

# Ahmed Youssef

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## SKILLS

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**Programming Languages/Systems:** Python, C++, SQL, Apache Spark, Git, Docker, Linux

**Frameworks & Libraries:** PyTorch, TensorFlow, HuggingFace, JAX, NumPy, pandas, Scikit-Learn

**Technologies & Tools:** AWS, Distributed Training, Jupyter, Deep Learning, LLMs, Vision-Language Models

**Soft Skills:** Organizational Leadership, Technical Writing, Education, Multilingual (English, German, Arabic)

## PROFESSIONAL EXPERIENCE

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### HEP-THEORY GROUP AT UNIVERSITY OF CINCINNATI

Cincinnati, OH, US

**Researcher in Computational Physics** | University of Cincinnati, Cincinnati, OH, US

Jan 2020 -Present

- Led ML-based particle collision simulations using Generative Models (VAE, Normalizing Flows), adopted by 10k+ researchers globally
- Developed a Monte Carlo reweighting framework, improving simulation accuracy and increasing computational speed by 3-4x
- Designed a test statistic for CERN collider experiments, impacting 1,000+ datasets and billions of events
- Applied machine learning techniques to solve large-scale data analysis challenges, transferable to industry data modeling and predictive analysis tasks

### UC CENTER FOR ENTREPRENEURSHIP

Cincinnati, OH, US

**Multiple Entrepreneurial Engagement**

Jan 2023 -Present

- Led market research, accelerating product development and securing \$7,500 in total funding through the Lab2Market fellowship and pitching at the New Venture Championship
- Refined startup concepts and go-to-market plans through the UC Venture Lab Pre-Accelerator Program
- Developed a computer vision-based quality control system, achieving 90% classification accuracy for manufacturing optimization

### INDEPENDENT AI RESEARCHER

Jul 2022 -Present

- Collaborated with EEML and Google DeepMind to design compact models for creative output, achieving high performance with reduced model size and faster inference.
- Published a GAN-based art generator using CLIP at NeurIPS ML for Creativity and Design workshop
- Developed AI explainability techniques for Vision-Language Models (see Project section)

## PROJECTS

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### Few-Shot Abstractive Summarization for Style Transfer

- Developed a novel text style transfer method using large language models (LLMs) like OPT and GPT-3, focusing on unsupervised inference to generate fluent, context-aware text transformations
- Achieved 84% classification accuracy and state-of-the-art fluency scores in few-shot learning for summarization and sentiment analysis; published at ICNLP 2023

### Vision Language Models Unlocker

- Designed AI explainability techniques for Vision-Language Models (VLMs) such LLaVA by extending LIME for videos, enhancing model transparency and interpretability
- Evaluated these techniques using the Google DeepMind Perception Test, assessing the AI's perceptual understanding and reasoning abilities for improved model trustworthiness

## EDUCATION

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### UNIVERSITY OF CINCINNATI

*Ph.D. Candidate in Particle Physics (Focus in Machine Learning)*

Cincinnati, OH

Expected Grad: May 2025

### RUHR UNIVERSITY OF BOCHUM

*Bachelor of Science in Physics*

Bochum, Germany

2016-2019

## SELECTED PUBLICATIONS

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**NOTE: Authors in papers marked with (\*) are listed alphabetically, as per field convention**

- \**"Data-Driven Reweighting for Monte Carlo Simulations"*, accepted at ML4PS workshop, **NeurIPS 2024**
- \**"Towards data driven models of hadronization"*, ML4PS workshop, **NeurIPS 2023**
- *"Hacking Generative Models with Differentiable Network Bending"*, ML4CD workshop, **NeurIPS 2023**
- *"Few-Shot Abstractive Summarization for Text Style Transfer"*, **ICNLP 2023**
- *"Normalizing Flows for Fragmentation and Hadronization"*, ML4PS workshop, **NeurIPS 2022**
- \**"Towards a data-driven model of hadronization using normalizing flows"*, **SciPost Phys. 17, 045 (2024)**
- \**"Earth Mover's Distance as a measure for CP-violation"*, **JHEP, 10.1007/JHEP06(2023)098**
- \**"Modeling Hadronization using Machine Learning"*, **SciPost Phys. 14, 027 (2023)**
- \**"Reweighting Monte Carlo Predictions and Automated Fragmentation Variations in Pythia 8"*, **SciPost Phys. 16, 134 (2024)**
- \**"Describing Hadronization via Histories and Observables for Monte-Carlo Event Reweighting"*, **arXiv preprint: 2410.06342 (2024)**

## SELECTED TALKS AND PRESENTATIONS

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- *"Data-Driven Reweighting for Monte Carlo Simulations"*, **ML4PS, NeurIPS 2024**
- *"Hacking Generative Models with Differentiable Network bending"*, **ML4CD, NeurIPS 2023**,
- *"Towards data-driven models of Hadronization"*, **ML4PS, NeurIPS 2023**
- *"Earth Mover's Distance as a measure for CP-violation"*, **12th international Conference on the CKM Unitarity Triangle**, Santiago de Compostela, Spain, Sept 2023
- *"Few-Shot Abstractive Summarization for Text Style Transfer"*, **ICNLP 2023**
- *"Normalizing Flows for Fragmentation and Hadronization"*, **ML4PS, NeurIPS 2022**,
- *"ML for Physics: Simulating Particle Collisions"*, **CS and Math seminar, IST Austria**, Jul 2024
- *"Earth Mover's Distance as a measure for CP-violation"*, **HEP seminar, TU Dortmund**, Germany, Aug 2023
- *"MLHAD: A Machine Learning based Simulation for Hadronization"*, **Josef Stefan Institute (JSI)-FMF high-energy physics seminar**, JSI, Ljubljana, Slovenia Aug 2023
- *"MLHAD: A Machine Learning based Simulation for Hadronization"*, **Guest Lecturer in Particle Pheno, University Heidelberg**, Heidelberg, Germany Jul 2023

## SELECTED RESEARCH COMMUNITY INVOLVEMENT

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**Co-organizer, Muslim in ML Affinity Workshop, NeurIPS 2024**

- Spearheaded the organization of the workshop for 160 participants, coordinating speakers from OpenAI, Carnegie Mellon, MIT, and managing logistics, and maintained communication with the affinity chairs

**Reviewer, ML and Physical Science Workshop, NeurIPS 2024**

- Reviewed research submissions, offering in-depth feedback on methodologies and applications of ML in the physical sciences, shaping the quality and direction of the workshop's accepted papers

**Convener, Computing, Analysis Tool, and Data Handling Session, Pheno 2024**

- Led the session, overseeing abstract selection, managing panel discussions, and fostering cross-disciplinary dialogue on computational tools and data handling strategies

**Co-organizer, PIKIMO 13 Conference (Nov 2022)**

- Coordinated logistics and selected abstracts for a 15-speaker conference on high-energy physics

## SELECTED HONORS AND AWARDS

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- Awarded the **URC Fellowship** for research excellence in innovation and creativity; only 10% of students in each program are selected to apply
- Received the **GSG Research Fellowship** for outstanding research contributions in computational physics and machine learning
- Selected for the **Lab2Market Fellowship**, leading market research and securing \$2,500 in funding through the New Venture Championship
- Awarded the **Pheno Travel Award** for three consecutive years in recognition of research excellence and proposed presentations at the Pheno conference