

Michael Heinz - Curriculum Vitae

michael_heinz@berkeley.edu | Berkeley, CA 94703 | 614-717-3460
<https://mheinz757.github.io/>

EDUCATION

University of California Berkeley August 2020 - Present
Ph.D. in Applied Mathematics

The Ohio State University August 2016 - May 2020
B.Sc. in Mathematics and Physics with Honors (double major)
Overall GPA (4.00 scale): 4.00; Major GPA: 4.00
Graduation honors: Summa Cum Laude with Honors Research Distinction in Mathematics
Thesis: *New Resummation Techniques of Divergent Series: the Painlevé Equation P_{II}*

RESEARCH EXPERIENCE

Improving High-Energy Particle Detectors with Machine Learning June 2020 - August 2020
Research Intern at Lawrence Livermore Nat'l Lab advised by Aaron Angerami Livermore, CA

- Conducted DOE-funded research to use machine learning techniques to improve particle reconstruction of the ATLAS calorimeter for particles produced in high-energy nuclear collisions
- Utilized TensorFlow and Keras to train models and make predictions on new data
- Applied classification and energy regression in succession to make calibrated energy predictions for data including multiple types of particle showers
- Implemented a data generator using `uproot` to load input data into memory from root files as needed
- Presentation:
 - Summer SLAM! August 2020
Lawrence Livermore National Laboratory

Resummation of Divergent Series February 2018 - May 2019, August 2019 - May 2020
Undergraduate Research Asst. advised by Prof. Ovidiu Costin (Mathematical Physics) Columbus, OH

- Conducted university-funded research on advanced methods for resummation of divergent series to convergent solutions that give maximum information about the behavior of the associated function when dealing with incomplete information
- Applicable to various fields including obtaining higher precision in critical expansions at low and high temperatures in statistical mechanics
- Applied a new method of resummation developed by Prof. Costin to Painlevé Equation P_{II}
- Conference and Forum Presentations:
 - Young Mathematicians Conference August 2019
The Ohio State University
 - Denman Undergraduate Research Forum February 2019
The Ohio State University
 - Autumn Undergraduate Research Festival November 2018
The Ohio State University
- Publication:
 - O. Costin and M. Heinz, *Rational Approximations for Painlevé P_{II} Solutions* In preparation

Hydrodynamic Fluctuations in High-Energy Nuclear Collisions May 2019 - July 2019
Wayne State JETSCAPE REU advised by Prof. Chun Shen (High-Energy Nuclear Theory) Detroit, MI

- Conducted research funded by JETSCAPE on the smoothed particle hydrodynamics method (SPH) to solve partial differential equations for hydrodynamic fluctuations in high-energy nuclear collisions
- Wrote an open source code package in C++ with C++ 11 standard, as well as a summarizing report
- https://bitbucket.org/wayne_state_nuclear_theory/sph_solver/src/master/

Virtual Knot Invariants

June 2017 - December 2017

Knots and Graphs Research Program advised by Prof. Sergei Chmutov

Columbus, OH

- Conducted university-funded cutting-edge research on multiple knot invariants for virtual knots
- Worked to develop a novel knot invariant that would expand on current knowledge and distinguish more virtual knots
- Helped develop a program to output different knot invariants for any inputted virtual knot
- <https://people.math.osu.edu/chmutov.1/wor-gr-su17/wor-gr.htm>

Exploration in Low-Energy Nuclear Theory

June 2016 - December 2016

Undergraduate Research Asst. to Prof. Robert Perry (Low-Energy Nuclear Theory)

Columbus, OH

- Independently studied various problems in quantum mechanics and discussed findings with Prof. Perry
- Attended research meetings of the Low-Energy Nuclear Theory group

WORK EXPERIENCE

University of California, Berkeley, Dept. of Mathematics

Aug. 2020 - Present

Graduate Student Instructor

Berkeley, CA

- Lead weekly Numerical Analysis (Math 128A) discussion sections, and host weekly office hours
- Facilitate discussion, solve problems, and address students' questions about material
- Construct, administer, and grade bi-weekly quizzes as well as grade exams throughout the semester

The Ohio State University Dept. of Mathematics

Aug. 2017 - Dec. 2017, Aug. 2018 - May 2020

Student Instructional Assistant

Columbus, OH

- Led multiple weekly or semi-weekly recitations in Precalculus, Trigonometry, or Business Algebra
- Facilitated discussion, solved problems, and addressed students' questions about material
- Assisted students outside of recitation through tutoring and office hours
- Administered quizzes and exams throughout the semester

Colburn Hill Group

November 2018 - May 2019

Contractor

Columbus, OH

- Created AI using UiPath to scrape relevant information from health care sites and post to databases

Math and Stats Learning Center at The Ohio State University

January 2018 - May 2018

Mathematics Tutor

Columbus, OH

- Explained Calculus and other mathematics concepts in simplified language to increase understanding
- Helped students of various ages and levels connect concepts to continuously expand knowledge
- Identified individual learning levels of different students and broke down complex problems accordingly

ACADEMIC AWARDS

- Senior Alumni Award Winner
Department of Physics April 2020
The Ohio State University
- Goldstein Math Scholarship
Department of Mathematics Spring 2020
The Ohio State University
- Goldstein Math Scholarship
Department of Mathematics Autumn 2019
The Ohio State University
- Smith Junior Award Winner
Department of Physics April 2019
The Ohio State University
- Merit Scholarship from Gordan Memorial Fund
Department of Mathematics Spring 2019
The Ohio State University

- Merit Scholarship from Gordan Memorial Fund
Department of Mathematics Autumn 2018
The Ohio State University
- Smith Sophomore Award Winner
Department of Physics April 2018
The Ohio State University
- Honorable Mention in the Gordon Mathematics Competition
Razor-Bareis-Gordon Mathematics Competition March 2018
The Ohio State University
- Merit Scholarship from George Majda Scholarship Fund
Department of Mathematics Spring 2018
The Ohio State University
- Merit Scholarship from George Majda Scholarship Fund
Department of Mathematics Autumn 2017
The Ohio State University
- Helen Cowan Book Award Winner
Department of Physics April 2017
The Ohio State University
- Second Place in the Gordon Mathematics Competition
Razor-Bareis-Gordon Mathematics Competition March 2017
The Ohio State University
– awarded Goldstein Mathematics Scholarship
- Merit Scholarship from Morris Endowment Fund
Department of Mathematics Autumn 2016
The Ohio State University
- Maximus Scholarship Autumn 2016 - Spring 2020
The Ohio State University

TALKS AND PRESENTATIONS

- “Improving High-Energy Particle Detectors with Machine Learning”
Summer SLAM! August 2020
Lawrence Livermore National Laboratory
- “New Resummation Techniques of Divergent Series: the Painlevé Equation P_{II}”
Bachelor’s thesis: defense April 2020
The Ohio State University
- “Padé Approximations and their Applications”
Given for the Low-Energy Nuclear Theory group January 2019
The Ohio State University
- “Helley’s Theorem on Convex Sets”
Given in Math 5529H, Honors Combinatorics November 2016
The Ohio State University

SKILLS AND ACTIVITIES

Technical Skills:

- Numerical computing (Python: numpy, scipy, matplotlib; C++; MATLAB; Maple; Mathematica)
- Machine learning (TensorFlow; Keras)
- Version control (git)
- Documenting results (L^AT_EX; Microsoft Office)
- Other languages: UiPath

Language Skills:

- English (native)
- German (native)

Activities:

- Member of the Radical Pi Math Club at OSU August 2016 - May 2020
- Bassist in The Buckeye Philharmonic Orchestra August 2016 - May 2019
- Putnam Competition participant (achieved best score of 20, rank 693.5 out of 4,638) 2016, 2017