Mariel Pettee

Physicist, AI researcher, and artist
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Positions

University of Wisconsin–Madison 2025 - Now
Assistant Professor of Physics & Bernice Durand Faculty Fellow

Flatiron Institute & Polymathic AI 2022 - Now
Guest Researcher

Lawrence Berkeley National Laboratory 2022 - 2025
Chamberlain Postdoctoral Fellow

Education

Yale University 2021
PhD in Physics

University of Cambridge (Trinity College) 2015
MASt in Physics; Lt. Charles H. Fiske III Harvard-Cambridge Scholar

Harvard University 2014
AB in Physics & Mathematics (*Cum Laude, High Honors*); Minor in Dramatic Arts

Selected Publications

Full list of papers on my Google scholar page. *(**Note:** ▷ indicates alphabetical author ordering.)*

2025

Multimodal Datasets with Controllable Mutual Information — arXiv:2510.21686
R. Hashmani, G. Merz, H. Qu, **M. Pettee**, K. Cranmer.

AION-1: Omnimodal Foundation Model for Astronomical Sciences — NeurIPS, arXiv:2510.17960
Polymathic AI Collaboration.

A Practical Guide to Unbinned Unfolding — EPJC, arXiv:2507.09582
▷ F. Canelli, K. Cormier, A. Cudd, D. Gillberg, R. G. Huang, W. Jin, S. Lee, V. Mikuni, L. Miller, B. Nachman, J. Pan, T. Pani, **M. Pettee** (**editor**), Y. Song, F. Torales Acosta.

What's In Your Field? Mapping Scientific Research with Knowledge Graphs — arXiv:2503.09894
A. Das, N. Lourie, S. Golkar, **M. Pettee.**

Invisible Strings: Revealing Latent Dancer-to-Dancer Interactions with GNNs — ICCC, arXiv:2503.04816
L. Zerkowski, Z. Wang, I. Vidrin, **M. Pettee**.

Dyads: Artist-Centric, AI-Generated Dance Duets — arXiv:2503.03954
Z. Wang, L. Zerkowski, I. Vidrin, **M. Pettee**.

2024

A Simultaneous Unbinned Differential Cross Section Measurement of 24 Z+jets Kinematic Observables with the ATLAS Detector — Phys.Rev.Lett., arXiv:2405.20041
ATLAS Collaboration (**Contact Editor**).

2023

Evidence of the VH, H$\to \tau\tau$ process with the ATLAS detector in Run 2 — Phys.Lett.B
ATLAS Collaboration (**Contact Editor**). — arXiv:2312.02394

xVal: A Continuous Number Encoding for Large Language Models — NeurIPS AI4Sci.
S. Golkar *&* **M. Pettee**, M. Eickenberg, A. Bietti, M. Cranmer, G. Krawezik, F. Lanusse, M. McCabe, R. Ohana, L. Parker, B. Régalo-Saint Blancard, T. Tesileanu, K. Cho, S. Ho. — arXiv:2310.02989

Weakly-Supervised Anomaly Detection in the Milky Way — MNRAS
M. Pettee, S. Thanvantri, B. Nachman, D. Shih, M. R. Buckley, J. H. Collins. — arXiv:2305.03761

Learning Likelihood Ratios with Neural Network Classifiers — JHEP
S. Rizvi, **M. Pettee**, B. Nachman. — arXiv:2305.10500

Fast Point Cloud Generation with Diffusion Models in High Energy Physics — Phys.Rev.D
V. Mikuni, **M. Pettee**, B. Nachman. — arXiv:2304.01266

Heterogeneous GNN for Identifying Hadronically Decayed Taus at the HL-LHC — JINST
▷ A. Huang, X. Ju, J. Lyons, D. Murnane, **M. Pettee**, L. Reed. — arXiv:2301.00501

2022

Symmetry Group Equivariant Architectures for Physics — Snowmass
▷ A. Bogatskiy, S. Ganguly, T. Kipf, R. Kondor, D. W. Miller, D. Murnane, J. T. Offermann, **M. Pettee (co-editor)**, P. Shanahan, C. Shimmin, S. Thais. — arXiv:2203.06153

Point Cloud Deep Learning Methods for Pion Reconstruction in ATLAS — ATLAS PUB Note
ATLAS Collaboration (**co-editor**).

PirouNet: Creating Dance through Artist-Centric Deep Learning — EAI ArtsIT
M. Papillon, **M. Pettee**, N. Miolane. **(Best Paper Award)** — arXiv:2207.12126

Intentional Choreography with Semi-Supervised Recurrent VAEs — NeurIPS ML4CD
M. Papillon, **M. Pettee**, N. Miolane. — arXiv:2209.10010

Anomaly Detection Under Coordinate Transformations — arXiv:2209.06225
▷ G. Kasieczka, R. Mastandrea, V. Mikuni, B. Nachman, **M. Pettee**, D. Shih.

2021

Interdisciplinary Machine Learning for Particle Physics — PhD Thesis
M. Pettee. Yale University.

2020

Choreo-Graph: Learning Latent Graph Representations of the Dancing Body — NeurIPS ML4CD
M. Pettee, S. Miret, S. Majumdar, M. Nassar.

2019

Beyond Imitation: Generative and Variational Choreography via ML — ICCC
M. Pettee, C. Shimmin, D. Duhaime, I. Vidrin. — arXiv:1907.05297

Expected Performance of the ATLAS Detector at the HL-LHC — ATLAS PUB Note
The ATLAS Collaboration (**co-editor**).

Invited Talks

Department Colloquia

Argonne National Laboratory, Physics Division	2025
University of Wisconsin–Madison, Physics Department	2025
Georgia Tech, Physics Department	2025
Santa Clara University, Physics Department	2025
Carleton University, Physics Department	2024
Smith College, Physics Department	2024
Bard College, Physics Department	2024
University of Alabama, Physics Department	2022
University of Alabama, Theatre & Dance Department	2022
Seattle University, Physics Department	2021

Research Seminars

Rutgers University, High-Energy Physics Theory Seminar	2026
ATLAS, Machine Learning Forum	2026
Yale University, Physics x Data Science Seminar	2025
FirstPrinciples, Research Seminar	2025
Argonne National Laboratory, HEP Theory Seminar	2024
SLAC, AI Seminar	2024
UC Berkeley, Bakar Inst. of Digital Materials for the Planet Seminar	2024
Lawrence Berkeley National Lab, Physics Research Progress Meeting	2024
IBM Research, Zurich	2023
University of Chicago, Data Science Institute & James Franck Institute Seminar	2023
Rutgers University, High-Energy Physics Theory Seminar	2023
SLAC, AI Seminar	2022
UC Irvine, Physics & Astronomy Machine Learning Seminar	2022
Imperial College London, DataLearning Working Group Seminar	2022
Amherst College, AI in the Liberal Arts Seminar	2022
Cornell University, Laboratory for Elementary Particle Physics Journal Club	2022
UC Berkeley, Berkeley Institute for Data Science ML + Science Forum	2021
University of Tennessee, HEP Seminar	2021
Flatiron Institute, Center for Computational Astrophysics ML Forum	2021

Conference & Workshop Talks

Aligning AI with Science (Proposed ICML Workshop) (**Keynote**), *Seoul, Korea*	2026
Science at the Convergence of AI and Exascale Computing (**Keynote**), *Paris, France*	2026
Lepton-Photon (**Keynote**), *Madison, WI*	2025

AI for Science Summit, *Lawrence Berkeley National Laboratory* 2024
Foundation Models for Science Mini-Workshop, *CERN* 2024
NASA Science Mission Directorate AI Workshop, *Huntsville, AL* 2024
1st Large Language Models in Physics Symposium, *DESY, Hamburg* 2024
AI-Driven Discovery in Physics & Astrophysics (**Keynote**), *U. of Tokyo* 2024
ML for HEP Workshop, *KEK, Japan* 2024
IAIFI Summer Workshop, *MIT* 2024
ATLAS Standard Model Workshop, *Ljubljana* 2024
APS April Meeting, *Minneapolis, MN* 2023
Hammers & Nails, *Ascona, Switzerland* 2023
KITP Workshop on Data-Driven Galaxy Evolution, *Flatiron CCA* 2023

Arts & Interdisciplinary Talks

Munich Conservatory, Germany 2025
School of the Art Inst. of Chicago 2024
Pratt Institute, Brooklyn, NY 2024
Creativity in the Age of AI Symposium, Foothill College 2024
DanceHack Workshop, Mills College 2023
Ballet Des Moines, IA 2022
Kinetech Arts, San Francisco, CA 2022
Kinetech Arts Open Lab Talk, San Francisco, CA 2020
Conference for Research on Choreographic Interfaces, Brown U. 2020

Contributed Talks

ML4Jets, Caltech, Pasadena, CA 2025
France-Berkeley PHYSTAT Conference on Unfolding, Sorbonne Université, Paris 2024
Flatiron-Wide Machine Learning Meeting, Flatiron Institute, New York, NY 2023
Inter-experiment Machine Learning Workshop, CERN, Geneva 2022
APS April Meeting, New York, NY 2022
Strange Loop Conference, St. Louis, MO 2021
NeurIPS Workshop on ML for Creativity and Design, Vancouver, Canada 2020
ATLAS Tau & HLeptons Workshop, Online 2020
US ATLAS Workshop, UMass Amherst, MA 2019
ATLAS Tau & HLeptons Workshop, Prague, Czech Republic 2019
International Conference on Computational Creativity, UNC Charlotte, NC 2019
US LHC Users Association Meeting, Fermilab, Batavia, IL 2018
ATLAS Machine Learning Workshop, CERN, Geneva 2018
US ATLAS Workshop, U. of Pittsburgh, PA 2018
ATLAS P&P Physics Plenary, CERN, Geneva 2018
ATLAS TDAQ Week, CERN, Geneva 2018

Awards

Bernice Durand Faculty Fellowship, *University of Wisconsin–Madison* 2025

DOE Mission Science Allocation Award, *NERSC* 2023
- 120,000 GPU hours
- Title: "Multidisciplinary AI Models for Science"

Owen Chamberlain Postdoctoral Fellowship, *Lawrence Berkeley National Lab* 2021

Lightning Round Talk Winner, *US LHC Users Association* 2018

Women's Faculty Forum Seed Grant, *Yale University* 2018

Winner, Windy City Physics Slam, *ICHEP* 2016

Distinguished Poster Award (Top 20 out of 500), *ICHEP* 2016

Leigh Page Prize, *Yale University* 2015

Honorable Mention, *NSF Graduate Research Fellowship* 2015

Harvard-Cambridge Scholarship, *Harvard University* 2014
- Full tuition for a master's program at Cambridge

Julia Shaffner Memorial Prize (outstanding woman in science), *Harvard University* 2014

President's Challenge Finalist, *The Harvard Innovation Lab* 2013

15 Most Interesting Seniors, *The Harvard Crimson* 2013

Judges' Award for Acting, *International Student Drama Festival* 2012

Certificate of Distinction in Teaching, *Harvard University* 2012

Caroline Isenberg & Elizabeth Cary Agassiz Fellowships, *Harvard University* 2012

Best Lead Actress in a Play, *Harvard Theater Award* 2011

Leadership & Service

Referee: DOE High-Energy Physics (HEP) Grant Proposals, Phys. Rev. D, NeurIPS ML for the Physical Sciences Workshop, Women in ML Workshop at NeurIPS

Associate Editor, *Physical Review X Intelligence* 2026

Organizer, *Physics in the Era of Foundation Models* (Proposed ICML Workshop) 2026

Lead Organizer, *NeurIPS ML for the Physical Sciences Workshop* 2025

Organizer, *NeurIPS ML for the Physical Sciences Workshop* 2024

Mentor, *Google Summer of Code* 2024
- Supervised two open-source 12-week research projects with students

Trigger Studies Liaison, *ATLAS $H \to \tau\tau$ Analysis Group* 2017 - 2021

Session Co-Convener, *PyHEP (Conference for Python in High-Energy Physics)* 2020

President, *The Signet Society of Arts & Letters*, Harvard University 2014

Press

Viewing the Standard Model with unprecedented detail through the lens of AI — 2024
Berkeley Lab Physical Sciences News

ATLAS measures rare Higgs boson interaction with tau leptons, *ATLAS Briefing* — 2023

"Scientists Begin Building AI for Scientific Discovery Using Tech Behind ChatGPT" — 2023
- Simons Foundation Press Release
- Berkeley Lab Article

Interviewee on the Cognicast podcast — 2022
- A discussion of my research trajectory across AI, physics, and art
- Episode webpage
- Listen on Apple Podcasts

Mariel Pettee successfully defends PhD thesis, *Yale Physics* — 2021

Advice to Women in STEM: Mariel Pettee, *Yale Scientific Magazine* — 2020

Feature on Yale University's Instagram page — 2019

Featured on Women+ Art AI — 2019

Scientists Battle for Physics Slam Crown, *PBS Chicago* — 2016

15 Most Interesting Seniors: Mariel N. Pettee, *The Harvard Crimson* — 2013

Teaching Experience

Graduate Courses

Physics 805: Research Methods for Machine Learning & Physics, *UW-Madison* — 2025

Guest Lectures

CS 839: Theoretical Foundations of Deep Learning, *UW-Madison* — 2026
The Language of Movement, *Amherst College* — 2023
Graduate-level Machine Learning for Physics, *U. of Alabama* — 2021

Teaching Assistant Experience

Note: ▷ *indicates courses for which I was the sole TA.*

▷	Physics 115: The Physics of Dance, *Yale University*	2016 - 2018
▷	American Studies 349: Technologies for Movement Research, *Yale University*	2018
	Physics 171: University Physics for the Life Sciences, *Yale University*	2017
	Physics 205L: Modern Physical Measurement, *Yale University*	2016
	Physics 165L: General Physics Laboratory, *Yale University*	2015
▷	Math 121: Linear Algebra and Applications, *Harvard University*	2012 - 2013
	Math 110: Vector Space Methods for Differential Equations, *Harvard University*	2013

Graduate-level Training on Scientific Teaching

Physics 530: Theory and Practice of Scientific Teaching for Physical Scientists, *Yale* — 2016
Astro 302: Scientists Teaching Science, *Harvard* — 2014

Mentorship

Aneek Jana, graduate student in physics, UW-Madison	Fall 2025 - Now
Jianhao Wu, graduate student in physics, UW-Madison	Fall 2025 - Now
Radha Mastandrea, postdoc in physics, UChicago	Summer 2025
Malika Golshan, post-graduate in physics, UC Berkeley	Fall 2024
Abhipsha Das, graduate student in CS, NYU Courant Institute	Summer 2024
Luis Zerkowski, graduate student in AI at University of Amsterdam	Summer 2024
Zixuan Wang, graduate student in CS at Georgia Tech	Summer 2024
Shahzar Rizvi, undergraduate & then graduate student in Statistics at UC Berkeley	2022 - 2024
Sowmya Thanvantri, undergraduate in Physics at UC Berkeley	2022 - 2024
Jason Wong, undergraduate in Physics at UC Berkeley	2022

Inclusion & Outreach

QuarkNet Speaker — 2022 - 2024
- Presented a talk on physics, art, and ML to high school students
- Answered their questions in a separate hour-long interview

Member of the APS Inclusion, Diversity, and Equity Alliance — 2020

Member of the Yale Physics Climate & Diversity Committee — 2019 - 2021
- Contributed to the design of our department's Code of Conduct

US LHC Users Association advocacy trip to Capitol Hill — 2018 - 2020
- Met with the offices of around 15 representatives from Congress each year
- Garnered support for high-energy physics research through DOE & NSF

Speaker, *Science in the News*, delivering scientific talks to the New Haven public — 2017 - 2018

Girls' Science Investigations at Yale — 2017 - 2018
- Volunteer & "ask-a-scientist" Q&A speaker

Winner, Windy City Physics Slam at ICHEP — 2016

Choreographer of *Form Factors*, a dance intervention with physicists at ICHEP — 2016

Yale Women in Physics Mentor — 2015 - 2020

Scientific Essays

How to Unfold with AI — 2025
CERN Courier, Cover Feature, Jan/Feb 2025 Edition

A high-dimensional jet-powered measurement of the strong force — 2024
CERN Experimental Physics Newsletter

LLMs and the Language of Science — 2023
APS Topical Group on Data Science Newsletter

xVal: A Continuous Number Encoding for LLMs — 2023
Polymathic AI Collaboration Blog Post

Theories of Everything 2018
Sightline Arts

Now or Never: The Case for a Larger Hadron Collider 2018
Yale Distilled Magazine

Arts

AI & Art

mememormee: an evening-length work featuring AI-generated choreography set on six dancers, following a residency at Amherst College 2023
- Spotlight, 2023 NeurIPS Workshop on ML for Creativity & Design

Untitled Bird Project: a pop-up exhibit of AI-generated bird calls situated in nature 2021

Mirror Exercise: an AI-generated duet with myself 2020
- Featured in *Le Mérite*, at the Comédie de Caen, Théâtre des Cordes, France
- Highlight, NeurIPS Workshop on ML for Creativity & Design
- Shown at *Level Up*: The Dramaturgy of Digital Performance & Design
- Featured by the AI Transparency Institute & the 2020 AI Governance Forum
- Boston Cyberarts Gallery exhibition *Perceptions / Distortions*

Studio fellow, *Yale Center for Collaborative Arts & Media* 2020
- Year-long paid fellowship to develop work across art & technology

SIGMA: a short film of AI-generated choreography 2019
- NeurIPS Workshop on ML for Creativity & Design's AI Art Gallery

Live Performance

Singer, *Brooklyn Choir Project* 2025 - 2026
- Performing songs by Brooklyn's best emerging indie & underground artists.

Dancer, *Sublimation* 2022
- By Kinetech Arts
- Supported by the Djerassi Resident Artists Program and Creative Work Fund
- Performed at David Ruth Glass Studio, Oakland, CA

Dancer, *Detour* 2022
- By Kinetech Arts, commissioned by the Berkeley Dance Project
- Performed at Zellerbach Playhouse, Berkeley, CA

Dancer & Coordinator, *Transpositions* 2020
- Chor. Brian Seibert, Renee Robinson, & Elm City Dance Collective

Choreographer, *Elon Musk and the plan to Blow Up Mars the musical* 2020
- Yale Cabaret, dir. Liam Bellman-Sharpe

Dancer, Coordinator, & Rehearsal Director, *Yale Dance Lab* 2020
- New work by choreographer Vicky Shick: "*everywhere*"

Bill T. Jones/Arnie Zane Dance Company Intensive, *Yale Dance Theater* 2019
- Dancer in a restaging of *D-Man in the Waters*

Featured performer, *The Hexagonal Hive and a Mouse in a Maze* 2019
- Interviewed for a documentary by the Derek Jarman Lab, dir. Tilda Swinton

Dancer, *Dance Drawings (For Jock)* 2018
- Choreography by Emily Coates at the Yale Art Gallery's Sol LeWitt exhibit

Paul Taylor Dance Company Intensive, *Yale Dance Theater* 2018
- Lead role in the first restaging of Taylor's *Party Mix* in four decades

Featured performer, *Machine Woman*, dir. Anna Hagen & Jeannie Sui Wonders 2018
- A short film documenting my AI-generated choreography research

Choreographer: "La Mort du Chorégraphe", *A Different Drum Dance Company* 2017

Urban Bush Women Intensive, *Yale Dance Theater* 2017

Gaga Intensive with Saar Harari & Lee Sher, *Yale Dance Theater* 2016

Choreographer: "Rang Cherries", *A Different Drum Dance Company* 2016

Actor, *Attempts on Her Life*, dir. Tania Clarke, *University of Cambridge* 2015

Dancer, *Evolution*, ADC Theatre, *University of Cambridge* 2015

Director/Writer/Choreographer: *Symmetry Breaking*, *Harvard University* 2014
- Senior thesis & immersive multimedia performance about the Higgs boson

Choreographer-in-Residence, *Harvard Dance Center* 2014

Dancer, *Paper Wing*, chor. Jill Johnson, Farkas Hall 2014

Arts@CERN Internship 2013

Eurydice, *Antigonick*, dir. Ianthe Demos, American Repertory Theater Mainstage 2013

Isabelle & Executive Producer, *The Edge of the Map*, dir. Calla Videt (Sightline) 2013

Dancer, *At Last*, Loeb Experimental Theater, Harvard University 2013

Dancer, *On The Run*, Harvard Dance Center 2013

Vice-President & Mainstage Coordinator, *The Harvard-Radcliffe Dramatic Club* 2012

Lucy, *CryHurtFood*, Loeb Experimental Theater / Crucible Mainstage (Sheffield, UK) 2012

Director: *for the purpose of catching ourselves in the act of being the most* 2012
- Guinness World Record: longest telephone conversation between two people

Co-founder and collaborator, *The Harvard Generalist* artistic collective 2011

Drama & Dance Proctor, *Harvard University Freshman Arts Program* (2011-2014) 2011