Nathaniel Overton-Katz | Ph.D.

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Research Software Engineer

Education

Colorado State University **Fort Collins, CO**
Doctor of Philosophy, Mechanical Engineering, GPA: 3.833 *2016–2022*

Colorado State University **Fort Collins, CO**
Bachelors of Science, Mechanical Engineering, GPA: 3.506 *2012–2016*

Technical Interests

High-Performance Computing, Numerical Modeling, Computational Geometry, Algorithm Development

Ph.D Dissertation

Title: *Geometry Considerations for High-Order Finite-Volume Methods on Structured Grids with Adaptive Mesh Refinement*

Supervisors: Stephen Guzik, Xinfeng Gao

Skills and Qualifications

Vocational

- 8 years of experience working with computational frameworks and scientific software libraries including Chombo, AMReX, Overture, Deal.II, HDF5, VTK, CGNS, Eigen, Lapack, and PETSc.
- 10 years of software engineering experience with modern C++.
- 15+ years of experience using Unix/Linux operating systems, and various programming languages.
- 8 years of experience developing for high performance computing (HPC), including usage of distributed computing, multi-threading, vectorization, and GPU computing models.
- 8 years of experience presenting and published technical work.
- Extensive experience in self-directed proficiency with engineering software tools.
- Broad experience working within, and collaborating with small technical teams.

Programming Proficiency

Languages: C/C++, Python, Julia, Matlab, Fortran, Java, Lisp, Bash

Paradigms: MPI, CUDA, OpenMP, SHMEM, NVSHMEM

Dev tools: Git, Mercurial, CMake, Autotools

Engineering tools: Pointwise, Solidworks, Creo, Ansys, Paraview and Visit

Technical Experience

Lawrence Berkeley National laboratory **Berkeley, CA**
Postdoctoral Fellow *2022-present*

- Leading software architect on a novel high-order embedded boundary algorithm that scales over large compute clusters with CPU and GPUs.
- Developed numerical technique for high accuracy and adaptively refined surface representation from surface triangulation.

- Regular presentations and publications of technical work to diverse audiences.
- Compiled and performed large-scale simulations on HPC platforms and applications.
- Worked closely with different collaborators to achieve quality and cost effective numerical models of various physical systems.
- Exploration of applications for physics informed AI and machine leaning in scientific computing

CFD & Propulsion Laboratory, Colorado State University   **Fort Collins, CO**
Graduate Research Assistant   *2016-2022*

- Enabled geometric capabilities in Chord, allowing a team to explore complex turbulence and combustion in practical applications.
- Developed and implemented a general mapped multi-block method for Chord, a fourth-order finite-volume method with adaptive mesh refinement.
- Designed and implemented an approach for robust AMR in a high-order FVM.
- Trained new students in programming, algorithm development, and various environmental tools.
- Compiled and performed large-scale simulations with Chord on a variety of HPC platforms.

Lawrence Berkeley National laboratory   **Berkeley, CA**
Graduate Student Intern   *February–May 2019, May–August 2021*

- Designed and implemented a fourth-order finite-volume embedded boundary method for the unsteady Stokes equations as part of a collaborative effort.
- Worked closely on complex geometry representation under guidance from Hans Johansen.

CFD & Propulsion Laboratory, Colorado State University   **Fort Collins, CO**
Undergraduate Research Assistant   *2014-2016*

- Began graduate-level research during my undergraduate, with a research project as my senior capstone project.
- Implemented and investigated preliminary applications of data assimilation for a convection-diffusion-reaction model.

Teaching Experience

Colorado State University   **Fort Collins, CO**
Graduate Teaching Assistant   *2016–2021*

- Instructed lab sessions and prepared lectures for classes of 20+ students.
- Developed lab and homework materials, including Matlab templates and grading scripts for rapid student feedback.

Colorado State University   **Fort Collins, CO**
Instructor   *June 2018*

- Developed and taught a 40 hour, hands-on Matlab course on engineering problem solving for 15+ advanced high school students.

Hobbies

- 3D printing and modeling, Board games, Cooking, Hiking