockwood

[Teaching Assistant](#) Linear and Nonlinear Optimization (KAUST AMCS 212)  
INSTRUCTOR: Professor George Turkiyyah

[Teaching Assistant](#) Applied Mathematics II (KAUST AMCS 202)  
INSTRUCTOR: Professor Meriem Taous

## Programming languages

C++, Python, OpenMP, MPI.

## Professional Societies

Society for Industrial and Applied Mathematics: SIAM  
Association for Computing Machinery: ACM  
Peer reviewer for Euro-Par and IPDPS.