Oz Amram

Physics and Astronomy, Johns Hopkins University
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Research Interests

Experimental Particle Physics.
Model-agnostic searches for new physics, jet substructure, precision standard model measurements, silicon pixel trackers

Machine Learning.
Anomaly detection, semi-supervised learning, unsupervised learning

Education

Exp. 2022 **Johns Hopkins University**, *M.A. Ph.D.*
Advisors: Morris Swartz and Petar Maksimovic

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

Projects

CMS Pixel Detector Calibration and Software.
Active member of the CMS pixel offline group. Projects have included developing novel reconstruction techniques suitable for high levels of radiation damage, producing calibrations to account for radiation damage, testing candidate designs for the Phase-2 upgrade, maintenance and improvement of the pixel reconstruction code within the CMS software framework.

Measurement of the Drell-Yan Forward-Backward Asymmetry at High Dilepton Masses.
Main analyzer for CMS 13 TeV measurement. Employed a novel template fitting technique that improves sensitivity compared to counting based methods. Measurement used to set limits on the existence of new heavy Z'. Limits are complementary to bump-hunt searches and are not limited by center of mass energy.

Dijet Anomaly Detection: Tag N' Train.
Developed a novel technique for training machine learning classifiers on collider data. Demonstrated its applicability in a dijet anomaly search. Successfully able to find the hidden signal in the LHC Olympics anomaly detection challenge.

Positions

2021- Co-Convener of the CMS pixel offline software and reconstruction subgroup

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

2019- Regular Writer for Particle Bites

Awards and Honors

2016 Richard E. Cutcosky Award, Carnegie Mellon

2016 Phi Beta Kappa, Carnegie Mellon

2015 Phi Kappa Phi, Carnegie Mellon

Selected Publications

Primary Author

Oz Amram and Cristina Mantilla Suarez. Tag N' Train: a technique to train improved classifiers on unlabeled data. *JHEP*, 2021.

CMS Collaboration. Measurement of the Drell-Yan forward-backward asymmetry at high dilepton masses in proton-proton collisions at $\sqrt{s} = 13$ TeV. *(CMS-SMP-21-002, In Prep)*, 2021.

Contributor

Gregor Kasieczka et al. The LHC Olympics 2020: A Community Challenge for Anomaly Detection in High Energy Physics. 2021.

Erini Lambrides et al. Merger or Not: Accounting for Human Biases in Identifying Galactic Merger Signatures. *arXiv e-prints*, page arXiv:2106.15618, June 2021.

Presentations

CMS Internal Workshops

May 2020 "CASE: CMS Anomaly Search" B2G Workshop. Virtual

May 2020 "Inner Tracker Local Reconstruction for Phase 2" Tracker DPG Workshop. Virtual

Public

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 2020. 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

Technical Skills

Proficient In.

C, C++, Python, Numpy, Keras, Tensorflow, ROOT, CMSSW

Familiar With.

Fortran, Madgraph, Pythia, POWHEG