

Arturo Vargas

COMPUTATIONAL SCIENTIST

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Professional Experience

Lawrence Livermore National Laboratory (LLNL)

Livermore, CA

SCIENTIFIC SOFTWARE DEVELOPER

July 2017- Present

- **Scientific software developer for: RAJA**, a collection of C++ kernel abstraction layers which enable targeting CPU and GPU architectures. Code is available at <http://www.github.com/llnl/raja>.
 - Lead developer of the RAJA launch kernel abstraction for hierarchical parallelism, enabling sequential, OpenMP, CUDA, HIP, and SYCL. Launch is heavily used in finite element codes.
 - Co-led the creation and delivery of training tutorials and presentations for the RAJA user community, driving adoption beyond LLNL.
- **Scientific software developer for: MARBL**, LLNL's next-gen multi-physics application code.
 - Integrated the RAJA portability layer into MARBL's matrix-based ALE remap framework enabling kernel execution on both CPU and GPU platforms.
 - Reduced numerical diffusion and improved simulation fidelity by leading the research, development, and integration of a novel GPU-accelerated, matrix-free ALE remap framework into the MARBL production code.
 - Contributed C++ code and optimizations to the MFEM library, enabling high-order finite element methods used in the MARBL project. MFEM is available at <http://www.github.com/mfem/mfem>.
- **Applied Computer Science (ACS) meeting organizer** (2022-2025)
 - Directed technical content and managed all logistics as the lead organizer for the 2023 meeting, which convened various national labs to discuss scientific computing efforts.
 - Organizer of the high-order methods on advanced architectures working group. Responsible for inviting speakers and moderating discussion.
- **Summer student project mentor**
 - Authored and proposed various structured summer projects, spearheading the recruitment process and successfully guiding students from proof of concept to integration with production codes.
 - Evaluated student progress weekly, offering constructive feedback and tailoring instruction to individual learning styles, leading to successful completion of target goals.

Skills

- **Numerical Methods:** Finite Elements, Linear Algebra, Differential Equations
- **Computing/Software:** C/C++, CUDA, HIP, OpenCL, SYCL, OpenMP, MPI, MFEM, Matlab, Git
- **Leadership:** Participated in the **Emerging Leaders Development Program** with focus on improving communication skills and strategic decision-making abilities. Completed additional coursework focused on **improving organizational culture, team dynamics, and maximizing team performance**.

Education

Rice University

Houston, Texas

PHD. COMPUTATIONAL AND APPLIED MATHEMATICS

May 2017

- **PhD. Thesis:** Hermite methods for the simulation of wave propagation

Rice University

Houston, Texas

M.A. COMPUTATIONAL AND APPLIED MATHEMATICS

May 2015

University of California Irvine

Irvine, CA

B.S. IN APPLIED AND COMPUTATIONAL MATHEMATICS

June 2012

Select Publications

1. Vargas, A., Tomov, V.Z., Skinner, M.A., Dobrev, V., Nikl, J., Kolev, T. and Rieben, R.N., 2025. Multi-material ALE remap with interface sharpening using high-order matrix-free finite element methods. **Journal of Computational Physics**, p.114367.
2. Vargas, A., Stitt, T.M., Weiss, K., Tomov, V.Z., Camier, J.S., Kolev, T. and Rieben, R.N., 2022. Matrix-free approaches for GPU acceleration of a high-order finite element hydrodynamics application using MFEM, Umpire, and RAJA. **The International Journal of High Performance Computing Applications**, 36(4), pp.492-509.