Jessica S. Rehak

CONTACT INFORMATION
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github: https://github.com/JessicaRehak

PHD **University of California, Berkeley**, NUCLEAR ENGINEERING **Summer 2021**
A Novel Tool for the Assessment and Validation of Acceleration Methods for Solving the Neutron Transport Equation
Advisor: Professor Rachel N. Slaybaugh

MS **University of California, Berkeley**, NUCLEAR ENGINEERING **Spring 2017**
Implementation of Weighted Delta-tracking with scattering in Serpent 2

MEM **Old Dominion University – Norfolk VA**, ENGINEERING MANAGEMENT

BS **University of Maryland, College Park**, PHYSICS, ASTRONOMY **Spring 2007**

WORK & RESEARCH EXPERIENCE

Lawrence Berkeley National Lab, Berkeley, CA
Senior Scientific Engineering Associate **December 2024 – Present**
Supervisor: Heather Crawford – HLCrawford@lbl.gov
Applying machine learning to optimize the ECR ion source VENUS and the the GRETA detector.

Kairos Energy, Alameda, CA
Reactor Analyist (Engineer III) **September 2021 – October 2023**
Supervisor: Nader Satvat – satvat@kairospower.com
Developed a series of Python 3-based deployable libraries designed to work in concert to support the rapid iterative design and evaluation of novel pebble bed reactors. Some of the features included:

- conversion of material specifications provided in various formats into a standardized and shared elemental format,
- generation of a full pebble bed core model from a collection of user-defined yaml files, stored in a comprehensive Python 3 object complete with materials assigned to a polygon-based cross-sectional geometry,
- and generation of a core input file for the Serpent 2 Monte Carlo code, converting arbitrary rectangular and triangular polygons, as well as other features, into appropriate Serpent surfaces and cell definitions; evaluation of complex multi-point surfaces into a series of polygons to describe highly-detailed features or core regions; automatic determination and elimination of overlapping surfaces; and handling of regions with multiple layered universes, and distributed pebble-bed fuel materials.

University of California, Berkeley, Berkeley, CA
Graduate Student Researcher **Fall 2015 – Summer 2021**
Advisor: Professor Rachel N. Slaybaugh – slaybaugh@berkeley.edu
Developed a novel finite-element-based code for the implementation and assessment of acceleration methods for deterministic solves of the transport equation that leveraged modern C++ features, documentation systems, and testing frameworks.

The Idaho National Laboratory, Idaho Falls, ID
Student Intern - Reactor physics group **Summer 2016**
Advisor: Dr. Mark DeHart – mark.dehart@inl.gov
Implemented a novel delta-tracking algorithm for the Serpent 2 Monte Carlo code.

United States Navy
Submarine Officer – Honorably discharged as a lieutenant (O-3) **2008 – Fall 2015**

- Coordinated submarine operations and international participation for the Rim of the Pacific 2014 naval exercise involving 23 nations, 46 ships and six submarines.

- Supported two six-month deployments while qualified Officer of the Deck and Engineering Officer of the Watch on Los Angeles class submarines.
- Certified for assignment as Engineer Officer in charge of a Naval Nuclear Propulsion Plant.
- Led divisions responsible for the maintenance and operation of reactor plant instrumentation, radiological controls, and water chemical analysis.
- TS/SCI security clearance (single scope background investigation).

Publications & Proceedings

Rehak, J.S., Slaybaugh, R.N. "Assessing the Effectiveness of Acceleration Methods for Deterministic Neutron Transport Solvers" **Transactions of the American Nuclear Society** Volume 122. https://doi.org/10.13182/T122-32383 June 2020.†

Rehak, J.S., Kerby, L.M., DeHart, M.D., Slaybaugh, R.N. "Weighted delta-tracking in scattering media" **Nuclear Engineering and Design** Volume 342. https://doi.org/10.1016/j.nucengdes.2018.12.006. December 2018.†

Rehak, J.S., Kerby, L.M., DeHart, M.D., Slaybaugh, R.N., Leppänen, J. "Implementation of Weighted Delta-Tracking with Scattering in the Serpent 2 Monte Carlo Code" **Transactions of the American Nuclear Society** Volume 116. https://escholarship.org/uc/item/6bg1s71k June 2017.†

Honors and Awards

Department of Nuclear Engineering Graduate Fellowship **2015 – 2018**

Navy and Marine Corps Commendation Medal **August 2015**

For exceptional service as Submarine Force Exercise Officer and Submarine Watch Officer at Commander Submarine Forces Pacific

Navy and Marine Corps Achievement Medal **August 2015**

For coordination and execution of submarine operations for the Rim of the Pacific 2014 exercise

Navy and Marine Corps Achievement Medal **June 2013**

For service as a division officer on USS JACKSONVILLE (SSN-699) and successful completion of two six-month deployments and an extended dry-dock maintenance period.

Navy and Marine Corps Achievement Medal **April 2013**

For service as Chemistry/Radiological Assistant during an eight month dry-dock period.

Navy and Marine Corps Achievement Medal **January 2011**

For service as Reactor Control Assistant during a six-month deployment and Operational Reactor Safeguards Exam

Code Development

Bay Area Radiation Transport (BART) https://github.com/SlaybaughLab/BART

A finite-element-based transport solver that supports 1/2/3D and MPI, based on the deal.II finite element library.

- Designed for developer end-users for maximum modification and support of methods analysis and implementation.
- Designed to support reproducibility, portability, and testing in codes. utilizes continuous integration, code coverage, and Docker containers.
- Uses a novel protocol-buffer format for materials.

Scientific Computing Skills

Languages ..... Python 3, C++20, bash

Build Systems ..... setuptools, make, CMake

Testing ..... pytest, GoogleTest, GoogleMock, continuous integration, code coverage

Version Control ..... git, github

Other ..... sphinx, Doxygen, LaTeX, Protocol Buffers, Jupyter, Docker