Jeremy L Thompson

Research Software Engineer

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Education

2016–2021	**PhD**, *University of Colorado Boulder* Applied Mathematics
2012–2010	**MSc**, *University of Washington* Applied Mathematics
2005–2009	**BS**, *United States Air Force Academy* Mathematics

Experience

2021–current   **Research Software Engineer**, *University of Colorado Boulder PSAAP Center*

Research Associate
- Lead developer for low level performance portable library - github.com/CEED/libCEED
- Architect for solid mechanics library with PETSc and libCEED - gitlab.com/micromorph/Ratel
- Mentoring graduate students in software development and academic research practices

2017–2021   **Graduate Research Assistant**, *University of Colorado Boulder*

HPC Algorithms and Software Researcher
- Developing libCEED - C99 minimal dependency library with CPU/GPU performance portability; optimized AVX, CUDA, & HIP backends; C/C++, Fortran77, Rust, Julia, & Python interfaces
- Researching efficient implementations of high order finite elements for exascale hardware
- Architect/developer for extensible analysis toolkit - github.com/jeremylt/LFAToolkit.jl

2012–2016   **Assistant Professor**, *United States Air Force Academy*

Math Department Faculty
- Taught Calc I, Calc II, Calc III, Differential Equations, Engineering Mathematics, Discrete Mathematics
- Awarded Outstanding Academy Educator, Outstanding Course Director, Outstanding New Instructor

2014–2014   **Visiting Scientist**, *Lawrence Livermore National Laboratory*

Summer Visiting Faculty
- Improved wind data projections for optimizing power grid production balancing
- Implemented smoothing filters, FFT, Gaussian smoothing, and non-local means

2009–2012   **Advanced Weapon Systems Analyst**, *United States Air Force*

B-52 Testing and Analysis
- Executed testing and analysis for B-52 nuclear Air Launched Cruise Missile
- Restored USSTRATCOM confidence in USAF accuracy and reliability forecasts
- Awarded Air Combat Command Junior Military Scientist of the Year

Technical Skills

Rust, C, C++, CUDA, Fortran, Python, Julia

Make, Git, Doxygen, Sphinx, Prove, JUnit, GitHub Actions, Travis CI

Selected Publications

[1] Arash Mehraban, Jed Brown, Valeria Barra, Henry Tufo, Jeremy Thompson, and Richard Regueiro. Efficient residual and matrix-free jacobian evaluation for three-dimensional tri-quadratic hexahedral finite elements with nearly-incompressible neo-hookean hyperelasticity applied to soft materials on unstructured meshes in parallel, with PETSc and libCEED. In *Procedings of the 2020 International Mechanical Engineering Congress and Exposition*, July 2020.

[2] Jed Brown, Ahmad Abdelfattah, Valeria Barra, Natalie Beams, Jean-Sylvain Camier, Veselin Dobrev, Yohann Dudouit, Leila Ghaffari, Tzanio Kolev, David Medina, Will Pazner, Thilina Ratnayaka, Jeremy Thompson, and Stan Tomov. libceed: Fast algebra for high-order element-based discretizations. *Journal of Open Source Software*, 6(63):2945, 2021.

[3] Rachel Eaton, Kurt Herzinger, Ian Pierce, and Jeremy Thompson. Numerical semigroups and the game of sylver coinage. *The American Mathematical Monthly*, 127(8):706–715, 2020.

[4] Tzanio Kolev, Paul Fischer, Misun Min, Jack Dongarra, Jed Brown, Veselin Dobrev, Tim Warburton, Stanimire Tomov, Mark Shephard, Ahmad Abdelfattah, Valeria Barra, Natalie Beams, Jean-Sylvain Camier, Noel Chalmers, Yohann Dudouit, Ali Karakus, Ian Karlin, Stefan Kerkemeier, Yu-Hsiang Lan, and Vladimir Tomov. Efficient exascale discretizations: High-order finite element methods. *The International Journal of High Performance Computing Applications*, 06 2021.

[5] Arash Mehraban, Jeremy Thompson, Jed Brown, Richard Regueiro, Valeria Barra, and Henry Tufo. Simulating compressible and nearly-incompressible linear elasticity using an efficient parallel scalable matrix-free high-order finite element method. In *14th WCCM-ECCOMAS Congress 2020*, volume 1400, 2021.

[6] Jeremy L Thompson. An emperical evaluation of denoising techniques for streaming data. Technical Report LLNL-TR-659435, Lawrence Livermore National Laboratory, August 2014.

[7] Jeremy L. Thompson, Jed Brown, and Yunhui He. Local fourier analysis of p-multigrid for high-order finite element operators. *SIAM Journal on Scientific Computing*, 45(3):S351–S370, 2023.

[8] Jeremy L Thompson, Kurt Herzinger, and Trae Holcomb. The frobenius number of balanced numerical semigroups. *Semigroup Forum*, 94:632–649, 2017.

[9] Valeria Barra, Jed Brown, Jeremy Thompson, and Yohann Dudouit. High-performance operator evaluations with ease of use: libCEED's Python interface. In Meghann Agarwal, Chris Calloway, Dillon Niederhut, and David Shupe, editors, *Proceedings of the 19th Python in Science Conference*, pages 75–80, July 2020.