Ethan Ragbir

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Education

The College of New Jersey (TCNJ)
Expected Graduation: 2028
B.S. in Mathematics and Physics
Mathematics Advisor: Dr. Qifu Zheng
Physics Advisor: Dr. Wad Thulsi Wickramasinghe
Relevant Coursework: Classical Mechanics, Electromagnetism, Quantum Physics, Statistical Mechanics, Multivariable Calculus, Differential Equations, Abstract Algebra, Numerical Analysis, Discrete Structures, Machine Learning, Linear Algebra, Scientific Computing.

Work and Research Experience

Undergraduate Researcher *Jun 2025 – Present*
CERN, Compact Muon Solenoid (CMS) Experiment
Developing a neural-network-based machine learning algorithm to analyze CMS detector data. Enhancing supersymmetry search capabilities beyond 275 GeV. Collaborating with the Rutgers High Energy eXperiment (HEX) group to establish a research team at TCNJ.
Research Advisor: Dr. Alan Richards
Skills: Particle Physics, Deep Learning, ROOT

HEX Group Research Collaborator *Jun 2025 – Present*
Rutgers University, High Energy Experimental Physics Group
Contributed to CMS supersymmetry searches by developing advanced neural-network-based analysis methods. Trained on Monte Carlo collision simulations to detect rare decay patterns including electroweak channels with R-parity violating decays. Gained access to CERN and Fermilab datasets under Rutgers mentorship, acquiring skills in data acquisition, ML analysis, and visualization.
Skills: Supersymmetry, Monte Carlo Simulations, Scientific Visualization, CMS Data Analysis

Undergraduate Researcher *Apr 2025 – Present*
The College of New Jersey
Studying ice crystal morphology using scanning electron microscopy (SEM) under Dr. Nate Magee. Investigating behavior in extreme environments to improve climate modeling.
Research Advisor: Dr. Nathan Magee
Skills: SEM, Image Analysis, Climate Physics

Research Intern *Apr 2025 – Sept 2025*
General Dynamics
Applied machine learning and retrieval-augmented generation (RAG) to optimize jet propulsion dynamics. Integrated real-world datasets with physical models to improve system performance.
Skills: Machine Learning, Computational Modeling

Machine Learning Engineer Intern *Jan 2025 – May 2025*
Stealth Startup
Contributed to large language model (LLM) NLP systems under non-disclosure agreement. Supported model training and deployment pipelines.
Skills: Natural Language Processing, Python, Production ML

Lockheed Martin Intern *Apr 2024 – Sep 2024*
Lockheed Martin Advanced Technology Labs
Worked on autonomous navigation systems for aerospace applications. Integrated SLAM algorithms with sensor fusion pipelines and improved path-planning efficiency in robotic systems.
Skills: C++, ROS, Sensor Fusion, Computer Vision

Matroid Theory Researcher *Jun 2024 – Sep 2024*
Princeton University
Analyzed matroid structures in discrete mathematics for optimization and network reliability under Dr. June E.

Huh. Applied concepts to theoretical computer science problems.
Skills: Discrete Math, Optimization, Proof Techniques

Software Engineer Intern *Apr 2023 – Dec 2023*
New Jersey Institute of Technology (NJIT)
Maintained backend systems and contributed to scalable application development. Built RESTful APIs under faculty supervision.
Skills: Software Engineering, Python, Git

Technical Skills

Languages: Python, C++, Java, MATLAB, LaTeX, Julia, JavaScript, R
Tools / Libraries: Git, TensorFlow, PyTorch, CERN ROOT, OpenCV, ROS, LangChain, VS Code, Firebase, PostgreSQL, Linux, Bash, Docker, Conda, Jupyter, Pandas, NumPy, Scikit-learn, SLAM

Projects

Particle Detection with Neural Networks *CERN, 2025*
Built a classifier to identify particle interactions in CMS detector data. Integrated CERN ROOT preprocessing and TensorFlow training workflows.

Geophysical Ice Imaging Toolkit *TCNJ, 2025*
Automated extraction of morphological features of ice crystals using SEM. Developed batch-processing pipeline to support climate model research.

Monte Carlo Jet Propulsion Simulator *General Dynamics, 2025*
Simulated jet propulsion dynamics with Monte Carlo methods. Integrated physics-informed ML to analyze flow stability.

Matroid Optimizer *Princeton University, 2024*
Developed Python tool for evaluating matroid rank, closure, and independence properties. Used in optimization and graph theory research.

SLAM-Based Robotic Navigator *Lockheed Martin, 2024*
Implemented real-time SLAM and sensor fusion for robotic pathfinding. Used ROS and OpenCV to test systems in dynamic environments.

Numerical Solver Library *Independent, 2023*
Developed a modular Python/Julia package for solving differential equations numerically. Included Runge-Kutta methods and finite difference schemes.

Extracurricular Activities

Putnam Competition Team *Since Fall 2024*
The College of New Jersey
Compete in the William Lowell Putnam Mathematical Competition with intensive problem-solving training in advanced mathematics.

Mathematical Olympiad Prep Team *Fall 2022 - June 2024*
Frankloing
Weekly sessions in number theory, combinatorics, and geometry to prepare for national mathematical competitions.

Chess Club *Since Fall 2024*
The College of New Jersey
Participate in weekly tournaments and rated practice. Studying classical openings and tactics.

Volunteer Experience

Bonner Community Scholar *Aug 2024 – Present*
The College of New Jersey
Complete 300+ community service hours per academic year. Engage in social justice education, civic engagement, and public service projects.

Red Cross Volunteer Representative *2024 – Present*
American Red Cross
Serve as a youth representative for disaster relief coordination and public outreach campaigns.

Professional Memberships

Institute of Electrical and Electronics Engineers (IEEE) *Feb 2025 – Present*
American Physical Society (APS) *2025 – Present*
Society for Industrial and Applied Mathematics (SIAM) *2025 – Present*