Tim Mathew

Curriculum Vitae

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Academic Appointments

2026– **University of Oklahoma**, *Postdoctoral Research Associate*

Homer L. Dodge Department of Physics and Astronomy

Supervisor: Jackson Burzynski

ATLAS Collaboration at CERN.

- Focus on trigger algorithm development for Run 4, dark sector searches, and Large Radius Tracking algorithm performance and development

Education

2020–2026 **University of Oregon**, *Ph.D. Physics*

High Energy Particle Physics Experiment. Author with the ATLAS collaboration.

2017–2019 **University of Washington**, *B.S. Physics*

cum laude, 3.82 GPA

Comprehensive Physics major. Undergraduate research assistant at the Center for Experimental Nuclear Physics and Astrophysics (CENPA).

2015–2016 **Green River College**, *A.S. Physics*

Highest Honors, 3.99 GPA

Treasurer of the Green River Chapter of the Society of Physics Students.

Research Experience

2021–2026 **University of Oklahoma**, *High Energy Physics Experiment Group*, Postdoctoral Research Associate

Supervisor: Jackson Burzynski

ATLAS Collaboration at CERN.

- Developing dataflow firmware development for novel anomaly detection algorithm for use in the ATLAS Global Trigger. Optimizing the firmware algorithm to minimize FPGA footprint.
- Contributing to bitwise simulation of ATLAS Global Trigger algorithms.
- Leading role in full Run 3 H$\to \gamma\gamma_D$ search.
- Contributing to upcoming Run 4 online and offline Large Radius Tracking integration.

2021–2026 **University of Oregon**, *High Energy Physics Experiment Group*, Graduate Research Assistant

Supervisor: Stephanie Majewski

ATLAS Collaboration at CERN.

- Leading role in the Run 2 + 3 H$\to \gamma\gamma_D$ search. Developing and running the statistical fit on multiple control and validation regions, testing performance of the new neural network MET estimator tool (METNet) in `athena`, and developing new methods for primary vertex identification using geometric and neural network approaches. Current MC derivation contact for the analysis.
- Key role in testing performance of and providing feedback for new `athena` GNN vertex tagger tool.
- Developed novel anomaly detection algorithm for use in the ATLAS Global Trigger. Assisting in the software and firmware implementation in collaboration with UPenn.
- Developed production testing package for Global Common Modules (GCM), the central hardware platform for the ATLAS level-0 FPGA-based trigger upgrades, and assisted with GCM integration at Brookhaven National Laboratory.
- Designed, implemented, and tested software emulation of topological clustering firmware algorithms for the ATLAS Global Trigger.
- Contributed to the first ATLAS search for dark mesons using the full Run 2 dataset and was a main developer of the associated analysis framework, excluding $m_{\pi_D} < 940$ GeV for $m_{\pi_D}/m_{\rho_D} = 0.45$ and $m_{\pi_D} < 740$ GeV for $m_{\pi_D}/m_{\rho_D} = 0.25$
- Ran a statistical cost/benefit analysis of including the multi-lepton channel in the dark meson search.
- Developed various software routines to analyze ATLAS event simulations and data, and mentored fellow students on implementation.

2018–2020 **University of Washington**, *CENPA*, Undergraduate Research Assistant/Lab Technician

Supervisor: Jason Detwiler

Majorana Demonstrator (MJD) and Large Enriched Germanium Experiment for Neutrinoless $\beta\beta$ Decay (LEGEND) Collaborations.

- Extensive work with germanium radiation detectors and associated systems.
- Leading role in the R&D, construction, and data taking campaign of the Collimated Alphas Gammas and Electrons (CAGE) test stand, which will characterize germanium detector response to various collimated radiation sources on sensitive detector surfaces to improve background rejection and data analysis for LEGEND.
- Participated in work on the MJ60 detector test stand. The MJ60 test stand utilizes gaseous krypton-83 to characterize surface events versus bulk events to help understand backgrounds in MJD.
- Developed and implemented multiple routines in the prototype LEGEND data processing and analysis suite, `pygama`. Including auto-calibration and pulse shape discrimination (PSD) software for MJ60 and CAGE data.
- Mentored other members of the collaboration in the use of germanium detectors and analysis software

COHERENT Collaboration. COHERENT will measure Coherent Elastic Neutrino-Nucleus Scattering using the Spallation Neutron Source at Oak Ridge National Laboratory (ORNL).

- Contributed to the NaI[Tl] scintillating radiation detector characterization campaign, including a study of the internal alpha rate of the detectors to understand backgrounds in the low energy region. NaI[Tl] detectors will be sent to ORNL for a ton-scale CEvNS search using sodium recoils.
- Wrote analysis software using Python and ROOT.
- Involved in writing the standard operating procedure for training new assistants.

Awards and Honors

2026	University of Oregon Lokey Dissertation Fellowship
2024	US ATLAS ATC Award
2024	Outstanding Leadership Award-UO Physics
2019–	Sigma Pi Sigma member
2017–2019	Dean's List

Technical Skills

High Proficiency: Detector hardware and electronics(digital and analog), vacuum and cryogenic systems, data analysis and software development (Python, ROOT, Pandas, HDF5, c++, `athena`), git tools, radiation detection, radioactive source handling

Intermediate Proficiency: FPGA-based hardware, firmware, and software design, machine learning and neural networks, DC motors

Presentations

[1] *Integration Testing of the Global Common Modules for the ATLAS Global Trigger*.
USLUA Annual Meeting.
Palo Alto, California, 18 December, 2024.

[2] *Testing and Validation of the Topological Clustering Algorithm for the ATLAS Global Trigger*.
APS April Meeting.
Minneapolis, Minnesota, 17 April, 2023.

[3] *Initial Commissioning Results from the CAGE Scanner*.
CENPA Monday Meeting.
Seattle, Washington, 18 November, 2019.

[4] *An Internal Scanning Cryostat for High Purity Germanium Detectors*.
Fall Meeting of the American Physical Society, Division of Nuclear Physics, 2019.

[5] *The CAGE Scanner*.
Undergraduate Research Symposium 2019.
Seattle, Washington, 17 May, 2019.

Teaching and Mentorship Experience

2023– **US ATLAS Software Tutorial Instructor.** Instructor for the annual US ATLAS Software tutorial held at SLAC. Introduce the participants to the second-generation leptoquark search and lead hands-on activities designed to teach the basics of ATLAS software tools, including athena, TRExFitter, coffea, and more. Contributed to and refined the lecture materials.

2022,2025 **Oregon Community College Access to Materials research (OCCAM) Mentor.** Graduate student mentor and point of contact for community college students participating in the OCCAM summer research internship. Led bi-weekly professional development seminars and tracked student progress. Held one-on-one meetings with students to ensure their success in the program and handle any research challenges they faced. Developed the materials and resources for future OCCAM mentors.

2021–2026 **UO PAGES Mentor.** Mentor to undergraduate physics majors through the Physicists for Advancing Gender Equity in Science (PAGES) mentorship program. Meet with students monthly to round out their experience as a physics major and help them achieve their academic and research goals. Introduce students to faculty, and offer them a variety of resources to gain research experience. Advocate for students during times of difficulty and help them build confidence in their academic skills.

2020-2022 **UO Physics Department Teaching Assistant, various courses.** Graduate lab and teaching assistant for intro series physics courses and astronomy, and the lead TA for the upper division digital electronics lab. Guided students through physics labs and led tutorial sessions to solidify student understanding of the material. Assessed students through graded assignments. Accessible office hours were a priority to help students achieve their learning goals.

2019–2020 **Pacific Learning Academy Instructor, High School Physics and Chemistry.** Science teacher at a private high school in the Seattle area during gap year. Taught a mixture of traditional and active learning lectures using data driven education techniques. Created and implimented science labs that empowered students to master lecture material. Helped refine the physics curriculum to prepare students for modern college science classes. Assessed students through a mixture of homework, tests, presentations, and independent research.

Spring 2018 **UW Physics Lab Teaching Assistant, Calculus-based Introductory Physics: Waves and Optics.** Undergraduate lab assistant for 3 sessions of Physics 123. Guided lab groups through a mixture of traditional and modern experiments designed to reinforce concepts taught in lectures. Engaged students in open discussions to motivate active learning and provoke interest in physics.

2016–2017 **Green River College Tutor, Physics 121-123** Lead tutor for first-year physics courses. Taught students one-on-one and led group sessions to enrich understanding of fundamental concepts and improve problem-solving skills on homework and tests.

Publications

[1] ATLAS Collaboration. Search for dark photons from higgs boson decays in the gluon-gluon fusion channel in proton-proton collisions at $\sqrt{s} = 13.6$ tev with the atlas detector, 2026.

[2] ATLAS Collaboration. Search for dark mesons decaying to top and bottom quarks in proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. *JHEP*, 09:005, 2024.

[3] G. Othman, C. Wiseman, T. H. Burritt, J. A. Detwiler, M. P. Held, R. Henning, T. Mathew, D. Peterson, W. Pettus, G. Song, and T. D. Van Wechel. Cage: An internal source scanning cryostat for hpge characterization, 2026.

[4] T. Mathew et al. Commissioning cage: An internal-source scanning cryostat for hpge detectors. In *2020 CENPA Annual Report*, pages 41–44. Nuclear Physics Laboratory, University of Washington, 2020.

Last updated: October 13, 2026