Brandon Feder

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Summary

Four years experience in computational physics research and high-performance computing. Interested in the intersection of numerical methods and fundamental physics. Knowledgeable in higher-level mathematics, especially Commutative Algebra and Algebraic Geometry.

Education

Princeton International School of Mathematics and Science Graduating June 2024

Unweighted GPA: 3.88/4.0

Accepted to Penn State's Eberly College of Science for fall 2024

Relevant Coursework

AP Exams: AP Calculus AB (5), AP Calculus BC (5), AP Statistics (5), AP Physics C: Mechanics (5), AP Physics C: Electricity & Magnetism (4)
Other Courses: Linear Algebra, Calculus III, Special Relativity, Quantum Mechanics
Independent Coursework:

- Commutative Algebra & Algebraic Geometry (*A First Course in Abstract Algebra* by John Fraleigh *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)
- Point-Set Topology (*Topology; a first course* by James Munkers)
- 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)

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

Skills

Programming Languages: C/C++, Python, Java, JavaScript, R
Markup Languages: HTML, CSS, Markdown, LaTeX
Tools: Git/GitHub, Unix Shell, ROOT, CUDA, NodeJS

Projects

Out-of-Core Convolutions Dev. 2020 - Jan. 2022

- Researched reducing IO in GPU-accelerateed 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

Awards

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

References

Dr. Dominic Murphy dom@layermetricsinc.com
CTO, Layer Metrics Inc.

Dr. Brett Viren bviren@bnl.gov
Physicist, Brookhaven National Laboratory

Dr. Peter Rock prock01@bu.edu
Research Scientist, Metric Geometry and Gerrymandering Group; Boston University