

KYLE GERARD FELKER

Building 240, 4E19
Argonne National Laboratory
Leadership Computing Facility
9700 S. Cass Avenue
Lemont, IL 60439
+1 (630)-252-3344 :: +1 (920)-858-0419
felker@anl.gov :: kylefelk@gmail.com

EDUCATION

Princeton University

Ph.D. in Applied and Computational Mathematics September 2019
M.A. in Applied and Computational Mathematics September 2015
Doctoral thesis: *High-order finite volume methods for magnetohydrodynamics with applications in computational astrophysics* (advisor: James M. Stone)

University of Chicago

A.B. in Physics with Honors and Mathematics June 2013
Senior thesis: *The effect of turbulence on neutron transport in a direct numerical simulation of a reactor channel flow* (advisor: Robert Rosner)

WORK EXPERIENCE

Argonne National Laboratory 2019–Present
Postdoctoral Appointee Lemont, IL

- Member of the “Accelerated Deep Learning Discovery in Fusion Energy Science” project in the Aurora 2021 Early Science Program (ESP) hosted by the Leadership Computing Facility (LCF).
- Preparing and optimizing applications to run on the nation’s first exascale system.

Princeton Plasma Physics Laboratory 2016
CSGF Practicum Princeton, NJ

- Applied machine learning techniques including recurrent neural networks to predict disruptions in the Joint European Torus (JET) tokamak experiment; supervised by Dr. William Tang (Python and SQL).

Argonne National Laboratory 2011–2013
Co-Op Intern Lemont, IL

- Researched parallel algorithms for computational neutron transport for the Center for Exascale Simulation of Advanced Reactors (CESAR) under the direction of Dr. Andrew Siegel in the Mathematics and Computer Science (MCS) division.
- Designed, wrote, and deployed performance model applications on thousands of processors of IBM Blue Gene supercomputers using C/MPI.

Universidad de Chile 2010
NSF Intern Santiago, Chile

- Conducted granular mechanics simulations in the computational physics group (C).

OTHER EXPERIENCE

Teaching and Mentoring

- Mentor for certificate students in Applied and Computational Math (Princeton University). 2017–2018
- Assistant in Instruction for Numerical Algorithms for Scientific Computing (Princeton University). 2013
- Teaching Assistant for Masters Program in Computer Science (University of Chicago). 2012–2013
Courses: C Programming, Numerical Methods, High Performance Computing

Service

- Graduate College House Council Member (Princeton University). 2016–2017
- Graduate College Bar Manager (Princeton University). 2014–2016

SKILLS AND INTERESTS

Programming	C/C++, Python, FORTRAN, Perl, MATLAB, Mathematica, MPI, OpenMP, \LaTeX <i>Some experience:</i> CUDA, Pthreads, OpenACC, SQL, Haskell, Lisp
Software	Intel Advisor, VisIt, yt, HDF5
Workflow tools	Git, SVN, Jupyter, Travis CI, Jenkins, Codecov, Emacs
Languages	English and Spanish (fluent)

HONORS, AWARDS, FUNDING

Computational Sciences Graduate Fellowship (CSGF) (2014–2018) <i>National fellowship, 23 recipients</i>	Department of Energy
Argonne Training Program in Extreme-Scale Computing (ATPESC) (2017)	Argonne National Laboratory
International High Performance Computing Summer School (IHPCSS) (2014)	XSEDE
Careers in Higher Education Fellow (2012)	University of Chicago
“HPC for Undergraduates” invitee (2012)	ACM/IEEE Supercomputing
Dean’s List of Distinguished Students (all eligible quarters)	University of Chicago

REFEREED JOURNAL PUBLICATIONS

- **Felker, K.G.**, & Stone, J. M. (December 2018). A fourth-order accurate finite volume method for ideal MHD via upwind constrained transport. *Journal of Computational Physics*, 375, 1365-1400.
<https://doi.org/10.1016/j.jcp.2018.08.025>
- Siegel, A., Smith, K., **Felker, K.**, Romano, P., Forget, B., & Beckman, P. (April 2014). Improved cache performance in Monte Carlo transport calculations using energy banding. *Computer Physics Communications*, 185(4), 1195-1199. <https://doi.org/10.1016/j.cpc.2013.10.008>
- Siegel, A. R., Smith, K., Romano, P. K., Forget, B., & **Felker, K. G.** (Feb 2014). Multi-core performance studies of a Monte Carlo neutron transport code. *International Journal of High Performance Computing Applications*, 28(1), 87-96. <https://doi.org/10.1177/1094342013492179>
- **Felker, K. G.**, Siegel, A. R., & Siegel, S. F. (May 2013). Optimizing memory constrained environments in Monte Carlo nuclear reactor simulations. *International Journal of High Performance Computing Applications*, 27, 210-216. <https://doi.org/10.1177/1094342012445627>
- Siegel, A. R., Smith, K., Romano, P. K., Forget, B., & **Felker, K.** (Feb 2013). The effect of load imbalances on the performance of Monte Carlo algorithms in LWR analysis. *Journal of Computational Physics*, 235, 901-911.
<https://doi.org/10.1016/j.jcp.2012.06.012>

OTHER PUBLICATIONS

- Stone, J.M., Tomida, K., White, C.J., & **Felker, K. G.**, (2019). *The Athena++ adaptive mesh refinement framework: magnetohydrodynamic solvers*. Submitted to American Astronomical Society journals.
- **Felker, K. G.**, Siegel, A. R., Smith, K. S., Romano, P. K., & Forget, B. (2014). The energy band memory server algorithm for parallel Monte Carlo transport calculations. In D. Caruge, C. Calvin, C. M. Diop, F. Malvagi, & J.-C. Trama (Eds.), *SNA + MC 2013 - Joint International Conference on Supercomputing in Nuclear Applications + Monte Carlo*. EDP Sciences. <https://doi.org/10.1051/snmc/201404207>

PRESENTATIONS

<i>Computational efficiency of high-order finite volume methods for magnetohydrodynamics,</i> Felker, K.G.	
CSGF Annual Program Review, Arlington, VA.	07/2018
<i>Fourth-Order Accurate Ideal MHD in Athena++,</i> Felker, K.G.	
ASTRONUM 2018 Panama City Beach, FL.	06/2018

- Recurrent neural network prediction of fusion plasma disruptions,*
Felker, K.G.
 PICSciE Research Computing Day, Princeton, NJ. 10/2016
- Big data machine learning prediction of tokamak disruptions,*
 Tang, W., Kates-Harbeck, J., & **Felker, K.G.**
 Invited Special Seminar, General Atomics, San Diego, CA. 09/2016
- The energy band memory server algorithm for parallel Monte Carlo transport calculations,*
Felker, K.G., Siegel, A., Smith, K., Romano, P., & Forget, B.
 Joint International Conference on Supercomputing in Nuclear Application + Monte Carlo,
 Cité des Sciences et de l'Industrie de la Villete, Paris. 10/2013
- The effect of turbulence on neutron transport in a direct numerical simulation of a reactor channel flow,*
Felker, K.G.
 Senior physics thesis seminar, University of Chicago, Chicago, IL. 05/2013

CONFERENCE POSTERS

- Fourth-order accurate magnetohydrodynamics calculations in Athena++ via constrained transport,*
 CSGF Annual Program Review, Arlington, VA. 07/2017
- High-order finite volume methods in Athena++,*
 CSGF Annual Program Review, Arlington, VA. 07/2016
- Numerical methods for general relativistic radiative transfer,*
 CSGF Annual Program Review, Arlington, VA. 07/2015