Lawrence Lee, PhD

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Professional Experience

Assistant Professor, University of Tennessee, Knoxville	2021-
Research Associate, Harvard University – Supervisor: J. Huth	2016-21
Research Associate, University of Adelaide – Supervisor: P. Jackson	2014–16
Education	
Ph.D. Physics, Yale University – <i>Supervisor: T. Golling</i>	2014
B.S. Physics, Rutgers University – Supervisors: R. Ransome, R. Gilman, R. Tumulka	2009
Research Experience	
Member of the CMS Collaboration	2021-
Physics Analysis	
Heavy Stable Charged Particle Search	2022-
Searching for detector-stable particles carrying electric charge and leaving anomalous ion- ization and timing signatures in the CMS detector.	
Multijet Search	2023-
Searching for new physics in multijet final states using conventional techniques and ma- chine learning	
Recursive Jigsaw Reconstruction Search	2022
Contributed to calculation of exclusion limits for a search for compressed supersymmetry spectra using the Recursive Jigsaw Reconstruction method.	
Phase-II Outer Tracker Upgrade	
Phase-II Tracker DAQ Software	2021-
Outer Tracker Module Assembly and Grading	2022-
Member of the ATLAS Collaboration	2009–21
New Small Wheel Muon Spectrometer Upgrade	
Micromegas Trigger Coordinator	2020
Integration of trigger electronics for the micromegas detector of the New Small Wheel (NSW) upgrade for the ATLAS muon spectrometer	
Online Software Coordination 2	019–20
Designed, implemented, and/or maintain the readout, configuration, and calibration soft- ware systems for the NSW	

Physics Analysis	
Convener of SUSY RPV/LL sub-group	2017–19
Defined standards and direction of searches for long-lived particles and R -parity-violatir supersymmetry. Served two terms.	ıg
Searches for Long-Lived Particles	2016-21
Led many analysis teams in searches for long-lived particles in a variety of signatures. So Publications.	ee.
Common Analysis Software Development	2015-21
Primary developer of common analysis software used by roughly ten analysis teams	
Common Result Interpretation	2018-21
Responsible for standards of exclusion interpretation and limit interpolation within th ATLAS SUSY working group, implementing new methods for presentation of results	ne
Inclusive searches for Supersymmetry	2014-16
Led flagship search for supersymmetry in inclusive zero-lepton final states in 2016 includ ing leading the first searches for new physics using "Recursive Jigsaw" variables. Create and commissioned novel triggers for use during Run-2 of the LHC geared toward findir new physics in low-mass-splitting scenarios.	d- ed Pg
All-Hadronic BSM Signatures	2011-14
Led two searches for new phenomena in the context of R -Parity violating supersymmetr in fully hadronic final states	Y
Quark-vs-Gluon Jet Tagging	2010-12
Developed the first quark- vs. gluon-jet discriminator at a hadron collider	
Nucleon Physics Research	2007-09
Developed the prototype trigger and data acquisition systems for Fermilab E-906/SeaQuest	
Assembled the photomultiplier tube units used in MINERvA	

Upgraded a Fabry-Perot cavity for use in a JLAB Compton polarimeter

Publications

Over 1050 published papers, mostly as part of the ATLAS and CMS Collaborations, with over 150,000 citations [*Inspire*]. Selected publications with significant contributions are listed below. \blacktriangleright *indicates a primary editor or analyzer role.*

Independent Publications

1.	▶ L. Lee, C. Bell, J. Lawless, E. Nibigira, QCD Reference Frames and False Jet Individualism, St.	ıbmit-
	ted to PRD	2023
	Intellectual lead in argument and analysis demonstrating how modern jet physics relies on a frame- specific assumption that can fail in interesting corners of phase space.	
2.	C. Accettura, et al (296 others), Towards a Muon Collider, Eur. Phys. J. C 83, 864	2023
	Contributed studies of Beam-Induced Background mitigation at a future muon collider.	

3. G. Iakovidis, et al (100 others), The New Small Wheel electronics, JINST 18 P05012 2023

Contributed to readout electronics integration with readout software and FELIX, integration of trigger hardware readout and dataflow, development of control and calibration software, and noise studies.	
4. ► A. Badea, W. Fawcett, J. Huth, T.J. Khoo, R. Poggi, LL, Solving Combinatorial Problems at Particl Colliders Using Machine Learning, <i>PRD</i> 106 1, 016001 202	е 2
Designed physics-informed neural network to solve combinatorial ambiguities in collider events with many objects, especially for decays from pair-produced heavy resonances.	
 C. Bakalis, I. Grayzman, LL, L. Levinson, V. Polychronakos, Accessing register spaces in FPGAs within the ATLAS DAQ scheme via the SCA eXtension, JINST 16 P06041 202 Designed the software infrastructure around an FPGA implementation of a CERN GBT-SCA-like register interface for use in detector configuration. 	ո 1
6. M. Bauer, O. Brandt, LL, C. Ohm, ANUBIS: AN Underground Belayed In-Shaft search experiment In Revision, arXiv: 1909.13022 2020 Responsible for original idea to instrument service shafts above the ATLAS Experiment for a dedi- cated long-lived particle experiment. Helped shape technical proposal outlined in paper.	:, 0
 7. ► LL, M. Hance, ATLAS Pushes the Limits on Supersymmetry, CERN Courier 201st Co-author on summary of recent searches for supersymmetry from the ATLAS experiment with particular responsibilities for long-lived particles and strongly-produced particles. 	9
 X. Cid Vidal, et al., Beyond the Standard Model Physics at the HL-LHC and HE-LHC, CERN-LPCC 2018-05 Contributed studies of HL-LHC projections for long-lived gluino searches. Responsible for sensitivity projections. 	- 8
 9. ► LL, C. Ohm, A. Soffer, and T. Yu, Collider Searches for Long-Lived Particles Beyond the Standard Model, Progress in Particle and Nuclear Physics 3695 201^a Co-responsible for all experimental aspects of this broad review of collider searches for long-lived particles. 	d 9
Selected Peer-Reviewed Publications from the ATLAS and CMS Collaborations	

10. Search for long-lived, massive particles in events with displaced vertices and multiple jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector, *JHEP* 06, 200 2023 Led initial design and implementation of a search for decays of BSM particles with displaced vertices

and jets, including reconstruction algorithms, analysis software, and background estimation design.

11. \blacktriangleright A search for the decays of stopped long-lived particles at $\sqrt{s} = 13$ TeV with the ATLAS detector, JHEP 173 2021

Led search for very long lived particle decays in empty LHC bunch crossings.

12. Search for displaced leptons in $\sqrt{s} = 13$ TeV pp collisions with the ATLAS detector, Phys. Rev. Lett. 127 051802 2021

Developed analysis software and provided design guidance for a search that extends the limits obtained from LEP for long-lived sleptons.

13. Search for long-lived, massive particles in events with a displaced vertex and a muon with large impact parameter in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector, *Phys. Rev. D* 102 032006 2020

Co-coordinator of analysis. Responsible for all aspects of the analysis, including background estimation scheme, physics targets, and analysis software. 14. ► Search for long-lived, massive particles in events with displaced vertices and missing transverse momentum in 13 TeV pp collisions with the ATLAS detector, *Phys. Rev. D* 97 052012 2018

Co-coordinator of analysis. Particularly responsible for background estimation methods and their validation, limit-setting, and data-flow model.

- 15. Search for new phenomena in high-mass diphoton final states using 37 fb⁻¹ of proton-proton collisions collected at $\sqrt{s} = 13$ TeV with the ATLAS detector, *Phys. Lett. B* 775 105 2017 *Responsible for creation and validation of BSM signals and Higgs EFT models.*
- 16. Search for new phenomena in events containing a same-flavour opposite-sign dilepton pair, jets, and large missing transverse momentum in $\sqrt{s} = 13$ TeV pp collisions with the ATLAS detector, *Eur. Phys. J C* **77** 144 2017

Responsible for studies of the jet system dynamics.

17. ► Search for squarks and gluinos in final states with jets and missing transverse momentum at √s = 13 TeV with the ATLAS detector, Eur. Phys. J. C 76: 392 2016
 Co-coordinator of search. Responsible for all aspects of limit-setting. Responsible for background estimation design and implementation for RJR analysis.

18. Search for massive supersymmetric particles decaying to many jets using the ATLAS detector in pp collisions at $\sqrt{s} = 8$ TeV, *Phys. Rev. D* 91, 112016 2015

Co-coordinator of search. Responsible for all aspects of the search from background estimation, signal simulation, and limit-setting.

19. Light-quark and Gluon Jet Discrimination in pp Collisions at $\sqrt{s} = 7$ TeV with the ATLAS Detector, *Eur. Phys. J.* C 74: 3023 2014

Responsible for analysis design, data-driven template determination and validation.

20. Search for pair production of massive particles decaying into three quarks with the ATLAS detector in $\sqrt{s} = 7$ TeV pp collisions at the LHC, Journal of High Energy Physics 12, 1–42 2012

Responsible for signal simulation and limit-setting.

Selected Public Documents

A. Affolder, et al., Solid State Detectors and Tracking for Snowmass, Contribution to Snowmass 2021, 2022

► D. Ally, et al., Strategies for Beam-Induced Background Reduction at Muon Colliders, Contribution to Snowmass 2021, 2022

► J. Cochran, et al., Particle Physics Outreach at Non-traditional Venues, Contribution to Snowmass 2021, 2022

K. Black, et al., Prospects for the Measurement of the Standard Model Higgs Pair Production at the Muon Colliders, Contribution to Snowmass 2021, 2022

N. Bartosik, et al., Simulated Detector Performance at the Muon Collider, Contribution to Snowmass 2021, 2022

J. De Blas, et al., The physics case of a 3 TeV muon collider stage, Contribution to Snowmass 2021, 2022

C. Aime, et al., Muon Collider Physics Summary, Contribution to Snowmass 2021, 2022

S. Jindariani, et al., Promising Technologies and R&D Directions for the Future Mu tors , <i>Contribution to Snowmass 2021</i> ,	on Collider Detec- 2022
Generation and Simulation of R-Hadrons, ATL-PHYS-PUB-2019-019	2019
 Supersymmetry Summary Plots, Main overview and RPV plots 	2018-20
Performance of vertex reconstruction algorithms for detection of new long-lived par the ATLAS inner detector , ATL-PHYS-PUB-2019-013	rticle decays within 2019
Reinterpretation of searches for supersymmetry in models with variable R-parity- strength and long-lived R-hadrons, ATLAS-CONF-2018-003	violating coupling 2018
First look at pp collisions data at $\sqrt{s} = 13$ TeV in preparation for a search for squa final states with jets and missing transverse momentum with the ATLAS detector, 2015-028	arks and gluinos in ATL-PHYS-PUB- 2015
Additional public documents supporting the publications described above.	
One CMS Analysis Review Committee (ARC)	
Nine ATLAS Editorial Boards (EBs)	
Work in Progress	
Studies of muon collider environments Measuring quantum entanglement and nonlocality at future lepton colliders	
Awards & Honors	
UTK Provost's Junior Faculty Fellow	2023-25
UTK College of Arts and Sciences Faculty Award for Academic Outreach	2022
UTK Physics Teacher of the Year	2021-22
Funding	
NSF CAREER Award - \$1M	2023
USCMS Upgrade Project Funding	2022
ALLO	ZUZ.)

2025
2022
2022
2022
2015

Professional Activities

LHC LLP Working Group Convener	2022-24
SESAPS Nominating Committee	2022-23
US LHC Users Association (USLUA) Executive Committee Member	2022-23
Journal Referee for Physical Review Letters, Physical Review D,	2018-
Letters in High Energy Physics, Universe	

Selected Scientific Presentations

Seminars and Colloquiua

University of California, Irvine, Virtual	2022
University of Kansas, Particle Physics on the Plains, Lawrence, KS	2022
University of Tennessee, Seminar on RPV SUSY, Knoxville, TN	2021
University of Tennessee, <i>Physics Colloquium</i> , Knoxville, TN	2020
Fermilab, LPC Physics Forum, Batavia, IL	2020
LHC Experiments Committee (LHCC) Meeting Open Session, CERN, Geneva	2020
Lund University, Sweden	2020
Michigan State University, East Lansing, MI	2019
University of Illinois, Urbana-Champaign, IL	2018
Fermilab Topic of the Week, Batavia, IL	2018
SLAC, Palo Alto, CA	2018
University of Oregon, Eugene, OR	2018
University of Pennsylvania, Philadelphia, PA	2018
Rutgers University, Piscataway, NJ	2018
Higgs Cross-Section Working Group Meeting, CERN, Geneva	2018
Harvard University, Cambridge, MA	2018
Oskar Klein Centre, Stockholm, Sweden	2018
Lawrence Berkeley National Laboratory, Berkeley, CA	2017
Harvard University, Cambridge, MA	2015
University of Adelaide, Australia	2014
University of Melbourne, Australia	2014
Institut de Física d'Altes Energies (IFAE), Barcelona, Spain	2014
2nd International Spring School on Particle Physics and Philosophy	2014
Santa Cruz Institute of Particle Physics Seminar, Geneva, Switzerland	2013
Fermilab, LPC Workshop on Exotic Top Partners, Batavia, IL	2013

Conference Presentations

Fermilab Users Meeting – Invited Plenary	2023
UCSB, Kavli Institute of Theoretical Physics, Muon Collider Workshop – <i>Invited Plenary</i>	2023
CMS Exotica Workshop – Invited Plenary	2022
ML4Jets, Rutgers University, Piscataway, NJ	2022
Snowmass Community Summer Study Workshop, Seattle, WA	2022
APS April Meeting, New York City, NY	2022
CMS Exotica Workshop – Invited Plenary	2021
SESAPS2021, FSU, Tallahassee, Fl – <i>Invited 'Highlight' Talk</i>	2021
LHCP2021, Virtual – Invited Plenary	2021
APS April Meeting, Virtual – <i>Invited Plenary</i>	2021
A Rainbow Of Dark Sectors, Aspen Center for Physics, Virtual – <i>Invited Plenary</i>	2021
ICNFP, Kolymbari, Crete, Greece	2019
USATLAS Workshop, Pittsburgh, PA – <i>Invited Plenary</i>	2018
SUSY2017, Mumbai, India	2017
IHEP-T2E, Kuala Lumpur, Malaysia – <i>Plenary</i>	2017
SUSY2016, Melbourne, Victoria, Australia	2016
SUSY2015, Lake Tahoe, CA	2015

Kruger2014, Kruger Gate, South Africa	2014
SUSY2012, Peking University, Beijing, China	2012
Conference and Workshop Organization	
CPAD 2024, Knoxville, TN, Local Conference Organizer	2024
The Future of High Energy Physics, Aspen Center for Physics, Conference Organizer	2024
ML4Jets, Rutgers University, Session Chair	2022
ATLAS SUSY and Exotics Workshop, Virtual	2020
ATLAS Reaching New Heights Workshop, CERN	2019
ATLAS SUSY Workshop, Lecce, Italy	2019
APS Division of Particles and Fields Meeting, Northeastern University	2019
ATLAS SUSY Workshop, Stockholm, Sweden	2018
ATLAS SUSY and Exotics Workshop, Bucharest, Romania	2017
Recursive Jigsaw Workshop, Harvard University	2015
Workshop on LHC Searches, LBNL	2014

Selected Outreach Activities

Quantum Canvases: Physics, the Arts, and the Humanities

Lead organizer of a series of events in downtown Knoxville on the intersection of physic	s the arts
and the humanities in collaboration with UTK Physics & Astronomy, CERN, and the UT F	Jumanities
Center.	
Electronic music event ("Harmonic Motion: Physics x Electronic Music")	
Events around a collection of science fiction short stories	
A panel discussion on the intersection of physics and science fiction	
A humanities-facing physics colloquium event	
Interviews	
Interview for article for Symmetry Magazine on CERN music festival program	2023
Interview with Sparks Magazine on Asian Americans in STEM	2023
Interview with Danish podcast TechTopia	2022
Interview for article for Symmetry Magazine on naturalness	2019
Interview for Swedish-language podcast Professor Magenta about science and art	2016
Public screening of film Particle Fever	2014
Higgs Tenth Anniversary Celebration	2022
Primary organizer for a documentary screening of <i>Particle Fever</i> and open panel session for anniversary of the discovery of the Higgs Boson. Held at Central Cinema in Knoxville, TN.	the tenth
STEAM Trailer Design Project	2021-22
Worked with the UTK College of Architecture and Design to design and construct an educ perience for local middle schoolers with a focus on the physics of sound and visualization.	ational ex-
Keynote presentation at event for Eureka Science Museum. Grand Junction. CO	2021

Reynote presentation at event for Eureka Science Museum, Grand Junction, CO	2021
ColliderScope – Particle-Physics-Inspired Electronic Music Project	2019-
Music with sound waves that show particle physics images in Lissajous figures Live performances:	

2023

Blue Moon Tavern, Seattle (as part of the Snowmass summer meeting)	2022
Roskilde Festival, Denmark	2022
ICHEP2020 and You lube, Live from the CERN Control Centre	2020
Lund, Sweden	2020
Aeronaut Brewing, Somerville, MA	2019
ATLAS Experiment Party, Geneva, Switzerland	2019
CERN Open Days, Geneva, Switzerland	2019
Pohoda Music Festival, Trencin, Slovakia	2019
Commissioned Compositions:	2022
Intro videos for the CERN Science Gateway Educational Program	2023
Intro Videos for CERN Music Festival Program	2019
Featured in Symmetry Magazine and other publications	
Presented at multiple international conferences	
Presentations to Grade School Students	
L&N STEM Academy, Knoxville, TN	2023
Tel Aviv University – Future Scientists CERN Tour	2017-19
Five presentations to NJ and NY schools	2011-16
Harvard NSW Activities at CERN - Video (YouTube)	
Fully produced video for recruitment	2018
In Particular - Podcast	2015-16
Video audio and original music production	
Tans of thousands of downloads (a. 11 TB served)	
Eastured by CERN, iTures. The Guardian Science Blogs. Are Technica, Vice, and others	
reatured by CERN, frunes, the Guardian Science blogs, Ars reclinica, vice, and others	
Visiting Scholar, Dharma Drum Mountain, Taiwan	
Several weeks of conversations with monastery's monks and academics	2014
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Teaching	
Classical Mechanics I & II (PHYS 311/312)	2021-23
UTK HEP/Astro Seminar	2022
Graduate Research Participation Seminar	2021
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