

Brandon Feder

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RESEARCH INTEREST

I am interested in questions of computability and undecidability that arise in and Algebraic Geometry, and more specifically how elliptic curves and are used to prove generalizations of Hilbert's 10th Problem.

EDUCATION

Penn State

Graduating June 2028

Unweighted GPA: 3.67/4.0

Princeton International School of Mathematics and Science

Graduated June 2024

Unweighted GPA: 3.88/4.0

RELEVANT COURSEWORK

Linear Algebra, Calculus I-III, Special Relativity, Abstract Algebra, General Topology, Ordinary Differential Equations, Mathematical Coding Theory (audited), Real Analysis I-II, Algebraic Topology (graduate, audited)

Independent Coursework:

- Algebraic Geometry (*Undergraduate Algebraic Geometry* by Miles Reid)
- Linear Algebra (*Linear algebra done right* by Sheldon Axler)
- Differential Geometry & Real Analysis (*Vector Calculus, Linear Algebra, and Differential Forms: A Unified Approach* by John H. Hubbard and Barbara Burke Hubbard)
- Logic & Computability (*Modern Logic* by Graeme Forbes, *Computability: Computable Functions, Logic, and the Foundations of Mathematics* by Richard L. Epstein and Walter A. Carnielli)
- Elliptic Curve Theory (*The Arithmetic of Elliptic Curves* chapters 1 - 5 by Joseph H. Silverman)

AP Exams: AP Calculus AB (5), AP Calculus BC (5), AP Statistics (5), AP Physics C: Mechanics (5), AP Physics C: Electricity & Magnetism (4)

AWARDS

3x President Volunteer Service Award
Hubert N. Alyea Award
AP Scholar With Distinction
AP Scholar With Honors

SKILLS

Programming Languages: C/C++, Python, Java, JavaScript, R, Lean

Markup Languages: HTML, CSS, Markdown, L^AT_EX

Tools: Git/GitHub, Unix Shell, ROOT, CUDA, NodeJS

EXPERIENCE

WORK EXPERIENCE

Layer Metrics Inc

Nov. 2023 – Present

- Responsible for implementation of proprietary analysis algorithms for the opto-photonic sensing and metrology of additive metal printing process
- Responsible for review of code and in charge of company codebase
- Work closely with CTO and present progress biweekly

RESEARCH EXPERIENCE

Lehigh University Research Experience for Undergraduates

May. 2023 - Aug. 2023

- Collaborated with Lehigh University's Relativistic Heavy-Ion Group in order to investigate the directional-dependence of energy deposition in the sPHENIX experiment
- Wrote analysis packages for the sPHENIX Collaboration in ROOT
- Collaborated with physicists and computer scientists across the North-East and presented progress weekly to Lehigh's Relativistic Heavy-Ion Group
- Only high schooler to participate in Lehigh University's REU

Brookhaven National Laboratory High School Research Program

Nov. 2021 - Aug. 2022

- Researched heuristics based on graph optimization for removing ambiguity in the tomographic reconstruction of data relating to neutrinos from the DUNE Experiment
- Used CUDA to implement a package for WireCell Toolkit that performs GPU-accelerated fast Fourier transforms and fast convolutions to be used in the analysis of time-projection chambers
- Presented progress weekly to a subset of Brookhaven's Electronic Detector Group

Brookhaven National Laboratory High School Research Program

March. 2020 - Jun. 2020

- Used CUDA to implement GPU-accelerated algorithms for the real-time detection of fast radio bursts for Brookhaven National Laboratory's BMX telescope

PROJECTS

Out-of-Core Convolutions

Dev. 2020 - Jan. 2022

- Researched reducing IO in GPU-accelerated out-of-core convolutions for the high-precision computation of algebraically transcendental constants such as π
- Presented research at IEEE North Jersey Student Conference 2022

REFERENCES

Dr. Peter Rock

Research Scientist, Metric Geometry and Gerrymandering Group; Cornell University

✉ peter.rock@cornell.edu

Dr. Ae Ja Yee

Professor of Mathematics, Penn State University

✉ yee@psu.edu

Dr. Brett Viren

Physicist, Brookhaven National Laboratory

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