

Daniel Hellfeld, Ph.D.

CONTACT	Lawrence Berkeley National Laboratory 1 Cyclotron Rd. (B50C - 3315) Berkeley, CA 94720	1.949.680.9345 dhellfeld@lbl.gov dhellfeld.github.io
EDUCATION	Doctor of Philosophy (Ph.D.) , Nuclear Engineering (4.0/4.0) <i>University of California, Berkeley</i> ◦ Thesis: “Free-moving Omnidirectional 3D Gamma-ray Imaging and Localization”. ◦ Advisor: Prof. Kai Vetter. Master of Science (M.S.) , Nuclear Engineering (4.0/4.0) <i>Texas A&M University</i> ◦ Thesis: “Feasibility of Remote Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in the WATER Cherenkov Monitor of ANTineutrinos (WATCHMAN)”. ◦ Advisor: Prof. Craig Marianno. Bachelor of Science (B.S.) , Physics (3.89/4.0) <i>University of California, Santa Barbara</i>	Aug 2015 - Jul 2019 <i>Berkeley, CA</i> Aug 2013 - May 2015 <i>College Station, TX</i> Sep 2009 - Jun 2013 <i>Santa Barbara, CA</i>
RESEARCH EXPERIENCE	Senior Scientific Engineering Associate <i>Applied Nuclear Physics Group, Lawrence Berkeley National Laboratory</i> ◦ Real-time quantitative 3D gamma-ray imaging and scene data fusion. ◦ 3D object detection and tracking in LiDAR point clouds using sparse convolution networks for improved radiological source detection and attribution. Research Fellow <i>Nuclear Science and Security Consortium, UC Berkeley</i> ◦ Modeling and imaging algorithm development for free-moving hand-held and UAS-mounted gamma-ray imagers (proximity, coded aperture, Compton). ◦ Experimental demonstration of omnidirectional 3D active coded mask imaging in real-time. ◦ Fusion of contextual sensors (e.g., LiDAR, RGB camera, IMU) and computer vision techniques (e.g., SLAM, photogrammetry) with gamma-ray image reconstruction. Physics Intern <i>Rare Event Detection Group, Lawrence Livermore National Laboratory</i> ◦ Monte Carlo simulations and data analysis for a water Cherenkov antineutrino detector. ◦ Study on the feasibility of remote clandestine nuclear reactor directionality with antineutrino-electron elastic scattering. ◦ Investigation of potential electron scattering background sources in water and the impact of overburden, fiducial volume, and radon contamination on directionality. Graduate Research Assistant <i>Department of Nuclear Engineering, Texas A&M University</i> ◦ Design, construction and characterization of a vehicle-mounted scintillator detector array for wide area radiological search in urban environments. ◦ Review on the use of solid-state photodiodes and photomultipliers in improving scintillation detection systems.	Aug 2019 - Present <i>Berkeley, CA</i> Nov 2014 - Jul 2019 <i>Berkeley, CA</i> Jun - Aug 2015/2014 <i>Livermore, CA</i> Sep 2013 - Nov 2014 <i>College Station, TX</i>
TEACHING EXPERIENCE	Stand-in Lecturer <i>Department of Nuclear Engineering, UC Berkeley</i> ◦ Multiple lectures for the undergraduate radiation detection and imaging courses (NE 104, 107). ◦ Semiconductor and scintillator detector operation, manufacturing, signal generation, readout techniques, applications and limitations. ◦ X-ray detection, image formation, computed tomography, and phase contrast imaging.	Jan - May / Sep - Nov 2018 <i>Berkeley, CA</i>

	Lab Instructor <i>Department of Nuclear Engineering, Texas A&M University</i> <ul style="list-style-type: none"> ◦ Setup and teardown of weekly laboratory experiments for the graduate radiation detection course (NUEN 605). ◦ Assisted students with experimental procedures and graded lab reports. 	Sep - Dec 2014 <i>College Station, TX</i>
MENTORSHIP EXPERIENCE	Kalie Knecht, graduate <i>Department of Nuclear Engineering, UC Berkeley</i> <ul style="list-style-type: none"> ◦ 3D Compton image reconstruction and scene data fusion with a free-moving pixellated CdZnTe detector and auxiliary contextual sensor package. 	Sep 2019 - Present
	David Raji, undergraduate <i>Department of Nuclear Engineering, Georgia Institute of Technology</i> <ul style="list-style-type: none"> ◦ Sensitivity-weighted adaptive voxelization for free-moving imaging. ◦ Real-time probabilistic tri-state point cloud occupancy with ray-casting. 	Jun - Aug 2018/2017
SCIENTIFIC COMPUTING SKILLS	Languages: Computing Environments: Data/Statistical Analysis: Monte Carlo Transport: Build Systems: Operating Systems: Robotics: Databases: Documentation: Markup: Version Control: Other Software:	Python, C/C++, bash IPython, Mathematica, Matlab ROOT, R Geant4, MCNP5/X, Serpent make, CMake macOS, Linux, Windows ROS HDF5, SQL Doxygen, Sphinx Markdown, XML, HTML git L ^A T _E X, MS Office
PROFESSIONAL SOCIETY MEMBERSHIPS	IEEE Nuclear and Plasma Sciences Society Institute of Nuclear Materials Management American Nuclear Society National Society of Collegiate Scholars Golden Key International Honor Society	2016 - Present 2014 - Present 2013 - Present 2009 - 2013 2009 - 2013
AWARDS	Best Paper - Radiation Detection , UC Berkeley NE Dept. Valentin T. Jordanov Rad. Instrum. Travel Grant , IEEE NSS-MIC Runner-up NSS Student Paper Competition , IEEE NSS-MIC Valentin T. Jordanov Rad. Instrum. Travel Grant , IEEE NSS-MIC Best Oral Presentation , University Program Review Meeting JD Williams Best Poster Award , INMM Annual Meeting Nuclear Science and Security Consortium Fellowship , UC Berkeley Graduate Enhancement Fellowship , Texas A&M University Highest Academic Honor Award , UC Santa Barbara, Physics Dept. Highest Honors , UC Santa Barbara	Dec 2018 Aug 2018 Oct 2017 Aug 2017 Jun 2017 Jul 2015 Nov 2014 Aug 2013 May 2013 May 2013
WORKSHOPS & SEMINARS	Medical Image Reconstruction - Theory and Practice 2018 IEEE NSS-MIC Short Course Applied Antineutrino Physics Workshop Lawrence Livermore National Laboratory Machine Learning for Science Workshop Lawrence Berkeley National Laboratory, NERSC Image Quality and Statistical Analysis 2017 IEEE NSS-MIC Short Course	Nov 2018 <i>Sydney, Australia</i> Oct 2018 <i>Livermore, CA</i> Sep 2017 <i>Berkeley, CA</i> Oct 2017 <i>Atlanta, GA</i>

Novel Technologies for Safeguards and Arms Control Verification Institute for Nuclear Materials Management, Sandia National Laboratory	Aug 2017 Albuquerque, NM
Fundamentals of Nondestructive Assay Training Course Los Alamos National Laboratory, NSSC	Jun 2017 Los Alamos, NM
Fukushima Fieldwork for Radiation Disaster Recovery Phoenix Program, Hiroshima University	Aug 2016 Fukushima, Japan
Python Boot Camp UC Berkeley, NSF, Berkeley Institute for Data Science	Aug 2016 Berkeley, CA
Nuclear Safeguards Policy and Information Analysis Course Middlebury Institute for International Studies at Monterey	Jun 2016 Monterey, CA
Next Generation Fukushima Workshop IRC, LBNL, FREA, Koriyama City	Apr 2016 Koriyama, Japan
International Symposium for Resilient Communities IRC, LBNL, FREA, Koriyama City	Apr 2016 Koriyama, Japan
Applied Antineutrino Physics Workshop Center for Neutrino Physics, Virginia Tech University	Dec 2015 Arlington, VA
Public Policy and Nuclear Threats Summer Boot Camp Institute on Global Conflict and Cooperation, UC San Diego	Jun 2015 San Diego, CA
Global Nuclear HR Development for Safety, Security & Safeguards Academy for Global Nuclear Safety and Security, Tokyo Institute of Technology	Feb 2015 Tokyo, Japan
NDA Fundamentals for Nuclear Safeguards Next Generation Safeguards Initiative, Oak Ridge National Laboratory	Nov 2014 Oak Ridge, TN

PUBLICATIONS,
PROCEEDINGS
& PAPERS

- [1] **D. Hellfeld**, P. Barton, A. Haefner, D. Gunter, L. Mihailescu, and K. Vetter, "Real-time Free-moving Active Coded Mask 3D Gamma-ray Imaging," *IEEE Trans. Nucl. Sci.*, vol. 66, no. 10, pp. 2252–2260, Oct. 2019.
- [2] **D. Hellfeld**, T. H. Y. Joshi, M. S. Bandstra, R. J. Cooper, B. J. Quiter, and K. Vetter, "Gamma-Ray Point-Source Localization and Sparse Image Reconstruction using Poisson Likelihood," *IEEE Trans. Nucl. Sci.*, vol. 66, no. 9, pp. 2088–2099, Jul. 2019.
- [3] **D. Hellfeld**, "Free-moving Omnidirectional 3D Gamma-ray Imaging and Localization," Ph.D. dissertation, University of California, Berkeley, Jul. 2019.
- [4] K. Vetter, A. Haefner, R. Barnowski, P. Barton, **D. Hellfeld**, T. H. Y. Joshi, R. Pavlovsky, Y. Sanada, Y. Shikaze, and T. Torii, "3-D Radiation Mapping and Data Fusion for Environmental Remediation and Cleanup," in *Proc. Waste Management Symp.*, Phoenix, AZ, Mar. 2018.
- [5] **D. Hellfeld**, P. Barton, D. Gunter, L. Mihailescu, and K. Vetter, "A Spherical Active Coded Aperture for 4π Gamma-ray Imaging," *IEEE Trans. Nucl. Sci.*, vol. 64, no. 11, pp. 2837–2842, Nov. 2017.
- [6] **D. Hellfeld**, P. Barton, A. Haefner, D. Gunter, L. Mihailescu, and K. Vetter, "Omnidirectional 3D Gamma-ray Imaging with a Free-moving Spherical Active Coded Aperture," in *Proc. IEEE NSS-MIC*, Atlanta, GA, Oct. 2017.
- [7] S. Dazeley, A. Bernstein, T. Classen, E. Reedy, **D. Hellfeld**, M. Duvall, and C. Marianno, "Antineutrino Detection based on ^6Li -doped Pulse Shape Sensitive Plastic Scintillator and Gd-doped Water," in *Proc. Int. Conf. App. Nucl. Tech.*, Crete, Greece, Jun. 2017.
- [8] **D. Hellfeld**, S. Dazeley, A. Bernstein, and C. Marianno, "Reconstructing the Direction of Reactor Antineutrinos via Electron Scattering in Gd-Doped Water Cherenkov Detectors," *Nucl. Instrum. Meth. A*, vol. 841, pp. 130–138, Jan. 2017.

- [9] **D. Hellfeld**, P. Barton, D. Gunter, L. Mihailescu, and K. Vetter, “Optimization of a Spherical Active Coded Mask Imager,” *in Proc. IEEE NSS-MIC*, Strasbourg, France, Nov. 2016.
- [10] N. S. Bowden, K. M. Heeger, P. Huber, C. Mariani, and R. B. Vogelaar, “Applied Antineutrino Physics - Conference Summary,” *arXiv:1602.04759*, Arlington, VA, Dec. 2015.
- [11] **D. Hellfeld**, A. Bernstein, S. Dazeley, and C. Marianno, “Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in a Gd-Doped Water Cherenkov Detector,” *in Proc. INMM Annual Meeting*, Indian Wells, CA, Jul. 2015.
- [12] **D. Hellfeld**, “Feasibility of Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in the WATER Cherenkov Monitor of ANTineutrinos (WATCHMAN),” Master’s thesis, Texas A&M University, May 2015.
- [13] A. Bernstein and the WATCHMAN collab., “The Physics and Nuclear Nonproliferation Goals of WATCHMAN: A WATER Cherenkov Monitor for ANTineutrinos,” *arXiv:1502.01132*, Feb. 2015.

REFERENCES

Available upon request.