JACOB FRITCHIE

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EDUCATION

Ph.D. Candidate | ***Nuclear, Plasma, and Radiological Engineering*** Jan 2025 – Present
University of Illinois Urbana-Champaign (UIUC) Urbana, Illinois

- Cumulative GPA: 4.0 / 4.0
- NNSA Nuclear Nonproliferation and International Safeguards Fellow
- Expected Completion: May 2027

Master of Science | ***Nuclear, Plasma, and Radiological Engineering*** Jan 2022 – Dec 2024
University of Illinois Urbana-Champaign (UIUC) Urbana, Illinois

- Cumulative GPA: 4.0 / 4.0
- **Thesis**: *Characterization of Silicon Photomultipliers for Radiation Detection Applications*

Bachelor of Science | ***Physics*** Aug 2017 – May 2021
University of Illinois Urbana-Champaign (UIUC) Urbana, Illinois

- Cumulative GPA: 3.57 / 4.0

PROFESSIONAL EXPERIENCE

Sandia National Laboratories June 2022 - Present
Graduate Research and Development Intern Albuquerque, New Mexico

- **Nuclear Safeguards & Nonproliferation**: Evaluated and contributed to nuclear safeguards measures for advanced reactors, focusing on security protocols and nonproliferation.
- **Waste Management & Security**: Analyzed advanced reactor waste management strategies and researched self-protecting radioactive sources to enhance security measures.
- **Simulation & Modeling**: Conducted simulations using GADRAS and MCNP to model nuclear waste containers and HPGe detectors.
- **System Design**: Designed and implemented a temperature controller for silicon photomultiplier (SiPM) characterization, enhancing measurement precision.
- **Publication:** Authored and co-authored 4 technical reports on safeguards and security-related topics, currently under review prior to publication.

RESEARCH EXPERIENCE

Silicon Photomultiplier Characterization Jan 2022 - Present
Graduate Research Assistant, Advisor: Prof. Angela Di Fulvio, UIUC Urbana, Illinois

- Characterized response parameters of several commercial SiPM for comparison.
- Simulated response of SiPMs using radiation transport software.

Contributed to the design of reaction plane detector for CERN ATLAS project April 2021 – December 2021
Undergraduate Research Assistant, Advisor: Prof. Matthias Grosse-Perdekamp, UIUC Urbana, Illinois

- Used CAD to design parts of the reaction plane detector.
- Assisted with the construction of the detector.

Analysis and refurbishment of LHC ATLAS Zero Degree Calorimeter April 2021 – August 2021
Undergraduate Research Assistant, Advisor: Prof. Matthias Grosse-Perdekamp, UIUC Urbana, Illinois

- Led the analysis of light transmission studies of polished fused silica rods used in the ATLAS Zero Degree Calorimeter.

Independent study of basic quantum simulations May 2020 – August 2020
Undergraduate, Advisor: Prof. Aida El-Khadra, UIUC Urbana, Illinois

- Created simulations of basic quantum systems implementing Monte Carlo methods using Python.

Publications

Peer-Reviewed Journal Publications

1. S. Yang, A. Tate, R. Longo, M. Sabate Gilarte, F. Cerutti, S. Mazzoni, M. Grosse Perdekamp, E. Bravin, Z. Citron, B. Kühn, F. Nürnberg, B. Cole, J. Fritchie, I.Gelber, M. Hoppesch, S. Jackobsen, T. Koeth, C. Lantz, D. MacLean, A. Mignerey, M. Murray, M. Palm, M. Phipps, S. Popescu, N. Santiago, S. Shenkar, and P. Steinberg. Optical transmission characterization of fused silica materials irradiated at the cern large hadron collider. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 1055:168523, 2023

Conference Proceedings

1. **Jacob Fritchie**, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. Silicon photomultiplier characterization and minimization of cross-talk to enable radiation detection in harsh environments. In *Institute of Nuclear Materials Management Annual Meeting Proceedings*, 2023
2. **Jacob Fritchie**, Ming Fang, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. First-principle sipm characterization to enable radiation detection in harsh environments. In *IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC) Milan, IT*, 2022

Presentations

1. **Jacob Fritchie**, Jon Balajthy, and Angela Di Fulvio. Characterization of high-temperature sipm noise (poster). Tampa, Florida, November 2024. 2024 IEEE Nuclear Science Symposium, Medical Imaging Conference and Room Temperature Semiconductor Detector Conference
2. **Jacob Fritchie**, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. Characterization and reduction of sipm noise for improved detection performance (awarded best poster presentation). College Station, Texas, June 2024. DOE NNSA 2024 University Program Review
3. **Jacob Fritchie**, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. Silicon photomultiplier characterization and minimization of cross-talk to enable radiation detection in harsh environments (oral). Berkeley, CA, October 2023. 2023 Nuclear Science aand Security Consortium Fall Worskhop
4. **Jacob Fritchie**, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. Silicon photomultiplier characterization and minimization of cross-talk to enable radiation detection in harsh environments (oral). Urbana, IL, September 2023. 2023 Sandia/Illinois Student Talk Series
5. **Jacob Fritchie**, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. Silicon photomultiplier characterization and minimization of cross-talk to enable radiation detection in harsh environments (poster). Urbana, IL, September 2023. 2023 University of Illinois Urbana-Champaign Engineering Research Fair & International Symposium
6. **Jacob Fritchie**, Ming Fang, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. Silicon photomultiplier characterization and minimization of cross-talk to enable radiation detection in harsh environments (oral). Vienna, Austria, May 2023. INMM and ESARDA 2023 Joint Annual Meeting
7. **Jacob Fritchie**, Ming Fang, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. Silicon photomultiplier characterization and minimization of cross-talk to enable radiation detection in harsh environments (oral). Berkeley, California, June 2023. DOE NNSA 2023 University Program Review
8. **Jacob Fritchie**, Ming Fang, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. First-principle sipm characterization to enable radiation detection in harsh environments (poster). Milano, Italy, November 2022. 2022 IEEE Nuclear Science Symposium, Medical Imaging Conference and Room Temperature Semiconductor Detector Conference
9. **Jacob Fritchie**, Ming Fang, Jon Balajthy, Melinda Sweany, Thomas Weber, and Angela Di Fulvio. First-principle sipm characterization to enable radiation detection in harsh environments (poster). Urbana, USA, Septempber 2022. Fall 2022 Sandia National Laboratory-University of Illinois LDRD Conference

10. **Jacob Fritchie**. Silicon photomultiplier characterization (oral). Los Alamos National Laboratory, USA, August 2022. 2022 NSSC-LANL Keepin Nonproliferation Fellowship Presentations

Professional Affiliations

Institute of Nuclear Materials Management (INMM) September 2023 - Present
Secretary of Central Region Chapter

College Leadership Activities

UIUC International Nuclear Materials Management (INMM) Student Chapter August 2022 - Present
Founder and President Urbana, Illinois

- Founded the new INMM student chapter at UIUC.
- The UIUC INMM chapter aims to promote the goals and objectives of the INMM. These goals include promoting the advancement of nuclear materials management, improving qualifications of students and professionals working in the field, and improving nuclear material safeguards.

Graduate Ambassador August 2024 - Present
Grainger College of Engineering Urbana, Illinois

- Mentored 4 graduate students, helping them adjust to graduate school by providing advice on course selection, research strategies, and guidance on applying for jobs and internships.

UIUC Grainger College of Engineering Graduate Student Advisory Committee September 2023 - Present
Member Urbana, Illinois

- Provided graduate college with advice on student needs.
- Authored a report for the graduate college on the student experience with generative AI. Formulated recommendations for its effective deployment and utilization by faculty.
- Facilitated networking events for the graduate students.

Skills

- **Radiation Transport Software:** GEANT4, MCNP, GADRAS
- **Programming:** Python, MATLAB
- **Hardware and Fabrication:** PCB design, electronic systems integration, lathe and endmill operation.
- **Other Software:** ROOT, Origin, COMPASS, Linux-based systems, CAD

Awards

University Program Review Best Poster Presentation 2024
National Nuclear Security Administration

Nuclear Nonproliferation International Safeguards Fellowship 2023
South Carolina Universities Research and Education Foundation

NSSC-LANL Keepin Nonproliferation Fellowship 2022
Nuclear Science and Security Consortium and Los Alamost National Lab

Campus Honors Program Calvin Ke Award 2021
University of Illinois

Distinguished Chancellor's Scholar 2021
University of Illinois

Dean's List Spring 2021
University of Illinois

Elks National Foundation Most Valuable Scholar, 3rd Place 2017
Elks National Foundation

Chancellor's Scholar 2017-2021
University of Illinois

James Scholar 2017-2018
University of Illinois

Legacy Scholarship 2017-2021
University of Illinois

Leo Herning Scholarship 2017-2021
Leo Herning Foundation

Campbell Scholarship 2017-2021
University of Illinois

Hunter, J. E. and B. F. Scholarship 2017-2021
University of Illinois

Bloom, David and Mary Scholarship 2017-2021
University of Illinois