Curriculum Vitae

Personal Information

Family, first name: Badea, Anthony
Researcher identifier: ORCID 0000-0001-5199-9588
URL for website: anthonybadea.com (Personal in development)

Professional Career

2023 - 2026 Schmidt AI in Science Fellow, University of Chicago
Research Scientist, Enrico Fermi Institute
Mentor: Professor Edward Blucher
Research Activities: Measurements of e^+e^-, pp, and PbPb collision data, ATLAS data operations, ML/Silicon R&D for intelligent detectors and ML analysis techniques

Academic Career

2019 - 2023 Ph.D. Physics
Harvard University, USA
Supervisor: Professor John Huth
Thesis: Search for massive particles producing all hadronic final states in proton-proton collisions at the LHC with the ATLAS detector

2019 - 2020 M.A. Physics
Harvard University, USA

2015 - 2019 B.S. Double Major Physics and Mathematics (4.8/5.0 GPA)
Massachusetts Institute of Technology, USA
Supervisor: Professors Yen-Jie Lee and Jesse Thaler
Thesis: Search for the Production of Quark-Gluon Plasma in e^+e^- Collisions at $\sqrt{s} = 91$ GeV with ALEPH archived Data

Teaching

2025 ATLAS Experiment Lecture Series, Geneva, CH
Selected to present in the ATLAS experiment educational lecture series aimed at graduate students on the subject: An Introduction to Anomaly Detection

2024 94^{th} Enrico Fermi Institute Arthur H. Compton Lectures
One early-career researcher per Autumn/Spring, nominated by the Institute Director, delivers eight public 1 hour lectures on frontier particle physics and AI concepts

2020 Harvard Elementary Particle Physics
Teaching assistant, recitation instructor, and course co-designer for upper level undergraduate course on elementary particles

Research Mentorship

Since 2025 Thomas Critchley, Ph.D. student, CERN / University of Geneva (CH)
ATLAS work designing transformer models trained with unsupervised/contrastive learning on pp collision data to reconstruct combinatorially complex multi-jet final states

Since 2024 Danush Shekar, Ph.D. student, University of Illinois Chicago (USA)
ML/Silicon R&D with Fermilab and the SmartPixel Collaboration on the first prototype of in-pixel signal processing and AI/ML data reduction for hybrid-bonded pixel sensors

Since 2024	Takane Sano, Ph.D. student, University of Kyoto (JP) ATLAS physics on model-agnostic multi-jet searches in pp collisions for TeV-scale baryon number violation related to Sakharov conditions
2023 - 2024	Stefano Francellucci, Ph.D. student, University of Geneva (CH) ATLAS development of data scouting schemes for soft multijet trigger capabilities
2023 - 2024	Patrycja Potepa, Ph.D. student, AGH Krakow (PL) / Uni Bonn (DE) ATLAS physics for first observation of $t\bar{t}$ production in PbPb collisions

Memberships and Collaborations

Since 2025	Founding Member of the Electron-Positron Alliance Collection and analysis of archived e^+e^- data to perform state-of-the-art measurements using modern theoretical and experimental methods
Since 2023	Member of the SmartPixel Collaboration Fermilab-led, multi-institutional consortium developing on-chip ML for data reduction at the source to overcome bandwidth limits for hybrid-bonded pixel sensor detectors
Since 2019	Member of the ATLAS Collaboration General-purpose LHC experiment at CERN using precision measurements to explore fundamental questions about the building blocks of matter and the forces of nature

Organization of Workshops, Referee Activities, and Further Services

2025	Co-organizer for UChicago AI+Science Summer School
2025	Co-organizer for UChicago AI+Science Hackathon
2024	Co-organizer for UChicago AI+Science Summer School
2024	Co-organizer for UChicago AI+Science Hackathon
2024	Physical Review D Referee
2024	Schmidt Sciences Contributing Writer (e.g. ML Optimized Experiment Design)
2019	Harvard Science Contributing Writer (e.g. The Quark Soup)

Publication List

I am signing author of several collaborations and hence co-author of more than 400 published articles and papers. Therefore, I am selecting my research outputs to which I have made an important contribution.

2026	A model-agnostic search for multijet resonances in pp collisions at $\sqrt{s} = 13.6$ TeV with the ATLAS detector. The ATLAS Collaboration, *In Internal Review*
2026	Reinterpretation of searches for supersymmetry models with long-lived particles using the ATLAS experiment at the LHC. The ATLAS Collaboration, *In Internal Review*
2026	Overcoming the noise barrier in radiated pixel detectors through retraining on-detector neural networks. Badea et al., *In Internal Review*
2026	Performance of trigger level analysis and partial event building triggers in pp collisions at $\sqrt{s} = 13.6$ TeV with the ATLAS detector. The ATLAS Collaboration, *In Progress*
2025	Long-range near-side correlation in e^+e^- with W-boson pair events at 183-209 GeV with ALEPH archived data. Sheng et al., *In Arxiv Submission*
2025	Measurement of energy-energy correlators and thrust in e^+e^- collisions at 91.2 GeV with DELPHI open data. Zhang et al., *In Journal Submission*, AN:2510.18762
2025	In-pixel integration of signal processing and AI/ML based data filtering for particle tracking detectors. Parpillon and Badea et al., *Submitted to TNS*, 2510.07485

2025 Sensor co-design for *smartpixels*. Shekar and Mills et al., 2510.06588

2025 Unbinned measurement of thrust in e^+e^- collisions at $\sqrt{s} = 91.2$ GeV with archived ALEPH data. Badea et al., *Submitted to PRL*, 2510.22038, AN:2507.14349

2025 Energy Correlators from Partons to Hadrons: Unveiling the Dynamics of the Strong Interactions with Archival ALEPH Data. Bossi et al., *Submitted to Nature*, 2511.00149, AN:2505.11828

2024 Intelligent pixel detectors: towards a radiation hard ASIC with on-chip machine learning in 28nm CMOS. Badea et al., *PoS ICHEP2024 (2025)*, 2410.02945

2024 Observation of $t\bar{t}$ production in Pb+Pb collisions at $\sqrt{s_{\text{NN}}} = 5.02$ TeV with the ATLAS detector. The ATLAS Collaboration, *PRL Editors' Suggestion*, 2411.10186, CERN Physics Briefing, ATLAS Physics Briefing, ATLAS Video Briefing, APS Physics Viewpoint, Nature Research Highlight

2024 Smart Pixels: In-pixel AI for on-sensor data filtering. Parpillon et al., *IEEE NSS MIC RSTD 2024*, 2406.14860

2024 The quest to discover supersymmetry at the ATLAS experiment. The ATLAS Collaboration, *Physics Reports*, 2403.02455

2024 The ATLAS Trigger System for LHC Run 3 and Trigger performance in 2022. The ATLAS Collaboration, *JINST*, 2401.06630

2024 A data-driven and model-agnostic approach to solving combinatorial assignment problems in searches for new physics. Badea and Berlingen, *PRD*, 2309.05728

2023 A search for R-parity-violating supersymmetry in final states containing many jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. The ATLAS Collaboration, *JHEP*, 2401.16333, ATLAS Physics Briefing

2023 The ATLAS Experiment at the CERN LHC: A Description of the Detector Configuration for Run 3. The ATLAS Collaboration, *JINST*, 2305.16623

2023 The New Small Wheel Electronics. Iakovidis et al., *JINST*, 2303.12571

2023 Long-range near-side correlation in e^+e^- Collisions at $\sqrt{s} = 189-209$ GeV with ALEPH Archived Data. Chen et al., *PLB*, 2312.05084

2022 Jet energy spectrum and substructure in e^+e^- collisions at $\sqrt{s} = 91$ GeV with ALEPH archived data. Chen et al., *JHEP*, 2111.09914

2022 Solving Combinatorial Problems at Particle Colliders Using Machine Learning. Badea et al., *PRD*, 2201.02205

2019 Measurements of two-particle correlations in e^+e^- collisions at $\sqrt{s} = 91$ GeV with ALEPH archived data. Badea et al., *PRL*, 1906.00489

Invited Presentations

2025 AGH Krakow Seminarium HEP Białasówka / HEP Seminar, Krakow, PL
New Measurements with the LEP Archived Datasets

2025 Workshop on The Strong Coupling Constant α_S, Aussois, FR
Measurements of Hadronic Final States in LEP Archived Data

2025 CERN FCC-ee Group Seminar, Geneva, CH
New Measurements with the LEP Archived Datasets

2025 Strong Coupling from Thrust at Lepton Colliders, Geneva, CH
Unbinned Measurement of Thrust in e^+e^- ALEPH Archived Data

2025 Machine Learning for the Front End Workshop, Virtual
In-pixel integration of signal processing and machine learning based data filtering for particle tracking detectors

2025 MIT LNS Seminar, Boston, USA
Probing High Multiplicity Hadronic Systems for New Insights into Fundamental Physics

2024 CERN Collider Cross Talk, Geneva, CH
Inter-Experimental Physics of R-Parity Violating Multi-Jet Signatures

2024 University of Tennessee Seminar, Knoxville, USA
Towards a Signature Driven Search Program at the LHC

2024 Korea Institute For Advanced Study, Virtual
Exploring the Hadronic Landscape from Model Dependent to Independent Searches

2020 Snowmass Computational Frontier, Virtual
The World of Open Data from LEP

2020 4$^{\text{th}}$ FCC Physics Workshop, Virtual
QCD Measurements in LEP Data, Lessons for FCC-ee

Major Conference Presentations

2024 42$^{\text{nd}}$ International Conference on High Energy Physics, Prague, CZ
Intelligent Pixel Detectors: Towards a Radiation Hard ASIC with On-Chip Machine Learning in 28nm CMOS

2024 58$^{\text{th}}$ Rencontres de Moriond on Electroweak Physics and Unified Theories, La Thuile, IT
Exploring Hadronic Landscapes, a Novel Search in pp Multi-Jet Events in ATLAS

2020 40$^{\text{th}}$ International Conference on High Energy Physics, Virtual
Multi-Differential and Unbinned Measurements of Hadronic Event Shapes in e^+e^- Collisions at $\sqrt{s}$=91 GeV from ALEPH archived data

2018 39$^{\text{th}}$ International Conference on High Energy Physics, Seoul, KR
Long-Range Angular Correlations of Charged Particles in High Multiplicity e^+e^- Collisions using Archived Data from the ALEPH detector at LEP

2018 27$^{\text{th}}$ Quark Matter Conference on Ultrarelativistic Heavy Ion Collisions, Venice, IT
Studies of High Multiplicity e^+e^- Collisions using ALEPH Archived Data

Workshop and Conference Presentations

2025 BOOST, Providence, USA
Unbinned measurement of thrust in e^+e^- ALEPH archived data

2024 UChicago DSI Research Day, Chicago, USA
ASIC R&D for future trackers

2024 MuC Annual Meeting, Geneva, CH
ASIC R&D for future trackers

2024 6$^{\text{th}}$ CERN Machine Learning Workshop, Geneva, CH
A data-driven and model-agnostic approach to solving combinatorial assignment problems in searches for new physics

2024 Schmidt Future Workshop, Lake Geneva, USA
Discovering new physics in hadronic final states of particle collisions

2021 5$^{\text{th}}$ ATLAS Machine Learning Workshop, Virtual
Tackling the permutation nightmare: ML for event reconstruction in all-hadronic events

2020 BOOST, Virtual

Multi-Differential and Unbinned Measurements of Hadronic Event Shapes in e^+e^- Collisions at 91 GeV from ALEPH Open Data

2019 JETSCAPE, College Station, USA

Measurements of two-particle correlations in e^+e^- collisions at 91 GeV with ALEPH archived data

Major CERN Internal Presentations

2024 Top and Heavy Ion Group Plenary, CERN, CH

Analysis Approval for $t\bar{t}$ in PbPb Collisions

2023 Paper Publication Presentation, CERN, CH

Paper Approval for RPV Multijet Run 2 Analysis

2021 Muon Week, CERN, CH

Testing the New Small Wheel Micromegas Trigger with Cosmic Ray Muons

2021 New Small Wheel General, CERN, CH

New Small Wheel Micromegas Cosmic Ray Muon Tests and Trigger Algorithm

2021 Muon Week, CERN, CH

New Small Wheel Micromegas Trigger Integration in BB5

2020 Muon Week, CERN, CH

New Small Wheel Micromegas Wedge Integration

2020 New Small Wheel Project Readiness Review, CERN, CH

New Small Wheel Micromegas Trigger Connectivity Tests

Leadership

Since 2025 Expert contact for ATLAS data preparation and pileup profile creation

Since 2025 Expert contact for ATLAS New Small Wheel Detectors data taking

Since 2024 Analysis contact for ATLAS model-agnostic BSM searches in multijet final states

Since 2024 Creator and convener of FNAL Emerging Technologies *smartpixel* chip hardware group

2023 - 2024 Analysis contact for ATLAS observation of $t\bar{t}$ production in PbPb collisions

2021 - 2022 Expert contact for ATLAS New Small Wheel Detectors first data taking

2020 - 2022 Co-lead for ATLAS New Small Wheel Micromegas Trigger commissioning at CERN

Honors

2025 Breakthrough Prize in Fundamental Physics with ATLAS Experiment

To the ATLAS, CMS, ALICE and LHCb Collaborations at CERN's LHC

2025 Singapore Global Young Scientist Summit Attendee

Selected among top young researchers to explore emerging trends in science

2023 - 2026 UChicago Schmidt AI in Science Fellowship

Research fellowship to pursue new AI+Science research directions

2025 Stanford Science Fellowship (declined)

Research fellowship to pursue new interdisciplinary research directions

2021 - 2022 Harvard Frederick Sheldon Traveling Fellowship

Selected by committee for full funding for on-site research at CERN

2020 Harvard Certificate of Distinction in Teaching

Selected for outstanding teaching in Harvard Physics 145 on elementary particle physics

2019 - 2023 Harvard Graduate Prize Fellowship

	Selected by admission committee to the doctoral program for full Ph.D. funding
2019	MIT Malcom Cotton Brown Outstanding Senior Experimentalist Award
	Presented to a senior with outstanding academic record and research in exp. physics
2019	MIT News Cover
	Selected to be featured on the front of MIT news as an undergraduate
2019	Rhodes Scholarship Finalist
	Selected from internal MIT competition and as a finalist for Southern CA district
2016 - 2019	MIT Undergraduate Research Opportunities Program
	Selected for research funding by the institute for work in the MIT heavy ion group

Funding

2025	DOE-HEP Hardware-Aware AI (Co-PI $350k) (FermiLab News)
2024 - 2025	UChicago Research Computing Center Allocation (110k CPU hours)
2024 - 2025	UChicago AI and Science Research Initiative Grant ($15k and GPU time)
2023 - 2026	UChicago Schmidt AI in Science Postdoctoral Fellowship ($95k/year)
2023	Stanford Science Fellowship (declined) ($93k/year)
2021 - 2022	Harvard Frederick Sheldon Traveling Fellowship ($40k)
2019 - 2023	Harvard Graduate Prize Fellowship (Full Ph.D. funding)
2018	Quark Matter Young Scientist Grant
2016 - 2019	MIT Undergraduate Research Opportunities Program Grant ($15k/year)

References

Prof. John Huth	Harvard University, huth@g.harvard.edu, Ph.D. Advisor
Prof. Matthias Schott	University of Bonn, mschott@uni-bonn.de, Collaborator
Prof. Anna Syfrla	University of Geneva, anna.sfyrla@unige.ch, ATLAS Deputy Spokesperson
Prof. Shion Chen	University of Kyoto, shion.chen@cern.ch, Collaborator
Prof. Mel Shochet	University of Chicago, shochet@hep.uchicago.edu, UChicago Group Leader
Prof. Ed Blucher	University of Chicago, blucher@hep.uchicago.edu, EFI Director / Mentor
Dr. Farah Fahim	Fermilab, farah@fnal.gov, Microelectronics Division Head
Dr. Ben Parpillon	Fermilab, bparpill@fnal.gov, Senior ASIC Engineer
Prof. Iwona Bold	AGH Krakow, iwona.grabowska@cern.ch, Collaborator
Prof. Benjamin Nachman	Stanford University / SLAC, nachman@stanford.edu, Collaborator
Prof. Theo Alexopoulos	NTU Athens, theoalex@central.ntua.gr, Collaborator
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Prof. Jesse Thaler	MIT, jthaler@mit.edu, Bachelors Advisor
Prof. Yen-Jie Lee	MIT, yenjie@mit.edu, Bachelors Advisor