Fernando Torales Acosta

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Summary

Postdoctoral Researcher working on machine learning developments for natural sciences. These include generative models to replace computational expensive simulators, AI-assisted design of detectors and hardware, and new network architectures suitable for collider physics. Passionate about deep learning and the intersection of software engineering and science.

Work Experience

Lawrence Berkeley National Lab – Postdoctoral Research Fellow   Feb 2022 - present

– Designed and executed experiments to evaluate the performance of generative diffusion models. Achieved 150x reduction in disk space and 3x faster sampling time with no loss in model performance.
– Graph Neural Networks for AI-assisted detector design. Achieved 50% improvement in precision.
– Deep learning for multidimensional data correction, enabling previously impossible measurements.
– Primary researcher, synthesizing data, and emphasizing MLOps to streamline team's design process.

University of California, Berkeley – Graduate Researcher   Aug 2018 - Dec 2021

– Dramatically reduced data processing time from 10 days to 1 hour by implementing a parallelized data correction framework
– Deep learning for background rejection, obtained 30% improvement over robust 15-year-old algorithm.
– Updated data pipeline, converted petabytes of data, and sped up team's analysis tasks by 4x.

Projects

Particle Feature Regression with Graph Neural Networks   GitHub Link

– Utilized DeepSets and Graph Neural Networks in the development of innovative physical detectors
– Established full data pipeline, data QA, model validation, and inference scripts for teammates
– Optimal detector design saved $1M by showing expnsive alternatives were not required

Comparing Stable Diffusion Models   GitHub Link

– Trains and compares diffusion models based CNNs to models based on Point Clouds + GNNs.
– Presented research results at a top-tier AI conference, resulting in the publication of a paper.
– Helped change inefficient paradigm of image-based modeling, and influenced later generative projects

Education

University of California, Berkeley	Ph.D. (Physics)	2016 - 2021
Stony Brook University	B.S.(Physics)	2012 - 2016

Relevant Publications

- Point Cloud vs. Image based generative diffusion: **NeurIPS 2023 #192**
- Optimal design of detectors using DeepSets and GNNs: **DOI: 10.1088/1748-0221/19/06/P06002**
- Isolated Photon-Hadron Correlation in ALICE: **Phys. Rev. C 102, 044908**

Skills

- Python • C • Git • Pytorch • Tensorflow • Model Evaluation • Generative Models • HPC
- Experiment Design • Software Development • Problem Solving • Team Collaboration • Writing