Hariprashad Ravikumar

PhD Candidate in Physics
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

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

Technical Skills

Programming	Python, C++, Bash, JavaScript, Lua, HTML/CSS, YAML
ML / DL	Pandas, Scikit-learn, TensorFlow, PyTorch, NumPy
Cloud & MLOps	Azure (App Service, Functions), AWS (Lambda, S3, API Gateway), Docker, GitHub
Data & Viz	SQL, Matplotlib, JupyterLab
APIs	Flask, FastAPI, RESTful APIs
Methods & HPC	Regression, Monte Carlo, HPC clusters, Statistical modeling

Technical Project Portfolio

- **AI-DataScience-Lab: Cloud-Hosted Forecasting App** GitHub Repository
  Built an end-to-end data-science platform (v1.0.0 Beta) that lets users upload CSV files, cleans data with `pandas`, trains a `scikit-learn` linear-regression model, and returns forecasts with R^2 and MSE metrics. Integrated OpenAI GPT-3.5 to auto-generate natural-language data summaries and used `matplotlib` for interactive plots. Deployed the Python (Flask) backend on Microsoft Azure App Service with CI/CD via GitHub Actions; static frontend served through GitHub Pages. Designed a modular architecture to add polynomial, ridge, and time-series models in future releases. You can access the frontend of the app at: https://hariprashad-ravikumar.github.io/AI-DataScience-Lab

- **HariBot: AI-Powered Chatbot Integration** GitHub Repository
  Developed and deployed a custom AI chatbot using the OpenAI API to enhance user interaction on my personal website. The backend, implemented in Python (Flask), is hosted on Render for scalable cloud performance, while the frontend is integrated into my GitHub Pages for a responsive, cross-device experience. The chatbot delivers real-time responses about my background, research, and professional experience.

- **$\mathbb{Z}_2$ Lattice Gauge Monte Carlo Simulation** GitHub Repository
  Developed a Python simulation of $\mathbb{Z}_2$ lattice gauge theory using Markov chain Monte Carlo methods and Metropolis algorithms. Explored confinement phenomena through Wilson loop measurements and benchmarked results against analytical predictions. Served as foundational computational experience in stochastic sampling and lattice QCD simulation ahead of full PhD research.

PhD Research

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

- **Lattice QCD Calculations of TMDs:** 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:** Processed multi-terabyte lattice QCD data across several computation stages using GPU-accelerated HPC clusters (NERSC Perlmutter). Performed Monte Carlo simulations and statistical analyses to extract hadronic matrix elements relevant to nucleon EDMs, enabling connections to CP-violating operators in Standard Model (SM) and Beyond Standard Model (BSM) physics. Supported by a Travel Grant from the New Mexico Consortium at Los Alamos.

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

- **Interpolating Conformal Algebra:** Investigated conformal invariance in interpolating form dynamics between instant-form and light-front relativistic frameworks. Used Mathematica symbolic computation to analyze algebraic structures and symmetry constraints in interpolated Poincaré and conformal algebras.

Certifications

- (Apr 2025) **Google Advanced Data Analytics Professional Certificate**
  Credential ID: U0HU8UKT89L4

- (Apr 2025) **Kaggle Intro to Machine Learning**
  View Certificate

Graduate Assistantships

Research Assistant, NMSU (2022–2025):
Conducting research in Lattice QCD under Dr. Michael Engelhardt, including symbolic regression (PySR), high-performance computing, and theoretical modeling as part of PhD dissertation work.

Teaching Assistant, NMSU (2021–2023):
Conducted undergraduate physics labs, led discussion sections, and provided tutoring support for Physics (E&M and Mechanics) courses.

Selected Talks

- (Jun. 07, 2024) *"Lattice QCD Calculations of Sivers TMD x Dependency"*, 2024 CFNS Summer School on the Physics of the Electron-Ion Collider, Center for Frontiers in Nuclear Science, Stony Brook University, NY, USA

- (May 16, 2024) *"Lattice QCD Calculations of x Dependence of Sivers TMD"*, T-2 Seminar, Theoretical Division (T-2), Los Alamos National Laboratory, USA

- (June 15, 2023) *"Lattice QCD Calculations of TMDs"*, HUGS Student Seminar Presentation, Thomas Jefferson National Accelerator Facility, Newport News, USA

- (Dec. 02, 2021) *"Interpolating Conformal Algebra Between the Instant Form and the Front Form of Relativistic Dynamics"*, Light Cone 2021: Physics of Hadrons on the Light Front, Jeju Island, South Korea

For a full list of talks, please visit: hariprashad-ravikumar.github.io/talks

Awards & Highlights

- Recipient of the **2023 George and Barbara Goedecke Physics Excellence Fund Scholarship**, awarded by the NMSU Physics Department

- Recipient of the **2021 Graduate Success Scholarship**, awarded by the NMSU Graduate School

- Nominated for participation in the **70th Lindau Nobel Laureate Meeting (2020)**, Germany, by the Department of Science & Technology, Government of India

- Recipient of the **2018 Indian Academy of Sciences Summer Research Fellowship**

MSc Thesis

Ravikumar, H. (2021, August). *The Poincaré algebra interpolation between instant form dynamics (IFD) and light-front dynamics (LFD)* (Master's thesis). National Institute of Technology, Jalandhar, India.
Supervised by Prof. Harleen Dahiya (NIT Jalandhar) in collaboration with Prof. Chueng-Ryong Ji (North Carolina State University).

Selected Summer Programs

- **Jun 03 – Jun 14, 2024:** CFNS Summer School on the Physics of the Electron-Ion Collider, Center for Frontiers in Nuclear Science, Stony Brook University, New York, USA

- **May 30 – Jun 16, 2023:** Hampton University Graduate Studies (HUGS) Summer Program, Thomas Jefferson National Accelerator Facility, Newport News, USA
  Awarded the HUGS Scholarship.

- **Jan 20 – Jan 26, 2022:** TMD Winter School, Santa Fe, USA

- **Jun 21 – Jun 25, 2021:** National Nuclear Physics Summer School (NNPSS), Universidad Nacional Autónoma de México (Mexico) and Indiana University (USA)