Parth Rana

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EDUCATION

Wayzata High School, Plymouth, MN — Expected June 2028
High School Diploma; Weighted GPA 4.4; 12 AP courses to date

University of Minnesota, Twin Cities, Minneapolis, MN — Sept 2023–Present
Post-Secondary Enrollment Options (PSEO) and University of Minnesota Talented Youth Mathematics Program (UMTYMP)

- Completed the UMTYMP sequence through Calculus II; currently enrolled in Differential Equations, with Linear Algebra scheduled for spring 2027.
- Relevant university coursework: Data Science and Machine Learning in Finance (FM 5323).

RESEARCH EXPERIENCE

Zhou Lab, Johns Hopkins University, Baltimore, MD — Aug 2026–Present
Developer, BodyMaps

- Integrate the lab's publicly released AtlasNet organ and tumor segmentation models into the BodyMaps website, with label maps, 73 tests and a verification run on an A100 GPU under Slurm.
- Earned the role by building BodyMaps Viewer, a CT scan viewer that runs entirely in the browser (TypeScript and WebGL2, 186 tests), for the lab's developer call.

VISION Project, University of Minnesota, Minneapolis, MN — Aug 2026–Present
Research Assistant (advisor: Dr. Shancong Mou)

- Annotation and data-quality work for VISION, an industrial defect-inspection dataset: correct model-proposed defect masks and audit the team's annotation rounds.
- Replicated DISCO (ICML 2025) at paper scale on the Minnesota Supercomputing Institute's Agate cluster (146 GPU-hours under Slurm) and reported the results with proposed follow-up studies.

Particle4X, Saint Paul, MN — Sept 2026–Present
Machine Learning Intern

University of Minnesota, Minneapolis, MN — Aug 2026–Present
Research Student, Prof. Liyan Xie

- Test whether image-generation models change behavior at a detectable moment mid-generation, applying sequential change-detection statistics to the step-by-step denoising path of a diffusion model.
- Built the trajectory extraction scripts and experimental design for the study.

MIT Beaver Works Summer Institute, Cambridge, MA — July–Aug 2026
Student Researcher, Quantum Software Track

- Reproduced a 15-qubit repetition-code experiment (arXiv:1709.00990) in Q# on a team of four; built the circuit, the shot runner and the code-distance sweep.

RESEARCH PROJECTS

DeepScope: Biological-Plausibility Deepfake Detection — 2025–2026

- Built a deepfake detector that reads involuntary signals of a real face, such as micro-tremor, blinking and skin-texture persistence: MediaPipe landmark tracking, Procrustes alignment, twelve biological-plausibility metrics and a two-stage gradient-boosted cascade.
- Rebuilt it from scratch on open datasets (2,043 clips, including 538 face swaps and LivePortrait reenactments I generated on MSI GPUs) to test whether biology-based detection generalizes to unseen generators.
- Earned a 3rd Place Grand Award in Software Design at Regeneron ISEF 2026 as an individual project; adapting the work into a manuscript for the Columbia Junior Science Journal.

ChemPrint: PFAS Source Attribution — 2025–2026

- Built a machine learning ensemble that traces PFAS contamination in water back to its likely industrial source; named a Stockholm Junior Water Prize National Finalist.

CNN-Based Plant Disease Detection System 2024–2025

- Built a convolutional network classifying plant diseases from leaf images for low-cost deployment where expert diagnosis is unavailable; won the 3M Young Inventor Award and presented at 3M headquarters.

HONORS AND AWARDS

- **3rd Place Grand Award, Software Design**, Regeneron International Science and Engineering Fair, Society for Science, May 2026.
- **National Finalist (top 20) and Minnesota State Winner**, Stockholm Junior Water Prize, Water Environment Federation, May 2026; invited to the Industrial Water Solutions Conference.
- **Minnesota State Winner**, NCWIT Aspirations in Computing Award, March 2026.
- **3rd Place**, High School Terminal, Correlation One, sponsored by Citadel, July 2026.
- **Global Winner**, Purple Comet Math Meet, perfect score of 30/30, 2026; **Distinguished Honorable Mention** (top 10%), Stanford Math Tournament; **Minnesota All-State Math Team**.
- **Twin Cities Regional Science Fair**: two-time 1st Place; ProEquip Award for Thoughtful Consideration of Safety in Artificial Intelligence; Inspiring Excellence Project; Judges' Favorite in Coolest Projects, Raspberry Pi Foundation, sponsored by Broadcom.
- **Business Professionals of America**: six-time national qualifier; 6th nationally in C++ Programming, 5th nationally in Stock Market Game, 1st at state in User Experience Design Team as captain, 1st at state in Network Administration Using Cisco, 3rd at state in C++ Programming.

LEADERSHIP AND SERVICE

Financial Math Society, Minneapolis, MN May 2026–Present
Co-Founder, Co-President and Technical Coordinator

- Founded and run an organization of 80 PSEO and UMTYMP students under Dr. David Titus, sponsored by Susquehanna International Group, Jane Street and Citadel.
- Host Estimathon, MinneAnalytics events and mini-hackathons for the membership.

Boy Scouts of America, Troop 537, Plymouth, MN June 2024–Present
Senior Patrol Leader, Eagle Scout Candidate

- Lead troop meetings and planning as the senior youth officer; earned the Presidential Volunteer Service Award at the Gold level for over 100 service hours in 2024–2025.
- Tutor younger students in mathematics and computer science outside of school.

TECHNICAL SKILLS

Languages: Python, C++, Java, TypeScript, Q#, LaTeX
Machine Learning and Vision: PyTorch, nnU-Net, 3D medical image segmentation, convolutional networks, video and temporal models, diffusion models, Gaussian processes, Bayesian inference and MCMC
Computing: Slurm and GPU training on the MSI Agate cluster, WebGL2, Git, Linux