Kayla B. Clements

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Current position

PhD Candidate, School of Nuclear Science and Engineering, Oregon State University
Advisor: Dr. Todd Palmer
Topic: Uncertainty quantification and global sensitivity analysis for stochastic radiation transport solvers

Areas of specialization

Uncertainty quantification and global sensitivity analysis for stochastic computational methods • Computational methods for radiation transport and diffusion • Physics of nuclear reactors • Numerical methods

Education

Expected 2024 PhD in Nuclear Engineering, Oregon State University (expected 2024), *GPA* 3.76
2019 BS in Nuclear Engineering, University of Florida, *Cum Laude*

Honors and awards

2023 Second Prize, Best Paper & Presentation Award, "Global Sensitivity Analysis in Monte Carlo Radiation Transport" authored by K.B. Clements, G. Geraci, A.J. Olson, and T.S. Palmer, International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering 2023
2022 Best Paper & Presentation Award, "A Sampling-Based Approach to Solve Sobol' Indices Using Variance Deconvolution for Arbitrary Uncertainty Distributions" authored by A.J. Olson, K.B. Clements, and J. Petticrew, American Nuclear Society Mathematics and Computation Division Annual Meeting, November 2022
2020-present Achievement Rewards for College Scientists (ARCS) Foundation Scholarship
Member, Tau Beta Pi
2020 Provost's Distinguished Graduate Scholarship, Oregon State University
2016-2019 American Nuclear Society Scholarship Nuclear Regulatory Commission Nuclear Education Program Scholarship (awarded by University of Florida's Nuclear Engineering Program)
2015-2019 Florida Academic Scholars Award (Full Tuition Scholarship)

Publications

9. J. P. Morgan, I. Variansyah, S. Pasmann, K. B. Clements, B. Cuneo, A. Mote, C. Goodman, C. Shaw, J. Northrop, R. Pankaj, E. Lame, B. Whewell, R. McClarren, T.S. Palmer, L. Chen, D. Anistratov, C. T. Kelley, C. Palmer, K. E. Niemeyer, "Monte Carlo/Dynamic Code (MC/DC): An accelerated Python package for fully transient neutron transport and rapid methods development", *Journal of Open Source Software*, vol. 9(96), art. 6415, Apr 2024, https://doi.org/10.21105/joss.06415.

8. K.B. Clements, G. Geraci, A.J. Olson, T.S. Palmer, "A variance deconvolution estimator for efficient uncertainty quantification in Monte Carlo radiation transport applications", *Journal of Quantitative Spectroscopy and Radiative Transfer*, vol. 319, art. 108958, Mar 2024, https://doi.org/10.1016/j.jqsrt.2024.108958.

7. D. Lioce, A.J. Olson, K.B. Clements, A.K. Prinja, T.S. Palmer, "An analysis of two variance deconvolution approaches for stochastic media radiation transport using conditional point sampling", *Transactions of the 2023 American Nuclear Society Winter Meeting*, vol. 129(1), pp. 436-439, Nov 12-15, 2023, Washington, D.C., United States.

6. K.B. Clements, G. Geraci, A.J. Olson, T.S. Palmer, "Global sensitivity analysis in Monte Carlo radiation transport", *Proceedings of the International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering (M&C) 2023*, Aug 13-17, 2023, Niagara Falls, Canada.

5. G. Geraci, K.B. Clements, A.J. Olson, "A polynomial chaos approach for uncertainty quantification of Monte Carlo transport codes", *Proceedings of the International Conference on M&C*, Aug 13-17, 2023, Niagara Falls, Canada.

4. A.J. Olson, K.B. Clements, J.M. Petticrew, "A sampling-based approach to solve Sobol' indices using variance deconvolution for arbitrary uncertainty distributions", *Transactions of the 2022 American Nuclear Society Winter Meeting*, vol. 127(1), pp. 450-453, Nov 13-17, 2022, Phoenix, United States.

3. K.B. Clements, G. Geraci, A.J. Olson, "Numerical investigation on the performance of a variance deconvolution estimator", *Transactions of the 2022 American Nuclear Society Annual Meeting*, vol. 126(1), pp. 344-347, Jun 12-16, 2022, Anaheim, United States.

2. J.D. Bess, N.E. Woolstenhulme, B. Aranguren, D.B. Chapman, K.B. Clements, A.S. Epiney, A.D. Fleming, J.T. Johnson, M.R. Ramirez, D.M. Wachs, K.D. Weaver, "Enabling future microreactor testing with the NIMBLE platform in TREAT", *Transactions of the 2020 American Nuclear Society Winter Meeting*, vol. 123(1), pp. 482-485, Nov 16-20 2020, Online. https://doi.org/10.13182/T123-32978.

1. A.S. Epiney, B. Aranguren, J.D. Bess, D.B. Chapman, K.B. Clements, A.D. Fleming, J.T. Johnson, M.R. Ramirez, D.M. Wachs, K.D. Weaver, N.E. Woolstenhulme, "NIMBLE microreactor testing platform for TREAT: preliminary thermal-hydraulic considerations", *Transactions of the 2020 American Nuclear Society Winter Meeting*, vol. 123(1), pp. 1825-1828, Nov 16-20 2020, Online. https://doi.org/10.13182/T123-33233.

Peer reviewed abstracts

3. K.B. Clements, G. Geraci, A.J. Olson, "A variance deconvolution approach to sampling uncertainty quantification for Monte Carlo radiation transport solvers", *Society for Industrial and Applied Mathematics Conference on Uncertainty Quantification*, Apr 12-15, 2022.

2. G.P. Nobre, M. Dupuis, S. Hilaire, D. Brown, K.B. Clements, "Nucleon-induced cross-section predictions for deformed nuclei off-stability", *Proceedings of the 2019 Fall Meeting of the American Physical Society Division of Nuclear Physics*, vol. 64(12), Oct 14-17, 2019, Crystal City, Virginia.

1. K.B. Clements, G.P. Nobre, "Automating the development of a global nuclear reaction data library", *5th Joint Meeting of the American Physical Society Division of Nuclear Physics and the Physical Society of Japan*, Oct 23-27, 2018, Waikoloa, Hawaii.

Technical Reports

4. G. Geraci, B. Reuter, A.J. Olson, K.B. Clements "Multifidelity UQ methods for Monte Carlo radiation applications and stochastic media", *17th U.S. National Congress on Computational Mechanics*, 2023.

3. A.J. Olson, G. Geraci, D.S. Bolintineanu, K. Bossler, W.L. Davis IV, K.B. Clements, M. Olguin, L.J. Kersting, R.P. Kensek, B.C. Franke, C.M. Perfetti, G. Popoola, R. Davis, E.H. Vu, "Next generation uncertainty quantification and stochastic media Monte Carlo transport methods", Tech. Rep. SAND2022-10045, Sandia National Laboratories, 2022.

2. K.B. Clements, G. Geraci, A.J. Olson, "A Variance Deconvolution Approach to Sampling Uncertainty Quantification for Monte Carlo Radiation Transport Solvers", *Computer Science Research Institute Summer Proceedings 2021*, J.D. Smith and E. Galvan, eds., Tech. Rep. SAND2022-0653R, Sandia National Laboratories, Sept 2021, pp. 293–307.

1. K.B. Clements, J.D. Bess, "Enhancing TREAT's pulsing abilities using TREAT upgrade fuel", *Science Undergraduate Laboratory Internship Report*, Tech. Rep. INL/MIS-19-55298-Revision-0, Idaho National Laboratory, Aug 2019.

Teaching

ME 373 – Mechanical Engineering Methods, Instructor of Record, Winter 2022

Research Experience

2021-Present Year-Round Intern, Radiation Effects Theory Department, Sandia National Laboratories
- Develop uncertainty quantification and global sensitivity analysis methods for stochastic solvers, particularly Monte Carlo radiation transport solvers.
- Contribute as author, co-author, and presenter on developed methods for internal Sandia reports, professional conferences, and a journal publication.

2020-present Graduate Research Assistant, School of Nuclear Science and Engineering, Oregon State University
- Member of the Center for Exascale Monte Carlo Neutron Transport (CEMeNT), a PSAAP-III center.
- Co-developer and -maintainer of Monte Carlo: Dynamic Code (MC/DC), the center's parallel and machine-portable Python-based Monte Carlo neutron transport code.

2019, 2020 Intern, Reactor Physics Analysis & Design Department, Idaho National Laboratory
- Modeled fuel assemblies in MCNP for INL's Transient Reactor Test Facility (TREAT) using fabrication and technical specification documents from the reactor's previous design work.
- Performed criticality studies by integrating fuel model into an existing model of TREAT's geometry.

2018 Summer Intern, National Nuclear Data Center, Brookhaven National Laboratory

- Automated runs of the nuclear reaction code EMPIRE to generate reliable evaluated files across the whole nuclide chart, including nuclei off-stability.
- Implemented a previously-developed adiabatic model to describe statically-deformed nuclei in the rare-earth region.

2017-2019 Undergraduate Research Assistant, Nuclear Engineering Department, University of Florida

- Processed the ENDF/B-VIII.0 evaluated cross section libraries with the AMPX code system in SCALE.