Kathryn D. Huff

CONTACT Blue Waters Assistant Professor mobile: (281) 734-1342
INFORMATION University of Illinois, Urbana-Champaign e-mail: katyhuff@gmail.com
Nuclear, Plasma, and Radiological Engineering website: katyhuff.github.com

Affiliate Faculty, National Center for Supercomputing Applications

RESEARCH INTERESTS Advanced nuclear reactors and fuel cycles, multi-physics simulation, nuclear fuel cycle analysis, scientific computation.

PhD University of Wisconsin - Madison, Nuclear Engineering

Aug 2008 - Aug 2013

- An Integrated Used Fuel Disposition and Generic Repository Model for Fuel Cycle Analysis
- Advisor: Professor Paul P.H. Wilson

BA University of Chicago, Physics

Aug 2004 - Jun 2008

 \bullet Celestial Gain Calibrations of QUIET Telescope Polarimeters

Honors and Awards

American Nuclear Society, Young Member Excellence Award	2016
National Energy Research Scientific Computing Allocation, Senior Investigator	2015 – 2016
Data Science Fellowship, Berkeley Institute for Data Science, UC Berkeley	2014 – 2016
Nuclear Science and Security Consortium Postdoctoral Fellowship, UC Berkeley	2013 – 2016
DOE Office of Science Laboratory Graduate Appointment, Argonne National Lab	2011 - 2013
Roy G Post Foundation Nuclear Waste Management Graduate Scholarship	2011
John Randall Memorial Scholarship, American Nuclear Society FCWMD	2009
J.A McDeavitt Scholarship, University of Chicago, Chicago, IL	2007 - 2008
University Scholar Award, University of Chicago, Chicago, IL	2004 - 2008
Los Alamos Distinguished Student Performance Award, Los Alamos National Lab	2004

RESEARCH EXPERIENCE

University of Illinois at Urbana-Champaign, Urbana, IL

Assistant Professor, Nuclear Plasma and Radiological Engineering

Blue Waters Asst. Prof., National Center for Supercomputing Applications

Principal investigator, advanced reactors and fuel cycles group.

Aug 2016 – Present

Aug 2016 – Present

University of California - Berkeley, NE Dept., Berkeley, CA

Postdoctoral Scholar, Nuclear Science and Security Consortium

Data Science Fellow, Berkeley Institute for Data Science

Developing computational tools and multiphysics models for advanced reactor safety analysis.

Sep 2013 – Jul 2016

Aug 2014 – Jul 2016

Argonne National Laboratory, Argonne, IL

Jun 2011 – Aug 2013

Laboratory Graduate Research Appointee, Used Fuel Disposition Campaign Developed a used fuel disposition and generic repository computational model.

University of Wisconsin - Madison, NEEP Dept., Madison, WI Jun 2008 - Aug 2013 Graduate Research Assistant, Computational Nuclear Engineering Research Group Developed and applied Cyclus, a nuclear fuel cycle systems analysis tool.

Idaho National Laboratory, Idaho Falls, ID

Jun – Aug 2010

Graduate Research Assistant, Systems Analysis Campaign

Developed software functions and requirements for the Fuel Cycle Simulator concept.

Kavli Institute For Cosmological Physics, Chicago, IL

Jan 2005 – Jun 2008

Research Assistant, Laboratory for Astrophysics and Space Research

Programmed & machined instrumentation. Planned protocol for QUIET polarimeter calibration.

Universidad de Chile, Physics Dept., Santiago, Chile

Jun - Sep 2006

Research Assistant, Chicago-Chile Research Exchange Program

Constructed and operated a far-from-equilibrium granular materials experiment.

Los Alamos Neutron Science Center, Los Alamos, NMJun – Sep 2004Research Assistant, LANSCE-3May – Aug 2003Applied digital filtration algorithms and MCNPX models to experimental data.

Воокѕ

[1] Scopatz, A., **Huff**, **K.**. "Effective Computation in Physics: Field Guide to Research in Python" O'Reilly Media. 2015. shop.oreilly.com/product/0636920033424.do.

BOOK CHAPTERS

- [2] **Huff, K.**. "Case Study: Cyclus Project," in The Practice of Reproducible Research, 1st ed., Justin Kitzes, Fatma Imamoglu, and Daniel Turek, Eds. University of California, Berkeley: University of California Press. 2017.
- [3] **Huff, K.**. "Lessons Learned," in The Practice of Reproducible Research, 1st ed., Justin Kitzes, Fatma Imamoglu, and Daniel Turek, Eds. University of California, Berkeley: University of California Press. 2017.

Journal Publications

- [4] Andreades, C., Cisneros, A.T., Choi, J.K., Chong, A.Y., Fratoni, M., Hong, S., Huddar, L.R., Huff, K., Kendrick, J., Krumwiede, D.L., Laufer, M., Munk, M., Scarlat, R.O., Wang, X., Zwiebaum, N., Greenspan, E. and P. Peterson. "Design Summary of the Mark-I Pebble-Bed, Fluoride SaltCooled, High-Temperature Reactor Commercial Power Plant," Nuclear Technology, vol. 195, no. 3, pp. 222-238, Sep. 2016.
- [5] Huff, K., Gidden, M., Carlsen, R., Flanagan, R., McGarry, M., Opotowsky, A., Schneider, E., Scopatz, A., Wilson, P. "Fundamental Concepts in the Cyclus Nuclear Fuel Cycle Simulation Framework." Advances in Engineering Software, vol. 94, pp. 4659, Apr. 2016.
- [6] Aruliah, D.A., Brown, C.T., Chue Hong, N.P., Davis, M., Guy, R.T., Haddock, S.H.D., Huff, K., Mitchell, I., Plumbley, M., Waugh, B., White, E.P., Wilson, G.V., and Wilson, P.P.H. "Best Practices For Scientific Computing." PLOS Biology, Vol 1, Issue 12, 2014. dx.doi.org/10.1371/journal.pbio.1001745
- [7] Clerc, M., Dunstan, J., Huff, K., Mujica, N., Varas, G. "Liquid-Solid-Like Transition in Quasi-One-Dimensional Driven Granular Media", Nature Physics, Vol 4, 249 - 254, 2008.

Submitted

[8] **Huff, K.** "Rapid Methods for Radionuclide Contaminant Transport in Nuclear Fuel Cycle Simulation", 2015. (submitted)

REFEREED CONFERENCE PROCEEDINGS

- [9] **Huff, K.**, Bae, J., Mummah, K., Flanagan, R., Scopatz, A. "Current Status of Predictive Transition Capability in Fuel Cycle Simulation" **GLOBAL 2017 International Nuclear Fuel Cycle Conference**, Seoul, South Korea. September 2017.
- [10] Bae, J., Roy, W., Huff, K.. "Benefits of Siting a Borehole Repository on Non-Operating Nuclear Facility" Paper 19727. International High-Level Radioactive Waste Management Converence (IHLRWM 2017), Charlotte, NC. April 2017.
- [11] Wang, X., Huff, K., Aufiero, M., Peterson, P., Fratoni, M. "Coupled reactor kinetics and heat transfer model for nuclear reactor transient analysis." Paper 60728. 24th International Conference on Nuclear Engineering (ICONE24), Charlotte, NC. June 2016.
- [12] Wang, X., Huff, K., Aufiero, M., Peterson, P., Fratoni, M. "A sensitivity study of a coupled kinetics and thermal-hydraulics model for Fluoride-salt-cooled, High-temperature Reactor (FHR) transient analysis." The International Congress on Advances in Nuclear Power Plants (ICAPP), San Francisco, CA. April 2016.
- [13] Greenberg, H., Fratoni, M., Djokic, D., Huff, K., Nibbelink, R., Scopatz, A. "The Application of CYCLUS to Fuel Cycle Transition Modeling" Paper 5061. Proceedings of Global, Paris, France. September 2015.
- [14] Huff, K., "PyRK: Python for Reactor Kinetics." Proceedings of the 14th Python in Science Conference, Austin, TX. July 2015.
- [15] Krumwiede, D.L., Andreades, C., Choi, J.K., Cisneros, A.T., Huddar, L., Huff, K., Laufer, M.D., Munk, M., Scarlat, R.O., Seifried, J.E., Zweibaum, N., Greenspan, E., Peterson, P.F. "Design of the Mark-I Pebble-Bed, Fluoride-Salt-Cooled, High-Temperature Reactor Commercial Power Plant," Paper 14231. Proceedings of ICAPP, Charlotte, NC. April 2014.

- [16] **Huff**, **K.** "CYCLUS Fuel Cycle Simulation Capabilities with the Cycler Disposal System Model," Paper 7730. **Proceedings of Global**, Salt Lake City, UT. October 2013.
- [17] Gidden, M., Wilson, P., **Huff, K.**, Carlsen, R. "An Agent-Based Framework for Fuel Cycle Simulation with Recycling," Paper 7737. **Proceedings of Global**, Salt Lake City, UT. October 2013.
- [18] Huff, K., Nutt, M. "Hydrologic Nuclide Transport Models in Cyder, a Geologic Disposal Software Library," Paper 13328. Proceedings of the Waste Management Symposium, Phoenix, AZ. February 2013.
- [19] Oliver, K.M., Wilson, P.P.H., Reveillere, A., **Huff, K.** "Studying international fuel cycle robustness with the GENIUSv2 discrete facilities/materials fuel cycle systems analysis tool", Paper 9166. **Proceedings of Global**, Paris, France. 2009.
- [20] Rochman, D., Haight, R. C., Wender, S. A., O'Donnell, J. M., Michaudon, A., Huff, K., Vieira, D. J., Bond, E., Rundberg, R.S., Kronenberg, A., Wilhelmy, J., Bredeweg, T. A., Schwantes, J., Ethvignot, T., Granier, T., Petit, M., Danon, Y. "First Measurements with a Lead Slowing-Down Spectrometer at LANSCE," AIP Conference Proceedings, International Conference on Nuclear Data for Science and Technology. Volume 769. 2005.

REFEREED CONFERENCE ABSTRACTS

- [21] Huff, K., Scopatz, A. "Modernizing Computational Nuclear Engineering Education In the Open" Transactions of the American Nuclear Society Winter Conference. Washington, DC. November 2015.
- [22] **Huff, K.**, Fratoni, M., Greenberg, H. "Extensions to the CYCLUS Ecosystem in Support of Market-Driven Transition Capability" **Transactions of the American Nuclear Society Winter Conference.** Anaheim, CA. November 2014.
- [23] Bates, C., Biondo, E., **Huff, K.**, Kiesling, K., Scopatz, A. "PyNE Progress Report" **Transactions** of the American Nuclear Society Winter Conference. Anaheim, CA. November 2014.
- [24] Huff, K., Bara, A. "Dynamic Determination of Thermal Repository Capacity For Fuel Cycle Analysis." Transactions of the American Nuclear Society Annual Conference. Atlanta, GA. June 2013.
- [25] Huff, K., Nutt, M. "Key Processes and Parameters in a Generic Clay Disposal System Model." Transactions of the American Nuclear Society Winter Conference. San Diego, CA. November 2012.
- [26] Scopatz, A.M., Romano, P.K., Wilson, P.P.H., Huff, K. "PyNE: Python For Nuclear Engineering." Transactions of the American Nuclear Society Winter Conference. San Diego, CA. November 2012.
- [27] Huff, K., Bauer, T. "Numerical Calibration of an Analytical Generic Nuclear Repository Heat Transfer Model." Transactions of the American Nuclear Society Annual Conference. Chicago, IL. June 2012.
- [28] **Huff, K.**, Gidden, M., Wilson, P.P.H. "Open architecture and modular paradigm of CYCLUS, a fuel cycle simulation code." **Transactions of the American Nuclear Society Annual Conference.** Hollywood, FL. June 2011.
- [29] Huff, K., Scopatz, A., Preston, N., Wilson, P.P.H. "Rapid Peer Education of a Computational Nuclear Engineering Skill Suite." Transactions of the American Nuclear Society Annual Conference. Hollywood, FL. June 2011.
- [30] **Huff, K.** "CYCLUS: An Open, Modular, Next Generation Fuel Cycle Simulator Platform." (poster) **Waste Management Symposium.** Phoenix, AZ. March 2011.
- [31] Huff, K., "MOX Fuel Recipe Approximation Tests in GENIUSv2." Proceedings of the American Nuclear Society Student Conference. Ypsilanti, MI. April 2010.
- [32] Huff, K., Oliver, K., Wilson, P.P.H. "GENIUSv2 Discrete Facilities/Materials Modeling of International Fuel Cycle Robustness." Transactions of the American Nuclear Society Winter Conference. Washington D.C. November 2009.
- [33] **Huff, K.**, Wilson, P.P.H., Oliver, K. "GENIUS Version 2: Modelling the Worldwide Nuclear Fuel Cycle." (poster) **eHub Conference.** University of Wisconsin Madison. November 2009.

TECHNICAL Reports

- [34] C. Andreades, A. T. Cisneros, J.K. Choi, A.Y.K. Chong, D. L. Krumwiede, L.R. Huddar, K. Huff, M. R. Laufer, M.O. Munk, R.O. Scarlat, J. Seifried, N. Zweibaum, E. Greenspan, and P. F. Peterson, "Technical Description of the Mark 1 Pebble-Bed Fluoride-Salt-Cooled High-Temperature Reactor (PB-FHR) Power Plant," U.C. Berkeley Nuclear Engineering, Report UCBTH-14-002, 2014.
- [35] Huff, K., Nutt, W.M. "FY12 Sensitivity Studies Using the UFD Clay Generic Disposal System Model." Argonne National Laboratory. July 2012.
- [36] Huff, K., Bauer, T.H. "Benchmarking a New Closed-Form Thermal Analysis Technique Against a Traditional Lumped Parameter, Finite-Difference Method" Argonne National Laboratory. (FCRD-UFD-2012-000142). July 2012.
- [37] Huff, K., Dixon, B., Braase, L. "Next Generation Fuel Cycle Simulator Functions and Requirements Document." Idaho National Laboratory (FCRD-SYSA-2010-000110). July 2010.
- [38] Huff, K. "Digital Filtering Application to the Lead Slowing Down Spectrometer." Los Alamos Neutron Science Center. August 2004. (awarded los alamos distinguished student award.)
- [39] Huff, K. "Excess Single Event Effects in the Second Chip of a Series." Los Alamos Neutron Science Center. August 2003.

OTHER Publications

- [40] Huff, K. An Integrated Used Fuel Disposition and Generic Repository Model for Fuel Cycle Analysis. Ph.D. Dissertation-Nuclear Engineering and Engineering Physics. University of Wisconsin -Madison. August 2013.
- [41] Huff, K. "Celestial Calibrations of the Quiet Telescope." Undergraduate Honors Thesis. University of Chicago. June 2008.
- [42] Biris, O., Gracey, K., Huff, K., Ng, W.K. "An Analysis of the Consolidated Fuel Treatment Center Nuclear Reprocessing Initiative." Big Problems Energy Seminar. University of Chicago. June 2008.

Software PRODUCTS

- [43] Huff, K.. "PyRK v0.1" figshare. http://dx.doi.org/10.6084/m9.figshare.1540727. September 2015.
- [44] Bates, C., Biondo, E., Brachem, C., Carlsen, R., Cary, J., Davis, A., Dembia, C., Elfring, M., Flanagan, R., Gidden, M., Haines, T., Howland, J., Huff, B., Huff, K., Jackson, S., Kiesling, K., Klebenow, M., Kuett, M., Manalo, K., M. McCormick, A. Opotowsky, C., Pavlovsky, R., Rabbani, M., Relson, E., Romano, P., Scopatz, A., Shriwise, P., Slaybaugh, R., Wilson, P., Xia, J., J. Zachman, C., and Zweig, M. "PyNE v0.5." github. github.com/pyne/pyne/releases/tag/0.5.0. April 2015.
- [45] Carlsen, R., Gidden, M. Huff, K., Opotowsky, A., Rakhimov, O., Scopatz, A., Welch, Z., Wilson, P. "Cyclus v1.0.0." figshare. http://dx.doi.org/10.6084/m9.figshare.1041745. June 2014.
- [46] Carlsen, R., Gidden, M. Huff, K., Opotowsky, A., Rakhimov, O., Scopatz, A., Welch, Z., Wilson, P. "Cycamore v1.0.0." figshare. http://dx.doi.org/10.6084/m9.figshare.1041829. June 2014.

Selected Invited Talks

SciPy 2017, Scientific Python Conference, Austin, TX, Keynote.	Jul 12, 2017
PyCon 2017, Portland, OR. Keynote.	May 19, 2017
U. Illinois, Computational Science and Engineering, Seminar.	Feb 2, 2017
U. Illinois, AE3 Lightning Symposium, Lightning Talk.	Mar 2, 2017
U. Illinois, Nuclear, Plasma, & Radiological Engineering, Undergraduate Seminar.	Feb 14, 2017
U. California, Berkeley, Berkeley Institute for Data Science, Symposium.	Jan 27, 2017
U. Illinois, Informatics, Seminar.	Oct 13, 2016
PyData 2016, Chicago, IL. Keynote.	Aug 27, 2016
Oak Ridge National Laboratory, RPNSD, Seminar.	Mar 3, 2016
U. Tennessee, Knoxville, Nuclear Engineering, Seminar.	Mar 2, 2016
Michigan State, Computational, Mathematics, Science, and Engineering, Seminar	Dec 15, 2015
U. Illinois, Nuclear, Plasma, & Radiological Engineering, Seminar.	Dec 8, 2015
SC15, Austin TX, Python in High Performance Computing workshop, Keynote.	Nov 15, 2015
U. Illinois, National Center for Supercomputing Applications, Colloquium.	Nov 6, 2015
North Carolina State University, Nuclear Engineering, Colloquium.	Oct 15, 2015
Texas A&M University, Nuclear Engineering, Colloquium.	Sep 29, 2015
Rensselaer Polytechnic Inst, Mechanical and Nuclear Engineering, Colloquium.	Sep 21, 2015
U. Washington, What Can Academia Learn from Open Source?, Panel.	Feb 2, 2015

Engineering Teaching	University of Illinois at Urbana-Champaign, DEPT. OF NUCLEAR, PLASMA, AND RADIOLOGICAL ENGINEERING NPRE 412, Nuclear Power Economics and Fuel Management	Fall 2016
	University of California, Berkeley, Dept. of Nuclear Engineering NE 155, Introduction to Numerical Simulations in Radiation Transport Point Reactor Kinetics, Monte Carlo Methods	Apr 1,3,22, 2015
	University of California, Berkeley, Dept. of Nuclear Engineering NE 255, Numerical Simulation in Radiation Transport Best Practices in Computational Nuclear Engineering	Sep 11, 2014
	University of Wisconsin - Madison, Dept. of Nuclear Engineering NE 571, Economic and Environmental Aspects of Nuclear Energy Nuclear Waste Repository Technology, Policy, and History	Apr 1&3, 2013
	University of Wisconsin - Madison, Dept. of Nuclear Engineering NE 406, Nuclear Reactor Analysis UNIX Shell, Basic Scripting, Environment Variables, Permissions, Regular Ex	Sep 9&11, 2009 pressions. Makefiles
	University of Wisconsin - Madison, Dept. of Nuclear Engineering NE 506, Practicum in Monte Carlo Radiation Transport UNIX Shell, Basic Scripting, Environment Variables, Permissions, Regular Ex	Feb 10, 2010
Invited Scientific	SciPy Conference, Austin, TX Introductory Python For Scientific Software	Jul 6–7, 2015
Computing Teaching	University of Split, Split, Croatia G-Node Advanced Scientific Programming in Python Summer School	Sep 8–13, 2014
	SciPy Conference, Austin, TX Version Control and Unit Testing For Scientific Software	Jun 25, 2013
	University of Chicago, Graduate School, Chicago, IL Computational Literacy Workshop	Jan 12–13, 2013
	University of California, Berkeley, Berkeley, CA Department of Statistics Scientific Computing Workshop	Oct 20–21, 2012
	Lawrence Berkeley National Laboratory, Berkeley, CA Software Carpentry Python Workshop	Oct 17–18, 2012
	International Center for Theoretical Physics, Trieste, Italy UNESCO/IAEA Advanced School on Scientific Software Development	Feb 20–Mar 2, 2012
	University of Toronto, Toronto, ON, Canada SciNet Consortium For High Performance Computing Software Carpentry Boo	Nov 7–8, 2011 otcamp
	American Nuclear Society Winter Meeting, Washington, D.C. Young Professionals Congress Hacker Within Scientific Computing Tutorial	Nov 1, 2011
	Michigan State University, East Lansing, MI Institute for Cyber Enabled Research (iCER) and BEACON Center THW Bo	Jun 4–5, 2011 octcamp
SCIENTIFIC COMPUTING	Berkeley Institute for Data Science, Berkeley, CA Managing Databases in SQL	Jan 14–15, 2015
Teaching	Berkeley Institute for Data Science, Berkeley, CA Testing for Scientific Software	Jun 4–5, 2015

Lawrence Berkeley National Laboratory, Berkeley, CA Apr 14–15, 2014

Women in Science and Engineering Bootcamp

The University of Chicago, Chicago, IL Apr 2–3, 2012

Software Carpentry Scientific Computing Workshop

The University of Wisconsin, Madison, WI

Jan 12–14, 2011

The Hacker Within Python Bootcamp	lison, WI Jan 12–14, 2010
The University of Wisconsin, Mac The Hacker Within C++ Bootcamp	dison, WI Mar 24–31, 2009
The University of Wisconsin, Mac University of Wisconsin, Hacker With	
Languages Build Systems	bash/csh, C++, FORTRAN, Perl, Python, XM, make, CMake, automak
Databases	HDF5, SQI
Test Frameworks Version Control	CTest, GoogleTest, nos cvs, git, hg, svi
	nx, GoldSim, LaTeX, Mathematica, MatLab, MCNP, MOOSI
f Editor $Proceed$	Journal of Open Source Software 2010 lings of the SciPy Scientific Python Conference 2013 & 2019
${f Manuscript~Referee} \ Journal$	Annals of Nuclear Energy of Nuclear Energy Science and Power Generation Technology Nuclear Engineering and Design Nuclear Science and Engineering Nuclear Technology Progress in Nuclear Energy
Grant Proposal Referee	Dept. of Energy Nuclear Energy University Programs Dept. of Energy Technology Commercialization Fund Blue Waters Fellows Program
	Alfred P. Sloan Foundation
Book Proposal Referee	O'Reilly Medic

Professional Service

SCIENTIFIC COMPUTING SKILLS

EDITING AND REVIEWING

Technical Program Committee, IHLRWM Conference	2017
Chair, Fuel Cycle & Waste Management Division, ANS	2016 - 2017
Vice Chair, Fuel Cycle & Waste Management Division, ANS	2015 - 2016
Chair, Steering Committee, Software Carpentry Foundation	2014 - 2015
Secretary—Treasurer, Fuel Cycle & Waste Management Division, ANS	2013 - 2015
Secretary, Young Members Group, ANS	2013 - 2014
Technical Program Co-Chair, SciPy, Scientific Python Conference	2013 - 2014
Member, Next Generation Leadership Committee, Waste Management Symposium	2013 - 2014
Moderator, Organizer, Panelist, inSCIght Scientific Computing Podcast	2011 - 2013
Co-Founder, Nuclear Pride, LGBTQA Organization	2011 - 2013
Co-Founder, Treasurer, President, Hacker Within Scientific Computing Group	2008 – 2011
Governor, Treasurer, University of Wisconsin ANS student section	2008 – 2010