Jeremy L Thompson

Research Software Engineer

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Education

2021 **PhD**, *University of Colorado Boulder, Applied Mathematics*

2012 **MSc**, *University of Washington, Applied Mathematics*

2009 **BS**, *United States Air Force Academy, Mathematics*

Experience

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

- Architect for solid mechanics library with PETSc and libCEED - gitlab.com/micromorph/Ratel
- Lead developer for performance portable HPC library - github.com/CEED/libCEED
- Mentor graduate students; teach software development and academic research practices
- Quality focused; improve maintainability and documentation while expanding core functionality
- Research software innovation; developed matrix-free Material Point Method

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

- libCEED core developer - C99 library with CPU/GPU performance portability; optimized AVX, CUDA, & HIP backends; C/C++, Fortran77, Rust, Julia, & Python interfaces
- Architect/developer for FEM analysis toolkit - github.com/jeremylt/LFAToolkit.jl
- Research efficient implementations of high order finite elements for exascale hardware
- Develop Local Fourier Analysis toolkit for sharp convergence estimates of preconditioners for arbitrary order finite element based operators, including p-multigrid

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

- Taught Calc I/II/III, Differential Equations, Engineering Mathematics, Discrete Mathematics
- Major coordinator; ensure students in major on track, organized majors events
- Research mentor; advised students for independent research in math and operations research
- Faculty club advisor, Cadet Honor Guard and Freethinkers; mentor student leaders, coordinate club travel and budget, monitor chemical and explosive safety programs
- Multiple teaching awards: Outstanding Academy Educator, Outstanding Course Director, Outstanding New Instructor

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

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

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

- NUCWSEP analyst; conducted live tests of B-52 Air Launched Cruise Missile
- Analyzed Air Combat Command nuclear weapon testing results
- Overhauled annual accuracy and reliability forecasts; restored USSTRATCOM confidence
- Awarded Air Combat Command Junior Military Scientist of the Year

Technical Skills

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

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

Honors and Awards

2020, 2021, 2022, 2023 **Annual freeCodeCamp Top Contributor Award**, *freeCodeCamp*

2018 **Helping Hands Volunteer Award**, *Moving to End Sexual Assault*

2016 **Brigadier General Daniel W Litwhiler Award for Outstanding Course Director**, *USAFA Department of Mathematical Sciences*

2014 **Outstanding Academy Educator**, *USAFA Department of Mathematical Sciences*

2013 **Outstanding New Instructor**, *USAFA Department of Mathematical Sciences*

2011 **Junior Military Scientist of the Year**, *USAF Air Combat Command*

2010 **Honor Graduate**, *Operations Research Systems Analysis Military Application Course*

2008 **Award for Excellence in Student Exposition and Research**, *American Mathematical Society*

Selected Publications

[1] 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.

[2] 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.

[3] 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.

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

[5] 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.

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