

JADEN PALMER

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EDUCATION

Ph.D. in Nuclear Engineering Expected May 2029
North Carolina State University, NC, USA

Honors Bachelor of Science (H.B.S.) in Nuclear Engineering May 2025

Minor in Physics

Idaho State University, Idaho, USA

Overall GPA: 3.72/4.0

Undergraduate Honors Thesis: "Utilizing Physics-Informed Synthetics Data to Predict Reactor Operations"

B.S. in Mechanical Engineering May 2025

Idaho State University, Idaho, USA

Overall GPA: 3.72/4.0

Involvement: Honors Program (Inducted 2021); Kinematica Club (2022 - Present); American Nuclear Society - Idaho State University Chapter (2021 - Present)

RESEARCH EXPERIENCE

Graduate Research Assistant August 2025 - Present
Department of Nuclear Engineering, North Carolina State University Raleigh, NC

- Conducting research in the disentanglement of aleatory and epistemic uncertainty in deep learning models to benchmark various uncertainty quantification methods
- Implementing physics-informed neural networks with specialized learning strategies for predicting reactor operations
- Performing anomaly detection of reactor operations using deep learning methods for nuclear proliferation detection

Reactor Twin Analytics Intern January 2023 - August 2025
Computational Data Science Department, Idaho National Laboratory Idaho Falls, ID

- Developed a generalized framework for predicting reactor operations using a long-short term recurrent neural network architecture
- Constructed a pipeline for generating synthetic data to predict reactor operations of a realistic heat pipe-cooled microreactor and AGN-201 research reactor
- Performed uncertainty quantification of various recurrent neural network models and architectures used Monte Carlo dropout
- Assisted in developing backend programming for a generalized machine learning application with a graphical user interface

Mechanical Engineering Undergraduate Researcher January 2023 - July 2025
Department of Mechanical Engineering, Idaho State University Pocatello, ID

- Developed a reinforcement learning model using Unity ML-Agents to automatically perform robotic and prosthetic actuation according to user needs
- Created an augmented reality application that allows users to interact with objects using an electromyography armband and trained reinforcement learning model

Nuclear Engineering Undergraduate Researcher
Department of Nuclear Engineering, Idaho State University

February 2024 - May 2025
Idaho Falls, ID

- Automated safeguards code to model the proliferation potential of pyroprocessing plants re-processing fast reactor fuel

MIT Summer Research Intern
MIT Media Lab, Massachusetts Institute of Technology

June 2024 - October 2024
Cambridge, MA

- Contributed to and presented work on the Earth Mission Control virtual reality project to potential project investors and senior NASA visualization staff
- Combined satellite Earth observation data, hyperspatial locations, and other interactive for advanced data visualization, further increasing understanding in climate data
- Developed multiple new functionalities for dynamically displaying Earth Observation Data using the Mixed Reality Toolkit (MRTK) in the Unity platform
- Created media assets used in 2024 SIGGRAPH conference keynote: *Humanity Becoming Interplanetary: Exploring Space for Earth* by Dava Newman

REFEREED JOURNAL PUBLICATIONS

1. **Palmer, J.**, Rogers, D., Shields, A., & Stewart, R., (2025). Recurrent Neural Networks for Predicting Reactor Operations with Uncertainty Quantification, (*in preparation for Annals of Nuclear Energy*)
2. **Palmer, J.**, Stewart, R., Vainqueur, B., Shields, A., Pope, C. & Ritter, C., (2025). Utilizing Physics-Informed Synthetic Data to Predict Reactor Operations, (*in review, Progress in Nuclear Energy*)
3. Done, C., **Palmer, J.**, Oakey, K., Gupta, A., Thiros, C., Franklin, J. & Schoen, M., (2025). Reinforcement Learning–Driven Prosthetic Hand Actuation in Augmented Reality Using Unity ML-Agents, (*Virtual Worlds*) 4(4):53.
4. Barker, E., Hargreaves, A., Witt, J., Berry, J., Bice, L., Frasure, M., Gannon, L., Gunderson, C., Lambert, M., Langx, E., Munoz, S., **Palmer, J.**, Shanahan, S., Snow, N. & Pope, C., (2024). Understanding Pyroprocessing Throughput in the Context of Safeguards, *InTechOpen*.
5. Stewart, R., Treviño, E., Shields, A., Heaps, K., Darrington, J., Williams, Q., Pope, C., Scott, J., Baker, B., **Palmer, J.**, Vainqueur, B., Palmer, T. S., Palmer, C., Bays, S., Schanfein, M., Reyes, G. & Ritter, C., (2025). The AGN-201 Digital Twin: A Test Bed for Remotely Monitoring Nuclear Reactors, *Annals of Nuclear Energy*, 213:111041.

CONFERENCE PROCEEDINGS

1. **Palmer, J.**, Stewart, R., and Wu, X. (2026). A Comparative Uncertainty Quantification Study for Machine Learning-based Operational Prediction of a Realistic Heat Pipe-cooled Microreactor. In Proceedings of the International Conference on Physics of Reactors (PHYSOR 2026). Turin, Italy, April 19-23, 2026 (under review)
2. Snow, N., **Palmer, J.**, Wu, X., and Hou, J. (2026). An Investigation on the Learning Strategies for a Physics-Informed LSTM Model with a Point-Reactor Kinetics Problem. In Proceedings of the International Conference on Physics of Reactors (PHYSOR 2026). Turin, Italy, April 19-23, 2026 (under review)
3. Moloko, L., **Palmer, J.**, Bokov, P., Delipei, G., Wu, X., and Ivanov, K. (2026). Validation of Physics-based and Data-driven Models using Measured SAFARI-1 Axial Neutron Flux Profiles. In Proceedings of the International Conference on Physics of Reactors (PHYSOR 2026). Turin, Italy, April 19-23, 2026 (under review)

4. **Palmer, J.**, Done, C., Oakey, K., Gupta, A., Franklin, J., Thiros, C., Hagedorn, S. & Schoen, M., (2025), Individualized Prosthesis Actuation Design using Adaptive Reinforcement Learning, In *Proceedings of 2025 Intermountain Engineering and Technology Conference*, Orem, UT, May. 9-10.
5. **Palmer, J.**, Shields, A. & Stewart, R., (2025), Recurrent Neural networks to Predict Reactor Operations using Physics Informed Data, In *Proceedings of 2025 ANS Student Conference*, Albuquerque, NM, USA, Apr. 3-5.
6. **Palmer, J.**, Cherner, P., Connolly, R., Rathnasabapathy, M. & Newman, D., (2024), Earth Mission Control: Local Climate Change Intelligence through Advanced Data Visualizations, In *Proceedings of 2025 AGU Annual Meeting*, Washington D.C., USA, Dec. 9-13.
7. **Palmer, J.**, Shields, A., & Stewart, R. (2024), Creating Physics-Informed Synthetic Data to Train a Digital Twin for Predicting Reactor Operations , In *Proceedings of 2024 PBNC*, Idaho Falls, Idaho, Oct 7-10.
8. Rathnasabapathy, M., Connolly, R., Cherner, P., **Palmer, J.**, Newman, D. & SubbaRao, M., (2024), Designing Earth Mission Control: An Immersive Data Visualization Tool for Climate Communication and Decision-Making, In *Proceedings of the IEEE VIS 2024 Conference*, Virtual Conference, Oct. 13-18.
9. Barker, E., Hargreaves, A., Gunderson, C., Lambert, M., Munoz, S., **Palmer, J.**, Shanahan, S., Snow, N., Witt, J., Dolley, E. & Pope, C., (2024), Safeguards modeling for studies of pyroprocessing input accountancy and fuel impacts on ID and SEID, *Proceedings of the INMM/ESARDA 2024 Joint Annual Meeting*, Luxembourg, Luxembourg, May 14-16.
10. **Palmer, J.**, Oakey, K., Schoen, M. P. & Devine, N., (2024), Utilizing Augmented Reality for Upper-Extremity Prosthesis Dimensioning, *2024 Intermountain Engineering, Technology and Computing (IETC)*, Logan, UT, USA, May 13-14.
11. Stewart, R., Shields, A., Pope, C., Darrington, J., Wilsdon, K., Bays, S., Heaps, K., Scott, J., Reyes, G., Schanfein, M., Treviño, E., **Palmer, J.** & Ritter, C., (2023), A digital twin of the AGN-201 reactor to simulate nuclear proliferation, *Proceedings of the INMM/ESARDA 2023 Joint Annual Meeting*, Vienna, Austria, May 22-26.

HONORS AND AWARDS

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| • National Science Foundation Graduate Fellowship | 2025 |
| • North Carolina State University Provost's Doctoral Fellowship | 2025 |
| • ISU Outstanding Student Achievement Award Recipient | 2025 |
| • Barry S. Goldwater Scholarship | 2024 |
| • U.S. Department of Energy University Nuclear Leadership Program Scholarship | 2024 |
| • U.S. Nuclear Regulatory Commission Nuclear Leadership Program Scholarship | 2024 |
| • Full Merit Scholarship for High Energy Density Physics | 2023 |
| • Idaho State University SDS Scholarship for Honors Leadership | 2023 |
| • ExCEL Pepsico Scholar | 2022 |

WORKSHOPS AND PROFESSIONAL COURSES

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| • Data Science and Machine Learning Program Certification, MIT | August 2024 |
| • Summer School in High Energy Density Physics, University of Rochester | June 2023 |

TECHNICAL SKILLS

- **Monte Carlo Analysis Codes:** MCNP6
- **Probability Risk Assessment:** OpenBUGS
- **Programming:** MATLAB, Python, C#, C++, Simulink, \LaTeX
- **Machine/Deep Learning Libraries:** SciKitLearn API, PyTorch API, TensorFlow API
- **Virtual/Augmented Reality Development:** Unity Editor, OpenXR, Mixed Reality Toolkit (MRTK)