Vashisth Tiwari

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EDUCATION

University of Rochester   Rochester, NY
Bachelor of Science in Physics, Bachelor of Arts in Mathematics   *Anticipated 05/23*
- Cum. GPA 3.97/4.00 | 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.