Daniel Hellfeld, Ph.D.

CONTACT   Lawrence Berkeley National Laboratory   1.949.680.9345
1 Cyclotron Rd. (B50 - 4036R) Berkeley, CA 94720   dhellfeld@lbl.gov | dhellfeld.github.io

EDUCATION

Doctor of Philosophy (Ph.D.), Nuclear Engineering (4.0/4.0)   **Aug 2015 - Jul 2019**
University of California, Berkeley   *Berkeley, CA*

- 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)   **Aug 2013 - May 2015**
Texas A&M University   *College Station, TX*

- 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)   **Sep 2009 - Jun 2013**
University of California, Santa Barbara   *Santa Barbara, CA*

RESEARCH EXPERIENCE

Senior Scientific Engineering Associate   **Aug 2019 - Present**
Applied Nuclear Physics Group, Lawrence Berkeley National Laboratory   *Berkeley, CA*

- Development of real-time 3D gamma-ray imaging and scene data fusion for sUAS swarms.
- Quantitative imaging.
- Something else here that will take up two lines of text, just like this sentence that I have written here. See, it is two lines long.

Research Fellow   **Nov 2014 - Jul 2019**
Nuclear Science and Security Consortium, UC Berkeley   *Berkeley, CA*

- 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) with gamma-ray image reconstruction.

Physics Intern   **Jun - Aug 2015/2014**
Rare Event Detection Group, Lawrence Livermore National Laboratory   *Livermore, CA*

- 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   **Sep 2013 - Nov 2014**
Department of Nuclear Engineering, Texas A&M University   *College Station, TX*

- 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.

TEACHING EXPERIENCE

Stand-in Lecturer   **Jan - May / Sep - Nov 2018**
Department of Nuclear Engineering, UC Berkeley   *Berkeley, CA*

- 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.

Lab Instructor **Sep - Dec 2014**
Department of Nuclear Engineering, Texas A&M University *College Station, TX*

- Setup and teardown of weekly laboratory experiments for the graduate radiation detection course (NUEN 605).
- Assisted students with experimental procedures and graded lab reports.

MENTORSHIP EXPERIENCE		

Sophie Parsons, *undergraduate* **Oct 2018 - Mar 2019**
Physics Department, UC Berkeley

- Data analysis and gamma-ray image reconstruction using a double-sided strip Ge detector.

David Raji, *undergraduate* **Jun - Aug 2018/2017**
Department of Nuclear Engineering, Georgia Institute of Technology

- Sensitivity-weighted adaptive voxelization for free-moving imaging.
- Real-time probabilistic tri-state occupancy with ray-casting.

SCIENTIFIC COMPUTING SKILLS

Languages:	Python, C/C++, bash
Computing Environments:	IPython, Mathematica, Matlab
Data/Statistical Analysis:	ROOT, R
Monte Carlo Transport:	Geant4, MCNP5/X, Serpent
Build Systems:	make, CMake
Operating Systems:	macOS, Linux, Windows
Robotics:	ROS
Databases:	HDF5, SQL
Documentation:	Doxygen, Sphinx
Markup:	Markdown, XML, HTML
Version Control:	git (hub, lab)
Other Software:	LaTeX, MS Office

PROFESSIONAL SOCIETY MEMBERSHIPS

IEEE Nuclear and Plasma Sciences Society	**2016 - Present**
Institute of Nuclear Materials Management	**2014 - Present**
American Nuclear Society	**2013 - Present**
National Society of Collegiate Scholars	**2009 - 2013**
Golden Key International Honor Society	**2009 - 2013**

AWARDS

Best Paper - Radiation Detection, UC Berkeley NE Dept.	**Dec 2018**
Valentin T. Jordanov Rad. Instrum. Travel Grant, IEEE NSS-MIC	**Aug 2018**
Runner-up NSS Student Paper Competition, IEEE NSS-MIC	**Oct 2017**
Valentin T. Jordanov Rad. Instrum. Travel Grant, IEEE NSS-MIC	**Aug 2017**
Best Oral Presentation, University Program Review Meeting	**Jun 2017**
JD Williams Best Poster Award, INMM Annual Meeting	**Jul 2015**
Nuclear Science and Security Consortium Fellowship, UC Berkeley	**Nov 2014**
Graduate Enhancement Fellowship, Texas A&M University	**Aug 2013**
Highest Academic Honor Award, UC Santa Barbara, Physics Dept.	**May 2013**
Highest Honors, UC Santa Barbara	**May 2013**

WORKSHOPS & SEMINARS

Medical Image Reconstruction - Theory and Practice **Nov 2018**
2018 IEEE NSS-MIC Short Course *Sydney, Australia*

Applied Antineutrino Physics Workshop **Oct 2018**
Lawrence Livermore National Laboratory *Livermore, CA*

Machine Learning for Science Workshop **Sep 2017**
Lawrence Berkeley National Laboratory, NERSC *Berkeley, CA*

Image Quality and Statistical Analysis **Oct 2017**
2017 IEEE NSS-MIC Short Course *Atlanta, GA*

Novel Technologies for Safeguards and Arms Control Verification   **Aug 2017**
Institute for Nuclear Materials Management, Sandia National Laboratory   *Albuquerque, NM*

Fundamentals of Nondestructive Assay Training Course   **Jun 2017**
Los Alamos National Laboratory, NSSC   *Los Alamos, NM*

Fukushima Fieldwork for Radiation Disaster Recovery   **Aug 2016**
Phoenix Program, Hiroshima University   *Fukushima, Japan*

Python Boot Camp   **Aug 2016**
UC Berkeley, NSF, Berkeley Institute for Data Science   *Berkeley, CA*

Nuclear Safeguards Policy and Information Analysis Course   **Jun 2016**
Middlebury Institute for International Studies at Monterey   *Monterey, CA*

Next Generation Fukushima Workshop   **Apr 2016**
IRC, LBNL, FREA, Koriyama City   *Koriyama, Japan*

International Symposium for Resilient Communities   **Apr 2016**
IRC, LBNL, FREA, Koriyama City   *Koriyama, Japan*

Applied Antineutrino Physics Workshop   **Dec 2015**
Center for Neutrino Physics, Virginia Tech University   *Arlington, VA*

Public Policy and Nuclear Threats Summer Boot Camp   **Jun 2015**
Institute on Global Conflict and Cooperation, UC San Diego   *San Diego, CA*

Global Nuclear HR Development for Safety, Security & Safeguards   **Feb 2015**
Academy for Global Nuclear Safety and Security, Tokyo Institute of Technology   *Tokyo, Japan*

NDA Fundamentals for Nuclear Safeguards   **Nov 2014**
Next Generation Safeguards Initiative, Oak Ridge National Laboratory   *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 4π 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}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.*