**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**

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| --- | --- | --- |
| 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)**](https://labsites.rochester.edu/bloklab/) 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**](https://www.lanl.gov/) 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)**](https://www.desi.lbl.gov/)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**](https://geometrynyc.wixsite.com/polymathreu)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**](https://github.com/Vashistht/WebsiteThings/blob/main/Optimizing_Beam_Splitters_for_Matter_Waves_presentation.pdf)**)**

* Los Alamos National Laboratory Summer Symposium Jan-21

**Title: DESI Transient Identification Pipeline (**[**pdf**](https://github.com/Vashistht/WebsiteThings/blob/main/Vashisth%20Tiwari_AAS_RSPS_Poster.pdf)**)**

* American Astronomical Society, Co-presenter Jun-21
* [Rochester Symposium for Physics Students](https://youtu.be/8FrqQZWCJJ4) Mar-21
* DESI Research Forum Aug-21

**Title: On Bounds, Winning Strategies, and Generalizing the Zeckendorf Game (**[**pdf**](https://github.com/Vashistht/WebsiteThings/blob/main/Polymath%20Zeckednorf%20Group%20YMC.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*](https://github.com/Vashistht/WebsiteThings/blob/main/LaTeX_Workshop_Presentation__Vashisth_.pdf)*”* 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”.*](https://meetings.aps.org/Meeting/DAMOP22/Session/F01.90) In: Atoms (2022)

(2) [[Link](https://www.fq.math.ca/Papers/59-4/miller10182020.pdf)] 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*](https://arxiv.org/abs/2009.03708)”. Fibonacci Quart. 59, no. 4, 308–318. (2021).

(3) [[Link](https://www.fq.math.ca/Papers1/58-5/boldyriew1.pdf)] 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”.*](https://www.fq.math.ca/Papers1/58-5/boldyriew1.pdf) Fibonacci Quarterly, Vol. 58, Number 5 (2020).

(4) [[Link](https://meetings.aps.org/Meeting/CUWIP21/Session/U13.5)] Wasserman A., Tiwari V., and BenZvi S. *“*[*Developing a Transient Identification Pipeline for DESI Using ML”.*](https://meetings.aps.org/Meeting/CUWIP21/Session/U13.5) In: American Physical Society Bulletin (2021).

(5) [[Link](https://baas.aas.org/pub/2021n1i554p01/release/1)] 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](https://arxiv.org/abs/2009.09510)] 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*](https://arxiv.org/pdf/2009.09510.pdf)”. 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) |**SecretaryAug-20 – May-21

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

**Badminton Team |**Student AthleteAug-21– Jan-22

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