Roy T. Forestano
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Education

Physics Ph.D., University of Florida, Gainesville, FL *August 2021 - 2025*

Physics M.S., University of Florida, Gainesville, FL *August 2021 - December 2023*

Physics B.S., Mathematics B.S., Magna Cum Laude, Boston College, Chestnut Hill, MA *August 2017 - May 2021*

Steinert High School, Valedictorian, Hamilton Township, NJ *September 2013 - June 2017*

Research Interests

Deep Learning, Deep geometric methods, Generative Modeling, Quantum Machine Learning

Quantum Computing, Reinforcement Learning, NLPs, LLMs, Foundation Models, HEP, Astrophysics

Research

2024 Quantum Computing Summer School Fellowship *June - August 2024 / Los Alamos National Lab*

LANL and Xanadu, Using representation theory to improve quantum algorithms

Graduate RA in Theoretical High Energy Physics *January 2022 - August 2025/ University of Florida*

Group of Matchev/a, Novel ML/AI Applications to HEP and Astrophysics

Undergraduate RA in Theoretical CM Physics *January 2019 - May 2021/ Boston College*

Group of Kevin S. Bedell, Analyzed the effect of the Higgs amplitude mode on the SC transition temperature, T_C, in FFLs

Undergraduate RA in Experimental CM Physics *February 2018 - August 2018 / Boston College*

Group of Cyril P. Opeil, Used Resonant Ultrasound Spectroscopy (RUS) to reveal thermoelectric properties of materials

Experience

Introductory Physics I Instructor & Lecturer *May - August 2025 / University of Florida*

2024 Google Summer of Code (GSOC) ML4SCI Mentor *May - October 2024 / Google*

2023 Google Summer of Code (GSOC) ML4SCI Contributor *May - October 2023 / Google*

Graduate Student and Postdoc Seminar Organizer *Januray 2023 - August 2025 / University of Florida*

Graduate Discussion & Laboratory Teaching Assistant *September 2021 - May 2025 / University of Florida*

Presentations and Projects

Homogenous Spaces for Symmetry-aware Compilation *8 August 2024 / LANL*

Supervised Methods for Exoplanet Atmospheric Retrievals *3 October 2023/ AAS DPS*

Invariant and Equivariant Quantum Graph Neural Networks *19 September 2023/ GSOC*

Accelerated Machine Learning Symmetry Discovery *12 September 2023/ UF GSPS*

Deep Learning Symmetries and their Lie Groups *11 August 2023/ IAIFI*

Unsupervised ML Methods for Novelty and Outlier Detection *24 July 2023 / Sagan*

Deep Learning Symmetries and Lie Groups *25 April 2023 / APS April*

2022 NeurIPS Ariel Data Challenge: RT 1^{st} and LT 2^{nd} Place *18 November 2022 / NeurIPS*

Certifications

NVIDIA DLI – Generative AI with Diffusion Models *Issued 2024*

NVIDIA DLI – Building Transformer-Based Natural Language Processing Applications *Issued 2023*

NVIDIA DLI – Fundamentals of Accelerated Computing with CUDA Python *Issued 2022*

Awards and Honors

2023 Steigleman Family Fellowship *Presented by the UF Department of Physics in 2023*

Grinter Fellowship *Presented by the UF Department of Physics (active all graduate years) in 2021*

2021 George J. Goldsmith Award *Presented by the BC Department of Physics in 2021*

Mathematics Honors *Presented by the BC Department of Mathematics in 2021*

Skills

Technical Skills ***Fluent:*** Python | Numpy | PyTorch | Tensorflow | Pennylane | JAX | Scikit-learn | Seaborn | Sympy | CPLEX | DOCPLEX | C++ | C | LaTeX | Mathematica

Basic Knowledge: HPC | CUDA | Java | Qiskit | Cirq | HTML | MATLAB | LabVIEW

Languages ***Native:*** English ***Conversational:*** Italian

Publications

Supervised ML Methods with Uncertainty Quantification for Atmospheric Retrievals *2025*
Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva, Eyup B. Unlu
Submitted to he Astrophysical Journal. DOI: arXiv:2508.04982

Recursive Cartan decompositions for unitary synthesis *2025*
David Wierichs, Maxwell West, Roy T. Forestano, M. Cerezo, Nathan Killoran
arXiv:2503.19014

Lie-Equivariant Quantum Graph Neural Networks *2024*
Jogi S. Neto, Roy T. Forestano, Sergei Gleyzer, Kyoungchul Kong, Konstantin T. Matchev, Katia Matcheva
NeurIPS 2024 workshop on Machine Learning with New Compute Paradigms (MLNCP). DOI: OR

A Comparison Between Invariant and Equivariant Classical and Quantum Graph Neural Networks *2024*
Roy T. Forestano et al. *MDPI Axioms*. DOI: 10.3390/axioms13030160

Quantum Vision Transformers for Quark–Gluon Classification *2024*
Marcal C. Cara et al. *MDPI Axioms*. DOI: 10.3390/axioms13050323

Hybrid Quantum Vision Transformers for Event Classification in High Energy Physics *2024*
Eyup B. Unlu et al. *MDPI Axioms*. DOI: 10.3390/axioms13030187

$\mathbb{Z}_2 \times \mathbb{Z}_2$ Equivariant Quantum Neural Networks: Benchmarking against Classical Neural Networks *2024*
Zhongtian Dong et al. *MDPI Axioms*. DOI: 10.3390/axioms13030188

Identifying the Group-Theoretic Structure of Machine-Learned Symmetries *2023*
Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva, Alexander Roman, Eyup B. Unlu, Sarunas Verner
Physics Letters B. DOI: 10.3390/axioms13030160

Searching for Novel Chemistry in Exoplanetary Atmospheres using Machine Learning for Anomaly Detection *2023*
Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva, Eyup B. Unlu
The Astrophysical Journal. DOI: 10.3847/1538-4357/ad0047

Reproducing Bayesian Posterior Distributions for Exoplanet Atmospheric Parameter Retrievals with a ML Surrogate Model *2023*
Eyup B. Unlu, Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva
Conference Proceedings of *ECML*. arXiv: 2310.10521, ECML Program

Accelerated Discovery of Machine-Learned Symmetries: Deriving the Exceptional Lie Groups G2, F4, and E6 *2023*
Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva, Alex Roman, Eyup B. Unlu, Sarunas Verner
Physics Letters B. DOI: 10.1016/j.physletb.2023.138266

Inferring Physical Properties of Exoplanets From Next-Generation Telescopes *2023*
Kai Hou Yip, Quentin Changeat, Ingo Waldmann et al.
Proceedings of Machine Learning Research PMLR 220:1-17.

Discovering Sparse Representations of Lie Groups with Machine Learning *2023*
Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva, Alexander Roman, Eyup B. Unlu, Sarunas Verner
Physics Letters B. DOI: 10.1016/j.physletb.2023.138086

Oracle-Preserving Latent Flows *2023*
Alexander Roman, Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva, Eyup B. Unlu
MDPI Symmetry. DOI: 10.3390/sym15071352

Deep Learning Symmetries and Their Lie Groups, Algebras, and Sub-algebras from First Principles *2023*
Roy T. Forestano, Konstantin T. Matchev, Katia Matcheva, Alexander Roman, Eyup B. Unlu, and Sarunas Verner
Machine Learning: Science and Technology. DOI: 10.1088/2632-2153/acd989