

# Daniel Hellfeld, Ph.D.

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EDUCATION	<b>Doctor of Philosophy (Ph.D.)</b> , Nuclear Engineering (4.0/4.0) <i>University of California, Berkeley</i> <ul style="list-style-type: none"><li>◦ Thesis: “Free-moving Omnidirectional 3D Gamma-ray Imaging and Localization”.</li><li>◦ Advisor: Prof. Kai Vetter.</li></ul> <b>Master of Science (M.S.)</b> , Nuclear Engineering (4.0/4.0) <i>Texas A&amp;M University</i> <ul style="list-style-type: none"><li>◦ Thesis: “Feasibility of Remote Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in the WATER Cherenkov Monitor of ANTineutrinos (WATCHMAN)”.</li><li>◦ Advisor: Prof. Craig Marianno.</li></ul> <b>Bachelor of Science (B.S.)</b> , Physics (3.89/4.0) <i>University of California, Santa Barbara</i>	<b>Aug 2015 - Jul 2019</b> <i>Berkeley, CA</i> <b>Aug 2013 - May 2015</b> <i>College Station, TX</i> <b>Sep 2009 - Jun 2013</b> <i>Santa Barbara, CA</i>
RESEARCH EXPERIENCE	<b>Senior Scientific Engineering Associate</b> <i>Applied Nuclear Physics Group, Lawrence Berkeley National Laboratory</i> <ul style="list-style-type: none"><li>◦ Real-time quantitative 3D gamma-ray imaging and scene data fusion.</li><li>◦ Object detection and tracking with LiDAR.</li></ul> <b>Research Fellow</b> <i>Nuclear Science and Security Consortium, UC Berkeley</i> <ul style="list-style-type: none"><li>◦ Modeling and imaging algorithm development for free-moving hand-held and UAS-mounted gamma-ray imagers (proximity, coded aperture, Compton).</li><li>◦ Experimental demonstration of omnidirectional 3D active coded mask imaging in real-time.</li><li>◦ Fusion of contextual sensors (e.g., LiDAR, RGB camera, IMU) and computer vision techniques (e.g., SLAM) with gamma-ray image reconstruction.</li></ul> <b>Physics Intern</b> <i>Rare Event Detection Group, Lawrence Livermore National Laboratory</i> <ul style="list-style-type: none"><li>◦ Monte Carlo simulations and data analysis for a water Cherenkov antineutrino detector.</li><li>◦ Study on the feasibility of remote clandestine nuclear reactor directionality with antineutrino-electron elastic scattering.</li><li>◦ Investigation of potential electron scattering background sources in water and the impact of overburden, fiducial volume, and radon contamination on directionality.</li></ul> <b>Graduate Research Assistant</b> <i>Department of Nuclear Engineering, Texas A&amp;M University</i> <ul style="list-style-type: none"><li>◦ Design, construction and characterization of a vehicle-mounted scintillator detector array for wide area radiological search in urban environments.</li><li>◦ Review on the use of solid-state photodiodes and photomultipliers in improving scintillation detection systems.</li></ul>	<b>Aug 2019 - Present</b> <i>Berkeley, CA</i> <b>Nov 2014 - Jul 2019</b> <i>Berkeley, CA</i> <b>Jun - Aug 2015/2014</b> <i>Livermore, CA</i> <b>Sep 2013 - Nov 2014</b> <i>College Station, TX</i>
TEACHING EXPERIENCE	<b>Stand-in Lecturer</b> <i>Department of Nuclear Engineering, UC Berkeley</i> <ul style="list-style-type: none"><li>◦ Multiple lectures for the undergraduate radiation detection and imaging courses (NE 104, 107).</li><li>◦ Semiconductor and scintillator detector operation, manufacturing, signal generation, readout techniques, applications and limitations.</li><li>◦ X-ray detection, image formation, computed tomography, and phase contrast imaging.</li></ul>	<b>Jan - May / Sep - Nov 2018</b> <i>Berkeley, CA</i>

	<b>Lab Instructor</b> <i>Department of Nuclear Engineering, Texas A&amp;M University</i> <ul style="list-style-type: none"> <li>◦ Setup and teardown of weekly laboratory experiments for the graduate radiation detection course (NUEN 605).</li> <li>◦ Assisted students with experimental procedures and graded lab reports.</li> </ul>	<b>Sep - Dec 2014</b> <i>College Station, TX</i>
MENTORSHIP EXPERIENCE	<b>Sophie Parsons, undergraduate</b> <i>Physics Department, UC Berkeley</i> <ul style="list-style-type: none"> <li>◦ Data analysis and gamma-ray image reconstruction using a double-sided strip Ge detector.</li> </ul>	<b>Oct 2018 - Mar 2019</b>
	<b>David Raji, undergraduate</b> <i>Department of Nuclear Engineering, Georgia Institute of Technology</i> <ul style="list-style-type: none"> <li>◦ Sensitivity-weighted adaptive voxelization for free-moving imaging.</li> <li>◦ Real-time probabilistic tri-state occupancy with ray-casting.</li> </ul>	<b>Jun - Aug 2018/2017</b>
SCIENTIFIC COMPUTING SKILLS	<b>Languages:</b> <b>Computing Environments:</b> <b>Data/Statistical Analysis:</b> <b>Monte Carlo Transport:</b> <b>Build Systems:</b> <b>Operating Systems:</b> <b>Robotics:</b> <b>Databases:</b> <b>Documentation:</b> <b>Markup:</b> <b>Version Control:</b> <b>Other Software:</b>	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 (hub, lab) L <sup>A</sup> T <sub>E</sub> 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	<b>2016 - Present</b> <b>2014 - Present</b> <b>2013 - Present</b> <b>2009 - 2013</b> <b>2009 - 2013</b>
AWARDS	<b>Best Paper - Radiation Detection</b> , UC Berkeley NE Dept. <b>Valentin T. Jordanov Rad. Instrum. Travel Grant</b> , IEEE NSS-MIC <b>Runner-up NSS Student Paper Competition</b> , IEEE NSS-MIC <b>Valentin T. Jordanov Rad. Instrum. Travel Grant</b> , IEEE NSS-MIC <b>Best Oral Presentation</b> , University Program Review Meeting <b>JD Williams Best Poster Award</b> , INMM Annual Meeting <b>Nuclear Science and Security Consortium Fellowship</b> , UC Berkeley <b>Graduate Enhancement Fellowship</b> , Texas A&M University <b>Highest Academic Honor Award</b> , UC Santa Barbara, Physics Dept. <b>Highest Honors</b> , UC Santa Barbara	<b>Dec 2018</b> <b>Aug 2018</b> <b>Oct 2017</b> <b>Aug 2017</b> <b>Jun 2017</b> <b>Jul 2015</b> <b>Nov 2014</b> <b>Aug 2013</b> <b>May 2013</b> <b>May 2013</b>
WORKSHOPS & SEMINARS	<b>Medical Image Reconstruction - Theory and Practice</b> 2018 IEEE NSS-MIC Short Course  <b>Applied Antineutrino Physics Workshop</b> Lawrence Livermore National Laboratory  <b>Machine Learning for Science Workshop</b> Lawrence Berkeley National Laboratory, NERSC  <b>Image Quality and Statistical Analysis</b> 2017 IEEE NSS-MIC Short Course	<b>Nov 2018</b> <i>Sydney, Australia</i>  <b>Oct 2018</b> <i>Livermore, CA</i>  <b>Sep 2017</b> <i>Berkeley, CA</i>  <b>Oct 2017</b> <i>Atlanta, GA</i>

<b>Novel Technologies for Safeguards and Arms Control Verification</b> Institute for Nuclear Materials Management, Sandia National Laboratory	<b>Aug 2017</b> Albuquerque, NM
<b>Fundamentals of Nondestructive Assay Training Course</b> Los Alamos National Laboratory, NSSC	<b>Jun 2017</b> Los Alamos, NM
<b>Fukushima Fieldwork for Radiation Disaster Recovery</b> Phoenix Program, Hiroshima University	<b>Aug 2016</b> Fukushima, Japan
<b>Python Boot Camp</b> UC Berkeley, NSF, Berkeley Institute for Data Science	<b>Aug 2016</b> Berkeley, CA
<b>Nuclear Safeguards Policy and Information Analysis Course</b> Middlebury Institute for International Studies at Monterey	<b>Jun 2016</b> Monterey, CA
<b>Next Generation Fukushima Workshop</b> IRC, LBNL, FREA, Koriyama City	<b>Apr 2016</b> Koriyama, Japan
<b>International Symposium for Resilient Communities</b> IRC, LBNL, FREA, Koriyama City	<b>Apr 2016</b> Koriyama, Japan
<b>Applied Antineutrino Physics Workshop</b> Center for Neutrino Physics, Virginia Tech University	<b>Dec 2015</b> Arlington, VA
<b>Public Policy and Nuclear Threats Summer Boot Camp</b> Institute on Global Conflict and Cooperation, UC San Diego	<b>Jun 2015</b> San Diego, CA
<b>Global Nuclear HR Development for Safety, Security &amp; Safeguards</b> Academy for Global Nuclear Safety and Security, Tokyo Institute of Technology	<b>Feb 2015</b> Tokyo, Japan
<b>NDA Fundamentals for Nuclear Safeguards</b> Next Generation Safeguards Initiative, Oak Ridge National Laboratory	<b>Nov 2014</b> 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.* (under review), 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.* (in press), 2019.
- [3] K. Vetter, A. Haefner, R. Barnowski, P. Barton, **D. Hellfeld**, T. 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.
- [4] **D. Hellfeld**, P. Barton, D. Gunter, L. Mihailescu, and K. Vetter, “A Spherical Active Coded Aperture for  $4\pi$  Gamma-ray Imaging,” *IEEE Trans. Nucl. Sci.*, vol. 64, no. 11, pp. 2837–2842, Nov. 2017.
- [5] **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.
- [6] S. Dazeley, A. Bernstein, T. Classen, E. Reedy, **D. Hellfeld**, M. Duvall, and C. Marianno, “Antineutrino Detection based on  $^6\text{Li}$ -doped Pulse Shape Sensitive Plastic Scintillator and Gd-doped Water,” in *Proc. Int. Conf. App. Nucl. Tech.*, Crete, Greece, Jun. 2017.
- [7] **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.
- [8] **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.

- [9] 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.
- [10] **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.
- [11] **D. Hellfeld**, C. Marianno, W. Charlton, and R. Webb, “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.
- [12] 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.*