

# Curriculum Vitae

Kevin J. Pedro

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## Education

Rensselaer Polytechnic Institute, Troy, NY: B.S. Physics, *summa cum laude* (May 2011), GPA: 3.97/4.0

University of Maryland, College Park, MD: Ph.D. Physics (December 2014), GPA: 4.0/4.0

## Positions

*Associate Scientist*

September 2019 - Present

CMS Experiment; Scientific Computing Division, Fermi National Accelerator Laboratory

Supervisors: Robert Harris, Nhan Tran, Daniel Elvira

*Postdoctoral Research Associate*

February 2015 - August 2019

CMS Experiment; Particle Physics Division, Fermi National Accelerator Laboratory

Supervisors: Frank Chlebana, Daniel Elvira

*Graduate Research Assistant*

August 2011 - January 2015

CMS Experiment; Physics Department, University of Maryland

Supervisor: Sarah Eno

## Research

- Leading comprehensive program to search for evidence of dark matter from strongly-coupled hidden sectors in the forms of semivisible jets, emerging jets, and soft unclustered energy patterns.
- Maintainer and primary developer for TreeMaker ntuple production software, used for numerous searches (including above).
- Lead developer of SONIC (Services for Optimized Network Inference on Coprocessors) in the CMS software to accelerate ML inference using coprocessors; consultant for same approach in LArSoft for DUNE.
- Investigating AI diffusion to accelerate detector simulation and graph neural networks for accurate, scalable calorimeter clustering.

## Leadership

*CMS L3 Machine Learning for Simulation (ML4Sim) Convener*

2020 - Present

*Snowmass Computational Frontier Theoretical Calculations and Simulation Co-convener*

2021 - 2022

*HEP Software Foundation (HSF) Detector Simulation Working Group Co-convener*

2021 - 2022

*CMS L2 Upgrade Software Coordinator*

2017 - 2020

*CMS L2 Deputy Release Manager for CMSSW*

2018 - 2019

*CMS L3 HCAL CMSSW Co-convener*

2016 - 2017

*CMS L3 Upgrade Simulation and Reconstruction Coordinator*

2016

## Journal Publications

- CMS Collaboration, “Search for soft unclustered energy patterns in proton-proton collisions at 13 TeV”, arXiv:2403.05311, March 2024, submitted to *Phys. Rev. Lett.*
- CMS Collaboration, “Search for new physics with emerging jets in proton-proton collisions at  $\sqrt{s} = 13$  TeV”, arXiv:2403.01556, March 2024, submitted to *JHEP*.
- CMS Collaboration, “Portable acceleration of CMS computing workflows with coprocessors as a service”, arXiv:2402.15366, February 2024, submitted to *Comp. Soft. Big Sci.*
- C. Savard et al., “Optimizing High Throughput Inference on Graph Neural Networks at Shared Computing Facilities with the NVIDIA Triton Inference Server”, arXiv:2312.06838, December 2023, submitted to *Comp. Soft. Big Sci.*
- O. Amram and K. Pedro, “Denoising diffusion models with geometry adaptation for high fidelity calorimeter simulation”, *Phys. Rev. D* 108 (2023) 072014, arXiv:2308.03876.
- T. Cai et al., “Accelerating Machine Learning Inference with GPUs in ProtoDUNE Data Processing”, *Comp. Soft. Big Sci.* 7 (2023) 11, arXiv:2301.04633.
- K. Pedro and P. Shyamsundar, “Optimal Mass Variables for Semivisible Jets”, *SciPost Phys. Core* 6 (2023) 067, arXiv:2303.16253.
- CMS Collaboration, “Search for new physics in multijet events with at least one photon and large missing transverse momentum in proton-proton collisions at 13 TeV”, *JHEP* 10 (2023) 046, arXiv:2307.16216.
- S. Bein et al., “Refining fast simulation using machine learning”, arXiv:2309.12919, September 2023, submitted to *Eur. Phys. J. Web Conf.*
- A. Čiprijanović et al., “DeepAstroUDA: Semi-Supervised Universal Domain Adaptation for Cross-Survey Galaxy Morphology Classification and Anomaly Detection”, *Mach. Learn. Sci. Tech.* 4 (2023) 025013, arXiv:2302.02005.
- S. Bhattacharya et al., “GNN-based end-to-end reconstruction in the CMS Phase 2 High-Granularity Calorimeter”, *J. Phys. Conf. Ser.* 2438 (2023) 012090, arXiv:2203.01189.
- S. Banerjee et al., “Denoising Convolutional Networks to Accelerate Detector Simulation”, *J. Phys. Conf. Ser.* 2438 (2023)

- 012079, arXiv:2202.05320.
- G. Albouy et al., “Theory, phenomenology, and experimental avenues for dark showers: a Snowmass 2021 report”, *Eur. Phys. J. C* 82 (2022) 1132, arXiv:2203.09503.
- A. Čiprijanović et al., “DeepAdversaries: Examining the Robustness of Deep Learning Models for Galaxy Morphology Classification”, *Mach. Learn. Sci. Tech.* 3 (2022) 035007, arXiv:2112.14299.
- CMS Collaboration, “Search for resonant production of strongly coupled dark matter in proton-proton collisions at 13 TeV”, *JHEP* 06 (2022) 156, arXiv:2112.11125.
- J. Apostolakis et al., “Detector Simulation Challenges for Future Accelerator Experiments”, *Front. Phys.* 10 (2022) 913510.
- F. Canelli et al., “Autoencoders for Semivisible Jet Detection”, *JHEP* 02 (2022) 74, arXiv:2112.02864.
- J. Krupa, K. Lin, et al., “GPU coprocessors as a service for deep learning inference in high energy physics”, *Mach. Learn. Sci. Tech.* 2 (2021) 035005, arXiv:2007.10359.
- M. Wang, T. Yang, et al., “GPU-accelerated machine learning inference as a service for computing in neutrino experiments”, *Front. Big Data* 3 (2021) 604083, arXiv:2009.04509.
- G. Amadio et al., “GeantV: Results from the prototype of concurrent vector particle transport simulation in HEP”, *Comp. Soft. Big Sci.* 5 (2021) 3, arXiv:2005.00949.
- D. Rankin et al., “FPGAs-as-a-Service Toolkit (FaaSST)”, *Proc. H2RC* (2020) 38, arXiv:2010.08556.
- N. Smith et al., “Coffea: Columnar Object Framework For Effective Analysis”, *Eur. Phys. J. Web Conf.* 245 (2020) 06012, arXiv:2008.12712.
- K. Pedro, “Integration and Performance of New Technologies in the CMS Simulation”, *Eur. Phys. J. Web Conf.* 245 (2020) 02020, arXiv:2004.02327.
- X. Ju et al., “Graph Neural Networks for Particle Reconstruction in High Energy Physics detectors”, *Proc. Mach. Learn. Phys. Sci.* (NeurIPS 2019), arXiv:2003.11603.
- K. Pedro, “Searches for new physics with unconventional signatures at ATLAS and CMS”, *Proc. Moriond QCD* (2019), arXiv:1912.04180.
- CMS Collaboration, “Search for supersymmetry in proton-proton collisions at 13 TeV in final states with jets and missing transverse momentum”, *JHEP* 10 (2019) 244, arXiv:1908.04722.
- K. Pedro, “Current and Future Performance of the CMS Simulation”, *Eur. Phys. J. Web Conf.* 214 (2019) 02036.
- J. Duarte et al., “FPGA-accelerated machine learning inference as a service for particle physics computing”, *Comp. Soft. Big Sci.* 3 (2019) 13, arXiv:1904.08986.
- CMS Collaboration, “Search for supersymmetry in events with a photon, jets, b-jets, and missing transverse momentum in proton-proton collisions at 13 TeV”, *Eur. Phys. J. C* 79 (2019) 444, arXiv:1901.06726.
- HEP Software Foundation, “A Roadmap for HEP Software and Computing R&D for the 2020s”, *Comp. Soft. Big Sci.* 3 (2019) 7, arXiv:1712.06982.
- CMS Collaboration, “Search for supersymmetry in multijet events with missing transverse momentum in proton-proton collisions at 13 TeV”, *Phys. Rev. D* 96 (2017) 032003, arXiv:1704.07781.
- M. Amouzegar et al., “Liquid scintillator tiles for calorimetry”, *JINST* 11 (2016) P11018.
- CMS-HCAL Collaboration, “Dose rate effects in the radiation damage of the plastic scintillators of the CMS Hadron Endcap Calorimeter”, *JINST* 11 (2016) T10004, arXiv:1608.07267.
- CMS Collaboration, “Search for supersymmetry in the multijet and missing transverse momentum final state in pp collisions at 13 TeV”, *Phys. Lett. B* 758 (2016) 152, arXiv:1602.06581.
- K. Pedro, “Search for Pair Production of Third-Generation Scalar Leptoquarks and R-Parity Violating Top Squarks in Proton-Proton Collisions at  $\sqrt{s} = 8$  TeV” (doctoral dissertation), November 2014, doi:10.13016/M26C9Q.
- CMS Collaboration, “Search for pair production of third-generation scalar leptoquarks and top squarks in proton-proton collisions at  $\sqrt{s} = 8$  TeV”, *Phys. Lett. B* 739 (2014) 229, arXiv:1408.0806.
- CMS Collaboration, “Determination of Jet Energy Calibration and Transverse Momentum Resolution in CMS”, *JINST* 06 (2011) P11002, arXiv:1107.4277.

## Public Documents

- D. Ciangottini et al., “Analysis Facilities White Paper”, arXiv:2404.02100, April 2024.
- M. Agarwal et al., “Applications of Deep Learning to physics workflows”, arXiv:2306.08106, June 2023.
- D. Elvira, S. Gottlieb, O. Gutsche, B. Nachman, et al., “The Future of High Energy Physics Software and Computing”, Snowmass 2021, arXiv:2210.05822, October 2022.
- P. Boyle, K. Pedro, and J. Qiang, “CompF2: Theoretical Calculations and Simulation Topical Group Report”, Snowmass 2021, arXiv:2209.08177, September 2022.
- R. Diurba et al., “Snowmass 2021 Community Engagement Frontier 6: Public Policy and Government Engagement: Non-Congressional Government Engagement”, Snowmass 2021, arXiv:2207.00125, July 2022.
- R. Diurba et al., “Snowmass 2021 Community Engagement Frontier 6: Public Policy and Government Engagement: Congressional Advocacy for Areas Beyond HEP Funding”, Snowmass 2021, arXiv:2207.00124, July 2022.
- M. Carneiro et al., “Snowmass ’21 Community Engagement Frontier 6: Public Policy and Government Engagement: Congressional Advocacy for HEP Funding (The “DC Trip”)", Snowmass 2021, arXiv:2207.00122, July 2022.

- P. Harris et al., “Physics Community Needs, Tools, and Resources for Machine Learning”, Snowmass 2021, arXiv:2203.16255, March 2022.
- A. Adelmann et al., “New directions for surrogate models and differentiable programming for High Energy Physics detector simulation”, Snowmass 2021, arXiv:2203.08806, March 2022.
- S. Banerjee et al., “Detector and Beamline Simulation for Next-Generation High Energy Physics Experiments”, Snowmass 2021, arXiv:2203.07614, March 2022.
- J. Pivarski et al., “HL-LHC Computing Review Stage 2, Common Software Projects: Data Science Tools for Analysis”, arXiv:2202.02194, February 2022.
- HEP Software Foundation, “HL-LHC Computing Review: Common Tools and Community Software”, HSF-DOC-2020-01, arXiv:2008.13636, August 2020.
- ATLAS and CMS Collaborations, “Report on the Physics at the HL-LHC and Perspectives for the HE-LHC”, arXiv:1902.10229, CMS-FTR-19-001, February 2019.
- HEP Software Foundation, “Detector Simulation White Paper”, HSF-CWP-2017-07, arXiv:1803.04165, October 2017.
- CMS Collaboration, “The Phase-2 Upgrade of the CMS Barrel Calorimeters”, CMS-TDR-015, September 2017.
- D. Elvira et al., “CMS Simulation in the HL-LHC Era”, HSF-CWP-011, January 2017.
- CMS Collaboration, “Further SUSY Simplified Model interpretations for Moriond 2016”, CMS PAS SUS-16-004, March 2016.
- CMS Collaboration, “CMS Phase II Upgrade Scope Document”, LHCC-G-165, September 2015.
- CMS Collaboration, “Technical Proposal for the Phase-II Upgrade of the CMS Detector”, LHCC-P-008, June 2015.
- CMS Collaboration, “Jet Performance in pp Collisions at  $\sqrt{s} = 7$  TeV”. CMS PAS JME-10-003, July 2010.

### Popular Articles

- Symmetry Magazine, “Will AI make MC the MVP of particle physics?”, July 2023.
- Nvidia Developer Blog, “Scaling Inference in High Energy Particle Physics at Fermilab Using NVIDIA Triton Inference Server”, April 2021.
- Fermi News, “The next big thing: the use of graph neural networks to discover particles”, September 2020.
- CMS Physics Briefing, “Enhancing the Missing Momentum Microscope”, July 2019.

### Conference Presentations

- “Evolution of Generation and Simulation Techniques in the AI/ML Era”. APS April Meeting, Sacramento, April 2024.
- “A Call to Action: Advocating for The Future of US High Energy Physics”. The Future of High Energy Physics: A New Generation, A New Vision, Aspen, March 2024.
- “CaloDiffusion with GLaM for High Fidelity Calorimeter Simulation”. ML4Jets, DESY, November 2023.
- “Machine Learning for Particle Physics Experiments”. ML4Jets, DESY, November 2023.
- “AI and Beyond: New Techniques for Simulation and Design in HEP”. 26<sup>th</sup> International Conference on Computing in High Energy and Nuclear Physics, Norfolk, May 2023.
- “Inference as a Service in High Energy Physics”. Accelerating Physics with ML, MIT, January 2023.
- “Optimal Mass Variables for Semivisible Jets”. ML4Jets, Rutgers, November 2022.
- “Semivisible Jets at CMS”. Semivisible Jets Workshop, Zurich, July 2022. LHC Dark Matter Working Group, CERN, January 2023.
- “Dark Showers for Snowmass”. Snowmass Energy Frontier Workshop, Providence, April 2022.
- “Denoising Convolutional Networks to Accelerate Detector Simulation”. 20<sup>th</sup> International Workshop on Advanced Computing and Analysis Techniques in Physics Research, South Korea, November 2021.
- “AI at Fermilab”. 54<sup>th</sup> Annual Users Meeting, Fermilab, August 2021.
- “Machine learning for detector simulation”. HSF WLCG Virtual Workshop, November 2020.
- “CMS perspective on dark showers”. Searching for long-lived particles at the LHC and beyond, November 2020.
- “FPGA-accelerated machine learning inference as a service for particle physics computing”. 24<sup>th</sup> International Conference on Computing in High Energy and Nuclear Physics, Adelaide, November 2019.
- “Integration and Performance of New Technologies in the CMS Simulation”. 24<sup>th</sup> International Conference on Computing in High Energy and Nuclear Physics, Adelaide, November 2019.
- “Searches for new physics with unconventional signatures at ATLAS and CMS”. 54th Rencontres de Moriond on QCD and High Energy Interactions, La Thuile, March 2019.
- “FPGAs as a service to accelerate machine learning inference”. Joint HSF/OSG/WLCG Workshop, JLab, March 2019.
- “Integration of new simulation technologies in the experiments”. Joint HSF/OSG/WLCG Workshop, JLab, March 2019.
- “Search for emerging jets”. Searching for long-lived particles at the LHC, Amsterdam, October 2018.
- “Current and Future Performance of the CMS Simulation”. 23<sup>rd</sup> International Conference on Computing in High Energy and Nuclear Physics, Sofia, July 2018.
- “Tests of GeantV in CMS Software Framework”. Joint WLCG & HSF Workshop, Napoli, March 2018.
- “Search for supersymmetry in multijet events with missing transverse momentum in proton-proton collisions at 13 TeV”. 2017 Meeting of the APS Division of Particles and Fields, Fermilab, August 2017.
- “Search for supersymmetry in the multijet and missing transverse momentum final state at 13 TeV”. 24<sup>th</sup> International Conference on Supersymmetry and Unification of Fundamental Interactions, Melbourne, July 2016.

- “Advanced Reconstruction Algorithms for the CMS High Granularity Calorimeter”. US LHC Users Association Meeting Lightning Round, Fermilab, November 2015.
- “Search for 3rd generation LQs and RPV stops”. Phenomenology 2014 Symposium, Pittsburgh, May 2014.
- “CMS HCAL Endcap Simulations for the High Luminosity LHC”. APS April Meeting, Denver, April 2013.
- “Fast Simulation of Calorimeters for the CMS Experiment”. Fast Detector Simulation in High Energy Physics, DESY-Zeuthen, January 2013.

## Seminars

- “Searching Where the Light Isn’t: Discovery Potential in LHC Anomalies”, Fermilab Wine and Cheese Seminar, January 2023. Northwestern, February 2023.
- “Software, Computing, and Analysis Tools at CMS”. CMS Data Analysis School, Fermilab, January 2022. CMS Data Analysis School, Fermilab, January 2023.
- “Overview of White Paper 1: Congressional advocacy for HEP funding (DC Trip)”. Community Engagement Frontier 06 Snowmass White Paper Town Hall, February 2022. (w/ K. Kaadze)
- “ML Inference Integration in CMS”. Fast Detector Simulation Workshop, LPCC, CERN, November 2021.
- “Simulation of Semi-visible Jets in CMS”. Snowmass Dark Showers Working Group, September 2021.
- “Is the dark force strong? New directions for LHC dark matter searches”. MIT, September 2021.
- “Coprocessors as a service to accelerate machine learning inference for particle physics”. Wayne State University, November 2020. University of Minnesota, November 2020. University of Maryland, April 2021.
- “AI for Particle Physics: Better, Smarter, Faster”. Fermilab Colloquium, May 2020.
- “FPGAs as a service to accelerate machine learning inference”. LPC Topic of the Week, Fermilab, April 2019.
- “Search for supersymmetry in multijet events with missing transverse momentum in proton-proton collisions at 13 TeV”. University of Notre Dame, September 2017. Saha Institute of Nuclear Physics, January 2018.
- “CMS Upgrade Simulation”. LHC Detector Simulations Workshop, LPCC, CERN, June 2017.
- “Search for supersymmetry in the multijet and missing transverse momentum final state at 13 TeV”. Rutgers, March 2016.
- “Reconstruction for the CMS High Granularity Calorimeter”. Northwestern University, July 2015. University of Chicago, February 2016.
- “Search for Pair Production of Third-Generation Scalar Leptoquarks and R-Parity Violating Top Squarks in Proton-Proton Collisions at  $\sqrt{s} = 8$  TeV”. Thesis Defense, University of Maryland, November 2014.
- “Search for Third-Generation Scalar Leptoquarks and R-Parity Violating Top Squarks”. Fermilab, September 2014. Cornell, October 2014. University of Virginia, November 2014.
- “What is a Higgs and how do you discover one?”. Physics Summer Outreach Program, University of Maryland, August 2014. (w/ M. Amouzegar, S. Eno)
- “Fast Simulation of Calorimeters for the CMS Experiment”. University of Maryland, February 2013.

## Awards & Honors

<i>FNAL Reward &amp; Recognition Award (AI/ML Research)</i>	March 2022
<i>FNAL Reward &amp; Recognition Award (Early Career Proposal Coordination)</i>	February 2022
<i>LPC Distinguished Researcher</i>	January 2019
<i>FNAL Exceptional Performance Recognition Award</i>	September 2018
<i>CMS Achievement Award - Offline &amp; Computing</i>	February 2018
<i>LPC Distinguished Researcher</i>	January 2018
<i>CMS Detector Award - HCAL</i>	April 2017
<i>US LHC Users Association Lightning Round Winner</i>	November 2015
<i>CMS Fundamental Physics Special Recognition Award</i>	December 2013
<i>CMS Achievement Award - Upgrade</i>	December 2012
<i>University of Maryland Dean’s Fellowship</i>	August 2011
<i>G. Howard Carragan Award</i>	May 2011
<i>Rensselaer Dean’s List</i>	Fall 2007 - Spring 2011
<i>Sigma Pi Sigma Physics Honors Society</i>	April 2010
<i>Meritorious Winner in the Mathematical Contest in Modeling</i>	April 2010
<i>Rensselaer Presidential Scholar</i>	July 2007
<i>Rensselaer Mathematics and Science Medal</i>	April 2006

## Grants

<i>Denoising Diffusion to Accelerate Detector Simulation (principal investigator)</i>	July 2023
USCMS HL-LHC S&C Operations Program, \$53,500	
<i>Accelerating offline computing with the Fast Machine Learning Lab (renewal) (co-investigator)</i>	June 2022
USCMS HL-LHC S&C Operations Program, \$46,000	
<i>High Velocity AI: Generative Models (principal investigator)</i>	August 2021
DOE High Energy Physics Computational HEP Sessions Program, \$328,000	

<i>AI Denoising to Accelerate Detector Simulation</i> ( <b>principal investigator</b> ) USCMS HL-LHC S&C Operations Program, \$43,000	May 2021
<i>Investigating Heterogeneous Computing at the Large Hadron Collider</i> (contributor) Internet2: Exploring Clouds for Acceleration of Science (Phase 2), \$500,000	July 2020
<i>Accelerating offline computing with the Fast Machine Learning Lab</i> (co-investigator) USCMS HL-LHC S&C Operations Program, \$43,000	June 2020
<i>High Velocity AI</i> (contributor) DOE High Energy Physics Computational HEP Sessions Program, \$400,000	September 2019
<i>Graph Neural Networks for Accelerating Calorimetry and Event Reconstruction</i> (co-investigator) FNAL Laboratory Directed Research and Development, L2019.017, \$480,000	March 2019
<i>Investigating Heterogeneous Computing at the Large Hadron Collider</i> (contributor) Internet2: Exploring Clouds for Acceleration of Science (Phase 1), \$156,000	November 2018
<i>Implement open source HEP NoSQL database</i> (contributor, 2018) FNAL Laboratory Directed Research and Development, L2016.032, \$395,000	January 2016

## Reviews

### Journal referee:

*Phys. Lett. B* (2023 - present), *JHEP* (2021 - present), *Comput. Softw. Big Sci.* (2021 - present), *Sci. Rep.* (2021 - present), *Front. Big Data* (2020 - present), *CHEP2018* proceedings (*Eur. Phys. J. Web. Conf.* 214 (2019))

### Analysis Review Committee (ARC) member: (CMS Collaboration)

“Search for long-lived particles using displaced vertices and missing transverse momentum in proton-proton collisions at  $\sqrt{s} = 13$  TeV”, arXiv:2402.15804, February 2023, submitted to *Phys. Rev. D*.

“Search for fractionally charged particles in proton-proton collisions at  $\sqrt{s} = 13$  TeV”, arXiv:2402.09932, February 2024, submitted to *Phys. Rev. Lett.*

“Development of the CMS detector for the CERN LHC Run 3”, arXiv:2309.05466, September 2023, submitted to *JINST*.

“A deep neural network to search for new long-lived particles decaying to jets”, *Mach. Learn. Sci. Tech.* 1 (2020) 035012, arXiv:1912.12238.

“A search for pair production of new light bosons decaying into muons in proton-proton collisions at 13 TeV”, *Phys. Lett. B* 796 (2019) 131, arXiv:1812.00380.

“Measurement of the production cross section for  $pp \rightarrow Z\gamma \rightarrow \nu\nu\gamma$  at 13 TeV”, CMS PAS SMP-16-004, June 2018.

### CMS Certified Language Editor (CCLE): (CMS Collaboration)

“Search for low-mass long-lived particles decaying to displaced jets in proton-proton collisions at  $\sqrt{s} = 13.6$  TeV”, CMS PAS EXO-23-013.

“Measurement of the  $t\bar{t}$  charge asymmetry in events with highly Lorentz-boosted top quarks in pp collisions at  $\sqrt{s} = 13$  TeV”, *Phys. Lett. B* 846 (2023) 137703, arXiv:2208.02751.

“HL-LHC searches for new physics in hadronic final states with boosted W bosons or top quarks using razor variables”, CMS PAS FTR-18-037.

“Search for  $t\bar{t}$  resonances at the HL-LHC and HE-LHC with the Phase-2 CMS detector”, CMS PAS FTR-18-009.

“Searches for light higgsino-like charginos and neutralinos at the HL-LHC with the Phase-2 CMS detector”, CMS PAS FTR-18-001.

“First Level Track Jet Trigger for Displaced Jets at High Luminosity LHC”, CMS PAS FTR-18-018.

### FNAL institutional review leader: (CMS Collaboration)

“Search for decays of the 125 GeV Higgs boson into a Z boson and a  $\rho$  or  $\phi$  meson”, *JHEP* 11 (2020) 039, arXiv:2007.05122.

“Azimuthal correlations for inclusive 2-jet, 3-jet, and 4-jet events in pp collisions at  $\sqrt{s} = 13$  TeV”, *Eur. Phys. J. C* 78 (2018) 566, arXiv:1712.05471.

“Search for lepton flavour violating decays of the Higgs boson to  $e\tau$  and  $e\mu$  in proton-proton collisions at  $\sqrt{s} = 8$  TeV”, *Phys. Lett. B* 763 (2016) 472, arXiv:1607.03561.

## Committees

<i>Fermilab CMS Postdoc Hiring Committee</i>	Fall 2023
<i>Fermilab Users Executive Committee</i>	October 2022 - Present
Chair, Government Relations Subcommittee	(October 2023 - Present)
Deputy Chair, Government Relations Subcommittee	(October 2022 - September 2023)
<i>Fermilab Institutional Cluster Acquisition Planning Committee</i>	January 2022 - April 2022
<i>Fermilab AI Associate Hiring Committee</i>	September 2021 - February 2022
<i>LPC Events Committee Co-chair</i>	January 2019 - December 2020
<i>Fermilab Computing Division Focus Group</i>	October 2019 - June 2020
<i>Fermilab High Velocity AI Hiring Committee</i>	Winter 2019 - 2020
<i>Fermilab Computational Physics Developer Hiring Committee</i>	Spring 2018
<i>Fermilab TARGET Program Committee</i>	Spring 2017
<i>LPC Computing Support Hiring Committee</i>	Fall 2016

**Workshops**

<i>ML4Jets 2023 (Session Chair: Super Resolution, Reweighting, and Refinement)</i>	November 2023
<i>Fast Machine Learning for Science Workshop (Session Chair: SONIC Developers Meeting)</i>	September 2023
<i>CMS Deep Dive: Fast and accurate simulation techniques (Co-chair)</i>	July 2023
<i>KITP Muon Collider Workshop (Early Career Panelist: The Path Forward)</i>	March 2023
<i>CMS ML Hackathon: FastSim (Co-chair)</i>	February 2023
<i>ML4Jets 2022 (Session Chair: Generative Models – Detector Level)</i>	November 2022
<i>FastSim Days 2022 (Co-chair)</i>	October 2022
<i>3rd Rucio Community Workshop (Local Organizer)</i>	March 2020
<i>Fall19 CMS Offline Software and Computing Week at the LPC (Local Organizer)</i>	October 2019
<i>Fast Machine Learning (Local Organizer)</i>	September 2019
<i>FastSim Days 2017 (Co-chair)</i>	February 2017
<i>Phase 2 Readiness for Physics with Full Simulation Event @ LPC (Local Organizer)</i>	October 2016
<i>HCAL DPG Event at the LPC (Local Organizer)</i>	September 2016

**Teaching**

<i>Project Advisor</i>	October 2023 - Present
University of Chicago Data Science Clinic	
Latent diffusion for particle showers	
<i>Co-director</i>	December 2023
2 <sup>nd</sup> COFI Advanced Instrumentation and Analysis Techniques School (Puerto Rico)	
Curriculum design (physics, computing, AI/ML), lecturer recruitment, logistics/organization	
<i>Facilitator</i>	June 2016 - September 2023
LPC Hands-On Advanced Tutorials (Fermilab)	
Git/GitHub/CMSSW; Docker/Apptainer; Government Outreach; Generators; Data and MC Processing; Jets	
<i>Teaching Assistant</i>	August 2020 - August 2021
OOPL C++/STL (Fermilab)	
<i>Facilitator</i>	January 2016 - January 2019
CMS Data Analysis School (Fermilab)	
Git/GitHub; Generators; B-tagging; Jets; Hadronic Supersymmetry; SUSY with Top Tagging	
<i>Graduate Teaching Assistant</i>	August 2011 - May 2012
University of Maryland	
General Physics: Mechanics and Particle Dynamics; Fundamentals of Physics II	
<i>Undergraduate Teaching Assistant</i>	August 2008 - May 2011
Rensselaer Polytechnic Institute	
Honors Physics I; Honors Physics II; Using Matlab, Maple, and Mathematica for Physics	

**Past Positions**

<i>Undergraduate Research Assistant</i>	January 2008 - August 2011
Daya Bay Experiment; Physics Department, Rensselaer Polytechnic Institute	
Supervisors: Jim Napolitano, John Cummings	
<i>Undergraduate Research Assistant</i>	January 2011 - May 2011
ATLAS Experiment; Physics Department, University at Albany	
Supervisor: Jesse Ernst	
<i>REU Student</i>	June 2010 - August 2010
CMS Experiment; Physics Department, University of Rochester	
Supervisors: Aran Garcia-Bellido, Marek Zielinski	
<i>CERN Summer Student</i>	June 2009 - August 2009
CMS Experiment, CLIC Test Facility 3; Physics Department, Northwestern University	
Supervisors: Mayda Velasco, Anne Dabrowski	

**Past Research**

- Searching for supersymmetry in the multijets plus missing energy final state.
- Supervised and consulted on HCAL radiation damage studies in simulation and collision data.
- Leading developer for HCAL Phase 1 software upgrades and electronics simulation.
- Co-developed HGCal reconstruction, with improved computing performance, using Pandora particle flow algorithm.
- Searched for third-generation scalar leptoquarks and R-parity violating top squarks in 8 TeV data.
- Returned and improved CMS hadronic fast simulation.
- Developed standalone simulation for Phase 2 calorimeter upgrade designs.
- Studied radiation hardness and light yield of organic scintillators.

- Commissioned transmissometer to measure attenuation length of ultra-pure water for Daya Bay muon veto system.
- Documented and developed TriggerFish software for fast estimates of ATLAS trigger rates.
- Studied jet response and resolution in first CMS data.