Sabin Thapa

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Research Interests

- Quantum computing and quantum simulation: real-time dynamics, many-body systems, lattice gauge theory prototypes
- Open quantum systems and numerical simulation of quantum dynamics
- High-energy nuclear theory/phenomenology: heavy-ion and small collision systems; quarkonium transport
- Applications of ML/AI in physics and emerging ML-for-quantum directions

Education

Kent State University — Kent, OH, USA
Ph.D. Physics (expected Aug 2026); M.A. Physics earned — *Aug 2019 – Aug 2026*

- Advisors: Dr. Andrew Hanlon, Dr. Ramona Vogt, Prof. Michael Strickland
- Coursework: Advanced Quantum Mechanics; Quantum Field Theory & Applications (QCD); Numerical Computing; Solid State Physics; Statistical Physics; Electrodynamics; Programming/Algorithms; Algorithm Design & Analysis

Amrit Campus, Tribhuvan University — Kathmandu, Nepal
B.Sc. Physics (Distinction; ranked 1st among 350+ students) — *Aug 2014 – Aug 2018*

- Minors: Mathematics (real/complex analysis, advanced calculus, algebra), Chemistry
- Undergraduate thesis: Molecular dynamics simulation using **GROMACS**

Publications

- S. Thapa, R. Vogt, M. Strickland, R. Rapp, B. Wu, J. Boyd, *Semi-classical treatment of bottomonium suppression in p–Pb collisions*, submitted (arXiv:2510.03456).
- M. Strickland, S. Thapa, R. Vogt, *Bottomonium suppression in 5.02 and 8.16 TeV p–Pb collisions*, Phys. Rev. D 109, 096016 (2024). doi:10.1103/PhysRevD.109.096016
- J. Boyd, S. Thapa, M. Strickland, *Transverse momentum dependent feed-down fractions for bottomonium production*, Phys. Rev. D 108, 094024 (2023). doi:10.1103/PhysRevD.108.094024
- M. Strickland, S. Thapa, *Bottomonium suppression at RHIC and LHC in an open quantum system approach*, Phys. Rev. D 108, 014031 (2023). doi:10.1103/PhysRevD.108.014031
- H. B. Omar, M. Á. Escobedo, A. Islam, M. Strickland, S. Thapa, P. V. Griend, J. H. Weber, *QTRAJ 1.0: A Lindblad equation solver for heavy-quarkonium dynamics*, Comput. Phys. Commun. 273 (2022).

Research Experience

Graduate Researcher — Kent State University
High-energy nuclear theory / phenomenology — *Aug 2019 – Present*

- Heavy quarkonium (charmonium/bottomonium) production/suppression and transport in different collision systems; cold and hot nuclear matter effects.
- Numerical modeling and analysis in **Python**, **C++**, and **Mathematica**; parameter studies, uncertainty handling, and reproducible result generation.
- Collaboration with HEFTY (Heavy Flavor Theory in QCD Matter) community and broader teams; contributions to papers and presentations.
- Quantum computing exploration: implemented learning-focused Qiskit prototypes for state preparation in **SU(2)** lattice gauge theory; studied practical circuit-depth constraints and began exploring variational approaches.
- Independent study: In addition to my primary PhD research, I have independently explored quantum computing as a self-driven extension of my interests in quantum dynamics. Through hands-on work with Qiskit, I implemented small-scale quantum simulations of time evolution and scattering-inspired processes, ran circuits on IBM quantum hardware, and studied the impact of Trotterization and noise. While this work was exploratory and not yet publishable, it motivated my strong interest in developing deeper expertise through structured mentorship and hands-on research.
- Guided study in lattice QCD / hadron spectroscopy topics with Dr. Hanlon.

Teaching Experience

Teaching Assistant — Kent State University
General Physics and Laboratory Instruction — *Aug 2019 – Dec 2022; Aug 2024 – Dec 2024*

- Instructed undergraduate physics labs; supported students with data analysis, uncertainty estimation, and computational workflows.
- TA for General University Physics II (PHY 23102) and other introductory physics courses.

Quantum Computing Certifications / Programs

- IBM Certified Associate Qiskit Developer (2024)
- IBM Quantum Challenge (2024) & IBM Quantum Challenge (Spring 2023)
- QWorld Global Quantum Scholarship (2023) & QBronze: Quantum Computing Course
- Qiskit Global Summer School (2023)
- Quantum Computing for Natural Sciences (with IBM Quantum) (2023)
- Introduction to Quantum Computing (2022), The Coding School

Machine Learning & Data Science Training

- Machine Learning for Fundamental Physics School (ML4FP), Lawrence Berkeley National Laboratory (2025)

- APS ML Training (3WC/2), APS DNP Meeting (2025)

Conferences, Schools & Talks

- Poster: "Quantum Computing for High-Energy Physics: Ground State Preparation of (2+1)D SU(2) Lattice Gauge Theory," Graduate Research Symposium, Kent State University (Apr 9, 2025).
- Oral talk: "Semi-classical treatment of bottomonium suppression in p–Pb collisions," APS Global Physics Summit (Mar 18, 2025).
- Oral talk (accepted): "Bottomonium suppression in p–Pb collisions at LHC energies," APS Topical Group on Hadronic Physics workshop (Mar 16, 2025).
- IPAM Winter School: "Quantum Error Suppression, Mitigation, and Correction," UCLA (Feb 3–5, 2025).
- Talk: "Bottomonium suppression in p+Pb collisions at LHC energies," Cold Nuclear Matter Effects: from the LHC to the EIC (Jan 13–16, 2025).
- HEFTY Summer School & Collaboration Meeting, Santa Fe, NM (Jun 24–28, 2024): talks on bottomonium suppression and feed-down fractions.
- Frontiers in Nuclear and Hadronic Physics, GGI Florence, Italy (Feb 26–Mar 8, 2024): talk on bottomonium suppression in p+Pb collision at LHC energies.

Leadership & Service

Coordinator — QNepal (QWorld Affiliate)
Quantum computing outreach and community building — *Summer 2023 – Present*

- Organized quantum-computing learning events and study programs; supported community activities for early-stage learners.

Co-founder — ASCOL Physics Society, Amrit Science Campus
Kathmandu, Nepal — *2014 – 2018*

- Organized talks and a workshop introducing computational physics topics to students and faculty.

Skills

- High Performance Computing (HPC): experience with SSH (slurm jobs), used Kent State's Cluster, NERSC Clusters (still have an access)
- Programming: Python, C++, Mathematica, Qiskit. Matlab (used long ago)
- Scientific computing: numerical simulation, statistical analysis, uncertainty propagation, visualization
- Tools/OS: Git; Linux, Windows, macOS

Awards

- Graduate Student Senate Research Award ($2000) — project exploring quantum algorithms in high-energy physics and lattice gauge theory on a quantum computer

- Golden Jubilee Scholarship (2014), Indian Embassy Kathmandu

References

Dr. Andrew Hanlon
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Dr. Ramona Vogt
Staff Scientist, Lawrence Berkeley National Laboratory
Adjunct Professor, UC Davis
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Dr. Ralf Rapp
Professor, Dept. of Physics & Astronomy
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