

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, Multi-variable 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 and Dr. Sunil Somalwar

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.

Research Advisor: Dr. June E. Huh**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*