

# 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. <i>GPA: 4.00</i>
2015 – 2019	BSE in Nuclear Engineering & Radiological Sciences, <i>Summa Cum Laude</i> Minor in Mathematics. <i>GPA: 3.91</i>

## Research experience

Sep 2019 – Present	<b>Detection for Nuclear Nonproliferation Group</b> Advisor: Professor Sara Pozzi (University of Michigan) <ul style="list-style-type: none"><li>Analyzing experimental correlations between fission observables to discover how angular momentum is generated in nuclear fission</li><li>Applying machine learning to reconstruct the initial conditions of fragments</li><li>Equipped laboratory for scintillator manufacturing and characterized glass bars coupled to silicon photomultipliers for neutron imaging (<a href="#">IEEE-NSS Proc.</a>, <a href="#">NIM:A</a>)</li></ul>
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- May 2021 – **Argonne National Laboratory**  
 Aug 2021 Mentors: Filip Kondev, Fredrik Tovesson (Physics Division)
- Newly determined angular momenta of discrete levels populated in  $\beta$  decay of  $^{146}\text{La}$  by studying  $\gamma$ -ray cascades of  $^{146}\text{Ce}$  Gammasphere
  - Found evidence of ground-state deformation in  $^{146}\text{La}$ , flipping the spins of the ground and isomeric states in the present evaluation ([APS DNP](#)).
- May 2016 – **Detection for Nuclear Nonproliferation Group**  
 Aug 2019 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 – **Los Alamos National Laboratory**  
 Aug 2018 Mentor: Marc Ruch (Safeguards Science & Technology Group)
- Developed an algorithm for analyzing time-correlated coincidence data for localizing correlated neutron sources
  - Simulated detection scenarios and tested algorithm on high-performance computing cluster
  - Presented findings orally ([LA-UR-18-27463](#)) and in an internal technical note

## Awards and honors

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|------------|--|
| 2022       | First Place, Innovations in Nuclear Tech R&D (US DOE Office of Nuclear Energy) |
| 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 2 <sup>nd</sup> 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  $\gamma$ -Ray Multiplicity and Compound Nucleus Excitation Energy in  $^{239}\text{Pu}(n, f)$ ". 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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1109/NSSMIC.2017.8532859)

## Teaching experience

- Summers 2020 **Lecturer, MTV Nuclear Engineering Summer School (University of Michigan)**  
 – 2022 Delivered lectures on basic nuclear physics topics, such as  [\$\gamma\$ -ray detection](#) and [neutrons and  \$\gamma\$  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  $^{146}\text{La}$   
*2021 Fall Meeting of the APS Division of Nuclear Physics*
- Sep 2021 Excitation energy dependence of fission neutron and  $\gamma$ -ray emission from  $^{239}\text{Pu}(n, f)$   
*University Program Review 2021*

Nov 2020	Melt-Cast Organic Glass Scintillators for a Handheld Dual Particle Imager <i>2020 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)</i>
Mar 2020	A Palm-Sized Adaptive Neutron Scatter Camera <i>MTV Virtual Student Research Symposium</i>
Apr 2019	Development of a Neutron Scatter Camera using SiPMs Coupled to Stilbene <i>2019 American Nuclear Society Student Conference</i>
Aug 2018	Resolving the Position of Fission Sources in a $^3\text{He}$ Well Counter using List-Mode Analysis <i>Los Alamos National Laboratory Student Symposium</i>
Oct 2017	Readout Electronics of a Handheld Dual Particle Imager <i>2017 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)</i>
Oct 2016	Prototype Printed Circuit Board for Readout of a Handheld Dual Particle Imager <i>2016 Consortium for Verification Technology Workshop</i>

## Mentorship

Jan 2022 – Present	Isabel Hernandez (undergraduate) Project: Simulating $\gamma$ -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	<b>Consortium for Verification Technology Outreach Program</b> 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	<b>Xplore Engineering Outreach Program</b> 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,  $\text{\LaTeX}$ , 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)