Nathan Giha

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Research interests

Nuclear fission; Reaction reconstruction with machine learning; Instrumentation

Education

University of Michigan

2019 – Present PhD in Nuclear Engineering & Radiological Sciences

2019 – 2022 MSE in Nuclear Engineering & Radiological Sciences
Highlighted coursework: Elementary particle physics; Electrodynamics & classical fields; Quantum mechanics. *GPA: 4.00*

2015 – 2019 BSE in Nuclear Engineering & Radiological Sciences, *Summa Cum Laude*
Focus in instrumentation. Mathematics minor. *GPA: 3.91*

Research experience

Sep 2019 – Present **Detection for Nuclear Nonproliferation Group**
Advisor: Professor Pozzi (University of Michigan)

- Analyzing experimental correlations between fission observables to discover how angular momentum is generated in nuclear fission
- Applying machine learning to reconstruct the initial conditions of fragments
- Equipped laboratory for scintillator manufacturing and characterized glass bars coupled to silicon photomultipliers for neutron imaging (IEEE-NSS Proc., NIM:A)

May 2021 – Aug 2021 **Argonne National Laboratory**
Mentors: Filip Kondev, Fredrik Tovesson (Physics Division)

- Newly determined angular momenta of discrete levels populated in β decay of ^{146}La by studying γ-ray cascades of ^{146}Ce Gammasphere
- Found evidence of ground-state deformation in ^{146}La, flipping the spins of the ground and isomeric states in the present evaluation (APS DNP).

May 2016 – Aug 2019 **Detection for Nuclear Nonproliferation Group**
Mentors: William Steinberger, Angela Di Fulvio, Marc Ruch, Sara Pozzi (University of Michigan)

- Designed and assembled readout electronics (IEEE-NSS Proc.) for silicon photomultiplier arrays
- Developed radiation imaging algorithms in Python and validated with Monte Carlo simulations
- Characterized radiation imaging systems (Scientific Reports, NIM:A)

May 2018 – Aug 2018 **Los Alamos National Laboratory**
Mentor: Marc Ruch (Safeguards Science & Technology Group)

- Developed an algorithm for analyzing time-correlated coincidence data
- Performed source localization with simulated data on high-performance computing cluster
- Presented findings orally (LA-UR-18-27463) and in an internal technical note

Honors and scholarships

2020 NSF Graduate Research Fellowship (National Science Foundation)

2019 Dean's Fellowship (UM College of Engineering)

2019 Best in Detection & Measurements, ANS Student Conference

2018 Michigan Competitive Scholarship (State of Michigan)

2017, 2018 Andrew A. Kucher Scholarship (NERS Department)

2016, 2017 Summer Research Fellowship (Consortium for Verification Technology)

2016 James D. Butt Scholarship (NERS Department)

2016 NERS 2nd Year Scholarship (NERS Department)

Journal Articles

2022 **N. Giha**, S. Marin, J. A. Baker, I. E. Hernandez, K. J. Kelly, M. Devlin, J. M. O'Donnell, R. Vogt, J. Randrup, P. Talou, A. E. Lovell, I. Stetcu, O. Serot, O. Litaize, A. Chebboubi, S. D. Clarke, and S. A. Pozzi. "Correlations Between γ-Ray Multiplicity and Compound Nucleus Excitation Energy in ^{239}Pu(n, f)". In: (In preparation)

2021 W. M. Steinberger, **N. Giha**, R. Lopez, J. C. Nicholson, S. D. Clarke, and S. A. Pozzi. "Passive gamma-ray imaging of special nuclear materials using a handheld dual particle imager". In: *IEEE Transactions on Nuclear Science* (Submitted July 2021)

2021 W. M. Steinberger, **N. Giha**, P. Marleau, S. D. Clarke, and S. A. Pozzi. "Source isolation and identification using the handheld dual particle imager". In: *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* (Submitted June 2021)

2021 **N. Giha**, W. M. Steinberger, L. Q. Nguyen, J. S. Carlson, P. L. Feng, S. D. Clarke, and S. A. Pozzi. "Organic glass scintillator bars with dual-ended readout". In: *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 1014 (2021), p. 165676. ISSN: 0168-9002. DOI: 10.1016/j.nima.2021.165676

2021 W. M. Steinberger, **N. Giha**, M. Y. Hua, S. D. Clarke, and S. A. Pozzi. "Anisotropic neutron response of trans-stilbene and impact on a handheld dual particle imager". In: *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 1003 (2021), p. 165266. ISSN: 0168-9002. DOI: 10.1016/j.nima.2021.165266

2020 W. M. Steinberger, M. L. Ruch, **N. Giha**, A. Di Fulvio, P. Marleau, S. D. Clarke, and S. A. Pozzi. "Imaging Special Nuclear Material using a Handheld Dual Particle Imager". In: *Scientific Reports* 10.1 (2020), p. 1855. DOI: 10.1038/s41598-020-58857-z

Conference Proceedings

2020 **N. Giha**, W. M. Steinberger, S. D. Clarke, S. A. Pozzi, L. Q. Nguyen, J. S. Carlson, and P. L. Feng. "Melt-Cast Organic Glass Scintillators for a Handheld Dual Particle Imager". In: *2020 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*. 2020, pp. 1–5. DOI: 10.1109/NSS/MIC42677.2020.9507862

2020 W. M. Steinberger, **N. Giha**, P. Marleau, S. D. Clarke, and S. A. Pozzi. "Optimizing the Position of Inorganic Scintillators in a Handheld Dual Particle Imager". In: *2020 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*. 2020, pp. 1–5. DOI: 10.1109/NSS/MIC42677.2020.9508098

2019 W. M. Steinberger, **N. Giha**, M. Bondin, S. D. Clarke, and S. A. Pozzi. "Neutron Imaging and Spectroscopy of Plutonium Using a Handheld Dual Particle Imager". In: *2019 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*. 2019, pp. 1–3. DOI: 10.1109/NSS/MIC42101.2019.9059619

2017 **N. Giha**, M. L. Ruch, A. Di Fulvio, W. M. Steinberger, and S. A. Pozzi. "Readout Electronics of a Handheld Dual Particle Imager". In: *2017 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*. 2017, pp. 1–3. DOI: 10.1109/NSSMIC.2017.8532622

2017 A. Di Fulvio, K. A. Beyer, T. H. Shin, **N. Giha**, S. D. Clarke, and S. A. Pozzi. "SiPM readout of stilbene crystals for safeguards applications". In: *2017 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*. 2017, pp. 1–3. DOI: 10.1109/NSSMIC.2017.8532859

Teaching experience

Summers 2020 – 2022 **Lecturer, MTV Nuclear Engineering Summer School (University of Michigan)**
Delivered lectures on basic nuclear physics topics, such as γ-ray detection and neutrons and γ rays from fission, to undergraduate and beginning graduate students.

Fall 2018 **Instructional Assistant, NERS 211: Introduction to Nuclear Engineering & Radiological Sciences (University of Michigan)**
Delivered lessons, graded assignments, and held office hours for a course on basic principles of nuclear physics and engineering. This course was intended for upper-level engineering majors outside the department.

Conference presentations (selected)

Oct 2021 Decay properties of low- and high-spin beta-decaying isomers in ^{146}La
2021 Fall Meeting of the APS Division of Nuclear Physics

Sep 2021 Excitation energy dependence of fission neutron and γ-ray emission from ^{239}Pu(n, f)
University Program Review 2021

Nov 2020 — Melt-Cast Organic Glass Scintillators for a Handheld Dual Particle Imager
2020 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)

Mar 2020 — A Palm-Sized Adaptive Neutron Scatter Camera
MTV Virtual Student Research Symposium

Apr 2019 — Development of a Neutron Scatter Camera using SiPMs Coupled to Stilbene
2019 American Nuclear Society Student Conference

Aug 2018 — Resolving the Position of Fission Sources in a ^{3}He Well Counter using List-Mode Analysis
Los Alamos National Laboratory Student Symposium

Oct 2017 — Readout Electronics of a Handheld Dual Particle Imager
2017 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)

Oct 2016 — Prototype Printed Circuit Board for Readout of a Handheld Dual Particle Imager
2016 Consortium for Verification Technology Workshop

Mentorship

Jan 2022 – Present — Isabel Hernandez (undergraduate)
Project: Simulating γ-ray cascades from highly-excited nuclei

Jan 2021 – Present — James Baker Jr. (undergraduate)
Project: Multiplicity correlations in fast neutron-induced fission

Jan 2020 – Mar 2020 — Emma Cho (undergraduate)
Project: Casting and characterizing organic glass scintillators

Outreach

Summer 2019 — **Consortium for Verification Technology Outreach Program**
Hosted laboratory tours for high school students belonging to groups that are historically underrepresented in STEM. Taught basics of radiation interactions with matter and detector physics.

Summer 2019 — **Xplore Engineering Outreach Program**
Introduced University of Michigan alumni and their 4th - 7th grade children to radiation detection through laboratory tours and demonstrations.

Professional membership and service

2021 – Present	American Physical Society
2019 – Present	IEEE Nuclear & Plasma Sciences Society UM Chapter President 2020-21; Vice President 2019-20
2017 – Present	Institute for Nuclear Materials Management UM Chapter President 2020-21; Vice President 2019-20; Communications Chair 2018-19
2016 – 2022	American Nuclear Society

Technical skills

Programming languages
Proficient in: Python, C++, Mathematica
Familiar with: C#, MATLAB

Software
ROOT, RadWare, MCNP, Geant4, LaTeX, Git, CAEN FPGA, CadSoft EAGLE (PCB design & layout), SolidWorks (CAD), SRIM

Hardware
Machining, soldering, detector construction

Languages
English (fluent), French (basic), Korean (basic), Spanish (basic)