Andrew Valentini

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Education

Carthage College — Kenosha, WI
Bachelor of Science in Physics and Mathematics; GPA: 3.98/4.0 — *September 2021 - May 2025*
14 *total physics courses and* ***11*** *total mathematics courses*
6 *separate research experiences and* ***18*** *total conference presentations*

Skills

Programming: Python (5+ years), R, C++, MATLAB (1+ years)
Technology: Linux, scikit-learn, Git/GitHub, Mathematica, Qiskit, Fusion 360, LaTeX, Microsoft Office Suite

Relevant Research Experience

National Science Foundation REU — State College, PA
Pennsylvania State University — *May 2024 – Aug 2024*

- Designed a quantum circuit simulation from scratch in Python.
- Developed multiple original animations and data visualization techniques to improve understanding of higher-order entanglement.
- Implemented machine learning models: symbolic regression, graph neural networks, and decision trees, to analyze and uncover patterns in qubit interactions and system behavior.
- Used high-performance computing grids to process data-intensive large-qubit simulations.

National Science Foundation REU — Baton Rouge, LA
Louisiana State University — *May 2023 – Aug 2023*

- Applied data analysis techniques to explore the effect of instrumental noise types on gravitational wave candidates.
- Developed a multi-dimensional statistical weighting approach to classify candidates by instrumental noise type.
- Used high-performance computing grids to extract and process large-scale datasets.

Gravitational Wave Data Analysis Research — Kenosha, WI
Carthage College — *Jan 2022 – Present*

- Designed a physics-informed algorithm for predicting astrophysical distances of gravitational wave events using physical and instrumental parameters.
- Analyzed large datasets to assess the behavior of gravitational wave overtones, contributing to a deeper understanding of waveform characteristics.
- Developed a computational model to simulate the evolution of gravitational waves emitted during black hole mergers, which aligns with the spectrograms observed data.
- Developed comparative plots demonstrating the relationship between binary system component masses, final merger mass, and radiated energy via gravitational waves.

Projects

Simulating an (n, m) **Spring Lattice**: Developed a simulation of an (n, m) spring lattice to model dynamics and performed frequency domain analysis to study the effects of spring constant and length on system behavior, providing insights into oscillatory properties.

Modeling Jupiter's Atmosphere: Compared derived atmospheric models with observational data collected by NASA's Galileo probe for Jupiter's atmosphere, identifying discrepancies and refining models for better predictions.

Leadership

Brainard Writing Center Fellow — Kenosha, WI
Carthage College — *January 2022 – Present*

- Assisted students in 120+ individual sessions, either an hour or half-hour long, from various disciplines.
- Designed and taught a one-credit course during Spring 2024 called Writer's Workshop.

Philosophy Club Vice President — Kenosha, WI
Carthage College — *September 2022 – May 2023*

- Continue to create slideshows to facilitate the group's discussion on topics such as the value of philosophy, the philosophy of science, existentialism, ethics, the philosophy of math, etc.
- Conducted the reading and research on philosophical topics necessary to lead our club's weekly meetings.

Outreach & Volunteering

Astrofest Volunteer | *Pennsylvania State University* — July 2024
Gave three talks on the science and history of gravitational waves to a combined audience of ∼50 attendees of varying age and ran educational stations.

Physics Demonstration Planning & **Building** | *Carthage College* — October 2023 - Feburary 2024
Planned a repository of physics demonstrations and built a Rubens' tube for public outreach.

Summer Astronomy Night Volunteer | *Louisiana State University* — June 2023
Helped organize an astronomy-focused public outreach event and performed a Ruben's tube demonstration for an audience of 50+ attendees of varying age.

Certifications

[1] The Complete Quantum Computing Course | August 2023
[2] Linux Command Line Bootcamp | July 2022
[3] Fusion 360 Beginners Course | June 2022
[4] Gravitational Wave Open Data Workshop #5 | May 2022