

# Ryan Cooley

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## Education

### Tufts University

B.S. in Chemical Physics

Minor in Applied Computational Science

• GPA: 3.89/4.00, Dean's List (All Semesters), Sigma Pi Sigma (Physics & Astronomy Honor Society)

**Mathematics:** Calculus I-III; Linear Algebra; Mathematical Modeling | **Physics:** Physics 11-12; Modern Physics; Quantum Theory I |

**Chemistry:** General; Organic Chemistry; Physical Chemistry | **Computer Science:** Introduction to Computer Science

Medford, MA

Expected May 2027

## Skills

**Programming:** Python (NumPy, pandas, Numba), C++, SQL (basic), Git | **Testing/DevOps:** pytest, GitHub Actions (CI), Docker, Black/Flake8

| **Quantitative Methods:** Monte Carlo (GBM), Black-Scholes, Greeks & hedging, IV surface calibration, VaR/CVaR, backtesting | **Algorithms**

**& Performance:** vectorization (NumPy broadcasting), Numba JIT, profiling/benchmarking | **Data & Visualization:** Jupyter, Matplotlib |

**Computing:** Linux/macOS CLI; HPC (Slurm: salloc, srun) | **Domain Tools:** OpenMM, VMD

## Experience

### Entegris

Metrology Retention Intern (Data Automation & Simulation)

Billerica, MA

May 2025 – August 2025

- Reduced end-to-end processing time from **38 min** to **<3 min** (~12× faster; ~92% reduction)
- Produced a **particle-tracking simulation** to model membrane transport and validate retention results
- Performed retention tests (**ICP-MS**, fluorescence spectroscopy) to ensure data quality

## Quantitative Projects

### Open Source — GitHub (Ryan-Cooley)

Remote

Monte Carlo Option Pricer (Python, Numba, CLI, CI/CD)

June 2025 – Present

- Architect a **Numba** Monte Carlo pricer; deliver 10× speedup vs **NumPy** on **1M+** paths with  $RMSE \leq 5 \times 10^{-4}$  (vs Black-Scholes)
- Design a **delta-hedging** simulator with costs; map **cost-error** frontiers and log **P&L metrics**
- Develop **IV calibration** (Brent/bisection, no-arbitrage) from CSV market data; render **3D IV surfaces**
- Instrument a reproducible **performance harness**: shared RNG seeding, stage-level profiling, **unit tests**, and automated reports

### Open Source — GitHub (Ryan-Cooley)

Remote

SMA Crossover Backtester (Python)

June 2025 – Present

- Build an **SMA backtester** (Stooq / yfinance) with **Jupyter** dashboard; **unit tests** and **modular** design
- Deliver a **CLI** and automated **grid search**; professional visualizations & metrics (**Sharpe**, **drawdown**, rolling analysis)
- Use **pandas**-based backtesting on **9+ years** of data; enable real-time strategy evaluation with parameter tuning

## Research

### Ding Group, Tufts University

Medford, MA

Undergraduate Research Assistant

May 2024 – Present

- Model **TIP3P** water in **OpenMM/Python**; process trajectories with **NumPy** to validate **force-field** parameters
- Investigate **bundled water** models within ongoing **solvation** and **molecular dynamics** studies
- Present weekly updates to the **PI**, covering progress, methods, and next steps
- Plan **free-energy calculations** using **alchemical methods** to probe **solvation energetics** (Fall 2025)

### Harvard-Smithsonian Center for Astrophysics

Cambridge, MA

Astrophysics Intern

June 2022 – August 2023

- Produced Chandra images using **CIAO/DS9**; practiced scientific writing in LaTeX

## Leadership & Activities

### Students for the Exploration and Development of Space (SEDS)

Medford, MA

CubeSat Communications & Ground Station Lead

November 2023 – Present

- Leverage **FCC Technician License** to assess ground-station hardware and uplink/downlink protocols
- Contribute to **orbital analysis** in 42; assist debris modeling with ESA MASTER

### Additional Memberships

Tufts University

American Chemical Society; Society of Physics Students; Club Squash; Club Rock Climbing

### Interests

Chess and poker (competitive strategy games)