MATTHEW KOWALSKI

*** * ******* Avenue ⋄ **********, **********, ***** ⋄ United States of America
--**** ⋄ kowal165@msu.edu

EDUCATION

Michigan State University *August 2017 - May 2021*
B.S. in Advanced Mathematics, *College of Natural Science* *Expected May 2021*
B.S. in Physics, *College of Natural Science* *Expected May 2021*
B.S. in Computational Mathematics, *College of Natural Science* *Expected May 2021*
Minor in Computer Science Engineering, *College of Engineering* *Expected May 2021*
GPA: 4.0 / 4.0

RESEARCH EXPERIENCE

Monte Carlo Photon Propagation Simulation *August 2017 - Present*
IceCube Neutrino Observatory, Computational Math and High Energy Physics, Professor Tyce DeYoung

- Created a Monte Carlo simulation of in-ice photon propagation to study the prediction of ice properties and numerical methods used in IceCube data creation
- Had the chance to manage my own project. Individually decided on project methods and direction. Pitched and implemented original uses of program.
- Gained experience in numerical methods, monte carlo simulations, statistical methods, and particle physics. Gained significant presentation experience through dozens of research updates.

Problems in Contemporary Symplectic Geometry *December 2019 - May 2020*
Mathematics Exchange Program, Mathematics/Mathematical Physics, Professor Casim Abbas

- Learned the basics of symplectic geometry up to important modern results
- Research focused on understanding modern papers in symplectic geometry. Specifically centered on Gromov's non-squeezing theorem.
- Project would have been presented at a school talk at the end of the semester (cancelled due to COVID-19)

Optimization of Psuedo-3D Model Observer for Emerging 2D Mammography Applications
KU Leuven, Belgium, Applied Mathematics and Medical Physics, Professor Hilde Bosmans
Cancelled due to COVID-19 - intended for Fall 2020

- Accepted a research position at KU Leuven, Belgium, for Fall of 2020.
- Would have utilized a generative adversarial network to simulate breast lesions and conduct virtual clinical trials. Intended to automate lesion simulation to high accuracy.
- Work would have been evaluated based on a thesis reviewed by Professor Bosmans and two colleagues, along with a public oral presentation and defense.

GRADUATE COURSEWORK (MSU)

Mathematics

- **Real Analysis I**, MTH828, Grade: 4.0 *Fall Semester 2020*
  Qualifying real analysis course. A measure theory course based on Terence Tao's "An Introduction to Measure Theory". Covered Lebesgue measure through to complex measures.

- **Complex Analysis**, MTH829, Grade: 4.0 *Spring Semester 2020*
  Qualifying complex analysis course. Based on Lang's "Complex Analysis". Covered basics of complex numbers through to Carathéodory's theorem of conformal mappings.

- **Machine Learning**, MTH890, Grade: 4.0   *Summer Semester 2020*
  Covered statistical methods used in machine learning and machine learning algorithms. Ended the course with a discussion of clustering algorithms and Markov chain Monte Carlo methods.

- **Real Analysis II**, MTH928 (upcoming)   *Spring Semester 2021*

Physics

- **Quantum Mechanics**, PHY851, Grade: 4.0   *Fall Semester 2020*
  Qualifying quantum mechanics course. Covered basic quantum mechanics through quantum scattering with a focus on intuitive methods.

- **Elementary Particle Physics**, PHY803, Grade: 4.0   *Spring Semester 2020*
  Followed Griffith's "Introduction to Elementary Particles". Covered basic particle physics through neutrino oscillations and supersymmetry.

- **Classical Mechanics**, PHY820, Grade: 4.0   *Fall Semester 2019*
  Qualifying classical mechanics course. Based on Goldstein's "Classical Mechanics". Covered Lagrangian mechanics with modern applications and Hamiltonian mechanics.

- **Classical Electrodynamics**, PHY841 (upcoming)   *Spring Semester 2021*
  Qualifying electrodynamics course. Will be based on Jackson's "Classical Electrodynamics".

- **Nuclear Physics**, PHY802 (upcoming)   *Spring Semester 2021*

WORK EXPERIENCE

Resident Assistant   *August 2018 - May 2020*
Residence Education and Housing Services, Michigan State University
- Live-in student team member supporting the academic community, establishing a strong community and ensuring student safety
- Work focused on diversity and inclusion, aiding underrepresented populations, and helping students with mental health throughout university
- Constant exposure to leadership, teaching, and teamwork in complicated and stressful situations

Teaching Assistant
Michigan State University, Department of Physics and Astronomy
Introductory Physics II (PHY232C)   *August 2017 - December 2017*
Introductory Physics I (PHY231)   *January 2018 - May 2018*
Physics for Scientists and Engineers II (PHY184)   *January 2019 - May 2019*
- Aided the students by answering questions on homework and concepts taught in lecture
- Gave experience in teaching students and helping with general course mechanics
- Fulfilling experience that brought out a passion for teaching and helping students

CFO/CMO and Founding Partner   *2012 - 2020*
Four Cousins Firewood
- Ran the financial side of a small firewood business
- Sold to and managed roughly two dozen clients

SELF-STUDY AND INDEPENDENT STUDY

Mathematics

- **Complex Analysis**, "Visual Complex Analysis" by Needham   *Summer 2020*
  Participated in a book club centered around Needham's Visual Complex Analysis. Book focused on an intuitive understanding of advanced complex analysis topics. Covered chapters 1-9, basics of complex numbers through contour integration. Acted as a conclusion to MTH829.

- **Topology**, "Topology Without Tears" by Morris *Summer 2020*
  Sought to understand basics of Topology. Book focused on intuitive understanding of the material with clear presentation. Covered chapters 1-7, basics of topologies through to compactness.

- **Symmetry Groups**, informal independent study with Professor Kulkarni *Spring 2020*
  Met with Professor Kulkarni Friday nights to discuss and learn about symmetry groups. Sought this out due to symmetries being skipped in abstract algebra I.

- **Quantum Information Theory**, independent study with Professor Schenker *Spring 2021*
  Will be based on Watrous' "The Theory of Quantum Information".

Physics

- **Quantum Mechanics**, "Principles of Quantum Mechanics" by Dirac *Summer 2020*
  Sought a wider and more intuitive understanding of modern quantum mechanics through Dirac's textbook. Completed chapters 1 through 4, which covers the theory behind bra-ket based quantum mechanics through representations and unitary transformations. Acted as a prequel to PHY851.

SIGNIFICANT COURSE PROJECTS

The 1994 Census: Predicting Income *October 2019 - December 2019*
Independent Research, Machine Learning (MTH496)
- Utilized data from the 1994 US Census to develop a machine learning model to predict income
- Gained experience in various machine learning methods and working with large datasets
- Wrote a paper describing the results and presented the topic for the class

The Reduced Fermi Coupling Constant *September 2019 - November 2019*
Independent Research, Advanced Physics Laboratory (PHY451)
- Measured muon decay times to calculate the reduced Fermi coupling constant
- Gained experience in regression methods in machines learning and lab documentation
- Wrote a paper describing the results and presented the topic for the class

Sterile Neutrino Mixing *March 2020 - May 2020*
Independent Research, Elementary Particle Physics (PHY803)
- Self-researched sterile neutrino mixing with the goal of understanding a recent research paper
- Based on "Search for sterile neutrino mixing using three years of IceCube DeepCore data"
- Wrote a paper describing the topic and the results of the experiment

SKILLS

Plotting/Data Analysis : Python, Mathematica	*August 2017 - Present*
Software Development : Java, C++, C	*Fall 2017 - Present*
Base Level Processing : Bash Scripts, Assembly	*August 2017 - Present, Fall 2020 - Present*
Machine Learning : intermediate proficiency	*Fall 2019 - Present*
LaTeX	*Fall 2019 - Present*

HONORS, SCHOLARSHIPS, AND AWARDS

Dr. Marshall and Barbara Hestenes Endowed Scholarship Award	*April 2020*
Natural Science Study Abroad Scholarship	*April 2020*
MSU Honors College	*Fall 2017 - Present*
MSU Dean's Honor List	*Fall 2017 - Present*
Honors College Non-Resident Tuition Grant	*Spring 2017*
National Merit MSU Scholar	*Spring 2017*
National Merit Finalist	*Spring 2016*