Michael Heinz - Curriculum Vitae

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EDUCATION

University of California Berkeley August 2020 - May 2025
Ph.D. in Applied Mathematics
GPA (4.00 scale): 4.00
Advisor: Professor Per-Olof Persson

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 PII
- Conference and Forum Presentations:
  - Young Mathematicians Conference August 2019
    The Ohio State University
  - Denman Undergraduate Research Forum February 2019
    The Ohio State University
  - Autumn Undegraduate Research Festival November 2018
    The Ohio State University

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
- Assisted students outside of recitation through tutoring and office hours
- Administered quizzes and exams throughout the semester

Colburn Hill Group November 2018 - May 2019
Software Intern *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 — April 2020
  Department of Physics — *The Ohio State University*
- Goldstein Math Scholarship — Spring 2020
  Department of Mathematics — *The Ohio State University*
- Goldstein Math Scholarship — Autumn 2019
  Department of Mathematics — *The Ohio State University*
- Smith Junior Award Winner — April 2019
  Department of Physics — *The Ohio State University*
- Merit Scholarship from Gordan Memorial Fund — Spring 2019
  Department of Mathematics — *The Ohio State University*

· Merit Scholarship from Gordan Memorial Fund — Autumn 2018
Department of Mathematics — *The Ohio State University*

· Smith Sophomore Award Winner — April 2018
Department of Physics — *The Ohio State University*

· Honorable Mention in the Gordon Mathematics Competition — March 2018
Rasor-Bareis-Gordon Mathematics Competition — *The Ohio State University*

· Merit Scholarship from George Majda Scholarship Fund — Spring 2018
Department of Mathematics — *The Ohio State University*

· Merit Scholarship from George Majda Scholarship Fund — Autumn 2017
Department of Mathematics — *The Ohio State University*

· Helen Cowan Book Award Winner — April 2017
Department of Physics — *The Ohio State University*

· Second Place in the Gordon Mathematics Competition — March 2017
Rasor-Bareis-Gordon Mathematics Competition — *The Ohio State University*
  – awarded Goldstein Mathematics Scholarship

· Merit Scholarship from Morris Endowment Fund — Autumn 2016
Department of Mathematics — *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" — August 2020
Summer SLAM! — *Lawrence Livermore National Laboratory*

· "New Resummation Techniques of Divergent Series: the Painlevé Equation P_{II}" — April 2020
Bachelor's thesis: defense — *The Ohio State University*

· "Padé Approximations and their Applications" — January 2019
Given for the Low-Energy Nuclear Theory group — *The Ohio State University*

· "Helley's Theorem on Convex Sets" — November 2016
Given in Math 5529H, Honors Combinatorics — *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 (LaTeX; Microsoft Office)
· Other languages: UiPath

Language Skills:

· English (native)
· German (native)

Activities:

· Member of URep in UC Berkeley Dept of Mathematics — August 2020 - Present
· 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