Kalie Knecht

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Education

University of California, Berkeley — **Berkeley, CA**
Doctor of Philosophy in Nuclear Engineering — Expected May 2024

- Dissertation Title: **Enhanced use of contextual data for quantitative gamma-ray imaging in nuclear safeguards applications**
- Advisor: Prof. Kai Vetter
- Minors: Radiation Imaging and Data Science. Obtained Graduate Certificate in Applied Data Science.
- Nuclear Science and Security Consortium Fellow

University of Tennessee — **Knoxville, TN**
Bachelor of Science in Honors Nuclear Engineering — May 2019

Research Experience

Lawrence Berkeley National Laboratory — **Berkeley, CA**
Graduate Student Researcher — August 2019 - Present

- Using 3D instance and semantic segmentation machine learning techniques to identify and label discrete objects in RGB-D and LiDAR point clouds.
- Developing genetic and other algorithmic approaches in Python to identify optimal measurement positions for quantitative gamma-ray imaging.
- Generated 3D Compton Images from radiation data collected at Fukushima Daiichi Nuclear Power Station and Chernobyl Nuclear Power Plant.

Los Alamos National Laboratory — **Los Alamos, NM**
Space Science and Applications Intern — June 2020 - August 2020

- Participated in the NSSC-LANL Keepin Summer Program - an internship with a nonproliferation related research project and a companion symposium series linking nuclear security science, technology, and policy.
- Developed software in Python to analyze the charge collection in a two-pixel semiconductor detector to be used in a space radiation telescope.

Oak Ridge National Laboratory — **Oak Ridge, TN**
Safeguards & Security Technology Intern — May 2019 - August 2019

- Investigated current international safeguards methods for research reactors.
- Collected data from HFIR-REDC Pu-238 production process to determine characteristics of normal operation at a research reactor with collocated hot cell facilities.

Argonne National Laboratory — **Lemont, IL**
Nuclear Science & Engineering Intern — May 2018 - August 2018

- Developed code in Fortran to update SAS4A/SASSYS-1 input preprocessor to allow free format input and extended unit testing capabilities.

University of Tennessee — **Knoxville, TN**
Nuclear Engineering Undergraduate Research Assistant — January 2017 - May 2019

- Simulated transition from an open to closed nuclear fuel cycle using Cyclus and interpreted results using Python.

Materials Science & Engineering Undergraduate Research Assistant — May 2015 - January 2017

- Synthesized a sample for study using conventional solid-state synthesis and conducted an in-situ high temperature x-ray diffraction (XRD) study.

Honors and Awards

Virgil Schrock Award for Outstanding Service — May 2022
Best Student Paper on Radiation Detection and Imaging — Dec 2021
"Polaris-LAMP: Multi-Modal 3-D Image Reconstruction With a Commercial Gamma-Ray Imager"
Virgil Schrock Award for Outstanding Service — May 2021
Virgil Schrock Award for Outstanding Mentorship — May 2020

Teaching Experience

NE 104 Graduate Student Instructor August 2021 - December 2021

- Undergraduate radiation detection (NE 104): semiconductor and scintillator detector operation, manufacturing, signal generation, readout techniques, applications and limitations.
- Supervised students in the laboratory and instructed students in scientific writing.

NE 104 Graduate Student Instructor August 2020 - December 2020

- Recorded laboratory experiments and edited videos to ensure safe & equitable learning during the COVID-19 pandemic.

University of Tennessee **Knoxville, TN**
Undergraduate Teaching Assistant August 2018 - May 2019

- Developed weekly review sessions for Thermal Science and Reactor Theory courses.
- Provided tutoring services for students enrolled in Thermal Science and Reactor Theory.

Industry Experience

Dominion Energy **Richmond, VA**
Nuclear Safety Analysis Intern May 2017 - August 2017

- Analyzed Time to Core Boil (TTCB) for various RCS conditions in GOTHIC thermal-hydraulic code resulting in more accurate TTCB estimates.

Nuclear Spent Fuel Intern August 2016 - December 2016

- Created a database of Millstone Power Station spent fuel that allows engineers to extract data for dry storage more efficiently, reducing engineering work time by at least 50%.

Nuclear Core Design Intern January 2016 - May 2016

- Reported burnup, isotopic, and monthly core follow data and ensured plant was operating as expected.

Leadership Experience

UCB Radwatch
Graduate Student August 2019 - Present

- Engaging with the community regarding the risks and hazards of radiation in our environment.

UCB NE Climate Committee
Graduate Member August 2019 - August 2023

- Coordinated Respect is a Part of Research, a peer led Sexual Violence and Sexual Harassment prevention training, for incoming nuclear engineering students.

Society of Women Engineers
UCB GradSWE New Student Chair August 2022 - May 2023

- Organized workshops to facilitate the transition to graduate school for first year students.
- Created and oversaw the GWE Buddies peer mentoring program.

UCB GradSWE Co-President August 2021 - July 2022

- Managed a team of 23 officers to run the UCB GradSWE Section.
- Coordinated with other graduate engineering student societies to plan a welcome back event for over 200 engineering graduate students.

Skills

Programming Languages:	Python, OpenCL, and Fortran
Code Proficiencies:	MCNP, GOTHIC, and Cyclus
Databases:	HDF5
Version Control:	git and SVN
Markup:	Markdown
Containers:	Docker
Computer Vision:	Instance Segmentation, Object Detection, Semantic Segmentation
Operating Systems:	Windows, macOS, and Linux
Laboratory Skills:	Radiation Measurements, Gamma Ray Spectroscopy, and X-ray Diffraction

First Author Publications, Proceedings, & Papers

1. **K. Knecht** et. al., "Leveraging Scene Data to Optimize Quantitative Compton Imaging in Safeguards Applications," intended for in IEEE Transactions on Nuclear Science (TNS). *In Progress.*
2. **K. Knecht** et. al., "Scene-informed Optimal Measurement Positions for Quantitative Safeguards Measurements," in Proc. INMM and ESARDA Joint Annual Meeting, Vienna, Austria, 2023, url: https://resources.inmm.org/annual-meeting-proceedings/scene-informed-optimal-measurement-positions-quantitative-safeguards.
3. **K. Knecht**, "From the Field," in Berkeley Science Review, May 2022, url: https://www.berkeleysciencereview.com/article/2022/05/03/from-the-field.
4. **K. Knecht** et. al., "3D Compton Imaging of Distributed Sources around the Chernobyl Nuclear Power Plant," in Proc. IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), Piscataway, NJ, 2021, pp. 1-4, doi: 10.1109/NSS/MIC44867.2021.9875432.
5. J. Hecla and **K. Knecht** et. al., "Polaris-LAMP: Multi-modal 3-D Image Reconstruction with a Commercial Gamma-ray Imager," in IEEE TNS, vol. 68, no. 10, pp. 2539-2549, Oct. 2021, doi: 10.1109/TNS.2021.3110162.
6. **K. Knecht** et. al., "Evaluating 3D gamma-ray Imaging Techniques for Distributed Sources at the Fukushima Daiichi Nuclear Power Station," in Proc. IEEE NSS/MIC, Boston, MA 2020, pp. 1-5, doi: 10.1109/NSS/MIC42677.2020.9507840.

Oral Presentations

1. **K. Knecht** et. al., "Enhanced Use of Contextual Data for Quantitative Compton Imaging," at IEEE NSS/MIC/RTSD, Vancouver, BC, Canada, 2023, doi: 10.1109/NSSMICRTSD49126.2023.10337904.
2. **K. Knecht** et. al., "Scene-informed Optimal Measurement Positions for Quantitative Safeguards Measurements," at INMM and ESARDA Joint Annual Meeting, Vienna, Austria, 2023.
3. **K. Knecht**, "Scene-informed Optimal Measurement Positions for Quantitative Safeguards Measurements," at University Program Review (UPR), Berkeley, CA, 2023.
4. **K. Knecht** et. al., "Scene-informed Optimization of Measurement Locations for Radiological Assessments," at IEEE NSS/MIC, Milan, Italy, 2022.
5. **K. Knecht**, "Scene-informed Optimization of Measurement Locations for Radiological Assessments," at UPR, Ann Arbor, MI, 2022.
6. **K. Knecht** et. al., "3D Compton Imaging of Distributed Sources around the Chernobyl Nuclear Power Plant," at IEEE NSS/MIC, Piscataway, NJ, 2021.
7. **K. Knecht**, "3D Compton Imaging of Distributed Sources Around the Chernobyl NPP," at UPR, 2021.
8. **K. Knecht** et. al., "Evaluating 3D Gamma-ray Imaging Techniques for Distributed Sources at the Fukushima Daiichi Nuclear Power Station," at IEEE NSS/MIC, Boston, MA, 2020.
9. **K. Knecht**, C. Roecker, and K. Smith, "Signal Generation in CdTe Detector with an Active Guard Ring," at LANL Keepin Program Student Presentation Session, 2020.

Poster Presentations

1. **K. Knecht**, *et. al.*, "Scene-informed Optimization of Measurement Locations for Radiological Assessment," at UPR, Berkeley, CA, 2023.
2. **K. Knecht**, *et. al.*, "3D Radiological Mapping in Chernobyl," at Nuclear Science & Security Consortium Fall Workshop and Advisory Board Meeting, 2022.
3. **K. Knecht**, *et. al.*, "3D Radiological Mapping in Chernobyl," at Lawrence Berkeley National Laboratory Nuclear Science Division Director's Review, 2021.
4. **K. Knecht**, *et. al.*, "Improving Facility-Specific Safeguards with Data Analytics," at ORNL Summer Student Poster Presentations, Oak Ridge, TN, 2019.
5. **K. Knecht**, *et. al.*, "Solid State Synthesis of $Nd_2Zr_2O_7$ and Study of its Thermal Properties Using *in-situ* X-ray Diffraction," at The Minerals, Metals and Materials Annual Meeting & Exhibition, Nashville, TN, 2016.

Other Publications, Proceedings, & Papers

1. D. Hellfeld, M. Folsom, T. HY Joshi, **K. Knecht**, J. Lee, D. Gunter, K. Schmitt et al., "Quantitative Compton Imaging in 3D," in Proc. INMM Annual Meeting, 2022, url: https://resources.inmm.org/annual-meeting-proceedings/quantitative-compton-imaging-3d.

2. J. Hecla, **K. Knecht**, K. Vetter, T. HY. Joshi, A. Haefner, and R. Pavlovsky. "Three-dimensional Radiation Mapping at Chernobyl Nuclear Power Plant," in Proc. Sixth International Conference on Nuclear Decommissioning and Environment Recovery, Ukraine, 2021, pp. 15.