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.

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
- Review of code and in charge of company codebase
- Work closely with Chief Technology Officer (CTO) and present progress biweekly

Lehigh University Research Experience for Undergraduates (REU)   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 on 12-person team to participate in Lehigh University's REU

Research Experience

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   Mar 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

Independent Research on Out-of-Core Convolutions   Dec 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 the Institute of Electrical and Electronics Engineers (IEEE) North Jersey Student Conference 2022

Princeton International School of Math & Science Junior-Senior Thesis   Sep 2022 – Jun 2024

- Two-year thesis on the extensions of Hilbert's 10th problem to other rings

Education

Princeton International School of Mathematics and Science   Graduating Jun 2024

- Received four-year merit-based scholarship
- Unweighted GPA: 3.9/4.0, SAT 1570
- Independent Coursework: Commutative Algebra & Algebraic Geometry, Linear Algebra, Differential Geometry & Real Analysis, Point-Set Topology, Logic & Computability, Elliptic Curve Theory
- Post AP STEM Courses: Linear Algebra, Calculus III, Special Relativity, Quantum Mechanics, Advanced Robotics, Data Sciences
- STEM AP Courses & Score: Calculus AB (5), Calculus BC (5), Statistics (5), Physics C: Mechanics (5), Physics C: Electricity & Magnetism (4)

Awards

- Three time President Volunteer Service Award winner, a civil award bestowed by the President of the United States to honor volunteers who give 100+ hours of service per year; 12+ year volunteer at the Trenton-Area Soup Kitchen.
- Recipient of the 2023 Hubert Alyea Award issued by Princeton University and the Princeton Section of the American Chemical Society for a 'demonstrated enthusiasm for the study of science and having distinguished himself as a student who excels in scientific disciplines'
- Attended Ross Mathematics, a selective number theory summer program, accepted first year of eligibility
- Key member of 2020 competitive science bowl team that won NJ and placed in top 16 at the National Department of Energy (DOE) Science Bowl.

Skills

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

References

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

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

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

Mr. Adam Kemp, Assistant Principal, Director of STEAM Department & Engineering Teacher, adam.kemp@prismsus.org