Javier M. Duarte
Department of Physics, 0319
University of California San Diego
9500 Gilman Drive
La Jolla, CA 92093-0319

office: Mayer Hall Addition 5513
email: jduarte@ucsd.edu
web: https://jduarte.physics.ucsd.edu
phone: (858) 246-4980

Education

Ph.D. Physics, California Institute of Technology 2016
Thesis: Naturalness confronts nature: Searches for supersymmetry with the CMS detector in pp collisions at $\sqrt{s}$ = 8 and 13 TeV
Advisor: Maria Spiropulu

M.S. Physics, California Institute of Technology 2015

S.B. Physics and Mathematics, Massachusetts Institute of Technology 2010
Thesis: Exotic antineutrino oscillations ($\bar{\nu}_e \to \bar{\nu}_{\not e}$) in Double Chooz
Advisor: Janet Conrad

Professional Experience

Associate Professor of Physics at UC San Diego, La Jolla, CA 2023–Present
Assistant Professor of Physics at UC San Diego, La Jolla, CA 2019–2023
Lederman Fellow at Fermilab, Batavia, IL 2016–2019
Technical Instructor in Junior Lab at MIT, Cambridge, MA 2010–2011

Fellowships and Awards

- Breakthrough Prize in Fundamental Physics (awarded to co-authors of CERN LHC Run-2 publications at ATLAS, CMS, ALICE, and LHCb) (2025)
- American Physical Society Henry Primakoff Award for Early-Career Particle Physics (2024)
- UCSD Inclusive Excellence Award (2023)
- Sloan Research Fellowship (2023)
- Research Corporation For Science Advancement Cottrell Scholar Award (2023)
- UCSD Undergraduate Research Hub Outstanding Mentor Award (2021)
- DOE Early Career Award (2020)
- William A. Lee Chancellor's Endowed Junior Faculty Fellowship II (2019–Present)
- LHC Physics Center Distinguished Researcher (2019)
- Fermilab Lederman Fellowship (2016–2019)
- NSF Graduate Research Fellowship (2011–2014)
- Gates Millenium Scholar sponsored by Hispanic Scholarship Fund (2006–2014)

Grants and External Funding

- Key Personnel for DOE Award UCSD Experimental and Theoretical Particle Physics (2024–2028).
- Co-PI of PREP: Advancing Research and Education in AI/ML for Science (AREAS) (2024–2027).
- Lead PI of RCSA Cottrell Scholars Collaborative Hidden Figures in Physics and Astonomy (2023–2025).
- PI of Sloan Research Fellowship (2023–2025).

- PI of RCSA Cottrell Scholar Award Building a Better Foundation: Teaching Physicists and Machines How to Learn from Data (2023–2026).
- Key Personnel for DOE Award U.S. CMS SPRINT—A Scholar Program for Research INTernship (2023–2026).
- Key Personnel for DOE Award Western Advanced Training for Computational High-Energy Physics (WATCHEP) (2022–2027).
- Key Personnel and Institute PI for NSF HDR Institute for Accelerated AI Algorithms for Data Driven Discovery (A3D3) (2021–2026).
- Key Personnel for DOE Award for HEP Consortium for Advanced Training (HEPCAT) (2021–2024).
- Co-PI for DOE Award for Real-time Data Reduction Codesign at the Extreme Edge for Science (2021–2024).
- PI of DOE Early Career Award for Real-Time Artificial Intelligence for Particle Reconstruction and Higgs Physics (2020–2025).
- Co-PI of DOE Award for FAIR Framework for Physics-Inspired Artificial Intelligence in High Energy Physics (2020–2023).
- Co-PI of NSF Award for Exploring Neural Network Processors for AI in Science and Engineering (2020–2021).
- Key Personnel for Investigating Heterogeneous Computing at the Large Hadron Collider Phase-II sub-award of Internet2 NSF Grant Exploring Clouds for Acceleration of Science (E-CAS) (2020-2021).
- DOE QuantISED Award Quantum Machine Learning and Quantum Computation Frameworks for HEP (QMLQCF) (2018–2020).
- Fermilab LDRD Award for Graph Neural Networks for Accelerating Calorimetry and Event Reconstruction (2019–2021).
- Fermilab LDRD Award for Accelerator Control with Artificial Intelligence (2019–2021).

Selected Research Experience

Higgs Boson Measurements & Combinations

- Co-convener of CMS Higgs $b\bar{b}$ / $c\bar{c}$ subgroup (2025–2027).
- Co-author of CMS search for triple Higgs boson production in the six bottom quark final state [11].
- Author of CMS search for boosted Higgs bosons decaying to two W bosons merged in a single jet [23].
- Author of CMS searches for boosted Higgs boson pair production in the four bottom quark final state [9, 74], all-hadronic $b\bar{b}VV$ final state [18, 34], and CMS statistical combination of Higgs boson pair searches [8, 68] using full Run 2 data (2020–Present).
- Lead author of search for a highly boosted Higgs boson decaying to a bottom quark-antiquark pair using full Run 2 data [107] and contributions to the charm quark-antiquark search [53] and dedicated vector boson fusion search [28] (2017–Present).
- Co-author of first search for a highly boosted Higgs boson decaying to a bottom quark-antiquark pair using 2016 data, published in *Phys. Rev. Lett.* [131]; Adapted analysis for interpretation for differential gluon fusion Higgs boson p_T measurement [123]; Combination of this result with other channels led to an observation of $H(b\bar{b})$ decay [125] and other measurements [122] (2016–2018).

- Level-1 and high-level (software) trigger development for Higgs decaying to bottom quark-antiquark pairs produced in association with a Z boson decaying to neutrinos [125] (2016–2017).

Exotic Long-lived Particle and Dijet Searches

- Supervision of students and postdoctoral researchers performing searches for long-lived particles [3, 35, 44, 54, 82, 91] (2019–Present).
- Co-convener of CMS Exotica Jets+X subgroup (2018–2020).
- Co-leader of analysis group searching for exotic, light spin-1 and spin-0 particles decaying to quarks [119, 120, 124, 132] (2017–2019).
- Co-leader of dijet resonance search group, including data scouting, wide resonance, and b-tagged resonance searches [24, 111, 113, 126–128, 133] (2016–2018).

Novel Machine Learning Algorithms for Physics

- Particle Data Group author responsible for review on machine learning [2] (2024–Present).
- Transformers for highly granular large-radius jet classification [15, 38] (2023–Present).
- Symmetry-preserving attention networks for boosted and resolved multi-Higgs-boson event reconstruction [6] (2022–Present).
- Co-author of reviews and book chapters on machine learning for high energy physics [27, 29, 31, 65, 75, 78] (2020–Present).
- Symbolic regression to find parametric functions to model binned distributions in high energy physics [20] (2024–Present).
- Co-convener of CMS Machine Learning Group (2023–2025).
- Self-supervised learning strategies for foundation models in high energy physics [14, 26, 30] (2023–Present).
- Development of frameworks for sharing findable, accessible, interoperable, and reusable (FAIR) data and models in high energy physics [47, 50, 52, 83] (2020–Present).
- Development of anomaly detection algorithms for new physics searches [13, 32, 49, 55, 84–86, 90, 92, 109] (2019–Present).
- Development of graph neural networks [31, 78] and transformers for particle-flow reconstruction [16, 22, 41, 59, 64, 80, 95, 100], including explainable AI techniques [62, 87], and charged particle tracking [51, 77, 93, 104] (2019–Present).
- Supervision of students developing generative adversarial networks and autoencoders for fast sparse data generation in high energy physics [48, 57, 71, 89, 99, 106] (2019–Present).
- Contributor to the Snowmass 2022 Community Planning Exercise, including white papers on machine learning for Higgs boson pair production [76], graph neural networks [79], fast machine learning [81], and data science and machine learning in physics education [69]; Co-convenor of the CompF04 subgroup on AI Hardware [58] and contributor to EF01/EF02 Higgs Boson [66], CompF03 Machine Learning [67], and Muon Collider reports [42].
- Studies of quantum machine learning and quantum computation frameworks for high energy physics, including charged particle tracking [94] (2018–Present).
- Development of deep neural networks for identifying boosted Higgs bosons decaying to $b\bar{b}$ and $c\bar{c}$ for the CMS experiment and beyond [63, 110, 115, 117, 130] (2017–Present).

Fast Machine Learning Inference for Physics

- Supervision of students developing tools for fault-tolerant edge neural networks [33, 40] (2023–Present).

- Neural architecture codesign [4, 17, 60] and surrogate models for fast resource esimtation [5] (2023–Present).
- Efficient and interpretable transformers for charged particle tracking [10, 39] and jet tagging [7, 12, 25] (2023–Present).
- Set- and graph-based neural networks for jet tagging on FPGAs in the level-1 trigger [36] (2022–Present).
- Supervision of postdoctoral researchers and students developing an ASIC-based encoder for data compression in the CMS HGCAL [97] and improving its training via a differentiable Earth mover's distance [46] (2020–Present).
- Fast machine learning scientific benchmarks [70] (2022–Present).
- Development of Quantized ONNX (QONNX) framework for representing arbitrary-precision neural networks [73] (2022–Present).
- Real-time AI on FPGAs for accelerator control [96] (2018–2021).
- Development of `hls4ml` for scientific low-power machine learning devices [1, 37, 45, 61, 72, 88, 97, 98, 102] (2020–Present).
- Development of Services for Optimal Network Inference on Coprocessors (SONIC) [19, 21, 43, 56, 101, 108, 116, 121] (2018–Present).
- Creation of `hls4ml` tool for creating low-latency FPGA-based firmware implementations of machine learning algorithms [75, 77, 84, 103–105, 112, 118, 129] (2017–Present).
- R&D, including firmware development and hardware demonstration, for the CMS Global Correlator Trigger for the Phase-2 upgrade of the Level-1 trigger [114] (2017–Present).

Selected Publications, Reviews, Reports, Book Chapters, and Conference Proceedings

Selected publications, reviews, reports, book chapters, and conference proceedings to which I made a substantial contribution are listed here.

[1] J.-F. Schulte et al., "hls4ml: A Flexible, Open-Source Platform for Deep Learning Acceleration on Reconfigurable Hardware", (2025), arXiv:2512.01463, Accepted by *ACM Trans. Reconfigurable Technol. Syst.*

[2] J. Duarte and U. Seljak and K. Terao,"Machine Learning", Ch. 41 in Particle Data Group et al., "Review of particle physics", (2025), arXiv:2512.11133, https://pdg.lbl.gov/2025/reviews/rpp2025-rev-machine-learning.pdf.

[3] CMS Collaboration, "Search for b hadron decays to long-lived particles in the CMS endcap muon detectors", (2025), arXiv:2508.06363, Accepted by *Phys. Rev. D*.

[4] J. Weitz et al., "Surrogate Neural Architecture Codesign Package (SNAC-Pack)", in 8th Machine Learning and the Physical Sciences Workshop at the 39th Annual Conference on Neural Information Processing Systems (Dec. 2025), arXiv:2512.15998.

[5] B. Hawks et al., "wa-hls4ml: A Benchmark and Surrogate Models for hls4ml Resource and Latency Estimation", (2025), arXiv:2511.05615, Accepted by *ACM Trans. Reconfigurable Technol. Syst.*

[6] H. Li et al., "Reconstruction of boosted and resolved multi-Higgs-boson events with symmetry-preserving attention networks", J. High Energy Phys. **11**, 119 (2025), doi:10.1007/JHEP11(2025)119, arXiv:2412.03819.

[7] T. Legge et al., "Why Is Attention Sparse In Particle Transformer?", in 8th Machine Learning and the Physical Sciences Workshop at the 39th Conference on Neural Information Processing Systems (Nov. 2025), arXiv:2512.00210, https://ml4physicalsciences.github.io/2025/files/NeurIPS_ML4PS_2025_238.pdf.

[8] CMS Collaboration, "Combination of searches for nonresonant Higgs boson pair production in proton-proton collisions at $\sqrt{s} = 13$ TeV", (2025), arXiv:2510.07527, Submitted to *J. Phys. G*.

[9] CMS Collaboration, *Improved results on Higgs boson pair production in the 4b final state*, CMS Physics Analysis Summary CMS-PAS-HIG-24-010 (Oct. 2025), https://cds.cern.ch/record/2947325.

[10] S. Govil et al., "Locality-Sensitive Hashing-Based Efficient Point Transformer for Charged Particle Reconstruction", in 8th Machine Learning and the Physical Sciences Workshop at the 39th Conference on Neural Information Processing Systems (Oct. 2025), arXiv:2510.07594.

[11] CMS Collaboration, *Search for nonresonant triple Higgs boson production in the six b-quark final state in proton-proton collisions at 13 TeV*, CMS Physics Analysis Summary CMS-PAS-HIG-24-012 (Oct. 2025), https://cds.cern.ch/record/2945361.

[12] A. Wang et al., "Spatially Aware Linear Transformer (SAL-T) for Particle Jet Tagging", (2025), arXiv:2510.23641.

[13] CMS Collaboration, *Anomaly detection with AXOL1TL at the CMS Level-1 Trigger in 2024 and 2025*, CMS Detector Performance Note CMS-DP-2025-061 (Sept. 2025), https://cds.cern.ch/record/2942560.

[14] Z. Hao et al., "RINO: Renormalization Group Invariance with No Labels", in 8th Machine Learning and the Physical Sciences Workshop at the 39th Conference on Neural Information Processing Systems (Sept. 2025), arXiv:2509.07486.

[15] CMS Collaboration, *Particle transformers for identifying Lorentz-boosted Higgs bosons decaying to a pair of W bosons*, CMS Physics Analysis Summary CMS-PAS-JME-25-001 (Aug. 2025), https://cds.cern.ch/record/2939451.

[16] CMS Collaboration, *Machine-Learned Particle-Flow Reconstruction with Transformer Models in CMS*, CMS Detector Performance Note CMS-DP-2025-033 (July 2025), https://cds.cern.ch/record/2937578.

[17] J. Weitz et al., "Neural architecture codesign for fast physics applications", Mach. Learn.: Sci. Technol. **6**, 035009 (2025), doi:10.1088/2632-2153/adede1, arXiv:2501.05515.

[18] CMS Collaboration, *Search for heavy scalar resonances decaying to a Higgs and a Higgs-like boson in the Lorentz-boosted $b\bar{b}4q$ final state*, CMS Physics Analysis Summary CMS-PAS-B2G-23-007 (July 2025), https://cds.cern.ch/record/2938006.

[19] D. Kondratyev et al., "SuperSONIC: Cloud-Native Infrastructure for ML Inferencing", in Practice and Experience in Advanced Research Computing (July 2025), doi:10.1145/3708035.3736049, arXiv:2506.20657.

[20] H. F. Tsoi et al., "SymbolFit: Automatic Parametric Modeling with Symbolic Regression", Comput. Softw. Big Sci. **9**, 12 (2025), doi:10.1007/s41781-025-00140-9, arXiv:2411.09851.

[21] H. Zhao et al., "Track reconstruction as a service for collider physics", J. Instrum. **20**, P06002 (2025), doi:10.1088/1748-0221/20/06/P06002, arXiv:2501.05520.

[22] F. Mokhtar et al., "Fine-tuning machine-learned particle-flow reconstruction for new detector geometries in future colliders", Phys. Rev. D **111**, 092015 (2025), doi:10.1103/PhysRevD.111.092015, arXiv:2503.00131.

[23] CMS Collaboration, *Search for Higgs boson production at high transverse momentum in the WW^* decay channel in proton-proton collisions at $\sqrt{s} = 13$ TeV*, CMS Physics Analysis Summary CMS-PAS-HIG-24-008 (May 2025), https://cds.cern.ch/record/2932358.

[24] CMS Collaboration, "Enriching the Physics Program of the CMS Experiment via Data Scouting and Data Parking", Phys. Rept. **1115**, 678 (2025), doi:10.1016/j.physrep.2024.09.006, arXiv:2403.16134.

[25] A. Wang et al., "Interpreting and Accelerating Transformers for Jet Tagging", in 7th Machine Learning and the Physical Sciences Workshop at the 38th Conference on Neural Information Processing Systems (Dec. 2024), arXiv:2412.03673, https://ml4physicalsciences.github.io/2024/files/NeurIPS_ML4PS_2024_189.pdf.

[26] S. Katel et al., "Learning Symmetry-Independent Jet Representations via Jet-Based Joint Embedding Predictive Architecture", in 7th Machine Learning and the Physical Sciences Workshop at the 38th Conference on Neural Information Processing Systems (Dec. 2024), arXiv:2412.05333, https://ml4physicalsciences.github.io/2024/files/NeurIPS_ML4PS_2024_222.pdf.

[27] J. Duarte et al., "Machine learning for analysis and instrumentation in high energy physics", in *Instrumentation and Techniques in High Energy Physics*, edited by D. Lincoln (World Scientific, Dec. 2024), p. 125, doi:10.1142/9789819801107_0005.

[28] CMS Collaboration, "Measurement of boosted Higgs bosons produced via vector boson fusion or gluon fusion in the $H \to b\bar{b}$ decay mode using LHC proton-proton collision data at $\sqrt{s} = 13$ TeV", J. High Energy Phys. **12**, 035 (2024), doi:10.1007/JHEP12(2024)035, arXiv:2407.08012.

[29] J. M. Duarte, "Novel machine learning applications at the LHC", in 42nd International Conference on High Energy Physics (Sept. 2024), doi:10.22323/1.476.0012, arXiv:2409.20413.

[30] Z. Zhao et al., "Large-Scale Pretraining and Finetuning for Efficient Jet Classification in Particle Physics", in 22nd International Workshop on Advanced Computing and Analysis Techniques in Physics Research (Aug. 2024), arXiv:2408.09343.

[31] E. Chien et al., "Opportunities and challenges of graph neural networks in electrical engineering", Nat. Rev. Electr. Eng. **1**, 529 (2024), doi:10.1038/s44287-024-00076-z.

[32] CMS Collaboration, *2024 Data Collected with AXOL1TL Anomaly Detection at the CMS Level-1 Trigger*, CMS Detector Performance Note CMS-DP-2024-059 (July 2024), https://cds.cern.ch/record/2904695.

[33] O. Weng et al., "FKeras: a sensitivity analysis tool for edge neural networks", ACM J. Auton. Transport. Syst. **1** (2024), doi:10.1145/3665334.

[34] CMS Collaboration, *Search for highly energetic double Higgs boson production in the two bottom quark and two vector boson all-hadronic final state*, CMS Physics Analysis Summary CMS-PAS-HIG-23-012 (July 2024), https://cds.cern.ch/record/2904879.

[35] CMS Collaboration, "Search for long-lived heavy neutral leptons decaying in the CMS muon detectors in proton-proton collisions at $\sqrt{s} = 13$ TeV", Phys. Rev. D **110**, 012004 (2024), doi:10.1103/PhysRevD.110.012004, arXiv:2402.18658.

[36] P. Odagiu et al., "Ultrafast jet classification on FPGAs for HL-LHC", Mach. Learn.: Sci. Technol. **5**, 035017 (2024), doi:10.1088/2632-2153/ad5f10, arXiv:2402.01876.

[37] J. Campos et al., "End-to-end codesign of Hessian-aware quantized neural networks for FPGAs", ACM Trans. Reconfigurable Technol. Syst. **17** (2024), doi:10.1145/3662000, arXiv:2304.06745.

[38] C. Li et al., "Accelerating Resonance Searches via Signature-Oriented Pre-training", (2024), arXiv:2405.12972.

[39] S. Miao et al., "Locality-Sensitive Hashing-Based Efficient Point Transformer with Applications in High-Energy Physics", in 41st International Conference on Machine Learning, Vol. 235 (May 2024), p. 35546, arXiv:2402.12535, https://proceedings.mlr.press/v235/miao24b.html.

[40] T. Baldi et al., "Reliable edge machine learning hardware for scientific applications", in 2024 IEEE 42nd VLSI Test Symposium (VTS) (May 2024), p. 1, doi:10.1109/VTS60656.2024.10538639, arXiv:2406.19522.

[41] J. Pata et al., "Improved particle-flow event reconstruction with scalable neural networks for current and future particle detectors", Commun. Phys. **7**, 124 (2024), doi:10.1038/s42005-024-01599-5, arXiv:2309.06782.

[42] K. M. Black et al., "Muon Collider Forum Report", J. Instrum. **19**, T02015 (2024), doi:10.1088/1748-0221/19/02/T02015, arXiv:2209.01318.

[43] CMS Collaboration, "Portable acceleration of CMS computing workflows with coprocessors as a service", Comput. Softw. Big Sci. **8**, 17 (2024), doi:10.1007/s41781-024-00124-1, arXiv:2402.15366.

[44] CMS Collaboration, "Search for long-lived particles decaying in the CMS muon detectors in proton-proton collisions at $\sqrt{s} = 13\,\text{TeV}$", Phys. Rev. D **110**, 032007 (2024), doi:10.1103/PhysRevD.110.032007, arXiv:2402.01898.

[45] O. Weng et al., "Tailor: Altering skip connections for resource-efficient inference", ACM Trans. Reconfigurable Technol. Syst. (2024), doi:10.1145/3624990, arXiv:2301.07247.

[46] R. Shenoy et al., "Differentiable Earth Mover's Distance for Data Compression at the High-Luminosity LHC", Mach. Learn.: Sci. Technol. **4**, 045058 (2023), doi:10.1088/2632-2153/ad1139, arXiv:2306.04712.

[47] J. Duarte et al., "FAIR AI Models in High Energy Physics", Mach. Learn.: Sci. Technol. **4**, 045062 (2023), doi:10.1088/2632-2153/ad12e3, arXiv:2212.05081.

[48] A. Li et al., "Induced Generative Adversarial Particle Transformers", in 6th Machine Learning and the Physical Sciences Workshop at the 37th Conference on Neural Information Processing Systems (Dec. 2023), arXiv:2312.04757, https://ml4physicalsciences.github.io/2023/files/NeurIPS_ML4PS_2023_213.pdf.

[49] CMS Collaboration, *Anomaly Detection in the CMS Global Trigger Test Crate for Run 3*, CMS Detector Performance Note CMS-DP-2023-079 (Oct. 2023), https://cds.cern.ch/record/2876546.

[50] R. Kansal et al., "JetNet: A Python package for accessing open datasets and benchmarking machine learning methods in high energy physics", J. Open Source Softw. **8**, 5789 (2023), doi:10.21105/joss.05789.

[51] S.-Y. Huang et al., "Low Latency Edge Classification GNN for Particle Trajectory Tracking on FPGAs", in 33rd International Conference on Field-Programmable Logic and Applications (Sept. 2023), p. 294, doi:10.1109/FPL60245.2023.00050, arXiv:2306.11330.

[52] E. A. Huerta et al., "FAIR for AI: an interdisciplinary and international community building perspective", Sci. Data **10**, 487 (2023), doi:10.1038/s41597-023-02298-6, arXiv:2210.08973.

[53] CMS Collaboration, "Search for higgs boson and observation of Z boson through their decay into a charm quark-antiquark pair in boosted topologies in proton-proton collisions at $\sqrt{s} = 13\,\text{TeV}$", Phys. Rev. Lett. **131**, 041801 (2023), doi:10.1103/PhysRevLett.131.041801, arXiv:2211.14181.

[54] CMS Collaboration, "Search for long-lived particles using out-of-time trackless jets in proton-proton collisions at $\sqrt{s} = 13\,\text{TeV}$", J. High Energy Phys. **07**, 210 (2023), doi:10.1007/JHEP07(2023)210, arXiv:2212.06695.

[55] Z. Hao et al., "Lorentz group equivariant autoencoders", Eur. Phys. J. C **83**, 485 (2023), doi:10.1140/epjc/s10052-023-11633-5, arXiv:2212.07347.

[56] CMS Collaboration, *Portable Acceleration of CMS Mini-AOD Production with Coprocessors as a Service*, CMS Detector Performance Note CMS-DP-2023-037 (June 2023), https://cds.cern.ch/record/2863316.

[57] R. Kansal et al., "Evaluating generative models in high energy physics", Phys. Rev. D **107**, 076017 (2023), doi:10.1103/PhysRevD.107.076017, arXiv:2211.10295.

[58] W. Bhimij et al., "Snowmass 2021 Computational Frontier CompF4 Topical Group Report Storage and Processing Resource Access", Comput. Softw. Big Sci. **7**, 5 (2023), doi:10.1007/s41781-023-00097-7, arXiv:2209.08868.

[59] F. Mokhtar et al., "Progress towards an improved particle flow algorithm at CMS with machine learning", in 21st International Workshop on Advanced Computing and Analysis Techniques in Physics Research (Mar. 2023), arXiv:2303.17657.

[60] L. McDermott et al., "Neural architecture codesign for fast Bragg peak analysis", in 3rd AAAI Workshop on AI to Accelerate Science and Engineering (AI2ASE) (2023), arXiv:2312.05978, https://ai-2-ase.github.io/papers/18%5cCameraReady%5cAAAI_Accelerating_Science_2.pdf.

[61] S. Hussain et al., "FastStamp: accelerating neural steganography and digital watermarking of images on FPGAs", in Proceedings of the 41st IEEE/ACM International Conference on Computer-Aided Design (Dec. 2022), p. 1, doi:10.1145/3508352.3549357, arXiv:2209.12391.

[62] F. Mokhtar et al., "Do graph neural networks learn traditional jet substructure?", in 5th Machine Learning and the Physical Sciences Workshop at the 36th Conference on Neural Information Processing Systems (Nov. 2022), arXiv:2211.09912, https://ml4physicalsciences.github.io/2022/files/NeurIPS_ML4PS_2022_57.pdf.

[63] CMS Collaboration, *Performance of the mass-decorrelated DeepDoubleX classifier for double-b and double-c large-radius jets with the CMS detector*, CMS Detector Performance Note CMS-DP-2022-041 (Nov. 2022), https://cds.cern.ch/record/2839736.

[64] CMS Collaboration, *Progress towards an improved particle flow algorithm at CMS with machine learning*, CMS Detector Performance Note CMS-DP-2022-061 (Nov. 2022), https://cds.cern.ch/record/2842375.

[65] J. Duarte et al., "Editorial: Efficient AI in particle physics and astrophysics", Front. AI **5**, 999173 (2022), doi:10.3389/frai.2022.999173.

[66] S. Dawson et al., "Report of the Topical Group on Higgs Physics for Snowmass 2021: The Case for Precision Higgs Physics", in 2022 Snowmass Summer Study (Sept. 2022), arXiv:2209.07510.

[67] P. Shanahan et al., "Snowmass 2021 Computational Frontier CompF03 Topical Group Report: Machine Learning", in 2022 Snowmass Summer Study (Sept. 2022), arXiv:2209.07559.

[68] CMS Collaboration, "A portrait of the Higgs boson by the CMS experiment ten years after the discovery", Nature **607**, 60 (2022), doi:10.1038/s41586-022-04892-x, arXiv:2207.00043, [Erratum: Nature 623, E4 (2023)].

[69] G. Benelli et al., "Data Science and Machine Learning in Education", in 2022 Snowmass Summer Study (July 2022), arXiv:2207.09060.

[70] J. Duarte et al., "FastML Science Benchmarks: Accelerating Real-Time Scientific Edge Machine Learning", in 3rd Workshop on Benchmarking Machine Learning Workloads on Emerging Hardware (MLBench) at 5th Conference on Machine Learning and Systems (MLSys) (July 2022), arXiv:2207.07958.

[71] M. Touranakou et al., "Particle-based fast jet simulation at the LHC with variational autoencoders", Mach. Learn.: Sci. Technol. **3**, 035003 (2022), doi:10.1088/2632-2153/ac7c56, arXiv:2203.00520.

[72] H. Borras et al., "Open-source FPGA-ML codesign for the MLPerf Tiny Benchmark", in 3rd Workshop on Benchmarking Machine Learning Workloads on Emerging Hardware (MLBench) at 5th Conference on Machine Learning and Systems (MLSys) (June 2022), arXiv:2206.11791.

[73] A. Pappalardo et al., "QONNX: Representing arbitrary-precision quantized neural networks", in 4th Workshop on Accelerated Machine Learning at the High-performance Embedded Architecture and Compilation 2022 Conference (June 2022), arXiv:2206.07527, https://accml.dcs.gla.ac.uk/papers/2022/4thAccML_paper_1(12).pdf.

[74] CMS Collaboration, "Search for nonresonant pair production of highly energetic Higgs bosons decaying to bottom quarks", Phys. Rev. Lett. **131**, 041803 (2023), doi:10.1103/PhysRevLett.131.041803, arXiv:2205.06667.

[75] A. M. Deiana et al., "Applications and techniques for fast machine learning in science", Front. Big Data **5**, 787421 (2022), doi:10.3389/fdata.2022.787421, arXiv:2110.13041.

[76] A. Apresyan et al., "Improving Di-Higgs Sensitivity at Future Colliders in Hadronic Final States with Machine Learning", in 2022 Snowmass Summer Study (Apr. 2022), arXiv:2203.07353.

[77] A. Elabd et al., "Graph neural networks for charged particle tracking on FPGAs", Front. Big Data **5** (2022), doi:10.3389/fdata.2022.828666, arXiv:2112.02048.

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Teaching

Computational Physics

- Instructor for Physics 141/241: Computational Physics I: Probabilistic Models and Simulations (Spring 2023, Winter 2022).
- Instructor for Physics 142/242: Computational Physics II: PDE and Matrix Models (Winter 2025, Winter 2024, Spring 2022).

Machine Learning & Data Science

- Creator of and instructor for Physics 139/239: Machine Learning in Physics (Fall 2025, Spring 2024, Winter 2023).
- Lecturer at SLAC Summer Instiute (Summer 2023).
- Lecturer at US ATLAS Machine Learning Training (Summer 2023).
- NSF IAIFI Ph.D. Summer School Lecturer on "Representations, networks, and symmetries for learning from particle physics data" and "Model compression and fast machine learning in particle physics" (Summer 2022).
- Particle physics domain mentor for data science capstone DSC 180AB (Fall 2020, Winter 2021, Fall 2021, Winter 2022).
- Guest speaker for Purdue Physics 324: Big Data Science II (Spring 2021)
- Guest speaker for MIT 8.S50: Computational Data Science in Physics (Winter 2021).
- Creator of the LHC Physics Center Machine Learning Tutorial (2017–2020).

Computer Science & Engineering

- Guest speaker for CSE 237C: Validation and Testing of Embedded Systems (Fall 2020, Fall 2021, Fall 2022, Fall 2023).

Particle Physics

- Creator of a HEPCAT Lab Module on ML/AI on FPGAs (Summer 2023).
- Co-instructor for Physics 239: Modern Collider Physics (Spring 2023).
- UCSD instructor of record for Physics 239: Statistics in Particle Physics at the LPC [Primary instructor: Harrison Prosper, Florida State University] (Fall 2021).

Introductory Physics

- Lead instructor for Physics 2C: Fluids, Waves, Thermodynamics, and Optics for 300+ undergraduate students (Winter 2020, Winter 2021, Spring 2021).
- Teaching assistant in statistical and quantum mechanics at Caltech (2011–2012).

Seminar Courses

- Organizer of Physics 191: Undergraduate Seminar on Physics (Fall 2020) and guest speaker (Fall 2019).
- Guest speaker for Physics 261: Seminar on Physics Research at UC San Diego (Winter 2020, Winter 2021).
- Guest speaker for Thurgood Marshall College 2: Transfer Year Experience. (Fall 2021).
- Facilitator for Taking Research into Your Classroom Workshop at Waubonsee Comunity College (2017).

Physics Lab

- Technical Instructor in MIT Junior Lab, teaching third-year undergraduate physics students and maintaining the experiments (2010–2011).

Outreach

Community Outreach

- Exhibitor for UC San Diego Physics and Duarte Lab at the Barrio Logan Science & Art Expo and Souteast Science & Art Expo (2022–2024).
- Presenter at "Career Exploration Event" at SAY San Diego Teen Leadership Connections Camp at Lincoln High School on Tuesday, July 18 (2023).
- Speaker at "Meet a US CMS Professor" for US CMS Internship Program on Wednesday, August 10 (2022).
- Panelist on "Careers in STEM Teaching and Research in Higher Education Panel" for UC San Diego Physical Sciences Division Student Success Center on Monday, November 15 (2021).
- Invited faculty speaker at UC San Diego Physics Graduate Student Diversity Initiative Grad Recruitment Fair on Saturday, October 23 (2021).
- Speaker on "Undergraduate and graduate research opportunities" at UC San Diego SACNAS Chapter's Community College Workshop on Saturday, November 21 (2020).
- Invited faculty speaker for Young Physicists Program at UC San Diego (2020, 2022).
- Co-director of Saturday Morning Physics and lectuer on Symmetry, Antimatter, and Supersymmetry at Fermilab (2018–2019).
- On-site coordinator for Saturday Morning Physics at Fermilab (2016–2018).

Mentoring

- Mentor for STEMULATE Community College Research Program (2024).
- Mentor for Cal-Bridge program (2021–Present).
- Mentor for APS National Mentoring Community (2021–Present).
- Mentor for ENLACE binational summer research program (2021–2023).
- Mentor for U.S. CMS Mentorship Program (2020–2022).

Advocacy

- U.S. LHC Users Association Annual Trip to U.S. Congress (2017, 2021).

Diversity Programs

- Co-chair of local organizing committee for APS Conference on Undergraduate Women and Gender Minorities in Physics (CU*iP) at UC San Diego (2023–2025).
- UC San Diego Physics representative for the Mentoring Project (2024–Present).
- PATHS Scholar Program Faculty Advocate (2022–Present).
- Creator and coordinator of A3D3 Postbaccalaureate Fellowship Program (2021–Present).
- UC San Diego Physics Department Equity, Diversity, and Inclusion Committee member (2020–2023).
- Faculty advisor for UC San Diego SACNAS Chapter (2022–Present).
- Coordinator of A3D3 NSF Institute Equity & Career Committee (2022–Present).
- US CMS Collaboration Diversity, Equity, and Inclusion Committee (2022–2024).
- Faculty advisor for UC San Diego Physics Department Graduate Student Diversity Initiative (2021).
- Mentor in the SIST internship program at Fermilab (2018)
- Graduate student ambassador for the Fermilab SHPE chapter (2018).

- Member of the TARGET program committee at Fermilab (2017–2019).
- Residential Facilitator for MIT Interphase EDGE program (2010).

Selected Conference, Workshop, and Seminar Presentations

- Progress on AI-based jet tagging Machine Learning for Jets (ML4Jets) 2025. August 18, 2025. Caltech, Pasadena, CA, USA.
- Machine Learning Topics in A3D3. A3D3 All-Hands Meeting. August 16, 2025. Caltech, Pasadena, CA, USA.
- hls4ml and friends: Tools for ML in trigger and DAQ. ML4FE Workshop. May 19, 2025. University of Hawaii, Honolulu, HI, USA.
- From collisions to discoveries with machine learning at the energy frontier. Physics Colloquium. January 30, 2025. Caltech, Pasadena, CA, USA.
- Machine learning opportunities for the next generation of particle physics. 41st International Conference on Machine Learning. July 24, 2024. Vienna, Austria.
- Novel ML technique applications. 42nd International Conference on High Energy Physics. July 23, 2024. Prague, Czech Republic.
- Exploring Higgs bosons at high energies: From jets as graphs to fast machine learning on FPGAs. Fundamental Physics Directorate Seminar. May 21, 2024. SLAC, Menlo Park, CA, USA.
- Exploring Higgs bosons at high energies: From jets as graphs to fast machine learning on FPGAs. APS April Meeting. Session F10: Narain, Primakoff and Sakurai Prize Session. April 4, 2024. Sacramento, CA, USA.
- Exploring Higgs bosons at high energies: From jets as graphs to fast machine learning on FPGAs. Frederica Darema Lecture Series. April 1, 2024. UC Davis, Davis, CA, USA.
- Machine learning at the edge of particle physics. IAIFI Summer Workshop. August 14, 2023. Northeastern University, Boston, MA, USA.
- Machine learning summary: From concept to practice. 15th International Workshop on Boosted Object Phenomenology, Reconstruction, Measurements, and Searches at Colliders. August 4, 2023. Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
- Building a better foundation: Teaching physicists and machines how to learn from data. Cottrell Scholar Conference. July 19, 2023. Tucson, AZ, USA.
- Machine learning for triggering. Aspen Winter Conference: Prospecting for New Physics through Flavor, Dark Matter, and Machine Learning. March 28, 2023. Aspen Center for Physics, Aspen, CO, USA.
- Recent advances in machine learning for high energy physics. Dark Interactions: New Perspectives from Theory and Experiment. November 16, 2022.
- Measuring Higgs bosons using artificial intelligence. Physics Department Colloquium. November 3, 2022. University of California San Diego, La Jolla, CA, USA.
- Measuring Higgs bosons using artificial intelligence. The Human Side of Science Lecture Series. November 1, 2022. University of San Diego, San Diego, CA, USA.
- Model compression and fast machine learning in particle physics. IAIFI Summer School. August 2, 2022. Tufts University, MA, USA.
- Representations, networks, and symmetries for learning from particle physics data. IAIFI Summer School. August 1, 2022. Tufts University, Medford, MA, USA.
- CompF3: ML for Data Analysis Summary. Community Summer Study Snowmass 2022. July 19, 2022. University of Washington, Seattle, WA, USA.

- CompF4: AI-Hardware Summary. Community Summer Study Snowmass 2022. July 19, 2022. University of Washington, Seattle, WA, USA.
- A3D3 Postbaccalaureate Fellowship Program. Community Summer Study Snowmass 2022. July 18, 2022. University of Washington, Seattle, WA, USA.
- Enabling the Higgs self-coupling measurement with highly energetic Higgs pairs in CMS. Joint Experimental-Theoretical Physics Seminar (Wine & Cheese). June 3, 2022. Fermilab, Batavia, IL, USA.
- Accelerated Graph Neural Network Inference. Mini-workshop on Graph Neural Networks for Tracking Colocated with Connecting the Dots 2022. June 3, 2022.
- Fast Machine Learning for Science. ML Performance: Benchmarking Deep Learning Systems (MLPerf-Bench) Tutorial at the 28th IEEE International Symposium on High-Performance Computer Architectures (HPCA 2022). April 3, 2022.
- AI at the Edge of Particle Physics. HEP Seminar. November 17, 2021. Columbia University, New York, NY, USA.
- AI at the Edge of Particle Physics. AI Distinguished Lecture Series. August 12, 2021. Argonne National Laboratory.
- AI-Hardware Codesign for Real-Time Science. Harnessing Data Science for Autonomous Computing Materials Symposium. May 27, 2021. Ohio State University.
- The Edge of Particle Physics. Department of Physics and Astronomy Colloquium. May 6, 2021. Cal State LA.
- Graph Neural Networks for High Energy Physics. Elementary Particle Physics Seminar. April 28, 2021. University of Minnesota.
- `hls4ml`: An open-source codesign workflow to empower scientific low-power machine learning devices. tinyML Research Symposium. March 26, 2021.
- Graph neural network tracking on FPGAs. IRIS-HEP Topical Meeting. October 21, 2020.
- Real-time AI in particle physics. ECE Graduate Seminar. October 16, 2020. Carnegie Mellon University, Pittsburgh, PA, USA.
- Recent highlights from CMS. 53rd Annual Fermilab Users Meeting. August 12, 2020. Fermilab, Batavia, IL, USA.
- Deep learning for Higgs and new physics at the LHC. High Energy Physics Division Seminar. April 8, 2020. Argonne National Laboratory, Lemont, IL, USA.
- Low-latency machine learning inference on FPGAs. 2nd Machine Learning and the Physical Sciences Workshop at NeurIPS 2019. December 14, 2019. Vancouver, Canada.
- Deep learning for Higgs and new physics at the LHC. Department of Physics and Astronomy Colloquium. November 11, 2019. University of Kansas, Lawrence, KS, USA.
- Deep learning for Higgs and new physics at the LHC. High Energy Experiment Seminar. October 10, 2019. Boston University, Boston, MA, USA.
- Machine learning on FPGAs for low-latency and high-throughput inference. eScience 2019. September 24-27, 2019. San Diego, CA, USA.
- Deep learning on FPGAs tutorial. 1st Real Time Analysis Workshop. July 15-26, 2019. Institute Pascal, Université Paris-Saclay, Saint Aubin, France.
- Machine learning using CERN open data. LHCP 2019. May 20–25, 2019. Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
- Dark sector searches in CMS. LHCP 2019. May 20-25, 2019. Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
- FPGA-accelerated machine learning inference for particle physics. Connecting the Dots 2019. April 2, 2019. Valencia, Spain.

- Unlocking the potential of LHC data: boosted Higgs and deep learning. Particle Physics Special Seminar. February 20, 2019. University of Chicago, Chicago, IL, USA.
- Boosted Higgs couplings and dark mediators with deep learning in CMS. Joint Experimental-Theoretical Physics Seminar (Wine & Cheese). December 14, 2018. Fermilab, Batavia, IL, USA.
- Heavy flavour identification for boosted resonances and large cone jets in CMS. Machine Learning for Jets (ML4Jets) 2018. November 14–16, 2018. Fermilab, Batavia, IL, USA.
- Boosted Higgs, dark matter, and deep learning. High Energy Physics Seminar. October 3, 2018. University of Pittsburgh, Pittsburgh, PA, USA.
- `hls4ml`: Deploying Deep Learning on FPGAs for L1 trigger and Data Acquisition. Topical Workshop on Electronics for Particle Physics (TWEPP) 2018. September 17-21, 2018. KU Leuven Campus Carolus, Antwerp, Belgium.
- Searches for Dark Matter Mediators with the CMS Detector. Conference on the Intersections of Particle and Nuclear Physics (CIPANP) 2018. May 29 - June 3, 2018. Hyatt Regency Indian Wells Conference Center, Indian Wells, CA, USA.
- Fast inference of deep neural networks in FPGAs for particle physics. Research Techniques Seminar. April 24, 2018. Fermilab, Batavia, IL, USA.
- Fast reconstruction and data scouting. Connecting the Dots 2018. March 20-22, 2018. University of Washington, Seattle, WA, USA.
- Boosted Higgs in CMS. Higgs Couplings 2017. November 6–10, 2017. Heidelberg University, Heidelberg, Germany.
- Unlocking the potential of CMS data: boosted Higgs, low-mass dijet resonances, and data scouting. High Energy Physics Seminar. October 30, 2017. Caltech, Pasadena, CA, USA.
- Search for low-mass dijet resonances. TeVPA 2017. August 7-11, 2017. Columbus, OH, USA.
- Inclusive search for boosted SM Higgs bosons using H to bb decays with the CMS detector at 13 TeV. APS DPF 2017. July 31 - August 4, 2017. Fermilab, Batavia, IL, USA.
- Inclusive Higgs boson search using $H \to b\bar{b}$ decays. Collider Cross Talk. July 20, 2017. CERN, Geneva, Switzerland.
- Introduction to CMS open data for boosted object tagging with machine learning applications. Data Science at High Energy Physics (DS@HEP) 2017. May 8–12, 2017. Fermilab, Batavia, IL, USA.

Service and Committee Work

Thesis Committees

- Ph.D. Thesis Committee (Chair) for Zihan Zhao (UC San Diego) (2024–Present).
- Ph.D. Thesis Committee for Wyatt Joyce (UC San Diego) (2024–Present).
- Ph.D. Thesis Committee (Co-Chair) for Luke Fairbanks (UC San Diego) (2024–Present).
- Ph.D. Thesis Committee (Chair) for Daniel Primosch (UC San Diego) (2024–Present).
- Ph.D. Thesis Committee for Michael Pokornik (UC San Diego) (2024–Present).
- Ph.D. Thesis Committee for Olivia Weng (UC San Diego) (2024–Present).
- Ph.D. Thesis Committee for Qingyuan Chen (UC San Diego) (2023–Present).
- M.S. Thesis Committee (Chair) for Steven Tsan (UC San Diego) (2023–2024).
- Ph.D. Thesis Committee for Robert Lee (UC San Diego) (2023–Present).
- Ph.D. Thesis Committee (Chair) for Anthony Aportela (UC San Diego) (2023–Present).

- Ph.D. Thesis Committee (Chair) for Farouk Mokhtar (UC San Diego) (2023–Present).
- Ph.D. Thesis Committee for Yifan Xiang (UC San Diego) (2023–2024).
- M.S. Thesis Committee for Kyle Yang (UC San Diego) (2022).
- Ph.D. Thesis Committee for Yueqi Zhao (UC San Diego) (2023–Present).
- Ph.D. Thesis Committee (Chair) for Raghav Kansal (UC San Diego) (2022–2024).
- M.S. Thesis Committee for Paul Wang (UC San Diego) (2021).
- Ph.D. Thesis Committee for Christian Aganze (UC San Diego) (2021–2023).

Other Service

- San Diego Faculty Association Executive Board Member (2025–Present).
- APS Henry Primakoff Award for Early-Career Particle Physics Selection Committee (2024–2025).
- Scientific program committee (Track 2: Data Analysis - Algorithms and Tools) for the 22nd International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT) (2024).
- Scientific organizing committee for 2nd, 3rd, 4th, and 5th Fast Machine Learning for Science Workshops and Accelerated Artificial Intelligence for Big-Data Experiments Conference(2020–2023).
- Program committee for Fast Machine Learning for Science Workshop at ICCAD (2023).
- Reviewer for the Neural Information Processing Systems (NeurIPS) Conference (2023).
- Local organizing committee for Multi-Boson Interactions Conference at UC San Diego (2023).
- Organizer of NSF HDR Postbaccalaureate Workshop at UC San Diego (2023).
- Referee for *Physical Review Letters*, *Physical Review D*, *Physical Review Research*, *Journal of High Energy Physics*, *Physics Letters B*, *European Physics Journal C*, *Machine Learning: Science and Technology*, *Computing and Software for Big Science*, *Applied Optics*, *Nuclear Instruments and Methods in Physics Research Section A*, and *Science Bulletin* (2019–Present).
- US CMS Advisory Board (2022–2024).
- US CMS Collaboration Annual Meeting Planning Committee (2021–2023).
- US CMS Collaboration Diversity, Equity, and Inclusion Committee (2022–2023).
- Reviewer for the 2022 Datasets and Benchmarks Track, and 3rd and 4th Machine Learning for the Physical Sciences Workshops at the Neural Information Processing Systems (NeurIPS) Conference (2020–2022).
- External reviewer for Swiss Data Science Center (SDSC), French National Research Agency (ANR), US Department of Energy (DOE) Early Career Research Program, and European Science Foundation (ESF) (2019–2022).
- Faculty advisor for UC San Diego Physics Department Graduate Student Diversity Initiative (2021).
- Guest Associate Editor for Efficient AI in Particle Physics and Astrophysics Research Topic in Frontiers in Big Data and AI (2021–2022).
- UC San Diego Physics Department Equity, Diversity, and Inclusion Committee member (2020–2022).
- UC San Diego Physics Department Graduate Admissions Committee member (2019–2022).

Supervision and Mentorship

Postdoctoral Researchers

- Melissa Quinnan (UC San Diego). Schmidt AI in Science Postdoctoral Fellow. CMS level-1 trigger, Higgs boson searches (2022–Present).
- Daniel Diaz (UC San Diego). LPC Distinguished Researcher. CMS level-1 trigger, long-lived particle searches (2021–Present).

Doctoral Students

- Ellison Scheuller (UC San Diego). WATCHEP fellow. Anomaly detection for CMS level-1 trigger (2025–Present).
- Jason Weitz (UC San Diego). WATCHEP fellow. Neural architecture codesign (2024–Present).
- Daniel Primosch (UC San Diego). Higgs boson pair production searches in CMS (2023–Present).
- Hyeon Seo Yun (Purdue University). A3D3 Mentorship Program (2023–Present).
- Zihan Zhao (UC San Diego). Self-supervised learning for jet tagging (2022–Present).
- Russell Marroquin Solares (UC San Diego). WATCHEP fellow. CMS level-1 trigger long-lived particle tagger (2022–Present).
- Haoyang (Billy) Li (UC San Diego). Higgs boson jet assignment, FAIR AI models (2022–Present).
- Olivia Weng (UC San Diego). Optimization of AI algorithms for FPGAs (2021–Present).
- Jieun Yoo (UIC). U.S. CMS Mentorship Program (2021–2022).
- Anthony Aportela (UC San Diego). Sloan fellow, HEPCAT fellow. Graph-based autoencoders for anomaly detection; Search for long-lived particles (2021–Present).
- Daniel Guerrero (University of Florida). U.S. CMS Mentorship Program (2020–2021).
- Farouk Mokhtar (UC San Diego). HDSI fellow, IRIS-HEP fellow. Machine learned particle-flow reconstruction; Search for boosted $H \to WW$ (2020–Present).
- Raghav Kansal (UC San Diego). IRIS-HEP fellow, LPC AI fellow, LPC graduate scholar. Graph-based generative adversarial networks for particle physics simulation; Search for boosted $HH \to b\bar{b}WW$ (2019–2024).
- Martin Kwok (Brown). Boosted Higgs boson search (2018–2020).
- Michael Krohn (CU Boulder). Boosted Higgs boson search, coupling measurement, and trigger development (2017–2018).
- Sean-Jiun Wang (University of Florida). Development and monitoring of triggers for the Higgs boson produced in association with a Z boson decaying to neutrinos (2017–2018).
- Andrzej Novak (RWTH Aachen University). Development of deep neural networks for boosted Higgs identification in CMS (2017–2019).
- Jiajing Mao (Caltech). Data scouting trigger stream development (2016–2018).
- Giulia D'Imperio and Federico Preiato (Sapienza University of Rome). Dijet searches (2016).

Masters Students

- Vivekanand Sahu (UC San Diego). Efficient particle transformer (2023–Present).
- Priyansh Bhatnagar (UC San Diego). Efficient transformers for particle physics (2023–2024).
- Rounak Sen (UC San Diego). Discretized GANs for particle physics (2023–2024).
- Prashant Krishnan Vaidyanathan (UC San Diego). Self-supervised learning for particle physics (2023–2024).
- Steven Tsan (UC San Diego). Diffusion models for particle physics (2022–2024).
- Venkat Krishnamohan (UC San Diego). Graph GANs for particle physics (2022–2023).

- Selwyn Reis Gomes (UC San Diego). Xilinx Alveo coprocessor support in `hls4ml` (2022–2023).
- Nirmal Thomas (UC San Diego). Ragged batching for graph neural network inference as a service (2022–2023).

Postbaccalaureate Students

- Luke McDermott (UC San Diego). Neural architecture codesign (2023–2024).
- Michael Miranda. US CMS Intern. CMS level-1 long-lived particle triggers (2023).
- Andrew Skivington (UC San Diego). A3D3 Postbaccalaureate Fellow. Anomaly detection for CMS level-1 trigger (2022–2023).

Undergraduate Students

- Trevin Lee (UC San Diego). LLP identification, SONIC, and MoE particle transformers (2024–Present).
- Timothy Legge (UC San Diego). Particle transformers for jet tagging interpretability (2025–Present).
- Samantha Rodriguez (San Diego City College). STEMULATE Program. Boosted decision trees for Higgs boson pair searches (2024).
- Juan D. Guadalupe-Rosado (University of Puerto Rico). US CMS Intern. Large-radius jet tagging level-1 trigger in CMS (2024).
- Lauren Cadle (UC San Diego). Symmetry-preserving attention networks for semi-merged top quarks (2024–Present).
- Peera Serumaga (UC San Diego). Symmetry-preserving attention networks for semi-merged top quarks (2024–Present).
- Adolfo Partida (UC San Diego). Symmetry-preserving attention networks for semi-merged top quarks (2024–Present).
- Julian Jackson (UC San Diego). Symmetry-preserving attention networks for semi-merged top quarks (2024–Present).
- Chang Liu (UC San Diego). Long-lived particle searches in CMS (2024–Present).
- Shuyang Zhang (UC San Diego). Long-lived particle searches in CMS (2023–Present).
- Jason Weitz (UC San Diego). Neural architecture codesign (2023–2024).
- Dmitri Demler (UC San Diego). Neural architecture codesign (2023–2025).
- Emily Pan (UC San Diego). GNNS for identifying long-lived particles (2023–Present).
- Aditya Sriram (UC San Diego). GNNS for identifying long-lived particles (2023–Present).
- Kaitlyn White (UC San Diego). Symmetry-preserving attention networks for multi-Higgs-boson reconstruction (2023–Present).
- Darius Chao (UC San Diego). Symmetry-preserving attention networks for multi-Higgs-boson reconstruction (2023–Present).
- Rohan Sachdeva (UC San Diego). Anomaly detection for CMS level-1 trigger (2023–Present).
- Jet Yue (UC San Diego). ABCD neural network for background estimation in CMS. (2023–Present).
- Evelyn Lorenzo (UC San Diego). PATHS Program Scholar (2022–2023).
- Zhaoyu Zhang (UC San Diego). Graphs GANs for particle physics (2022–2024).
- Mengke Zhang (UC San Diego). Undergraduate Research Award. Machine-learned particle-flow for the Compact Linear Collider (2022–Present).
- Anni Li (UC San Diego). IRIS-HEP fellow. Conditional generation with graph networks (2022–2023).

- Ricardo Efraín Parra Payano (Universidad Nacional de Ingeniería, Peru). APS National Mentoring Community (2022).
- Parvat Sapkota (University of Texas at Arlington). APS National Mentoring Community (2021).
- Saloni Agrawal (UC San Diego). EXPAND program. JetNet (2022).
- Carlos Pareja (UC San Diego). EXPAND program. JetNet (2022–2024).
- Thomas Sievert (UC San Diego). FMP program. Quantum machine learning for high energy physics (2021–2023).
- Brian Sheldon (UC San Diego). FMP program. Boosted Higgs boson searches at the Future Circular Collider (hadron mode) (2021–Present).
- John Choi (UC San Diego). FMP program. Long-lived particle identification for CMS level-1 trigger (2021–2023).
- Ishaan Kavoori (UC San Diego). FMP program. FAIR4HEP cookiecutter FAIR AI template (2021–2023).
- Simon Poon (UC San Diego). FMP program. Machine-learned missing transverse momentum for CMS level-1 trigger (2021–Present).
- Sukanya Krishna (UC San Diego). IRIS-HEP fellow. Real-time anomaly detection for jets (2021–Present).
- Jason Liang (UC San Diego). tinyML with Brevitas and FINN. (2021–2023).
- Tai Nguyen (UC San Diego). Undergraduate Research Scholarship. tinyML with Brevitas and FINN. (2021).
- Han Hiller (University of Washington). UM-CERN-REU program. Machine-learned missing transverse momentum for CMS level-1 trigger (2021).
- Rohan Shenoy (UC San Diego). Undergraduate Research Award. Improved autoencoder training for HGCAL ASIC for data compression (2021–2023).
- John Chen (UC San Diego). AEP program. Variable-sized-input generative graph networks (2021).
- Jevon Suharnoko (UC San Diego). Dream fellow. Transpilation of PyTorch-based neural networks to FPGA firmware with `hls4ml` (2021–2022).
- Rushil Roy (UC San Diego). FMP program. tinyML with `hls4ml` (2021–Present).
- Zichun Hao (UC San Diego). FMP program, Undergraduate Research Award. Lorentz-equivariant generative neural networks and $H \to WW$ tagging (2021–2023).
- Abdelrahman Elabd (University of Pennsylvania). IRIS-HEP fellow. Implementation of graph neural networks on FPGAs and integration into hls4ml. (2021–2022).
- Haifeng Ding (UC San Diego). FMP program. Higgs pair production sensitivity at future colliders (Snowmass study). (2021).
- Steven Tsan (UC San Diego). TRELS program. Unsupervised or semi-supervised anomaly detection algorithms for high energy physics. (2020–2022).
- Vesal Razavimaleki (UC San Diego). IRIS-HEP fellow. Implementation of graph neural networks on FPGAs. (2019–2021).
- Eric Moreno (Caltech). SURF program. Development of interaction and graph neural networks for boosted jet tagging with CMS open data. (2018–2020).
- Sydney Jenknins (University of Chicago). Compression and firmware implementation of interaction and graph neural networks for charged particle tracking at the LHC (2018).
- Eric Scotti (Brown University). Development of deep neural networks for boosted Higgs identification in CMS (2017–2018).

Press

- "Physics vocabulary: AI edition" By Emily Ayshford, Kim Hickok, and Chris Patrick, Symmetry Magazine, April 18, 2024
- "Inside the hunt for new physics at the world's largest particle collider" by Dan Garisto, MIT Technology Review, February 20, 2024
- "From life experience to research experience" by Sarah Charley, Symmetry Magazine, February 6, 2024
- "LHC Physicists can't save them all" by Laura Dattaro, Symmetry Magazine, November 14, 2023
- "SDSC, UC San Diego Physicist Receives 2024 Henry Primakoff Award" by Cynthia Dillon, SDSC News, October 26, 2023
- "Javier Duarte Recognized for Inclusive Excellence" by Michelle Franklin, UC San Diego School of Physical Sciences News, August 8, 2023
- "Will AI make MC the MVP of particle physics?" by R. M. Davis, Symmetry Magazine, July 18, 2023
- "Four Early Career Professors at UC San Diego Awarded Sloan Research Fellowships" by Michelle Franklin, Daniel Kane, Katherine Connor, UC San Diego Today, March 1, 2023
- "Two UC San Diego Faculty Named 2023 Cottrell Scholars" by Michelle Franklin, UC San Diego Today, February 9, 2023
- "San Diego Supercomputer Center, UC San Diego Join Federal Effort to Train Next-Gen Physics Workforce" by Cynthia Dillon, UC San Diego Today, February 7, 2023
- "Machine Learning Shaking Up Hard Sciences, Too" by Dan Garisto, IEEE Spectrum, October 7, 2022
- "How physicists are probing the Higgs boson 10 years after its discovery" by Emily Conover, Science News Magazine, June 29, 2022
- "Probing Higgs self-coupling with boosted Higgs pairs" by Artur Apresyan and Si Xie, Fermilab News, June 9, 2022
- "MLPerf Results Show Advances in Machine Learning Inference Performance and Efficiency", MLCommons, June 4, 2022
- "MLPerf Results Highlight Advances in Machine Learning Inference Performance and Efficiency", Inside HPC, April 6, 2022
- "Double trouble Higgs" by Sarah Charley, Symmetry Magazine, April 26, 2022
- "Graph neural networks boost di-Higgs search", CERN Courier, March 11, 2022
- "Physicists Apply FAIRness to Data Studies" by Kimberly Mann Bruch, UC San Diego News, February 15, 2022
- "SDSC Builds AI-Focused 'Voyager' Supercomputer", Intel, November 9, 2021
- "Muon detector probes long-lived particles", CERN Courier, November 5, 2021
- "Hunting anomalies with an AI trigger", CERN Courier, August 31, 2021
- "A new window into the shadow world: Exotic particle decays in the muon detectors", CMS Physics Briefing, August 30, 2021
- "Physics, Computation Experts Help Earn $15M to Advance AI, Data Analysis" by Cynthia Dillon, UC San Diego News, September 28, 2021
- "San Diego Supercomputer Center Teams Up with Habana to Power Voyager" by Cynthia Dillon, UC San Diego News, April 9, 2021
- "Live long and propser: Searching for the long-lived relatives of the Higgs boson", CMS Physics Briefing, August 16, 2021
- "Long-lived particles gather interest" by James Beacham and Albert De Roeck, CERN Courier, July 21, 2021

- "National Science Foundation Awards SDSC $5 Million to Develop Innovative AI Resource" by Jan Zverina, UC San Diego News, July 1, 2020
- "Boosting into the unknown: The highest energy Higgs bosons", CMS Physics Briefing, May 20, 2020
- "UC San Diego Physicist Making a Mark" by Cynthia Dillon, UC San Diego Division of Physical Sciences News, July 1, 2020
- "Fermilab scientists help push AI to unprecedented speeds" by Javier Duarte, Sergo Jindariani, Ben Kreis and Nhan Tran, Fermilab News, January 29, 2019

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