

# Fernando Torales Acosta

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## SUMMARY

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Researcher working on machine learning developments for natural sciences. These include fast generative surrogate models, AI-assisted hardware design, deep learning for solving inverse problems, and implementing state of the art model architectures. Passionate about deep learning, engineering, and research.

## WORK EXPERIENCE

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

- Lead researcher, designed experiments, synthesized training data, containerized pipeline and tutorials
- Enhanced generative diffusion models, achieving a 150x reduction in disk space and 3x faster sampling
- Developed Graph Neural Networks for AI-assisted detector design, achieving a 50% gain in precision
- Applied deep learning to solve inverse problems for data denoising, enabling entirely new measurements
- Contributor to one of the first foundation models in high energy physics

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

- Implemented parallelized data correction framework to decrease processing from 10 days to 4 hours
- 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

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**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 expensive alternatives were not required

**Comparing Denoising Diffusion Models** [GitHub Link](#)

- Trained and compared diffusion models based on CNNs to models based on Point Clouds + GNNs
- Helped change inefficient paradigm of image-based modeling, and influenced later generative models
- Presented research results at a top-tier AI conference, resulting in changes to future approaches

**OmniFold PyPi: Deep learning for Inverse Problems** [Python Package](#)

## EDUCATION

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

## RELEVANT PUBLICATIONS

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- Point Cloud Diffusion for complete event generation: [NeurIPS 2024 #131](#)
- 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

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Python; C; Git; Pytorch; Tensorflow; Model Evaluation; Generative Models; High performanc computing  
Experiment Design; Software Development; Data Structures and Algorithms; Technical Writing