Ethan Lipson

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EDUCATION

Columbia University — New York, New York
Applied Mathematics, Minor in Computer Science - GPA 3.74 — **August 2022 - May 2026**
Past Coursework - Linear Algebra, ODE, Multivariable Calculus, Discrete Math, Combinatorics, CS Theory
Current Coursework - Convex Optimization, Digital Signal Processing, Real Analysis, Group Theory, Topology

Stuyvesant High School — New York, New York
GPA 93/100 — **September 2018 - June 2022**

EXPERIENCE

Xscape Photonics - *Intern* — **May 2023 - August 2023**
- Automating control, calibration, and synchronization of lab equipment (power supplies, lasers, spectrum analyzers)
- Optical fiber alignment using mathematical optimization in a 12-degree-of-freedom mechanical environment

Columbia University Department of Mathematics - *Researcher* — **March 2023 - Present**
Topology research with Professors Konstantin Aleshkin and Melissa Liu
- Analysis of polygon subdivisions to enumerate Calabi-Yau manifolds, advancing current models of string theory
- Application of combinatorial methods to enumerate quintic threefolds up to homeomorphism

Heights Labs - *Intern* — **June 2022 - September 2022**
Wrote software that scanned the web for cryptocurrency addresses, with the purpose of identifying crime and illicit movement of funds. Used **AWS**, **PySpark**, **Tesseract OCR**, **Vue**, and **TypeScript**.
- Scanned the web for cryptocurrency addresses with the purpose of identifying crime and illicit movement of funds
- Used AWS, PySpark, Tesseract OCR, Vue, TypeScript

TECHNICAL SKILLS

Languages: Python, JavaScript, TypeScript, Rust, C++, Java
Parallel GPU programming
- Massively parallel million-body simulations using **CUDA**, and web-based GPU compute using **WebGL/WebGPU**

Physics simulation
- Fluid simulation, rigidbody/softbody dynamics, parallelized to run on multi-core or GPU

Computer graphics
- Knowledge of linear algebra and quaternion algebra for use in **OpenGL**, **WebGL**, **WebGPU**, and **Three.js**

Machine learning and data science
- Deep neural networks with **PyTorch**, data processing with **Apache Spark** on remote clusters

PROJECTS - Available at ethanlipson.com

Fluid Simulation - Position-Based Fluids are used to perform a 30,000 particle simulation in real-time
Cloth Simulation - Interactive simulation of cloth draped over a post, implementing collision and shadows
Julia Sets - Interactive visualization of Julia sets, a well-known phenomenon in holomorphic dynamics
Boids - Simulation of approximately 100,000 boids, a model of flocking behavior seen in birds, fish, and other animals
Metaballs - Interaction of the metaballs algorithm to create a lava lamp effect, visualized using marching cubes
Gravity - System of over 200,000 multicolored particles falling towards a center of gravity
Jets - 2D Eulerian fluid simulation, displaying a continuously evolving boundary between opposing flows
Raytracing - Real-time, interactive implementation of Ray Tracing in One Weekend, a well-known static raytracer