

# Oz Amram

Postdoc at Fermilab

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## Research Interests

### Experimental Particle Physics.

Model-agnostic searches for new physics, jet substructure, fast calorimeter simulations

### Machine Learning.

Anomaly detection, weakly supervised learning, unsupervised learning, generative modeling

## 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.*

## Selected Publications

### Primary Author

- [1] CMS Collaboration. "Model-agnostic search for dijet resonances with anomalous jet substructure in proton-proton collisions at  $\sqrt{s} = 13$  TeV". In: *CMS-PAS* (2024). Link.
- [2] Oz Amram and Kevin Pedro. "Denoising diffusion models with geometry adaptation for high fidelity calorimeter simulation". In: *Phys. Rev. D* 108.7 (2023). DOI: 10.1103/PhysRevD.108.072014. arXiv: 2308.03876.
- [3] CMS Collaboration. "Measurement of the Drell-Yan forward-backward asymmetry at high dilepton masses in proton-proton collisions at  $\sqrt{s} = 13$  TeV". In: *JHEP* 2022.08 (2022). DOI: 10.1007/JHEP08(2022)063. arXiv: 2202.12327.
- [4] Oz Amram and Cristina Mantilla Suarez. "Tag N' Train: a technique to train improved classifiers on unlabeled data". In: *JHEP* 01 (2021). DOI: 10.1007/JHEP01(2021)153. arXiv: 2002.12376.

### Significant Contribution

- [5] 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". In: *CMS PAS* (2024). URL: <https://cds.cern.ch/record/2905397>.

### Minor Contribution

- [6] Gregor Kasieczka et al. "The LHC Olympics 2020 a community challenge for anomaly detection in high energy physics". In: *Rept. Prog. Phys.* 84.12 (2021). DOI: 10.1088/1361-6633/ac36b9. arXiv: 2101.08320.
- [7] Claudius Krause et al. "CaloChallenge 2022: A Community Challenge for Fast Calorimeter Simulation". In: (Oct. 2024). arXiv: 2410.21611.
- [8] Erini Lambrides et al. "Merger or Not: Accounting for Human Biases in Identifying Galactic Merger Signatures". In: *The Astrophysical Journal* 919 (Sept. 2021). DOI: 10.3847/1538-4357/ac0fdf. arXiv: 2106.15618.

## 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- 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

## Positions

- 2024- Co-Convener of the CMS Exotica Jets+X Subgroup (L3)
- 2021-2022 Co-Convener of the CMS pixel offline software and reconstruction subgroup (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

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

2020-2022    Mentored a younger graduate student at Ohio State through USCMS mentoring program  
2017-2021    Head Teaching Assistant, General Physics I at JHU  
2016-2017    Teaching Assistant, General Physics Lab JHU