Anindita Maiti

Curriculum Vitae

Contact

Perimeter Institute, Waterloo, ON, Postal Code N2L 2Y5, Canada. Personal website
Citizenship: Indian amaiti@perimeterinstitute.ca

Academic Positions

Perimeter Institute for Theoretical Physics – Waterloo, Canada Sept 2023 - Present
Postdoctoral Fellow

Harvard John A. Paulson SEAS – Boston, USA May 2023 - Aug 2023
Postdoctoral Fellow (Applied Math)
Supervisor: Cengiz Pehlevan

Education

Northeastern University – Boston, USA 2017-2023
Ph.D. (Physics)
Advisor: James Halverson

The NSF AI Institute for Artificial Intelligence and Fundamental Interactions – Boston
Junior Investigator 2020-2023

Indian Institute of Technology Bombay – Mumbai, India 2012-2017
Integrated Bachelor and Master of Technology (Engineering Physics) with Honors (Physics)
Advisor: Urjit Yajnik

Research Interests

Neural Networks & Machine Learning for Quantum Field Theory (QFT).
Statistical Physics & QFT for Machine Learning.
Neural Networks & Machine Learning for Quantum.

Preprints & Publications

J. N. Howard, M. S. Klinger, **A. Maiti**, A. G. Stapleton, "*Bayesian RG Flow in Neural Network Field Theories*", [arXiv:2405.17538].

Y. M. Lu, M. I. Letey, J. A. Zavatone-Veth, **A. Maiti**, C. Pehlevan, "*Asymptotic theory of in-context learning by linear attention*", [arXiv:2405.11751].

J. N. Howard, R. Jefferson, **A. Maiti**, Z. Ringel, "*Wilsonian Renormalization of Neural Network Gaussian Processes*", [arXiv:2405.06008].

M. Demirtas, J. Halverson, **A. Maiti**, M. D. Schwartz, K. Stoner, "*Neural Network Field Theories: Non-Gaussianity, Actions, and Locality*", Mach. Learn. Sci. Tech. 5, 015002 (2024), [arXiv:2307.03223].

A. Maiti, K. Stoner, J. Halverson, "*Symmetry-via-Duality: Invariant Neural Network Densities from Parameter-Space Correlators*", MACHINE LEARNING: IN PURE MATHEMATICS AND THEORETICAL PHYSICS, 2023, **293-330**, [arXiv:2106.00694v1].

J. Halverson, C. Long, **A. Maiti**, B. Nelson, G. Salinas, "*Gravitational waves from dark Yang-Mills sectors*", JHEP **05** (2021), 154, [arXiv:2012.04071].

J. Halverson, **A. Maiti**, K. Stoner, "*Neural Networks and Quantum Field Theory*", Mach. Learn. Sci. Tech. **2** (2021) no. 3, 035002, [arXiv:2008.08601].

In-Progress

"*Restricted Boltzmann Machines are Gaussian Processes in Reciprocal Space*" - with Javier Toledo-Marin, Roger Melko.

"*Grassmann Neural Network Field Theories*" - with James Halverson, Fabian Ruehle, Samuel Frank.

"*Reinforcement Learning Exploration of Chiral Gauge Theories*" - with James Halverson.

Awards & Honors

UC Riverside Chancellor's Postdoctoral Fellowship: Jul 1, 2023 to Jul 1, 2024 (Declined).

Dean's Graduate Student Excellence Award in Research: Northeastern University College of Science (Spring 2021).

Lawrence Award for Graduate Academic Excellence: Northeastern University Dept. of Physics (Spring 2018).

Travel Grants: "Theoretical Physics for Machine Learning" Workshop by Aspen Center for Physics (Feb 2023); "New Frontiers in Machine Learning and Quantum" Workshop by Perimeter Institute (Nov 2022); The NSF IAIFI (Feb 2023); Northeastern University Dept. of Physics (Summer 2022); Northeastern University PhD Network (Summer 2022).

Indian Academy of Sciences Summer Research Fellowship: Indian Academy of Sciences, (Summer 2014).

Seminars, Talks, Colloquia

Invited Workshop, Conference Talks

String Data 2024, Kyoto University, Japan — Dec 2024

Machine Learning and the Renormalization Group, ECT*, Italy — May 2024

Future Horizons: Bridging AI, Quantum and New Materials, IVADO, Perimeter Institute, Institut Courtois and Mila Quebec, Canada — May 2024

Fields, Strings, and Deep Learning, Aspen Center for Physics — Jan 2024

(Non-speaking) Program Invitation: Deep Learning from the Perspective of Physics and Neuroscience, Kavli Institute for Theoretical Physics, UCSB — Nov 2023

AI and Quantum Information for Particle Physics, KAIST and IBS Center for Theoretical Physics of the Universe — Nov 2023

Probing the Frontiers of Nuclear Physics with AI at the EIC, Stony Brook University CFNS — Sept 2023

Machine Learning for Lattice Field Theory and Beyond, ECT*, Italy — Jun 2023

New Frontiers in Machine Learning and Quantum, Perimeter Institute — Nov 2022

Short Talks: A Deep-Learning Era of Particle Theory, Mainz Institute for Theoretical Physics, Johannes Gutenberg University [slides] — June 2022

String Data 2021, University of Witwatersrand & University of Cape Town [slides] — Dec 2021

Gong Show: Strings, Geometry, and Data Science, Simons Center for Geometry and Physics, Stony Brook University [slides] — Jan 2020

Invited Seminars

High Energy Physics Seminar, Indian Institute of Technology Kanpur — June 2024

Stanford Linear Accelerator Center (SLAC) AI Seminar, Stanford University — Feb 2024

ORIGINS Data Science Lab Seminar, TU Munich — Jul 2023

Center for Theoretical Physics Seminar, Seoul National University — Mar 2023

AIC Seminar, Université Paris-Saclay, CEA-LIST — Jan 2023

UCI Physics Astro/Particle-ML Seminar Series, UC Irvine — Oct 2022

UCSB Joint HEX-HET Seminar Series, UC Santa Barbara — Oct 2022

HEP Seminar, UC Riverside — Oct 2022

Majorana-Raychaudhuri Seminar Series, INFN & University Salerno, Italy & PAMU, Indian Statistical Institute, Kolkata, India — Sept 2022

Computational Algebra Seminar Series, University of Nottingham, UK — Sept 2022

Pehlevan Research Group Journal Club, Harvard University [slides] — Aug 2022

QFT Research Seminar, Institute for Theoretical Physics - Münster (WWU) [slides] — May 2021

Joint High Energy Theory and Machine Learning Seminar, Heidelberg University, LMU Munich and Northeastern University [slides] — May 2021

Journal Club, The NSF AI Institute for A. I. and Fundamental Interactions [slides] Feb 2021

Seminar Series on String Phenomenology [slides] Oct 2020

Contributed Workshop, Conference Talks, Posters

String Data 2023, Caltech Dec 2023

Parallel Session: Summer Workshop 2023, The NSF AI Institute for Artificial Intelligence and Fundamental Interactions (IAIFI) Aug 2023

Poster Session: Theoretical Physics for Machine Learning, Aspen Center for Physics Feb 2023

Poster session: Summer Workshop 2022, The NSF IAIFI Aug 2022

Parallel Session: String Phenomenology 2022, University of Liverpool [slides] Jul 2022

Lightning Talks on Discovering Latent Structure in Artificial and Physical Systems, The NSF IAIFI [slides] May 2022

Lightning Session: IAIFI-AIMLAC Workshop, The NSF IAIFI [slides] Mar 2022

Gong Show: String Data 2020, CERN [slides] Dec 2020

Contributed Seminars

IPPP Seminar, Institute for Particle Physics Phenomenology, Durham University Nov 2022

Oxford Dalitz Seminar in Fundamental Physics, U. Oxford Nov 2022

Theoretical Particle Physics & Cosmology Seminar, King's College London Oct 2022

Mathematics Seminar, City, University of London Oct 2022

Theoretical Physics Seminar, Uppsala University Oct 2022

Journal Club, The NSF AI Institute for A. I. and Fundamental Interactions Sept 2022

Organization

Workshops and Conferences

Generative AI for High & Low Energy Physics, Kavli Institute for Theoretical Physics, UC Santa Barbara, USA Nov-Dec 2025
- Member of the organizing committee and DEI coordinator

Future Horizons: Bridging AI, Quantum and New Materials, IVADO, Perimeter Institute, Institut Courtois and Mila Quebec, Canada May 2024
- Member of the organizing committee

At the interface of physics, mathematics and artificial intelligence, Pollica Physics Center, Italy May-June 2023
- Member of the organizing committee

Teaching Experience

Tutorial Lead – Future Horizons: Bridging AI, Quantum and New Materials 2024
Machine Learning from a Physicist's Perspective: lectures by Anindita Maiti

Tutorial Lead – The NSF IAIFI Summer School 2023
Normalizing Flows for Lattice Field Theory: lectures by Miranda Cheng

Teaching Assistant – Northeastern University, Boston, Massachusetts
PHYS 7325: Quantum Field theory 1 (Fall 2020, Fall 2019)
PHYS 5115: Quantum Mechanics (Spring 2020, Spring 2019)
PHYS 3601: Classical Dynamics (Fall 2018)
PHYS 2305: Thermo and Statistical Mechanics (Spring 2018)
PHYS 1155: Physics Lab for Engineering 2 (Fall 2017)
PHYS 3600: Advanced Physics Lab (multiple semesters)
Undergraduate Physics lab (multiple semesters)

Teaching Assistant – IIT Bombay, Mumbai, India
PH 117: Undergraduate Physics lab (Spring 2017)
EP 215: Undergraduate Electronics lab (Fall 2016)

Professional Service Activities

Member, Anti-Racism Working Group & Mental Health Working Group: Perimeter Institute for Theoretical Physics (Sept 2023 - Present).

Member, Organizing Committee: At the Interface of Physics, Mathematics and Artificial Intelligence, Pollica Physics Center (May 2023).

Member, AI / ML Summer School organizing committee: Scientists for Palestine. (Jan 2023 - Present)

Alumnus Mentor: For undergraduate students in Engineering Physics major at IIT Bombay. (Sept 2022 - Present)

Member, Early Career and Equity Committee: The NSF AI Institute for Artificial Intelligence and Fundamental Interactions. (Jan 2021 - Dec 2022)

Member, Graduate Student Council: Northeastern University College of Science. (Sept 2020 - Aug 2022)

Coordinator & Initiator, Graduate Women in Physics Society : Northeastern University Dept. of Physics. (Sept 2021 - May 2023)

Referee: SynS & ML @ ICML2023; NeurIPS 2022 workshop on Machine Learning and the Physical Sciences; NeurIPS 2021 workshop on Machine Learning and the Physical Sciences; 'Foundations of Physics' Journal; NeurIPS 2020 workshop on Machine Learning and the Physical Sciences.

Summer Schools

- IAIFI Summer School, Aug 2022, The NSF AI Institute for Artificial Intelligence and Fundamental Interactions.
- Theoretical Advanced Study Institute in Particle Theory (TASI), June 2021, CU Boulder.
- Deep Learning Theory Summer School at Princeton, Jul 2021, Princeton University.

References

(1) Prof. Roger Melko, (*Email: rmelko@perimeterinstitute.ca*),
Professor, Department of Physics & Astronomy, University of Waterloo,
Associate Faculty, Perimeter Institute for Theoretical Physics,
Canada Research Chair in Computational Quantum Many-Body Physics

(2) Prof. James Halverson, (*Email: j.halverson@northeastern.edu*),
Associate Professor, Dept. of Physics, Northeastern University,
The NSF AI Institute for Artificial Intelligence and Fundamental Interactions.

(3) Prof. Cengiz Pehlevan, (*Email: cpehlevan@seas.harvard.edu*),
Assistant Professor, Dept. of Applied Mathematics, Harvard University.
Kempner Institute Associate Faculty.

(4) Prof. Matthew Schwartz, (*Email: schwartz@g.harvard.edu*),
Associate Professor, Dept. of Physics, Harvard University,
The NSF AI Institute for Artificial Intelligence and Fundamental Interactions.

(5) Prof. Fabian Ruehle, (*Email: f.ruehle@northeastern.edu*),
Assistant Professor, Dept. of Physics and Dept. of Mathematics, Northeastern University,
The NSF AI Institute for Artificial Intelligence and Fundamental Interactions.

Technical skills

Programming languages: Python, C, C++, Mathematica, Matlab, Pytorch.