Hariprashad Ravikumar

PhD Candidate in Physics
New Mexico State University

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Education

PhD in Physics	(Current)	New Mexico State University, USA
MS in Physics	(2024)	New Mexico State University, USA
MSc in Physics	(2021)	National Institute of Technology - Jalandhar, India
BSc in Physics	(2018)	Dr. N.G.P. Arts and Science College, India

Technical Skills

Programming Languages:	Python, C++, Lua, HTML, LaTeX
Libraries & Frameworks:	NumPy, pandas, Matplotlib, PySR, Qiskit
Scientific Tools:	CHROMA, MATLAB, Mathematica
Modeling Techniques:	Monte Carlo Simulation, Symbolic Regression, Statistical Modeling
Tools & Platforms:	Git, GitHub, Docker, JupyterLab, Visual Studio, HPC environments, Linux/Unix Shell (Bash)

PhD Research

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

- **Lattice QCD Calculations of TMDs:** Focused on calculating the dependence of longitudinal momentum fraction on Transverse Momentum Dependent Parton Distribution Functions (TMDs) using lattice QCD, which is based on Monte Carlo simulations of discretized spacetime fields. Our analysis also utilizes *PySR* symbolic regression, a machine learning technique, to extract analytical functions from the lattice data.

Independent and Collaborative Research

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

- **Lattice QCD Calculations of CP Violation Contributions to nEDM:** Focused on lattice QCD calculations of the hadronic matrix elements needed to connect nucleon Electric Dipole Moments (EDMs) to 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 Between Instant and Light-Front Forms of Relativistic Dynamics:** Studying the conformal invariance of quantum fields in the interpolating form dynamics, where the interpolation angle parameter spans between the instant form dynamics (IFD) and the light-front dynamics (LFD).

Graduate-Level Coursework

Computational Physics:	Quantum Computing, Advanced Computational Physics
Theoretical Physics:	Classical Mechanics, Statistical Mechanics, Quantum Mechanics I & II, Quantum Field Theory I & II, General Relativity I, Electromagnetic Theory I & II
Experimental Physics:	Advanced Experimental Nuclear Physics

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.

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

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).

Conference Publication

Ji, C.-R., Dahiya, H., & Ravikumar, H. (2021, December). *Interpolating conformal algebra between the instant form and the front form of relativistic dynamics*. Presented at *Light Cone 2021 – Physics of Hadrons on the Light Front*, Jeju Island, South Korea.

Internships & Summer Schools

- **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)

- **Jun 04 – Aug 03, 2018:** Astrophysics Summer School: *An Observational View of the Universe*, Indian Institute of Astrophysics, Bengaluru, India
  Awarded the Indian Academy of Sciences IASC-INSA-NASI Summer Research Fellowship.
- **Jul 02 – Jul 06, 2018:** Radio Astronomy Summer School, National Centre for Radio Astrophysics – Tata Institute of Fundamental Research, Pune, India

Workshops & Courses Attended

- **Dec 14 – Dec 18, 2020:** XXIV DAE–BRNS Symposium on High Energy Physics, National Institute of Science Education and Research, India
- **Nov 02 – Nov 11, 2020:** International Workshop on Applications of Group Theory in Physics, Department of Physics, Assam University, Silchar, India
- **Sep 18 – Sep 22, 2020:** Short-Term Course on Advances in High Energy Physics, National Institute of Technology, Jalandhar, India
- **Dec 18 – Dec 21, 2017:** National Workshop on Theoretical Physics, Ramakrishna Mission Vivekananda Educational and Research Institute, Kolkata, India
- **Sep 11 – Sep 16, 2017:** GIAN Course on Introduction to Light-Front Hadron Physics by Prof. Stanley J. Brodsky (Stanford University/SLAC) and Prof. Chueng-Ryong Ji (North Carolina State University), Mumbai University, India
- **Jul 03 – Jul 13, 2017:** GIAN Course on The Field Theory of Classical and Quantum Phase Transition by Prof. Flávio S. Nogueira (Institute for Theoretical Solid State Physics, Germany), National Institute of Technology, Goa, India

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

Graduate Assistantships

Teaching Assistant, NMSU (2021–2023)
Led undergraduate physics labs and discussion sections across E&M, Mechanics, and problem-solving courses. Delivered lectures, provided one-on-one tutoring, and supported grading and course administration.

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.