Mohit Srivastav

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Education

- JHU (Johns Hopkins University) first-year Ph.D. student in Physics
- UVA (University of Virginia) Class of 2022 Echols Scholar (3.84/4 GPA)
  B.S. in Physics (Highest Distinction)
  B.A. in Computer Science (High Distinction)

Thesis, Presentations, and Awards

- Wrote a distinguished major's **thesis** for my research on using machine learning to improve the performance of the Mu2e Cosmic Ray Veto (CRV) (January 2022)
- Presented my thesis in a poster presentation in Hampton for the Virginia Space Grant Consortium Student Research Conference in coordination with NASA (March 2022)
- **Presented** at the Division of Particles and Fields (DPF) of the American Physics Society on thesis work for the Mu2e Collaboration (July 2021)
- University of Virginia Mitchell Undergraduate Research Scholarship (June 2021)
- **Virginia Space Grant Consortium Undergraduate Research Scholarship** (April 2021)
- University of Virginia Intermediate Honors (November 2020)

Experience

Graduate Teaching Assistant for Physics 1 for Physical Science Majors
Currently a teaching assistant for physics 1 course (AS.171.01) at Johns Hopkins University under Professor Andrei Gritsan (gritsan@jhu.edu)
(January 2023 – Present)

- Leading discussion sections and proctoring/grading exams for students

- Holding 3 hours of office hours a week to assist student understanding of the homework.

Graduate Research Assistant for the CMS (Compact Muon Solenoid) Experiment at the LHC (Large Hadron Collider)
Professor Andrei Gritsan (gritsan@jhu.edu) is working with the CMS Collaboration at JHU on the physics surrounding the Higgs Boson, as well as on the alignment of the various detectors, calorimeters, drift chambers, and triggers at the LHC.
(August 2022 – Present, 40 hrs/week)

- Conducting spin-parity analyses and hypothesis testing for generated samples of newly-discovered tetraquark candidates produced using JHUGenerator or MCFM utilizing original code before unblinding and using real data from the LHC.

- Maintaining and updating the codebase for the research group by creating a more modular developmental structure for the analysis code, as well as vectorizing calculations to increase efficiency.

- Implementing new features such as running width capability to existing generators in MCFM and JHUGenerator to enable more accurate particle simulation.

- Assisting in the alignment of the CMS tracker at CERN through the usage of HipPy and alignment validation on the scale of microns.

Undergraduate Researcher for the Mu2e (Muon-to-Electron Conversion Experiment) Collaboration

Mu2e is a collaborative experiment beginning in 2025 with Fermilab, alongside many other institutions throughout the United States and Europe, looking to find neutrino-less Muon to Electron conversion. Work was done on the Mu2e CRV (Cosmic Ray Veto) at the University of Virginia under Professor E. Craig Dukes (ecd3m@virginia.edu) and Dr. Yuri Oksuzian (yoksuzian@anl.gov).
(June 2019 – May 2022, up to 40 hrs/week over summers)

- Created a program with user input using CERN ROOT, Python, and Bash scripting to analyze the module efficiencies of recently built cosmic muon detectors using 500,000+ data points to establish a useful baseline performance level for future detectors that were built, which was established at 99.9976% detection efficiency. This information was presented at a monthly CRV workshop meeting for collaboration researchers.
- Created temperature-corrected plots using curve-fitting in Python to analyze the aging rates of different types of detector counters (filled & unfilled preproduction counters, dry & filled reflectors, etc.) for the CRV using data sampled over 2 years. This information was presented at a monthly CRV workshop meeting for collaboration researchers.
- Designed, created, implemented, and analyzed a deep learning algorithm to improve the performance of the current Mu2e CRV's overall rejection algorithm to test the usefulness of applying deep learning to the Mu2e CRV event rejection algorithm in the future. Even with the strictest classification cutoff for events placed at 0.001 on a [0,1] range, the experimental deadtime was reduced from 50% to around 30% at the highest intensities, with even better results for cutoffs at 0.005 and 0.01, while still maintaining acceptable values for the cosmic-ray muon background, which has led to further investigation building upon the findings by the collaboration.

Teaching Assistant for Introductory Computer Science in Python
Was a teaching assistant for the introductory course in computer science in Python (CS 1110/1111) at the University of Virginia under Professor Nathan Brunelle (njb2b@virginia.edu).
(January 2019 – May 2022, 5-6 hrs/week)

- Graded programming assignments and exams to assist with the overall functioning of the course.
- Proctored exams and oversaw surveys meant to assist research into better diversifying the demographics of the computer science department each semester to support the course faculty.
- Led programming lab sections of up to 50 students to improve student understanding of course material.
- Held 1.5 hourlong office hours and review sessions to assist 500+ students each semester with programming assignments and exam material, respectively.

International Relations Organization at UVA (IRO) Treasurer
(November 2019 – January 2022, averaged 4 hrs/week)
The duties of the Treasurer entailed maintaining all financial records, preparing financial statements at the end of every month and fiscal year, as well as filing taxes, and maintaining IRO's status as an Incorporated entity in the state of Virginia. Reelected in November 2020 for a second term.

- Managed club finances of around $30,000 for the five branches of IRO to ensure its continued operation through negotiation and individual meetings.
- Dealt with issues of taxes alongside a tax company to ensure the continued function of IRO at a 501(c)(3) organization.
- Resolved monetary conflicts between, and delegated funds to, the five different branches of IRO to ensure that the monetary function of the organization was handled collaboratively.
- Created a **system** using Selenium in Python that displayed data collected from the IRO bank account to ensure transparency on behalf of the IRO executive board.
- Was a member of the IRO executive board, which entailed planning and staffing events, collaboratively making decisions, and jointly managing club logistics for one of the largest clubs at the University of Virginia.
- Wrote the treasurer's section, and collated others' sections into one LaTeX document, of the Spring 2020 IRO **End of Year Report** to assess the past performance and future trajectory of IRO's finances.

- Amended the constitution of the International Relations Organization to help ensure the continuation of good governance in the future

Teaching Assistant for Quantum Physics I

Was a teaching assistant for the quantum physics 1 course in physics (PHYS 3650) at the University of Virginia under Professor Peter Arnold (pa6z@virginia.edu)

(August 2021 – December 2021, 8 hrs/week)

- Graded problem sets for quantum physics students over the course of the semester to ensure that students received proper feedback on their work.
- Held hourlong office hours twice a week to assist students with issues on their problem sets and understanding of the material.

Teaching Assistant for Pre-Health Physics

Was a teaching assistant for the pre-health physics 1 course (PHYS 2010) at the University of Virginia under Professor Atsushi Yoshida (ay9a@virginia.edu)

(July 2021, 20 hrs/week)

- Took the place of a graduate teaching assistant to manage course logistics and ensure student success by managing camera operation and assisting with demonstrations during virtual lectures for 4 hours every weekday.
- Graded daily assignments and quizzes on time to ensure consistent student feedback.
- Improved upon an automated grading script in Python to ensure timely student feedback.
- Held daily office hours to assist students with homework and general course material issues, as well as logistical issues with virtual learning.

Teaching Assistant for Computer Algorithms

Was a teaching assistant for the computer algorithms course in computer science (CS 4102) at the University of Virginia under Professor Nathan Brunelle (njb2b@virginia.edu).

(June 2020 – June 2021, 6 hrs/week)

- Held individual and lecture-style office hours for a class of around 200 students for an hour 3-4 times a week to improve student understanding of the material as well as their ability to complete the problem sets.
- Graded assignments and exams on topics such as dynamic programming, divide and conquer, and graph algorithms to assist with the overall functioning of the course.

Technical Skills

- Experienced in rasterizing, raytracing, and simulating physical systems graphically using matrix algebra
- Experienced in using Machine Learning algorithms such as neural networks, and random forests, as well as analyzing their outputs
- Experienced in Python, Java, Wolfram Mathematica, C++, C, CERN ROOT, OCAML, Prolog, HTML, JavaScript, CSS, PHP, MySQL, Bash Scripting, and a UNIX Environment
- Experienced in data analysis and visualization in Python using Pandas/NumPy
- Experienced in the creation/usage of structures such as Linked Lists, AVL Trees, and hash tables
- Experienced in the usage of Vim, and LaTeX
- Experienced in utilizing numerical analysis methods such as root finding, differential equation, and integration methods
- Proficient in the usage of particle simulator software such as **JHUGenerator**, as well as the ability to decipher and debug third-party code
- Proficient in FORTRAN
- Certified for Microsoft Office Excel, Word, and PowerPoint

Extracurricular Activities at the University of Virginia

- Was a crisis director for the Virginia International Crisis Simulation (VICS) for 4 years (2019 – 2022), which entailed leading a team responsible for designing and implementing an interactive crisis simulation held for a Model United Nations conference.
- Was a crisis director for the Virginia Model United Nations Conference (VAMUN) for 3 years, which entailed leading a team responsible for designing and implementing an interactive crisis simulation held for a Model United Nations conference (2019 – 2021).
- Was a researcher for the Global Inquirer, a research podcast that looked at national issues. Was one of the main researchers for the episode *Through Smoke and Flames* about the wildfires in the Pacific Northwest in 2020
- 2nd Dan Black Belt; on the UVA Club Taekwondo team (January 2019 – May 2022)
- Verbal commendation for performance at Columbia and UCLA Model UN Conferences as part of the UVA Model UN travel team (2019)

Key Accomplishments in High School

- Virginia Space Grant Summer Academies at NASA Langley Research Center
  - VESSS (Virginia Earth System Science Scholars) (July 2018)
  - VASTS (Virginia Aerospace Science and Technology Scholars) (June 2017)
- Virginia Summer Residential Governor's School for Math, Science, and Technology (July 2017)

Languages spoken

- English, Hindi, Spanish