Jackson Burzynski

Curriculum Vitae

1-610 Salsbury Drive
Vancouver, BC V5L 3Z9
+1 (778)-886-4309
jackson.carl.burzynski@cern.ch
ORCID: 0000-0002-4690-0528

Education

2021 **Ph.D. Physics**, *University of Massachusetts*, Amherst, MA.
- Advisor: Benjamin Brau

2018 **M.S. Physics**, *University of Massachusetts*, Amherst, MA.
- Advisor: Benjamin Brau

2016 **B.S. Physics & Mathematics**, *Tufts University*, Medford, MA.
- Advisor: Pierre-Hugues Beauchemin
- *summa cum laude*

Professional Experience

2026– **Assistant Professor (tenure-track)**, *University of Oklahoma*, Norman, OK.
Appointment begins January 1, 2026.

2021–2025 **Postdoctoral Research Fellow**, *Simon Fraser University*, Burnaby, BC.

2016–2021 **Graduate Research Assistant**, *University of Massachusetts*, Amherst, MA.

Awards and Honors

2022 **ATLAS Outstanding Achievement Award**, *ATLAS Collaboration.*
Recognizes excellent contributions made to the ATLAS Collaboration. Awarded annually to approximately five to ten recipients. For "outstanding contributions to the integration of large-radius tracking into the standard ATLAS reconstruction".

2021 **Springer Thesis Prize**, *Springer Publishing.*
For the thesis "A Search for Exotic Higgs Decays, or: How I Learned to Stop Worrying and Love Long-lived Particles"

2021 **ATLAS Thesis Award**, *ATLAS Collaboration.*
For the thesis "A Search for Exotic Higgs Decays, or: How I Learned to Stop Worrying and Love Long-lived Particles"

2017 **Summer Research Fellowship**, *University of Massachusetts Amherst.*

2016 **Phi Beta Kappa Honor Society**, *Tufts University.*

2016 **Amos Emerson Dolbear Scholarship**, *Tufts University.*

2014 **Summer Scholars Fellowship**, *Tufts University.*

Grants and Funding

2025– **Principal Investigator, University of Oklahoma Startup Grant**, *$750,000.*
To establish an independent research group focused on dark sector physics and machine learning.

2025–2030 **Ernest Rutherford Fellowship, STFC (UK)**, *£661,480 (declined).*
Highly competitive national fellowship supporting independent research on long-lived particle detection and machine learning in ATLAS, in collaboration with University College London.

Research Experience and Projects

Leadership and Management

2025–Present **LHC BSM Working Group: Dark Showers Task Force Co-convener**.
Co-convener of the LHC-wide Dark Showers Task Force under the LHC BSM Working Group, connecting the Dark Matter, Long-Lived Particle, and Prompt subgroups. Leading efforts to develop common benchmarks and unified interpretation frameworks for dark shower signatures across ATLAS, CMS, and theory. Organized two international workshops with over 100 participants to coordinate experimental and theoretical strategies for dark shower searches.

2024–Present **ATLAS Long-lived and Unconventional Physics Subgroup Convener**.
Lead the ATLAS Long-lived and Unconventional Physics (LUP) subgroup, coordinating searches for long-lived particles and other unconventional signatures (approximately 150 scientists across 25 analysis teams). Oversee analysis strategies and implementation, provide feedback and guidance to analysts, and manage coordination with related ATLAS working groups. Led the internal review of [3, 4, 5, 7].

2022–2024 **ATLAS Tracking and Vertexing Subgroup Convener**.
Coordinated all studies of track and vertex reconstruction for Run 3 (approximately 30 scientists). Maintained official ATLAS recommendations for tracking efficiency and fake rate uncertainties. Supervised ATLAS authorship qualification projects. Provided feedback on strategy for publications. Led review of [9, 16].

2022 **ATLAS Tracking Recommendations Forum Chair**.
Oversaw delivery of operational points and systematic uncertainties for both prompt and displaced track reconstruction for Run 3 (approximately 15 scientists). Developed and maintained tracking analysis software tools.

2021–Present **ATLAS Tracking Liaison to the Exotics Group**.
Disseminate information and present reports on track reconstruction performance and recommendations to the Exotics physics group (approximately 500 scientists).

2021–Present **ATLAS Expert Review**.
Expert reviewer and editorial board member for ATLAS publications, including [1, 11]. Ensure the quality and validity of results. Assist in preparing public documentation and publications.

Physics Analysis

2022–Present **Search for emerging jets in ATLAS**.
Lead analyst for the first search for s-channel production of emerging jets via a Z' mediator using partial Run 3 data. Designed and implemented a transformer-based jet tagging algorithm that improved analysis sensitivity by over one order of magnitude. Lead editor of paper [2]. First ATLAS search results published in *Reports on Progress in Physics* (impact factor 20.7). Analysis coordinator for the full Run 3 follow-up.

2021–2024 **Search for displaced vertices in the ATLAS Inner Detector**.
Proposer, co-coordinator, and lead analyst for a search for light long-lived particle decays in the ATLAS Inner Detector using Run 2 data. First ATLAS search results utilizing improved displaced track reconstruction algorithm. Achieved order of magnitude improvement in sensitivity for decays of the Higgs boson to long-lived particles with respect to previous ATLAS results using the same Run 2 dataset. First LHC results for long-lived photophobic axion-like particles. Lead editor of paper [8].

2019–2021 **Search for exotic decays of the Higgs boson to long-lived particles in ATLAS**.
Coordinator and lead analyst for the first search for exotic decays of the Higgs boson to pairs of long-lived particles decaying in the ATLAS Inner Detector using Run 2 data. Lead editor of paper [12].

2016–2019 **Search for displaced vertices in the ATLAS Inner Detector and Muon Spectrometer**.
Analyst for a search for long-lived particle pairs decaying in the ATLAS Inner Detector and Muon Spectrometer. Lead editor of paper [13].

Track and Vertex Reconstruction

2025–Present **Acts large impact parameter track reconstruction for HL-LHC**.
Lead efforts to establish baseline large-impact parameter track reconstruction algorithm for the ATLAS ITk using the Acts software framework. Working to integrate into ATLAS Event Filter trigger software.

2023–Present **Track reconstruction for HL-LHC using graph neural networks**.
Developer of a new algorithm for track reconstruction at the HL-LHC using graph neural networks. Assessing algorithmic susceptibility to detector misalignment and optimizing performance for displaced particles [14].

2023–Present **Primary vertex identification using transformers**.
Proposer and lead developer of a transformer network to improve the efficiency of identifying the hard-scatter primary vertex and rejecting pile-up interactions.

2021–2023 **Large impact parameter track reconstruction for Run 3**.
Developer of an improved algorithm for reconstructing displaced charged particles from long-lived particle decays in the ATLAS Inner Detector. Reduced CPU usage by a factor of ten and disk space requirements by a factor of fifty. Integrated into the standard ATLAS reconstruction, enabling all physics analyses to exploit displaced tracking information. Led the first performance study on data and derived systematic uncertainties on reconstruction efficiency. Coordinator, lead analyst, and lead author of paper [10].

Software and Hardware

2023–Present **Tracking Contact to the Analysis Model Group**.
Maintain ATLAS tracking software tools and manage installation of software input data.

2021–Present **Data formats for unconventional physics**.
Creator and maintainer of a data format enabling approximately ten long-lived and unconventional physics analyses in Runs 2 and 3. Proposed a novel strategy to reduce disk usage for analysis data formats. Contributing author of [6].

2018–2020 **ATLAS ITk upgrade**.
Developed and maintained a robotic testing apparatus for performing QA/QC measurements on flex circuits for ITk strip barrel staves.

Selected Presentations

Invited Speaker at International Conferences and Workshops

2025 **Exotic searches at ATLAS**, *9th International Conference on High Energy Particle and Nuclear Physics in the LHC Era*, Valparaiso, CL.

2024 **Searches for Long-lived Particles at the LHC**, *Dark Interactions 2024*, Vancouver, BC.

2024 **Probing the Lifetime Frontier at the LHC and Beyond**, *Physics Potential of Future Colliders*, Vancouver, BC.

2024 **Tracking and Vertexing in ATLAS**, *2024 ATLAS-CMS Flavour Tagging Workshop*, Genova, IT.

2024 **Multiple track signatures**, *Roadmap of Dark Matter models for Run 3*, Geneva, CH.

2022 **What's new for Run 3 for LLPs at ATLAS?**, *Searching for long-lived particles at the LHC and beyond: Twelfth workshop of the LLP Community*, Geneva, CH.

2022 **Searches for BSM physics using challenging and long-lived signatures with the ATLAS detector**, *The XXIX International Conference on Supersymmetry and Unification of Fundamental Interactions (SUSY 2022)*, Ioannina, GR.

2022 **Improved Track Reconstruction Performance for Long-lived Particles in ATLAS**, *Connecting the Dots (CTD2022)*, Princeton, NJ.

2022 **Reduced formats for long-lived particles in ATLAS**, *Analysis Ecosystems Workshop*, Orsay, FR.

2021 **Search for exotic decays of the Higgs boson to long-lived particles using displaced vertices in the ATLAS inner detector**, *Searching for long-lived particles at the LHC and beyond: Ninth workshop of the LLP community*, Geneva, CH.

2021 **Searches for New Long-lived Particles with the ATLAS detector**, *Phenomenology Symposium (PHENO)*, Pittsburgh, PA.

2019 **Electrical defects in co-cured bus tapes and quality control strategies**, *Forum on Tracking Detector Mechanics*, Ithaca, NY.

Seminars and Colloquia

2025 **Shining a light on the Dark Sector: Probing Dark QCD Signatures at ATLAS**, *Sun Yat-sen University*, Guangzhou, CH.

2025 **Probing the Lifetime Frontier at the Large Hadron Collider and Beyond**, *University of Oklahoma*, Norman, OK.

2025 **From Colliders to the Cosmos: Long-Lived Particles, Cosmic Neutrinos, and the Hunt for New Physics**, *University of Montreal*, Montreal, QC.

2025 **Probing the Lifetime Frontier with the ATLAS Inner Detector**, *Pontificia Universidad Catolica de Chile*, Santiago, CL.

2024 **Long-lived particle searches in ATLAS**, *ATLAS Lecture Series*, Online.

2024 **Probing the Lifetime Frontier with the ATLAS Inner Detector**, *University of Washington*, Seattle, WA.

2024 **Probing the Lifetime Frontier with the ATLAS Inner Detector**, *University of Oregon*, Eugene, OR.

2024 **Probing the Lifetime Frontier with the ATLAS Inner Detector**, *Nikhef*, Amsterdam, NL.

2024 **Probing the Lifetime Frontier with the Large Hadron Collider**, *New York University*, New York, NY.

Talks at National Conferences

2023 **ATLAS Run 3 Operations and Highlights**, *Canadian Association of Physicists (CAP) Congress*, Fredericton, NB.

Contributed Talks (not as speaker)

2024 **Improving Computational Performance of ATLAS GNN Track Reconstruction Pipeline**, *International Conference on Computing in High Energy and Nuclear Physics (CHEP2024)*, Krakow, PL.

2023 **Framework for custom event sample augmentations for ATLAS analysis data**, *International Conference on Computing in High Energy and Nuclear Physics (CHEP2023)*, Norfolk, VA.

Selected Presentations at Internal ATLAS Meetings

2025 **Hidden Sector Searches: Illuminating the Dark**, *Joint Exotics-HMBS Workshop*, Edinburgh, GB.

2024 **Software and Reconstruction Developments**, *US-ATLAS Summer Workshop*, Seattle, WA.

2023 **Hard scatter vertex selection**, *Higgs Workshop 2023*, Tokyo, JP.

2023 **Leveraging the FTAG Software Stack Beyond Flavour Tagging**, *2023 ATLAS Flavour Tagging Workshop*, Geneva, CH.

2023 **Emerging Jets**, *ATLAS Week*, Vancouver, BC.

2022 **Specialized data formats**, *ATLAS Exotics Workshop*, Amsterdam, NL.

2022 **Tracking CP report**, *ATLAS Week*, Geneva, CH.

2021 **Large Radius Tracking (LRT): Overview and Applications**, *ATLAS Joint Search Workshop*, Geneva, CH.

2020 **Long-Lived Particle searches for Moriond**, *ATLAS Physics and Performance Week*, Geneva, CH.

Outreach

2023–Present **ATLAS-Canada EDI Committee**.
Serve as the Equity, Diversity, and Inclusion (EDI) contact within the ATLAS-Canada Collaboration. Lead the collection and analysis of demographic data, coordinate reporting of diversity metrics, and promote awareness of EDI principles across the collaboration. Work to foster an inclusive and supportive research environment.

2020–2021 **HEP Software Foundation Mentor**.
Organized and facilitated two virtual training sessions on computing and data analysis for students and researchers across multiple high-energy physics experiments.

Organizational Activities

2025 **Organizing Committee**, *Violation of Fundamental Symmetries with B mesons*, Fermilab, Batavia IL.

2025 **Organizing Committee**, *LHCP 2025*, Taipei, TW.

2024-Present **Organizing Committee**, *LHC Dark Shower Task Force workshop series*.

2024 **Organizing Committee**, *ATLAS Exotics 2024 workshop*, Bologna, IT.

2023 **Session Chair**, *ATLAS HDBS and Exotics 2023 workshop*, Barcelona, ES.

Teaching Experience

As Lecturer

2022 **PHYS882 G100: Particle Physics II**, *Simon Fraser University*, Burnaby, BC.

As Teaching Assistant

2021 **PHY-440: Intermediate Laboratory A**, *University of Massachusetts*, Amherst, MA.

2017 **PHY-182LL: Physics II Lab - Electricity and Magnetism**, *University of Massachusetts*, Amherst, MA.

2017 **PHY-181LL: Physics I Lab - Mechanics**, *University of Massachusetts*, Amherst, MA.

2016 **PHY-131: Introductory Physics I**, *University of Massachusetts*, Amherst, MA.

2014–2016 **COMP-15: Data Structures**, *Tufts University*, Medford, MA.

Student Supervision

Graduate Students

- Aman Aman (Simon Fraser) — Search for emerging jets in Run 3
- Harshit Choudhary (Simon Fraser) — Search for emerging jets in Run 3
- Hamza Hanif (Simon Fraser) — Search for displaced vertices in the Inner Detector
- Paras Pokharel (Simon Fraser) — Transformer tagger for emerging jets
- Sadaf Kadir (Stanford) — Track reconstruction uncertainties for Run 3

- Luke McElhinney (Lancaster) — Secondary vertex reconstruction using transformers
- Elliot Sampson (Lancaster) — Displaced track reconstruction uncertainties

Undergraduate Students

- Sophie Glinas (UBC) — Search for emerging jets in Run 3
- Randon Hall (Simon Fraser) — Search for emerging jets in Run 3
- Michalis Panagiotou (CERN) — Search for displaced vertices in Inner Detector

Publications

I have more than 570 published articles in refereed journals and an h_{hep} index of 97 as calculated from the publication database INSPIRE. The publication policy for ATLAS is that all authors are listed in alphabetical order for each paper. I have included below the publications for which I was either a primary contributor or made a significant contribution to the review process. A full publication list is available on request.

With the ATLAS Collaboration

[1] ATLAS Collaboration, *Search for emerging jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS experiment*, arXiv:2510.12347 [hep-ex].

[2] ATLAS Collaboration, *Search for emerging jets in pp collisions at $\sqrt{s} = 13.6$ TeV with the ATLAS experiment*, Rept. Prog. Phys. **88** (2025) 097801, arXiv:2505.02429 [hep-ex].

[3] ATLAS Collaboration, *Search for events with one displaced vertex from long-lived neutral particles decaying into hadronic jets in the ATLAS muon spectrometer in pp collisions at $\sqrt{s} = 13$ TeV*, arXiv:2503.20445 [hep-ex].

[4] ATLAS Collaboration, *Search for heavy neutral leptons in decays of W bosons using leptonic and semi-leptonic displaced vertices in $\sqrt{s} = 13$ TeV pp collisions with the ATLAS detector*, JHEP **07** (2025) 196, arXiv:2503.16213 [hep-ex].

[5] ATLAS Collaboration, *Search for light neutral particles decaying promptly into collimated pairs of electrons or muons in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector*, Eur. Phys. J. C **85** (2025) 335, arXiv:2407.09168 [hep-ex].

[6] ATLAS Collaboration, *Software and computing for Run 3 of the ATLAS experiment at the LHC*, Eur. Phys. J. C **85** (2025) 234, arXiv:2404.06335 [hep-ex].

[7] ATLAS Collaboration, *Search for neutral long-lived particles that decay into displaced jets in the ATLAS calorimeter in association with leptons or jets using pp collisions at $\sqrt{s} = 13$ TeV*, JHEP **11** (2024) 036, arXiv:2407.09183 [hep-ex].

[8] ATLAS Collaboration, *Search for light long-lived particles in pp collisions at $\sqrt{s} = 13$ TeV using displaced vertices in the ATLAS inner detector*, Phys. Rev. Lett. **133** (2024) 161803, arXiv:2403.15332 [hep-ex].

[9] ATLAS Collaboration, *Software Performance of the ATLAS Track Reconstruction for LHC Run 3*, Comput. Softw. Big Sci. **8** (2023) 9, arXiv:2308.09471 [hep-ex].

[10] ATLAS Collaboration, *Performance of the reconstruction of large impact parameter tracks in the inner detector of ATLAS*, EPJC **83** (2023) 1081, arXiv:2304.12867 [hep-ex].

[11] ATLAS Collaboration, *Search for Heavy Neutral Leptons in Decays of W Bosons Using a Dilepton Displaced Vertex in $\sqrt{s} = 13$ TeV pp Collisions with the ATLAS Detector*, Phys. Rev. Lett. **131** (2023) 061803, arXiv:2204.11988 [hep-ex].

[12] ATLAS Collaboration, *Search for exotic decays of the Higgs boson into long-lived particles in pp collisions at $\sqrt{s} = 13$ TeV using displaced vertices in the ATLAS inner detector*, JHEP **11** (2021) 229, arXiv:2107.06092 [hep-ex].

[13] ATLAS Collaboration, *Search for long-lived neutral particles produced in pp collisions at $\sqrt{s} = 13$ TeV decaying into displaced hadronic jets in the ATLAS inner detector and muon spectrometer*, Phys. Rev. D **101** (2020) 052013, arXiv:1911.12575 [hep-ex].

Conference Proceedings and Reports

[14] ATLAS Collaboration, *Optimizations of the ATLAS ITk GNN reconstruction pipeline*, ATL-PHYS-PUB-2025-046, 2025, https://cds.cern.ch/record/2948192.

[15] P. van Gemmeren et al., *Framework for custom event sample augmentations for ATLAS analysis data*, EPJ Web of Conf. **295** (2024) 03016, https://doi.org/10.1051/epjconf/202429503016.

[16] ATLAS Collaboration, *Primary Vertex identification using deep learning in ATLAS*, ATL-PHYS-PUB-2023-011, 2023, https://cds.cern.ch/record/2858348.

[17] G. A. Stewart et al., *HSF IRIS-HEP Second Analysis Ecosystem Workshop Report*, 2022. https://zenodo.org/record/7418818.

[18] J. Burzynski, *Improved Track Reconstruction Performance for Long-lived Particles in ATLAS*, 2022, https://zenodo.org/record/8119727.

Theses

[19] J. Burzynski, *A Search for Exotic Higgs Decays: Or: How I Learned to Stop Worrying and Love Long-Lived Particles*. Springer, 2023.

Miscellaneous

[20] C. Arina et al., *t-channel dark matter models – a whitepaper*, Eur. Phys. J. C **85** (2025) 975, arXiv:2504.10597 [hep-ph], [Erratum: Eur.Phys.J.C 85, 1105 (2025)].

[21] S. Malik et al., *Software Training in HEP*, Computing and Software for Big Science **5** (2021), http://dx.doi.org/10.1007/s41781-021-00069-9.