

HANNAH BOSSI

Curriculum Vitae

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EDUCATION

Yale University (Thesis Advisor: John Harris)	2018 - 2023
Novel Uses of Machine Learning for Differential Jet Quenching Measurements at the LHC	
M.S., M.Phil, Ph.D. Physics	2021
Colby College	
B.A., Physics and Computer Science	2014 - 2018

APPOINTMENTS

Postdoctoral Associate, Massachusetts Institute of Technology (MITHIG)	2023 - present
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COLLABORATION MEMBERSHIP

sPHENIX Collaboration , BNL, Long Island, New York	2023 – present
CMS Collaboration , CERN, Geneva, Switzerland,	2023 – present
Electron-Positron Alliance (Archived Data) ,	2023 – present
ALICE Collaboration , CERN, Geneva, Switzerland	2017 – 2023

RESEARCH EXPERIENCE

CMS Collaboration, CERN, Geneva, Switzerland	2023 – present
• Photon tagged jet axis decorrelation measurement in heavy-ion collisions • Evidence of medium response to hard probe with Z-hadron correlations • First measurement D^0 meson photoproduction in ultra-peripheral heavy-ion collisions • Development and commissioning of the CMS Forward Shower Counter detector • Development and commissioning of the CMS Zero Degree Calorimeter detector and trigger system	
sPHENIX Collaboration	2023 – present
• Development of next-generation AI-based trigger systems for sPHENIX + EIC.	
Electron-Positron Alliance, (Archived Data)	2023 – present
• Precision measurement of energy-energy correlators from the collinear to the Sudakov limit	
ALICE Collaboration, CERN, Geneva, Switzerland	2017 – 2023
• Measurement and interpretation of the cone size dependence of charged-particle jet suppression • Implementation of a novel machine-learning based background subtraction technique for jets in heavy-ion collisions • Time-reclustered measurements of jets and their substructure in pp collisions • Development, validation, and commissioning of automated bad channel calibration of ALICE Electromagnetic Calorimeter in Run 3 • Involvement in ALICE Run 3 data preparations, focused mostly on discussions for the validation and implementation of the o^2 jet software framework	
Phenomenological Studies	
• Imaging the wake of the jet with energy correlators • Machine learning based calorimeter clustering at the EIC	
	2023 – present 2023

SELECTED PUBLICATIONS¹

Experimental Measurements

25. [e⁺e⁻ alliance, arXiv:2511.00149, Submitted to Nature](#) [lead author/analyzer] 2025
Energy Correlators from Partons to Hadrons: Unveiling the Dynamics of the Strong Interactions with Archival ALEPH Data
24. [e⁺e⁻ alliance, arXiv:2510.22038, Submitted to PRL](#) [co-author] 2025
Unbinned measurement of thrust in e⁺e⁻ collisions at $\sqrt{s} = 91.2$ GeV with archived ALEPH data
23. [CMS Collaboration, CMS-PAS-25-014](#) [co-author] 2025
Charged particle nuclear modification factor in neon-neon collisions and system-size dependence of nuclear suppression effects
22. [CMS Collaboration, arXiv:2509.08626, Submitted to PRL](#) [co-author] 2025
Measurement of D⁰ meson photoproduction in ultraperipheral heavy ion collisions
21. [CMS Collaboration, arXiv:2507.09307, Submitted to PLB](#) [co-author/analyzer] 2025
Evidence of medium response to hard probes using correlations of Z bosons with hadrons in heavy ion collisions
20. [CMS Collaboration, CMS-PAS-HIN-25-002](#) [co-author] 2025
Constraining low-x gluon densities with low-p_T D⁰-meson production in ultraperipheral lead-lead collisions at 5.36 TeV
19. [CMS Collaboration, CMS-PAS-HIN-24-003](#) [co-author] 2025
Constraining nuclear parton dynamics with the first measurement of D⁰-photoproduction in ultraperipheral heavy-ion collisions at the LHC
18. [CMS Collaboration, CMS-PAS-HIN-21-019](#) [co-author, student mentor] 2024
First measurement of jet axis decorrelation with photon-tagged jets in pp and PbPb collisions at 5.02 TeV
17. [ALICE Collaboration, Eur. Phys. J. C 84 \(2024\) 813](#) [co-writer for ML section] 2024
The ALICE experiment – A journey through QCD
16. [ALICE Collaboration, PLB 849 \(2024\) 138412](#) [lead analyzer, co-lead author] 2024
Measurement of the radius dependence of charged-particle jet suppression in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV

Detector Work

15. [arXiv:2508.09938, Submitted to Computing and Software for Big Science](#) [lead author] 2025
Machine Learning Power Week 2023: Clustering in Hadronic Calorimeters
14. [JINST 19 C02066](#) [co-author] 2024
A demonstrator for a real-time AI-FPGA-based triggering system for sPHENIX at RHIC
13. [CMS Collaboration, CERN-CMS-DP-2024-002](#) [lead author] 2024
L1 Trigger and ZDC Performance during 2023 Heavy Ion Run
12. [ALICE Collaboration, JINST 18 \(2023\) P08007](#) [co-writer for jet section] 2023
Performance of the ALICE Electromagnetic Calorimeter

Theory/Phenomenology

11. [arXiv:2609.05609](#), prepared for submission to PRL [co-author] 2026
The Colors of Jet Quenching
10. [JHEP. 2024, 73 \(2024\)](#) [co-author] 2024
Imaging the Wakes of Jets with Energy-Energy-Energy Correlators
9. [Phys. Rev. D. 100 \(2019\) 84022](#) [co-author] 2019
Gravity with explicit spacetime symmetry breaking and the Standard Model Extension,

¹THE FULL LIST OF 282 PAPERS CAN BE FOUND AT: [HTTPS://INSPIREHEP.NET/AUTHORS/1756687](https://inspirehep.net/authors/1756687)

8. [arXiv:1810.13408](#) [co-author] 2018
A Symmetric Two Higgs Doublet Model

Conference Proceedings & Public Notes

8. e^+e^- alliance, [arXiv:2510.18762](#) [co-author] 2025
Analysis note: measurement of thrust and track energy-energy correlator in e^+e^- collisions at 91.2 GeV with DELPHI open data
7. e^+e^- alliance, [arXiv:2507.14349](#) [co-author] 2025
Analysis note: measurement of thrust in e^+e^- collisions at $\sqrt{s} = 91$ GeV with archived ALEPH data
6. e^+e^- alliance, [arXiv:2505.11828](#) [lead author/analyzer] 2025
Analysis note: measurement of energy-energy correlator in e^+e^- collisions at 91 GeV with archived ALEPH data
5. [CDS Record 29922676](#) [co-author] 2025
Assessing the mental health state of LHC scientists
4. [Proceedings of the XXXth International Conference on Ultra-relativistic Nucleus-Nucleus Collisions](#), [European Physical Journal](#) [proceedings] 2024
Exploring medium properties using jet substructure measurements in pp and Pb–Pb collisions with ALICE
3. [Proceedings of The XXIXth International Conference on Ultra-relativistic Nucleus-Nucleus Collisions](#) [proceedings] 2022
R-dependence of inclusive jet suppression and groomed jet splittings in heavy-ion collisions with ALICE
2. [Nuclear and Particle Physics Proceedings QCD2021 00 \(2022\)](#) [proceedings] 2022
Recent Jet Measurements in ALICE
1. [POS HardProbes2020 315 \(2021\)](#) [proceedings] 2021
Inclusive Jet Measurements in Pb-Pb Collisions at 5.02 TeV with ALICE using Machine Learning Techniques

INVITED TALKS

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32. [Strong Electroweak Matter 2026](#), Helsinki, Finland Aug. 2026
Overview of recent experimental progress in inferring QGP properties
 31. [BOOST 2026](#), Krakow, Poland July 2026
Experimental Summary
 30. [Parton Showers and Resummation 2026](#), Manchester, England July 2026
Recent Results from the e^+e^- Alliance
 29. [Probing our Understanding of Quark Gluon Matter](#), Kavli Institute for Theoretical Physics Apr. 2026
Energy Correlators Across Collision Systems
 28. [Frontiers of Quark Gluon Matter](#), Kavli Institute for Theoretical Physics Mar. 2026
Opportunities with Run 3 Data using CMS
 27. [Special CFNS Seminar](#), Stony Brook University Feb. 2026
Insights at the extremes: Exploring the limits of Hot and Cold QCD
 26. [Niels Bohr Seminar](#), Manchester University Nov. 2025
Energy Correlators at the Recycling Frontier: Unveiling QCD Dynamics with Archival ALEPH Data
 25. [RHIC/AGS Users Meeting](#), Brookhaven National Lab, NY, US May. 2025
Machine Learning on FPGAs for Event Selection
 24. [Public Lecture](#), Peking University, Beijing, China May. 2025
Understanding the Universe by Breaking Particles: An Experimentalists View

23. [Plenary Talk, Quark Matter 2025, Frankfurt, Germany](#) Apr. 2025
Machine learning as a technique for physics analysis
22. [TH Heavy Ion Coffee, CERN, Geneva, Switzerland](#) Nov. 2024
First measurement of the energy-energy correlator from the collinear the back-to-back limit in e^+e^- collisions with ALEPH
21. [Theory Seminar, National Institute for Subatomic Physics - Nikhef, Netherlands](#) Nov. 2024
Energy correlators as a probe of QCD from simple to complex systems
20. [Plenary Talk, The 12th International Conference on Hard and Electromagnetic Probes of High-Energy Nuclear Collisions, Nagasaki, Japan](#) Sept. 2024
Machine learning for the analysis of hard probes
19. [Energy Correlators at the Collider Frontier, Mainz Institute for Theoretical Physics, Johannes Gutenberg University Mainz, Germany](#) Jul. 2024
First Investigations of Shape-Dependent Energy Correlators in Heavy Ion Collisions
18. [RHIC/AGS Users Meeting, Brookhaven National Lab, NY, US](#) Jun. 2024
Overview of Artificial Intelligence at RHIC and Beyond
17. [Miniworkshop on CMS gluon charge analysis and ALEPH results \(remote\)](#) Feb.2024
Future ALEPH Analyses
16. [New jet quenching tools to explore equilibrium and non-equilibrium dynamics in heavy-ion collisions, ECT*, Trento, Italy](#) Feb.2024
Imaging the wake of the jet with Energy Correlators
15. [New jet quenching tools to explore equilibrium and non-equilibrium dynamics in heavy-ion collisions, ECT*, Trento, Italy](#) Feb.2024
High Priority Observables for Jet Quenching
14. [ATLAS ML/Stats Meeting \(remote\)](#) Oct. 2023
Uncertainty Quantification for ML-based analyses in HEP
13. [Plenary Talk, Initial Stages](#) June 2023
Recent development of AI/ML in heavy-ion experiments
12. [PHENOMenal Meeting](#) June 2023
ALICE perspectives on Machine Learning
11. [EP Seminar, CERN](#) May. 2023
Measurement of the Radius-dependence of jet suppression in heavy-ion collisions with ALICE
10. [Physics Department Seminar, Colby College](#) Mar. 2023
Probing the Early Universe with Jets at the LHC
9. [ML PEP Workshop, Goethe University of Frankfurt](#) Nov. 2022
Series of 5 introductory lectures on ML.
8. [PAN Seminar, Wayne State University \(remote\)](#) Sept. 2022
Investigating the R-dependence of jet suppression in ALICE using machine learning techniques
7. [BNL Nuclear Physics Seminar, BNL](#) May 2022
Measurement of the R-dependence of inclusive jet suppression in Pb-Pb collisions with ALICE
6. [UIUC Journal Club, Urbana Champaign, IL \(remote\)](#) Mar. 2022
Current and Future Uses of ML for Heavy-ion Physics
5. [UTK RHIP Seminar, Knoxville, TN](#) Feb. 2022
Current and Future Uses of ML to Characterize a Jet Signal
4. [Yale WIDG Seminar, New Haven, CT](#) Sept. 2021
Radius-dependent measurements of jet suppression in heavy-ion collisions with ALICE
3. [RHIC/AGS Users' Meeting \(remote\)](#) June 2021
Use of Machine Learning for Jet Measurements
2. [Physics Division Seminar at ORNL \(remote\)](#) Aug. 2020
Machine learning based reconstruction of full jet transverse momentum in ALICE

1. [BNL Nuclear Physics Seminar \(remote\)](#) June 2020
Machine Learning for Jet Physics in ALICE

SELECTED CONTRIBUTED TALKS AND POSTERS

24. [BOOST 2026, Krakow, Poland](#) July 2026
Using Agentic AI Without Losing the Physics: Lessons from LEP Data Analysis
23. [LHC Forward Physics September 2025 Workshop, Madrid, Spain \(remote\)](#) Sept. 2025
CMS ZDC Status
22. [QCD @ LHC, Stony Brook, NY, USA](#) Sept. 2025
Precision QCD Measurements Using Archived ALEPH Data
21. [BOOST 2025, Providence, Rhode Island, USA](#) July 2025
New Constraints on the color-charge effects of energy loss with jet axis-based substructure in PbPb collisions at 5.02 TeV
20. [LHC Forward Physics June 2025 Workshop, Geneva, Switzerland \(remote\)](#) June 2025
ZDC status in CMS
19. [Poster, Quark Matter 2025, Frankfurt, Germany](#) Apr. 2025
sPHENIX machine learning on FPGAs for event selection
18. [Poster, The 12th International Conference on Hard and Electromagnetic Probes of High-Energy Nuclear Collisions, Nagasaki, Japan](#) Sept. 2024
Intelligent experiments through real-time AI: Fast Data Processing and Autonomous Detector Control for sPHENIX and future EIC detectors
17. [Poster, 12th Edition of the Large Hadron Collider Physics Conference, Boston USA](#) June 2024
Measurement of the energy-energy correlator in the back-to-back limit using the archived ALEPH e^+e^- data at 91.2 GeV
16. [Quark Matter 2023, Houston, TX](#) Sept. 2023
Exploring medium properties using jet substructure measurements in pp and Pb-Pb collisions with ALICE
15. [Lake Louise Winter Institute, Lake Louise, AB, Canada](#) Feb. 2023
Highlights from the ALICE Experiment
14. [APS Division of Nuclear Physics Meeting, New Orleans, Louisiana](#) Oct. 2022
Measurement of inclusive jet suppression in Pb-Pb collisions with ALICE
13. [Hot Quarks, Estes Park, Colorado](#) Oct. 2022
Measurement of the R-dependence of inclusive jet suppression in Pb-Pb collisions with ALICE
12. [Quark Matter 2022, Kraków, Poland](#) Apr. 2022
R-dependence of inclusive jet suppression and groomed jet splittings in heavy-ion collisions with ALICE
11. [APS Division of Nuclear Physics Meeting \(remote\)](#) Oct. 2021
Jet R_{AA} with Machine Learning
10. [24th High-Energy Physics International Conference in QCD \(remote\)](#) July 2021
Overview of Recent Jet Measurements in ALICE
9. [ML4Jets \(remote\)](#) July 2021
Using Machine Learning for Heavy-ion Jet p_T Reconstruction in ALICE
8. [APS Division of Nuclear Physics Meeting \(remote\)](#) Oct. 2020
Inclusive Jet Measurements at $\sqrt{s_{NN}} = 5.02$ TeV with ALICE using Machine Learning Techniques
7. [Hard Probes 2020, Austin, TX \(remote\)](#) June 2020
Inclusive Jet Measurements in Pb-Pb Collisions at $\sqrt{s_{NN}} = 5.02$ TeV
6. [ML4Jets New York, NY](#) Jan. 2020
Machine Learning Based Jet p_T Reconstruction in ALICE
5. [APS Division of Nuclear Physics Meeting, Crystal City, VA](#) Oct. 2019
Machine Learning Based Jet p_T Reconstruction with Full Jets in ALICE
4. [ALICE Physics Week, Prague, Czech Republic](#) July 2019
Full Jet ML Background Estimator

3. [ALICE USA Meeting, Knoxville, TN](#) Mar. 2019
Using Machine Learning for Full Jet p_T Reconstruction
2. [Quark Matter Poster Session Wuhan, China](#) Nov. 2019
Machine Learning Based Jet p_T Reconstruction with Full Jets in ALICE
1. [Yale Open House Graduate Student Research Poster Session](#) Mar. 2019
Probing the Quark Gluon Plasma with Jets

The full list of contributed talks and posters can be found at: <https://hbossi.web.cern.ch/hbossi/>

SELECTED OUTREACH AND SERVICE

Pen-Pal, Letters to a Pre-Scientist	2025 – present
CMS Young Scientist Committee US Regional Representative	2024 – present
ALICE Junior Representative	2021 – 2023
ALICE USA Junior Ambassador	2020 – 2023
Representative, Graduate Student Advisory Committee, Yale University	2020 – 2023
Representative, Graduate Curriculum Review Committee, Yale University	2020 – 2021
Session Organizer, Pathways Summer Scholars	2022
Organizer, LHC masterclass, Yale University, delayed due to COVID-19	2019 – 2023
Chair, Graduate Women in Physics+, Yale University	2021 – 2022
Volunteer, Girl's Science Investigations, Yale University	2018 – 2023

PROFESSIONAL ACTIVITIES

CMS High p_T PInG L3 Convener	2025 – present
<i>Convener of the physics interest group (PInG) focusing on high p_T probes</i>	
CMS FSC Software Coordinator	2025 – present
<i>Responsible for coordinating all software activities with the newly-installed CMS Forward Shower Counter (FSC) for diffractive physics</i>	
Organizer, New Opportunities in Particle and Nuclear Physics with Energy Correlators	2025
<i>Inaugural workshop held at the Central China Center for Nuclear Theory</i>	
Analysis Review Committee (CMS Internal)	2025 – present
<i>Multiplicity and transverse-momentum dependence of two-particle number and p_T correlations in pp collisions at 13 TeV</i>	
Analysis Review Committee (CMS Internal)	2023 – 2025
<i>Search for medium effects using jet axis decorrelation in inclusive jets from PbPb collisions at $\sqrt{s_{NN}} = 5.02$ TeV</i>	
CMS ZDC Working Group Member	2024 – present
<i>Served on task force to re-commission ZDC following bakeout of LHC Sector 45</i>	
CMS ZDC/HCAL DPG Software Coordinator	2024 – present
<i>Responsible for coordinating all software activities with the CMS ZDC</i>	
Organizer, INT-21-2B: Probing QCD at High Energy and Density with Jets	2023
Organizer, HGS-HiRe ML Power Week, ML-Based Clustering at the EIC	2023
Co-coordinator, ALICE Machine Learning Working Group	2022 – 2023
Analysis Review Committee (ALICE Internal)	2022 – 2023
<i>Inclusive Jet p_T Spectrum in pp collisions at 8 TeV $\sqrt{s} = 8$ TeV</i>	
Analysis Review Committee (ALICE Internal)	2022 – 2023
<i>Hardest $k_{T,g}$ Jet Splittings in pp and $Pb - Pb$ Collisions at $\sqrt{s_{NN}} = 5.02$ TeV</i>	
Analysis Review Committee (ALICE Internal)	2021 – 2023
<i>Measurements of jet-axis differences in pp collisions at $\sqrt{s} = 5.02$ TeV</i>	

TEACHING EXPERIENCE AND STUDENTS MENTORED

Xiaolin Rong, Massachusetts Institute of Technology, graduate	2026 – Present
Yu-Chen Chen, Massachusetts Institute of Technology, graduate	2023 – Present
Arjun Kudinoor, Massachusetts Institute of Technology, graduate	2023 – Present
Molly Park, Massachusetts Institute of Technology, graduate	2024 – 2025

Ananya Rai, Yale University, graduate	2023 – 2024
Zihui (Mary) Zhang, Colby College, undergraduate	2022 – 2023
Teaching Fellow, Yale University, Modern Physical Measurement	2019 – 2020
Teaching Fellow, Yale University, General Physics Laboratory	2018 – 2019
Teacher’s Assistant, Colby College, Computation and Visual Thinking	2014 – 2018
Teacher’s Assistant, Colby College, Foundations of Mechanics	2015 – 2018
Teacher’s Assistant, Colby College, Foundations of Electricity and Magnetism	2015 – 2018

HONORS AND AWARDS

Breakthrough Prize in Fundamental Physics	2025
<i>Awarded to co-authors of publications based on LHC Run-2 data at the experimental collaborations.</i>	
CMS Awards for outstanding contributions to the CMS experiment	2025
<i>For major contributions to the refurbishment of the Zero Degree Calorimeter (ZDC) and streamlining of the ZDC software</i>	
D. Alan Bromley Fellowship	2022 - 2023
National Science Foundation Graduate Research Fellowship	2020 - 2023
Nada Ledinko Fellowship	2020
Phi Beta Kappa	2018

IN THE NEWS

“How explorations in physics have informed artificial intelligence” - Innovation News	2026
“A charming look into the structure of nuclei using collisions with photon clouds” - CMS News	2024
“CMS uses photons to probe the structure of nuclei” - CERN News	2024
ALICE Ph.D. thesis: Hannah J. Bossi, Yale University - YouTube Summary	2023
Yale Wright Lab physicists on travel to a conference in Poland - YouTube Video	2022
“Who’s Who at the Lab - Hannah Bossi” - Wright Lab News	2021
“What are we made of?” - Colby News	2020