

John Mastroberti

Resumé

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Education

- 2016–2019 **B.A., Cornell University**, *College of Arts and Sciences*, Ithaca, NY, *GPA: 3.932*.
Majors: Physics (Magna Cum Laude), Math (Cum Laude)
- 2020–2021 **M.S., Indiana University**, *Department of Physics*, Bloomington, IN, *GPA: 4.0*.
- 2021–present **Ph.D. student, Indiana University**, *Department of Physics*, Bloomington, IN.
Concentration: experimental neutrino physics

Experience

Research

- 2020–present **COH-Ar-750**, *Rex Tayloe, Dan Salvat*, Center for Exploration of Energy and Matter, Bloomington, IN.
COH-Ar-750 is the proposed successor for CENNS-10, a liquid argon detector for coherent elastic neutrino-nucleus scattering. I am currently focused on the development of simulation software for CENNS-10 and COH-Ar-750. My work has focused on refactoring and modernizing our group's existing software, and I have been exploring new detector design directions such as the use of xenon-doping to increase scintillation light yield. I have also been involved in developing the cooling system for COH-Ar-750, which will utilize pressure-controlled liquid nitrogen for temperature regulation. I have investigated the viability of such a cooling system, and preliminary results show that this design would be feasible.
- 2019–present **CESR Linac Positron Converter**, *Jim Shanks, David Sagan*, CLASSE, Ithaca, NY.
In the fall of 2019, I started working on modeling the linear accelerator (Linac) used by Cornell's Electron Storage Ring (CESR). My work has focussed on modelling the positron converter, a slab of tungsten alloy which provides CESR with its positrons via Bremsstrahlung. Using Geant, a library for high energy physics simulations, we have developed a numerical model for the converter. This model will soon be added into Bmad, the software library used at Cornell to simulate and model CESR. This work will allow for the full simulation of the CESR linac in Bmad, enabling optimizations of the Linac lattice that were previously impossible.
- 2019–2020 **Tao development**, *David Sagan*, Cornell Lab for Accelerator based Science and Education (CLASSE), Ithaca, NY.
Tao is Cornell's Tool for Accelerator Optics, and it is used to model several particle accelerators around the world. I worked on developing a GUI for Tao using python. We also developed a general purpose scripting interface for the program.
- 2019–2020 **Conservative Machine Learning**, *Veit Elser*, Ithaca, NY.
My advisor, Veit Elser, and I explored an alternative machine learning algorithm referred to as conservative learning. Unlike stochastic gradient descent, which is almost universally employed in today's machine learning algorithms, conservative learning aims to take the smallest step size possible when updating the weights of the neural network.

2017 **Potentially Hazardous Asteroid Interception**, *Louis Rubbo*, Conway, SC.

During the summer of 2017, I worked with Dr. Louis Rubbo at Coastal Carolina University on this personal project. We analyzed interception techniques that could be employed to reach and deflect potentially hazardous asteroids. Most of this work was done using MATLAB to model orbits and compute interception trajectories.

Vocational

2020–2021 **Physics Associate Instructor (TA)**, *Indiana University Bloomington*, Bloomington, IN.

As an associate instructor, I taught weekly discussion and lab sections for IU's general physics courses. I also graded lab reports, quizzes, and exams, proctored exams, and held office hours.

2017–2019 **MATH 1120 Course Assistant**, *Cornell University Math Department*, Ithaca, NY.

As a course assistant, I was responsible for grading the homeworks from one to two sections of MATH 1120 each week. I also held a study group session each week where students worked together on their homework and asked course assistants for help if necessary.

2016–2017 **Special Collections Processing Assistant**, *Cornell University Division of Rare and Manuscript Collections*, Ithaca, NY.

My primary role as a processing assistant was to convert existing paper and index card catalogs to Excel spreadsheets. This occasionally required me to examine and label each item in a collection, many of which were from the 19th century or earlier.

2015–2016 **Private Tutor**, *Self Employed*, Conway, SC.

While I was high school senior at Scholars Academy, I worked as a private tutor for several students at Coastal Carolina University. Most of these students were taking introductory physics or calculus, though I did find some work tutoring upper-level physics courses as well. This experience helped me learn a great deal about being an effective tutor/teacher.

Computer skills

- C
- Python
- Git
- Linux
- Embedded Development
- HTML/CSS/Javascript
- Modern C++
- MATLAB
- Make and CMake
- Shell scripting
- SQL
- LaTeX

References

Name	Email	Relationship
◦ Rex Tayloe	rtayloe@indiana.edu	Research Advisor
◦ Dan Salvat	dsalvat@iu.edu	Research Advisor
◦ David Sagan	david.sagan@cornell.edu	Research Advisor
◦ Jim Shanks	shanks@cornell.edu	Research Advisor