

Mariel Pettee

Particle physicist, AI researcher, and artist

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Education

2021	YALE UNIVERSITY PhD in Physics	<i>New Haven, CT</i>
2015	UNIVERSITY OF CAMBRIDGE • Trinity College MASt in Physics, Commendable Performance Lt. Charles H. Fiske III Harvard-Cambridge Scholar	<i>Cambridge, UK</i>
2014	HARVARD UNIVERSITY AB in Physics and Mathematics (Cum Laude, High Honors in Field) Dramatic Arts Secondary	<i>Cambridge, MA</i>

Research

2021 - Now	MACHINE LEARNING FOR FUNDAMENTAL PHYSICS Chamberlain Postdoctoral Fellow. Developing generic ML techniques in likelihood-free and label-free learning for applications across particle physics, astrophysics, and more. Dr. Ben Nachman	<i>Lawrence Berkeley National Lab</i>
2017 - Now	GENERATIVE CHOREOGRAPHY WITH MACHINE LEARNING I lead multiple independent research groups of artists and scientists using AI to generate and perform novel choreography based on 3D motion capture of my own movements. <ul style="list-style-type: none">• 2022 - 2023: Brooklyn, NY & Amherst College• 2021 - 2022: University of California, Santa Barbara• 2020: Intel AI Lab• 2017 - 2020: Yale Center for Collaborative Arts & Media	
2016 - 2021	ATLAS EXPERIMENT Search for $V \rightarrow \text{leptons}$, $H \rightarrow \tau\tau$ in Run 2 with the ATLAS Experiment Prof. Sarah Demers	<i>CERN</i>
2016 - 2018	ATLAS EXPERIMENT Tau Identification with Recurrent Neural Networks in the ATLAS Trigger Prof. Sarah Demers	<i>CERN</i>

Publications

[Full list](#) of papers with the ATLAS collaboration.

2023	M. Pettee , S. Thanvantri, B. Nachman, D. Shih, M. R. Buckley, J. H. Collins. Weakly-Supervised Anomaly Detection in the Milky Way . [arXiv:2305.03761] [astro-ph.GA].	
	V. Mikuni, M. Pettee , B. Nachman. Fast Point Cloud Generation with Diffusion Models in High Energy Physics . [arXiv:2304.01266] [hep-ph].	
	A. Huang, X. Ju, J. Lyons, D. Murnane, M. Pettee , L. Reed. Heterogeneous Graph Neural Network for Identifying Hadronically Decayed Tau Leptons at the High Luminosity LHC . [arXiv:2301.00501] [physics.ins-det].	

- 2022 A. Bogatskiy, S. Ganguly, T. Kipf, R. Kondor, D. W. Miller, D. Murnane, J. T. Offermann, **M. Pettee (co-editor)**, P. Shanahan, C. Shimmin, and S. Thais. [Symmetry Group Equivariant Architectures for Physics](#). *Snowmass 2021 White Paper*. [arXiv:2203.06153] [cs.LG].
- The ATLAS Collaboration (**Co-writer & editor**). [Point Cloud Deep Learning Methods for Pion Reconstruction in the ATLAS Experiment](#). [ATL-PHYS-PUB-2022-040].
- M. Papillon, **M. Pettee**, N. Miolane. [PirouNet: Creating Dance through Artist-Centric Deep Learning](#). *EAI ArtsIT 2022 (Best Paper Award)*. [arXiv:2207.12126] [cs.LG].
- M. Papillon, **M. Pettee**, N. Miolane. [Intentional Choreography with Semi-Supervised Recurrent VAEs](#). *NeurIPS 2022 Workshop on Machine Learning for Creativity and Design*. [arXiv:2209.10010] [cs.LG].
- G. Kasieczka, R. Mastandrea, V. Mikuni, B. Nachman, **M. Pettee**, D. Shih. [Anomaly Detection Under Coordinate Transformations](#). [arXiv:2209.06225] [hep-ph].
- 2021 **M. Pettee**. [Interdisciplinary Machine Learning for Particle Physics](#). *PhD Thesis, Yale University*.
- 2020 **M. Pettee**, S. Miret, S. Majumdar, and M. Nassar. [Choreo-Graph: Learning Latent Graph Representations of the Dancing Body](#). *NeurIPS 2020 Workshop on Machine Learning for Creativity and Design*.
- 2019 **M. Pettee**, C. Shimmin, D. Duhaime, and I. Vidrin. [Beyond Imitation: Generative and Variational Choreography via Machine Learning](#). *Proceedings of the 10th International Conference on Computational Creativity*. [arXiv:1907.05297] [cs.LG].
- The ATLAS Collaboration (**Co-writer & editor**). [Expected Performance of the ATLAS Detector at the High-Luminosity LHC](#). [ATL-PHYS-PUB-2019-005].

Talks

Invited Talks

- 2023 WEAKLY-SUPERVISED ANOMALY DETECTION IN THE MILKY WAY
- University of Chicago Data Science Institute & James Franck Institute Seminar
 - Rutgers University High-Energy Physics Theory Seminar
- EQUIVARIANCE MEETS INVARIANCE: PHYSICS-INFORMED MACHINE LEARNING *Minneapolis, MN*
- American Physical Society (APS) April Meeting
- INTERDISCIPLINARY MACHINE LEARNING FOR FUNDAMENTAL PHYSICS *Flatiron CCA*
- Kavli Institute for Theoretical Physics & CCA Workshop on Data-Driven Galaxy Evolution
- 2022 MACHINE LEARNING FOR HIGH-ENERGY PHYSICS *University of Alabama*
- Departmental Colloquium: Physics & Astronomy
- DANCING WITH MYSELF *University of Alabama*
- Departmental Colloquium: Theatre & Dance
- PANEL DISCUSSION: CREATIVITY, SCIENCE, AND ETHICS *Ballet Des Moines*
- Y-EXCHANGE FEATURED ARTIST *Kinetech Arts*

- 2021 - 2022 INTERDISCIPLINARY MACHINE LEARNING FOR CHOREOGRAPHY & PARTICLE PHYSICS *Online*
- Stanford Linear Accelerator (SLAC) AI Seminar
 - UC Irvine Physics & Astronomy Machine Learning Seminar Series
 - Imperial College London, DataLearning Working Group Seminar
 - Amherst College, Artificial Intelligence in the Liberal Arts Seminar Series
 - Cornell Laboratory for Elementary Particle Physics Journal Club
 - Berkeley Institute for Data Science (BIDS) ML + Science Forum
 - Physics Dept. Colloquium at Seattle University
 - HEP Seminar Speaker at University of Tennessee, Knoxville
 - University of Alabama, Machine Learning Graduate Course Guest Seminar
 - Flatiron Institute Center for Computational Astrophysics ML Forum

- 2020 CHOREO-GRAPH: LEARNING LATENT GRAPH REPRESENTATIONS OF THE DANCING BODY *Online*
Kinetch Arts (San Francisco, CA)
- BEYOND IMITATION: GENERATIVE CHOREOGRAPHY WITH AI *Brown University*
Conference for Research on Choreographic Interfaces (CRCI)

Contributed Talks

- 2022 POINT CLOUD METHODS FOR PION RECONSTRUCTION IN THE ATLAS DETECTOR *CERN*
 - Inter-experiment Machine Learning Workshop *New York, NY*
 - APS April Meeting
- 2021 [DANCING WITH MYSELF](#) *St. Louis, MO*
Strange Loop
- 2020 CHOREO-GRAPH: LEARNING LATENT GRAPH REPRESENTATIONS OF THE DANCING BODY *Online*
NeurIPS Workshop on ML for Creativity and Design
- RUN 3 TRIGGERS FOR HLEPTONS ANALYSES *Online*
ATLAS Tau & HLeptons Workshop
- 2019 EXPECTED ATLAS PERFORMANCE AT THE HL-LHC *UMass Amherst*
US ATLAS Workshop
- OVERVIEW OF TAU VS. JET IDENTIFICATION *Prague, Czech Republic*
ATLAS Tau & HLeptons Workshop
- BEYOND IMITATION: GENERATIVE CHOREOGRAPHY VIA MACHINE LEARNING *Charlotte, NC*
International Conference on Computational Creativity (ICCC)
- 2018 RNN TAU IDENTIFICATION WITHIN THE ATLAS HLT *Fermilab*
US LHC Users Association Meeting
- RNN TAU IDENTIFICATION IN THE ATLAS HLT *CERN*
ATLAS Machine Learning Workshop
- THE 2018 ATLAS TAU TRIGGER & COMBINED PERFORMANCE *Pittsburgh, PA*
US ATLAS Workshop
- TAU TRIGGER & CP PERFORMANCE AT HIGH μ *CERN*
ATLAS P&P Physics Plenary
- FTK & THE TAU TRIGGER *CERN*
ATLAS TDAQ Week

Awards

2021	Owen Chamberlain Postdoctoral Fellowship	<i>Lawrence Berkeley National Laboratory</i>
2018	Lightning Round Talk Winner	<i>US LHC Users Association</i>
	Women's Faculty Forum Seed Grant	<i>Yale University</i>
2016	Winner, Windy City Physics Slam	<i>ICHEP</i>
	<ul style="list-style-type: none">• PBS Chicago Interview Clip	
	Poster Award for <i>Trigger Studies for the Muze Experiment</i>	<i>ICHEP</i>
2015	Leigh Page Prize	<i>Yale University</i>
	<ul style="list-style-type: none">• For potential contributions to the field of physics	
	Honorable Mention	<i>NSF Graduate Research Fellowship Program</i>
2014	Harvard-Cambridge Scholarship	<i>Harvard University</i>
	<ul style="list-style-type: none">• Full tuition for a master's program at the University of Cambridge	
	Julia Shaffner Memorial Prize	<i>Harvard University</i>
	<ul style="list-style-type: none">• Honoring an outstanding woman in science	
2013	President's Challenge Finalist	<i>The Harvard Innovation Lab</i>
	15 Most Interesting Seniors	<i>The Harvard Crimson</i>
2012	Judges' Award for Acting	<i>The International Student Drama Festival</i>
	Certificate of Distinction in Teaching	<i>Harvard University</i>
	The Caroline Isenberg and Elizabeth Cary Agassiz Fellowships	<i>Harvard University</i>
2011	Best Lead Actress in a Play	<i>Harvard Theater Award</i>

Press

2022	Interviewee on the Cognicast podcast	
	<ul style="list-style-type: none">• A wide-ranging discussion of my research trajectory across AI, physics, and art• Episode webpage• Listen on Apple Podcasts	
2021	Mariel Pettee successfully defends PhD thesis , <i>Yale Physics</i>	
2020	Advice to Women in STEM: Mariel Pettee , <i>Yale Scientific Magazine</i>	
2019	Feature on Yale's Instagram page	
2016	Scientists Battle for Physics Slam Crown , <i>PBS Chicago</i>	
2013	15 Most Interesting Seniors: Mariel N. Pettee , <i>The Harvard Crimson</i>	

Writing

2018	Theories of Everything , <i>Sightline Arts</i>	
	Now or Never: The Case for a Larger Hadron Collider , <i>Yale Distilled Magazine</i>	

Arts

Solo & Directorial Work

- 2023 *memormee*: an evening-length work featuring AI-generated choreography set on six dancers, following a residency at Amherst College
- 2021 [Untitled Bird Project](#): a 1 hour pop-up exhibit featuring AI-generated bird calls situated in nature
- 2020 [Mirror Exercise](#): an AI-generated duet with myself
- Featured in *Le Mérite*, at the Comédie de Caen, Théâtre des Cordes, France.
 - Highlighted in the NeurIPS Workshop on ML for Creativity and Design's [AI Art Gallery](#)
 - Digital exhibition at [Level Up: The Dramaturgy of Digital Performance & Design](#)
 - Selected by the AI Transparency Institute & featured at the 2020 AI Governance Forum
 - Boston Cyberarts Gallery exhibition *Perceptions / Distortions* (cancelled due to COVID-19)
- 2019 [SIGMA](#): a short film of AI-generated choreography
- Featured in the NeurIPS 2019 Workshop on ML for Creativity & Design's [AI Art Gallery](#)

Performance Work

BAY AREA

- 2022 Dancer, [Sublimation](#)
- By Kinetech Arts.
 - Supported by the Djerassi Resident Artists Program and Creative Work Fund.
 - Performed at David Ruth Glass Studio, Oakland, CA.
- Dancer, [Detour](#)
- By Kinetech Arts, commissioned by the Berkeley Dance Project.
 - Performed at Zellerbach Playhouse, Berkeley, CA.

YALE UNIVERSITY

- 2020 Studio fellow, *Yale Center for Collaborative Arts & Media*
- Year-long paid fellowship to develop collaborative work across art & technology
- Dancer & Coordinator, *Transpositions*
- Dancer in virtual performances by Brian Seibert and Elm City Dance Collective
- [Women+ Art AI](#): Part of a global collective of women working at the intersection of art & AI
- Choreographer, *Elon Musk and the plan to Blow Up Mars the musical*
- Yale Cabaret, dir. Liam Bellman-Sharpe
- Dancer, Coordinator, & Rehearsal Director, *Yale Dance Lab*
- New work by choreographer Vicky Shick: "everywhere"
- 2019 Featured performer, *Learning Film (working title)*
- Interviewed for a documentary by the Derek Jarman Lab, co-produced by Tilda Swinton
- Bill T. Jones/Arnie Zane Dance Company Intensive, *Yale Dance Theater*
- Dancer in a restaging of *D-Man in the Waters*
- 2018 Dancer, *Dance Drawings (For Jock)*
- Choreography by Emily Coates located at the Yale Art Gallery's Sol LeWitt exhibit
- Paul Taylor Dance Company Intensive, *Yale Dance Theater*
- Leading role as "The Hostess" in the first restaging of Taylor's *Party Mix* in four decades

- Featured performer, *Machine Woman*
- An experiential short film documenting my AI-generated choreography research
- 2017 Choreographer: “La Mort du Chorégraphe”, *A Different Drum Dance Company*
Urban Bush Women Intensive, *Yale Dance Theater*
- 2016 Gaga Intensive with Saar Harari & Lee Sher, *Yale Dance Theater*
Choreographer: “Rang Cherries”, *A Different Drum Dance Company*
- UNIVERSITY OF CAMBRIDGE
- 2015 Actor, *Attempts on Her Life*, dir. Tania Clarke, Corpus Playroom
Dancer, *Evolution*, ADC Theatre
- HARVARD UNIVERSITY
- 2014 Director/Writer/Choreographer: [Symmetry Breaking](#)
- My creative physics thesis: an immersive multimedia performance about the Higgs boson
- President, *The Signet Society of Arts & Letters*
Choreographer-in-Residence, *Harvard Dance Center*
Dancer, *Paper Wing*, chor. Jill Johnson, Farkas Hall
- 2013 Arts@CERN Internship
- Eurydice, *Antigonick*, dir. Ianthe Demos, American Repertory Theater Mainstage
Isabelle & Executive Producer, *The Edge of the Map*, dir. Calla Videt (Sightline Theater Company)
Dancer, *At Last*, Loeb Experimental Theater
Dancer, *On The Run*, Harvard Dance Center
- 2012 Vice-President & Mainstage Coordinator, *The Harvard-Radcliffe Dramatic Club*
- 35+ productions as a performer, director, producer, designer, & choreographer
- Lucy, *CryHurtFood*, Loeb Experimental Theater & Crucible Mainstage (Sheffield, UK)
Director: *for the purpose of catching ourselves in the act of being the most*
- Set the Guinness World Record for the longest telephone conversation between two people
- 2011 Co-founder and collaborator, *The Harvard Generalist* artistic collective
Drama & Dance Proctor, *Freshman Arts Program* (2011-2014)

Posters

- 2022 POINT CLOUD METHODS FOR PION RECONSTRUCTION IN THE ATLAS DETECTOR *Online*
LHCP 2022
- 2020 CHOREO-GRAPH: LEARNING LATENT GRAPH REPRESENTATIONS OF THE DANCING BODY *Online*
Women in Machine Learning (WiML) at NeurIPS 2020
- RNN TAU IDENTIFICATION IN THE ATLAS HIGH-LEVEL TRIGGER *CERN*
ATLAS Trigger & Data Acquisition Week 2020

2019	GENERATIVE & VARIATIONAL CHOREOGRAPHY VIA MACHINE LEARNING Women in Machine Learning (WiML) at NeurIPS 2019	<i>Vancouver, Canada</i>
	MACHINE WOMAN: PRESERVATION, MEMORY, FORGETTING, AND AI Women's Faculty Forum at Yale	<i>New Haven, CT</i>
2017	PERFORMANCE OF THE ATLAS TAU TRIGGER IN RUN 2 Advanced Computing & Analysis Techniques in Physics Research (ACAT)	<i>Seattle, WA</i>
2016	TRIGGER STUDIES FOR THE MU2E EXPERIMENT International Conference on High Energy Physics (ICHEP)	<i>Chicago, IL</i>

Leadership & Service

2017 - 2021	HLeptons Trigger Liaison: Trigger Studies for the ATLAS $H \rightarrow \tau\tau$ Analysis Group
2019 - 2020	Reviewer for NeurIPS Physical Sciences Workshop
2020	Session Co-Convener, PyHEP 2020 (Conference for Python in High-Energy Physics)
2019	Reviewer for Women in Machine Learning (WiML) Workshop

Teaching

Guest Lectures

2023	THE LANGUAGE OF MOVEMENT	<i>Amherst College</i>
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Training

2016	PHYSICS 530: Theory and Practice of Scientific Teaching for Physical Scientists	<i>Yale University</i>
2014	ASTRO 302: Scientists Teaching Science	<i>Harvard University</i>

Yale University

2018	Physics 115: The Physics of Dance American Studies 349: Technologies for Movement Research
2017	Physics 171: University Physics for the Life Sciences Physics 115: The Physics of Dance
2016	Physics 205L: Modern Physical Measurement Physics 115: The Physics of Dance
2015	Physics 165L: General Physics Laboratory

Harvard University

2013	Math 110: Vector Space Methods for Differential Equations
2012 - 2013	Math 121: Linear Algebra and Applications

Inclusion & Outreach Efforts

- 2022 QuarkNet Speaker & Interviewee
- Presented a talk on physics, art, and ML to high school students
 - Answered their questions in a separate hour-long interview
- 2020 Member of the American Physical Society's Inclusion, Diversity, and Equity Alliance (APS-IDEA)
- 2019 - 2021 Member of the Yale Physics Climate & Diversity Committee
- Advocated for a department-wide discussion of discrimination in our community
 - Contributed to the design of our department's Code of Conduct
- 2018 - 2020 US LHC Users Association advocacy trip to Capitol Hill
- Met with the offices of around 15 representatives from Congress each year to ask for their support for high-energy physics research and STEM funding in general
- 2017 - 2018 Speaker, *Science in the News*, delivering scientific talks to the New Haven public
Girls' Science Investigations at Yale
- 2016 Winner, Windy City Physics Slam at ICHEP
Choreographer: *Form Factors*, a dance intervention with physicists at ICHEP
- 2015 - 2020 Yale Women in Physics Mentor