Vashisth Tiwari

vtiwari2@u.rochester.edu | (+1) 585-524-8385 | vashisthtiwari.com | github.com/Vashistht | linkedin.com/in/vashistht/

EDUCATION

University of Rochester — Rochester, NY
Bachelor of Science in Physics, Bachelor of Arts in Mathematics — *Anticipated 05/23*
- Cum. GPA 3.98/4.00 | Physics Major GPA 4.00 /4.00
- Honors thesis on characterizing noise and tools to reduce it in superconducting qubit quantum computers.
- Relevant Coursework: Frontiers of Deep Learning, Deep Learning, Probability & Handling of Large Datasets (Grad), Data Structures & Algos, Linear Algebra (Hons), Multi-dimensional Calculus, Classical Mechanics, Quantum Theory

Mahindra United World College — Pune, India
International Baccalaureate Diploma (42/45) — *Aug-16 – May-18*
- Earned a full scholarship to an international school focusing on educational excellence and social responsibility.

HONORS AND AWARDS

2022	National	Semi-Finalist, Rhodes Scholarship Indian Consulate
2022	National	Inductee, Sigma Pi Sigma National Honors Society
2021	University	Physics Honors Prize: Highest grade in the first two years of physics classes
2021	Regional	Silver Medal, Northeastern Collegiate Badminton Conference (Division 2)
2020	University	Summer Research Grant: $1500 grant given to 66 students in total
2019	National	Next Genius Scholar (Full scholarship to attend the University of Rochester)

RESEARCH & PROFESSIONAL EXPERIENCE

Blok Lab (Quantum Computing with Superconducting Qubits) — Rochester, NY
Undergraduate Research Assistant |Mentor: Dr Machiel Blok — *Sep 2021 – Present*
- Characterized the noise in a quantum computer by comparing the probability distributions of the lab data with the expected distributions from quantum and statistical physics.
- Built Infrared noise filters using Eccosorb absorbers to increase coherence time in cryogenic microwave setup.
- Using neural networks to classify different readouts of different levels to reduce readout errors in the setup.

Mana Fund (Stealth startup working in crypto and artificial intelligence) — San Francisco, CA
Machine Learning & Research Intern — *May-22 – Aug-22*
- Devised statistical models by studying the underlying distribution of stock prices to quantify the volatility and risk in potential investments to better predict the expected yield.
- Built data pipeline to fetch the needed transaction data using the Graph.
- Prototyped a tool to automate smart contract decoding using python and solidity.

Los Alamos National Laboratory — Los Alamos, NM
Undergraduate Intern |Mentor: Dr Malcolm Boshier — *Jun-21 – Aug-21*
- Discovered optimal laser pulse parameters for beam splitters in an atom-interferometer, using Mathematica and python to model the system and using SciPy for high dimensional optimizations.
- Improved the fidelity of high momentum states by 5% beyond the current state-of-the-art pulse parameters.

Dark Energy Spectroscopic Instrument (DESI) — Rochester, NY
Research Assistant |Mentor: Dr Segev BenZvi — *Jan-20 – May 21*
- Designed multi-class convolutional neural networks with TensorFlow, scikit-learn to find galaxies with supernovae in the spectral data with 95%+ accuracy, high precision.
- Developed data pre-processing techniques for noise-removal and network optimization.
- Reduced the time taken to find supernovae as the model was accepted as the part of standard DESI data pipeline.

Polymath Research Experience for Undergraduates — Online
Undergraduate Intern |Mentor: Dr Steven Miller — *Jul-20– Aug-20*
- Contributed two proofs related to the bounds on the length of Zeckendorf Game, a number theory project.
- Verified these conjectures for large numbers using Mathematica and Python scripts.

CONFERENCES & PRESENTATIONS

Title: Optimizing Beam Splitters for Matter Waves (pdf)
- Los Alamos National Laboratory Summer Symposium — Jan-21

Title: DESI Transient Identification Pipeline (pdf)

- American Astronomical Society, Co-presenter — Jun-21
- Rochester Symposium for Physics Students — Mar-21
- DESI Research Forum — Aug-21

Title: On Bounds, Winning Strategies, and Generalizing the Zeckendorf Game (pdf)

- Young Mathematics Conference (a premier conference for undergraduate math research), Co-presenter — Aug-20
- University of Connecticut Mathematics REU Conference — Aug-20

Mentorship and Community Building

- Summer Opportunities Talk, *"How to Intern at National Labs?"* — Nov-21
- LaTeX Workshop, *"LaTeX: A Brief Introduction and the Essentials"* — Sep-21

PUBLICATIONS

(1) [Submitted Manuscript] Pandey S., Uzun C., Krzyzanowska K., Harell L. E., Cassidy M. C., Tiwari V., and Boshier M. *"High efficiency Bose-Einstein condensate splitting using tailored optical standing-wave pulses".* In: Atoms (2022)

(2) [Link] Cusenza A., Dunkelberg A., Huffman K., Ke D., Kleber D., Miller S. J., Mizgerd C., Tiwari V., Ye J., and Zheng X. *"Winning Strategy for the Multiplayer and Multivalence Zeckendorf Games*". Fibonacci Quart. 59, no. 4, 308–318. (2021).

(3) [Link] Bołdyriew E., Cusenza A., Dai L., Ding P., Dunkelberg A., Haviland J., Huffman K., Ke D., Kleber D., Kuretski J., Tiwari V. et al. *"Extending Zeckendorf Theorem to a Non-constant Recurrence and the Zeckendorf Game on this Nonconstant Recurrence Relation".* Fibonacci Quarterly, Vol. 58, Number 5 (2020).

(4) [Link] Wasserman A., Tiwari V., and BenZvi S. *"Developing a Transient Identification Pipeline for DESI Using ML".* In: American Physical Society Bulletin (2021).

(5) [Link] Wasserman A., Tiwari V., and BenZvi S., DESI Collaboration, et al. "Using Machine Learning to Develop a Transient Identification Pipeline for DESI". American Astronomical Society Meeting Abstracts. Vol. 53. 1. 2021, pp. 554–01.

(6) [Link] Cusenza A., Dunkelberg A., Huffman K., Ke D., Kleber D., Miller S. J., Mizgerd C., Tiwari V., Ye J., and Zheng X. *"Bounds on Zeckendorf Games*". arXiv:2009.09510 (2020).

PROJECTS

- **PersonaLearn** (HackMIT, 2022): An education assistance tool (chrome extension) that uses GPT-3 and YouTube API that recommends best videos using a holistic custom ranking to reinforce to the topics the student found confusing.
- **Spam Detection using Gates Recurrent Unit (GRU)**: Built a GRU from scratch using PyTorch to detect spam messages with 97% test accuracy.
- **"How good is your Pose?"**: Built a CNN and modified ViTPose (Vision Transformer for Pose Estimation) to classify lifts and quantify lifting form to suggest improvements.

TEACHING EXPERIENCE

Advanced Electromagnetism, Department of Physics and Astronomy — Aug-22 – Present
Waves and Modern Physics (Honors), Department of Physics and Astronomy — Jan-21 – May-21

- Held weekly workshops to aid the lecture material with practice questions and an overview of the key concepts.
- Assisted 30 students with weekly assignments in office hours, graded exams and homework.

Introduction to Programming using Python, Department of Computer Science — Aug-20 – Dec-20

- Guided 15 students with projects and weekly assignments in python through office hours and tutoring.
- Responsible for grading weekly assignments, projects, and exams.

LEADERSHIP & ACTIVITIES

University of Rochester — Rochester, NY

Society of Physics Students (SPS) |President (Previously Secretary) — Aug-21 – Present

- Started a new initiative to promote STEM education through interactive DIY activities for students at Rochester City School District, where the majority are low-income, Black and Hispanic students.
- Won outstanding chapter award (given to top 15% chapters) for community building and physics outreach.

Society of Physics Students (SPS) |Secretary — Aug-20 – May-21

- Organized tutoring for more than 300 students for introductory physics classes, previously as secretary.

Badminton Team |Student Athlete — Aug-21– Jan-22

- Selected to a 10-member team out of around 120 members to represent the University Badminton Team.