Oz Amram

Postdoc at Fermilab

Fermilab
Wilson Hall, 1167
✉ *oz.amram@gmail.com*

Research Interests

Experimental Particle Physics.
Model-agnostic searches for new physics, jet substructure, fast calorimeter simulations, hardware trigger

Machine Learning.
Anomaly detection, unsupervised learning, generative modeling, foundation models

Education

2016-2022 **Johns Hopkins University**, *M.A., Ph.D.*
Thesis : Searching for Anomalies in Proton-Proton Collisions at the Large Hadron Collider Advisors: Morris Swartz and Petar Maksimovic

2012-2016 **Carnegie Mellon University**, *B.S. Physics*.

Positions

2024- Co-Convener of the CMS analysis group dedicated to exotic searches for new particles with jets (EXO Jets+X L3). Reviewing and managing ∼15 active analyses

2021-2022 Co-Convener of the CMS pixel offline software and reconstruction subgroup (Tracker DPG L3)

2019- Regular writer for Particle Bites, "The high energy physics reader's digest"

2020-2021 JHU Physics and Astronomy Graduate Student Diversity & Inclusion Co-Chair

Selected Publications

Leading Contribution

1. CMS Collaboration. A new method for correcting the substructure of multi-prong jets using Lund jet plane reweighting in the CMS experiment. *CMS PAS JME-23-001*. `https://cds.cern.ch/record/2924412` (2025).
2. Amram, O. *et al.* Aspen Open Jets: Unlocking LHC Data for Foundation Models in Particle Physics. arXiv: `2412.10504 [hep-ph]` (Dec. 2024).
3. CMS Collaboration. Model-agnostic search for dijet resonances with anomalous jet substructure in proton-proton collisions at $\sqrt{s} = 13$ TeV. arXiv: `2412.03747` (2024).
4. CMS Collaboration. Search for t-channel scalar and vector leptoquark exchange in the high mass dimuon and dielectron spectrum in proton-proton collisions at $\sqrt{s} = 13$ TeV. *CMS PAS EXO-22-013*. `https://cds.cern.ch/record/2905397` (2024).
5. Amram, O. & Pedro, K. Denoising diffusion models with geometry adaptation for high fidelity calorimeter simulation. *Phys. Rev. D* **108.** arXiv: `2308.03876` (2023).
6. CMS Collaboration. Measurement of the Drell-Yan forward-backward asymmetry at high dilepton masses in proton-proton collisions at $\sqrt{s} = 13$ TeV. *JHEP* **2022.** arXiv: `2202.12327` (2022).
7. Amram, O. & Suarez, C. M. Tag N' Train: a technique to train improved classifiers on unlabeled data. *JHEP* **01.** arXiv: `2002.12376` (2021).

Minor Contribution

8. Krause, C. *et al.* CaloChallenge 2022: A Community Challenge for Fast Calorimeter Simulation. arXiv: 2410.21611 (Oct. 2024).
9. Kasieczka, G. *et al.* The LHC Olympics 2020 a community challenge for anomaly detection in high energy physics. *Rept. Prog. Phys.* **84.** arXiv: 2101.08320 (2021).
10. Lambrides, E. *et al.* Merger or Not: Accounting for Human Biases in Identifying Galactic Merger Signatures. *The Astrophysical Journal* **919.** arXiv: 2106.15618 (Sept. 2021).

Invited Seminars

2024-5 "Treasure Hunting without a Map: First Anomaly Detection Results from CMS". *UChicago, LBNL, Fermilab Wine & Cheese, Purdue, Michigan*

Conference Presentations

Oct 2024 "Fast Simulation of Particle Physics Calorimeters". Lightning Talk. FastML. Purdue, IN

May 2024 "Introduction to Anomaly Detection in HEP". Chalk Talk (invited). Fundamental Physics in the Era of Big Data and Machine Learning, Summer Workshop. Aspen, CO

Dec. 2023 "Techniques for ML-based Model Agnostic Searches in CMS". Lightning Talk, Award Winner. US LHC Users Association Meeting. Fermilab, IL

Nov. 2023 "Boosted Jet Tagging and Calibration in CMS". ML4Jets. Hamburg, Germany

Aug. 2023 "Boosted Jet Tagging and Calibration in CMS 13 TeV Data". BOOST. Berkeley, CA

May 2023 "Fast & Accurate Calorimeter Simulation with Diffusion Models". CaloChallenge Workshop. Rome, Italy. Virtual

May 2023 "Fast & Accurate Calorimeter Simulation with Diffusion Models". Computing in High Energy Physics (CHEP). Norfolk, VA

Mar. 2023 "Standard Model W, Z(+Jets) at CMS and ATLAS". Rencontres de Moriond : QCD & High Energy Interactions. La Thuile, Italy

Nov. 2022 "Recent ML-usage in searches with boosted objects in CMS". ML4Jets. Rutgers, NJ

Apr. 2022 "Recent Z boson Results from the LHC". Standard Model at LHC Workshop

Sep. 2021 "Machine Learning Based Anomaly Detection at the LHC". UChicago Rising Stars in Experimental Particle Physics Symposia. Virtual

Jul. 2020 "Anomaly Searches with Tag N' Train". Anomaly Detection Workshop, LHC Summer Olympics 2020. Virtual

Jan. 2020 "Tag N' Train : Combining Autoencoders and CWoLa for Better Unsupervised Searches". ML4Jets. New York, NY

April 2018 "Measurement of the forward-backward asymmetry of high mass Drell-Yan lepton pairs at 13 TeV" APS April Meeting. Columbus, OH

Service

2024 Organizer of 'Machine Learning for Fundamental Physics' School. A week long school introducing students to ML topics in HEP, hosted in Berkeley with 30 in person and 100 virtual participants. Also gave a lecture + exercise on anomaly detection

2023- Lead facilitator for yearly CMS 'Data Analysis School' at Fermilab. Led a multi-day exercise introducing group of 10 students to LHC analysis methods

Awards and Honors

2016 Richard E. Cutcosky Award, Carnegie Mellon

2016 Phi Beta Kappa, Carnegie Mellon

2015 Phi Kappa Phi, Carnegie Mellon

Mentoring & Teaching

2023- Mentoring group of UChicago undergraduate students on a project related to ML for calorimeter simulation as part of year-long data science course

2020- Mentored three younger graduate students at Ohio State, Notre Dame, and UCSD though USCMS mentoring program

2019-2022 Mentored younger graduate students at JHU on projects related to CMS pixel detector and data analysis

2017-2021 Head Teaching Assistant, General Physics I at JHU

2016-2017 Teaching Assistant, General Physics Lab JHU