

# Ethan Lipson

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## EDUCATION

### Columbia University

Applied Mathematics, Minor in Computer Science - GPA 3.74

New York, New York

August 2022 - May 2026

### Stuyvesant High School

GPA 93/100

New York, New York

September 2018 - June 2022

## EXPERIENCE

### Columbia University Department of Mathematics - *Researcher*

March 2023 - Present

- Conducting research with Professor Konstantin Aleshkin into current models of string theory
- Analysis of polygon subdivision to enumerate quintic threefolds, a specific kind of Calabi-Yau manifold

### Princeton University Department of Mathematics - *Researcher*

September 2023 - Present

- Conducting research with Professor Maria Chudnovsky into minimal colorings of certain classes of graphs
- Studying new phenomena describing relationships between polynomially  $\chi$ -bounded classes

### Xscape Photonics - *Intern*

May 2023 - August 2023

- Automated 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

### Heights Labs - *Intern*

June 2022 - September 2022

- Wrote software that scanned the web for cryptocurrency addresses, identifying crime and illicit movement of funds
- Used **AWS**, **PySpark**, **Tesseract OCR**, **Vue**, and **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](https://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

