

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)

2020–2022 **M.S., Indiana University**, *Department of Physics*, Bloomington, IN, *GPA: 4.0*.

Work Experience

Software Development

2022–present **Principle Computer Systems Analyst**, *Jay Twigg, Scot Hawkins, Jim Craig*,
Precise Systems/NSWC Crane, Crane, IN.

Key technologies: RF Hardware/Software Engineering, C++, Java, MATLAB, CMake, Git

I am a contractor for Precise Systems supporting WXQN (Electronic Warfare) at the Naval Surface Warfare Center in Crane. My responsibilities are currently split between two projects: SSP Telemetry and TESS. SSP oversees the Navy's strategic nuclear arsenal and coordinates annual test flights. Our group supports SSP by recording telemetry data transmitted over RF from re-entry bodies during missile test flights. WXQN aims to improve the integrity of telemetry data recorded in the most critical part of the test flights by providing an integrated hardware and software solution for telemetry recording. My role in this effort is to maintain and update our system's Java-based control software as needed and to support our system's deployment on test missions.

TESS is the Tactical Environmental Survey System and aims to put a more versatile tool for electromagnetic environment (EME) survey in the hands of the warfighter. The EME data that TESS records is critical for use in the design of RF-based equipment sent into theater. I am the primary developer for TESS's software stack, which currently consists of C++ and MATLAB. Over the course of just two weeks, I have brought the system from a defunct state to the point where record and basic display functionality is implemented and undergoing testing and evaluation.

- 2020–2022 **Neutrino Detector Simulation**, *Rex Tayloe, Dan Salvat*, Center for Exploration of Energy and Matter, Bloomington, IN.
Key technologies: C++, Make, Git, Geant4, ROOT
 In this position, I worked on the development of my research group's simulation software. Our detectors measured the elastic neutrino-argon scattering cross section as part of the COHERENT collaboration. The simulation software I worked on is written in C++ and makes use of Geant4, a semi-modern C++ library commonly used for particle physics simulations. We also made use of the C++ library ROOT for data serialization and analysis. This program is used by several researchers in the collaboration, and Git is used for version control. Simulation runs are primarily performed on computing clusters to take advantage of parallel execution.
 I was primarily responsible for maintaining, modernizing, and adding new features to our simulation program. One of the large projects I worked on was to modernize how the detector geometry is specified. I added support for GDML geometry specification, where an XML-like file containing the detector geometry is loaded at run-time. Previously, this information was hard-coded into the simulation executable and any changes to the detector required recompilation. I also worked on updating the scintillation physics engine to support xenon doped liquid argon. Additionally, I worked towards implementing a regression testing system so that refactoring and modernization projects could be undertaken with greater confidence. This project gave me great experience working on a moderate size code-base that was written by someone other than myself.
- 2019–2021 **Positron Converter Simulation and Modeling**, *Jim Shanks, David Sagan*, Cornell Lab for Accelerator based Science and Education (CLASSE), Ithaca, NY.
Key technologies: C++, CMake, Subversion, Geant4, GSL
 This project focused on developing simulation and modeling software for positron converters. These particle accelerator components are used to produce positrons for use in electron-positron colliders. I wrote this software from scratch using C++17. The simulation component made heavy use of Geant4, and the modeling component used the GNU Scientific Library for data analysis and fitting. I also wrote the user manual for this software, as well as a paper to be published in a peer reviewed journal. This software is packaged as part of the Bmad library of accelerator simulation software, which uses a CMake-based build system and Subversion for version control.
- 2019–2020 **Tao GUI Development**, *David Sagan*, CLASSE, Ithaca, NY.
Key technologies: Python, Fortran
 Tao is Cornell's Tool for Accelerator Optics, a program used around the world for modeling particle accelerators written in Fortran 95. 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.
Key technologies: C, Machine Learning
 My advisor 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.
Key technologies: MATLAB
 During the summer of 2017, I worked 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.

Side Projects

2018–present **Linux Tinkering.**

Key technologies: Linux, Shell scripting, GNU Core Utilities

I have been using GNU/Linux as my primary operating system since 2018. I am passionate about free software and try to use it in place of proprietary software whenever possible. This hobby has made me very proficient at the command line. I consider myself well versed in shell scripting and basic UNIX-like utilities, and I am very comfortable with Linux system administration tasks. These are skills that add to my strengths as a software developer.

2020–present **Personal Website.**

Key technologies: Javascript, Node.js, HTML/CSS, MySQL, Linux

I run my personal website, `johnmm.xyz`, on a Linux VPS hosted with Vultr. I host a basic HTML and CSS site using NGINX, and have a personal email service running on the server as well. This web-server also hosts a simple web app for chore tracking that I developed using client and server side JavaScript. This service also uses MySQL for database management.

Teaching

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 homework 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.

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

While I was high school senior, 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 and teacher.

Computer skills

Programming Languages

- Modern C++
- Python
- JavaScript
- C
- MATLAB
- Shell scripting (bash, POSIX sh)

Markup Languages

- HTML/CSS
- LaTeX

Other Technologies

- Linux
- Git
- Node.js
- GDB
- CMake and Make
- SQL

References

Name	Email	Relationship
○ Scot Hawkins	scot.a.hawkins@us.navy.mil	Supervisor
○ Jim Craig	james.e.craig@us.navy.mil	Supervisor
○ Rex Tayloe	rtayloe@indiana.edu	Research Advisor
○ David Sagan	david.sagan@cornell.edu	Research Advisor