

# Hariprashad Ravikumar

PhD Candidate in Physics, specializing in HPC & Machine Learning for High-Dimensional Data  
New Mexico State University

**Website:** hariprashad-ravikumar.github.io

**Email:** hari1729@nmsu.edu

**LinkedIn:** linkedin.com/in/hariprashad-ravikumar

**Phone:** +1 575-249-9610

**GitHub:** github.com/Hariprashad-Ravikumar

## Education

<b>PhD in Physics</b> , New Mexico State University, USA	<i>Aug 2021 – July 2026 (expected)</i>
<b>MS in Physics</b> , New Mexico State University, USA	<i>Aug 2021 – May 2024</i>
<b>MSc in Physics</b> , National Institute of Technology Jalandhar, India	<i>July 2019 – May 2021</i>
<b>BSc in Physics</b> , Dr. N.G.P. Arts and Science College, India	<i>June 2015 – May 2018</i>

## Technical Skills

<b>Programming</b>	Python, C++, CUDA, Bash, SQL, JavaScript, Lua, HTML/CSS, YAML
<b>Machine Learning</b>	TensorFlow, PyTorch, Scikit-learn, Pandas
<b>Cloud &amp; MLOps</b>	Azure, AWS (Lambda, S3), CI/CD, Docker, Git
<b>APIs</b>	: Flask, FastAPI
<b>Methods &amp; HPC</b>	Regression, Monte Carlo methods, GPU acceleration

## Technical Project Portfolio

- **AI-DataScience-Lab: Cloud-Hosted Forecasting App** GitHub Repository  
End-to-end forecasting platform: CSV upload, pandas cleaning, scikit-learn linear regression ( $R^2$ , MSE), GPT-3.5 summaries, and Matplotlib plots. Flask backend on Azure with GitHub Actions CI/CD; frontend on GitHub Pages. Modular design supports future polynomial, ridge, and time-series models. Frontend URL
- **Neural Network from Scratch with NumPy** GitHub Repository  
Two-layer NN in NumPy (ReLU hidden, softmax output); trained on 5000 samples with  $lr=0.1$  to achieve 80% accuracy in 60 epochs.
- **$\mathbb{Z}_2$  Lattice Gauge Monte Carlo Simulation** GitHub Repository  
Python MCMC simulation of  $\mathbb{Z}_2$  gauge theory using Metropolis; measured Wilson loops and benchmarked against analytical predictions.

## PhD Research

**Doctoral Advisor:** Dr. Michael Engelhardt (New Mexico State University, USA)

- **Lattice QCD Calculations of TMDs:** Developed parallelized Lua code for HPC clusters running on CPUs. Processed multi-terabyte lattice QCD data involving  $\sim 30,000$  correlator evaluations. Applied Monte Carlo methods with jackknife and bootstrap resampling to extract transverse momentum-dependent parton distribution functions (TMDs). Leveraged PySR symbolic regression - a machine learning technique to derive interpretable analytical models from high-dimensional simulation outputs.

## External Research Collaborations

**Collaborators:** Dr. Rajan Gupta and Dr. Tanmoy Bhattacharya (Los Alamos National Laboratory, USA)

- **Lattice QCD Calculations of CP Violation Contributions to nEDM:** Developed parallelized Lua and C++ codes for GPU-accelerated HPC clusters (NERSC Perlmutter). Processed multi-terabyte lattice QCD data across multiple computational stages. Performed Monte Carlo simulations and statistical analyses to extract hadronic matrix elements relevant to nucleon EDMs, supporting investigations of CP-violating operators in the Standard Model (SM) and Beyond the Standard Model (BSM) theories.

**Collaborator:** Dr. Chueng-Ryong Ji (North Carolina State University, USA)

- **Interpolating Conformal Algebra:** Implemented Mathematica symbolic computation to analyze algebraic structures and symmetry constraints in interpolated Poincaré and conformal algebras.

## Certifications

- (Jun 2025) Getting Started with Accelerated Computing in CUDA C/C++ by NVIDIA
- (Jun 2025) Supervised Machine Learning: Regression and Classification by DeepLearning.AI
- (Apr 2025) Google Advanced Data Analytics Professional Certificate

## Awards & Highlights

- **2025 NMC Collaboration Grant**, awarded by the New Mexico Consortium at Los Alamos.
- **2023 George and Barbara Goedecke Physics Excellence Fund Scholarship**, awarded by the NMSU Physics Department
- **2021 Graduate Success Scholarship**, awarded by the NMSU Graduate School

## Selected Talks

- (Jun 3, 2025) *"First Principles Lattice QCD Calculations of nEDMs"*, T-2 Seminar, Theoretical Division, Los Alamos National Laboratory, USA
- (May 16, 2024) *"Lattice QCD Calculations of  $x$  Dependence of Sivers TMD"*, T-2 Seminar, Theoretical Division, Los Alamos National Laboratory, USA

*Full list available at:* [hariprashad-ravikumar.github.io/talks](https://hariprashad-ravikumar.github.io/talks)