Siddharth Mishra-Sharma

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Appointments

Anthropic — **San Francisco, CA, USA**
Member of Technical Staff — Nov. 2024 – Present
Resident — Jul. 2024 – Oct. 2024

Boston University — **Boston, MA, USA**
Faculty of Computing & Data Sciences
Assistant Professor of Computing & Data Sciences and Physics — Sep. 2025 – Present

Massachusetts Institute of Technology — **Cambridge, MA, USA**
Harvard University — **Cambridge, MA, USA**
NSF AI Institute for Artificial Intelligence and Fundamental Interactions
IAIFI Fellow — Sep. 2021 – Jul. 2024

New York University — **New York, NY, USA**
Center for Cosmology and Particle Physics
Postdoctoral Associate — Sep. 2018 – Aug. 2021

Education

Princeton University — **Princeton, NJ, USA**
Ph.D. in Theoretical Physics — Sep. 2013 – Aug. 2018
Thesis: *Extragalactic Searches for Dark Matter Annihilation*
Advisor: Mariangela Lisanti

University of Cambridge — **Cambridge, UK**
Part III of the Mathematical Tripos (M.Math.) — Oct. 2012 – Jun. 2013
B.A. (Hons.) in Natural Sciences (Physical) — Oct. 2009 – Jun. 2012

Papers

Primary contributions: *(Note: where indicated with an asterisk*, authors are listed in alphabetical order as per the standard in that field. †denotes equal contribution.)*

56. A. Akhmetzanova, C. Cuesta-Lazaro, S. Mishra-Sharma, *Detecting Model Misspecification in Cosmology with Scale-Dependent Normalizing Flows*, Under review at Mach.Learn.Sci.Tech. [arXiv:2508.05744]
55. T. Nguyen, C. Modi, L. Y. Aaron Yung, R. Somerville, S. Mishra-Sharma, *Generating Dark Matter Halo Merger Trees with Graph Generative Models*, Accepted at Mon.Not.Roy.Astron.Soc. (MNRAS) [arXiv:2507.10652]
54. †S. Marks, †J. Treutlein, T. Bricken, J. Lindsey, J. Marcus, S. Mishra-Sharma et al., *Auditing language models for hidden objectives* [arXiv:2503.10965] [Paper]
53. T. Nguyen, J. Read, L. Necib, S. Mishra-Sharma, C.A. Faucher-Giguère, A. Wetzel, *Trial by FIRE: Probing the dark matter density profile of dwarf galaxies with GraphNPE*, Accepted at MNRAS

[arXiv:2503.03812]

52. S. Mishra-Sharma, T. Bricken, J. Lindsey, A. Jermyn, J. Marcus, K. Rivoire, C. Olah, T. Henighan, *Insights on crosscoder model diffing*, Transformer Circuits Thread, 2025. [Link]

51. T. Bricken, S. Mishra-Sharma, J. Marcus, A. Jermyn, C. Olah, K. Rivoire, T. Henighan, *Stage-Wise Model Diffing*, Transformer Circuits Thread, 2024. [Link]

50. T. Bricken, J. Marcus, S. Mishra-Sharma, M. Tong, E. Perez, M. Sharma, K. Rivoire, T. Henighan, *Using Dictionary Learning Features as Classifiers*, Transformer Circuits Thread, 2024. [Link]

49. C. Cuesta-Lazaro, A.E. Bayer, M.S. Albergo, S. Mishra-Sharma, C. Modi, D. Eisenstein, *Joint cosmological parameter inference and initial condition reconstruction with Stochastic Interpolants*, Machine Learning and the Physical Sciences Workshop at the 38th Conference on Neural Information Processing Systems (NeurIPS 2024) **[Spotlight Oral]** [Paper]

48. E.D. Ramirez, Y. Sun, M.R. Buckley, S. Mishra-Sharma, T.R. Slatyer, *Inferring the Morphology of the Galactic Center Excess with Gaussian Processes*, Phys.Rev. **D111** (2025) 063065 [arXiv:2410.21367]

47. J. Balla, S. Mishra-Sharma, C. Cuesta-Lazaro, T. Jaakkola, T. Smidt, *A Cosmic-Scale Benchmark for Symmetry-Preserving Data Processing*, Accepted at Proceedings of Machine Learning Research (PMLR) Volume on Symmetry and Geometry in Neural Representations; Learning on Graphs Conference 2024 **[Spotlight Oral]** [arXiv:2410.20516]

46. T. Nguyen, F. Villaescusa-Navarro, S. Mishra-Sharma et al., *How DREAMS are made: Emulating Satellite Galaxy and Subhalo Populations with Diffusion Models and Point Clouds*, Under review at Astrophys.J. [arXiv:2409.02980]

45. †G. Zhang, †T. Helfer, A. Gagliano, S. Mishra-Sharma, V.A. Villar, *Maven: A Multimodal Foundation Model for Supernova Science*, NeurIPS 2024 Foundation Models for Science Workshop, NeurIPS 2024 Workshop on Time Series in the Age of Large Models **[Spotlight Oral** and **Best Paper Runner-Up Award]**, NeurIPS 2024 Workshop on Self-Supervised Learning; Mach.Learn.Sci.Tech. **5** (2025) 045069 [arXiv:2408.16829]

44. A. Delaunoy, M. de la Brassinne Bonardeaux, S. Mishra-Sharma, G. Louppe, *Low-Budget Simulation-Based Inference with Bayesian Neural Networks* [arXiv:2408.15136]

43. *C. Giovanetti, M. Lisanti, H. Liu, S. Mishra-Sharma, J.T. Ruderman, *LINX: A Fast, Differentiable, and Extensible Big Bang Nucleosynthesis Package*, Phys.Rev. **D112** (2025) 063531 [arXiv:2408.14538]

42. *C. Giovanetti, M. Lisanti, H. Liu, S. Mishra-Sharma, J.T. Ruderman, *Cosmological Parameter Estimation with a Joint-Likelihood Analysis of the Cosmic Microwave Background and Big Bang Nucleosynthesis*, Phys.Rev. **D112** (2025) 063530 [arXiv:2408.14531]

41. N. Sabti, R. Reddy, J.B. Muñoz, S. Mishra-Sharma, T. Youn, *A Generative Modeling Approach to Reconstructing 21-cm Tomographic Data*, Mach.Learn.Sci.Tech. **6** (2025) 015039 [arXiv:2407.21097]

40. S. Mishra-Sharma, Y. Song, J. Thaler, *PAPERCLIP: Associating Astronomical Observations and Natural Language with Multi-Modal Models*, Conference on Language Modeling (COLM 2024) [arXiv:2403.08851]

39. M.M. Ivanov, †C. Cuesta-Lazaro, †S. Mishra-Sharma, †A. Obuljen, †M. Toomey, *Full-shape analysis with simulation-based priors: constraints on single field inflation from BOSS*, Accepted at Phys.Rev. D [arXiv:2402.13310]

38. *L. Heinrich, S. Mishra-Sharma, C. Pollard, P. Windischhofer, *Hierarchical Neural Simulation-Based*

Inference Over Event Ensembles, Transactions on Machine Learning Research (TMLR) [arXiv:2306.12584]

37. †S. Mishra-Sharma, †C. Cuesta-Lazaro, *A point cloud approach to generative modeling for galaxy surveys at the field level*
    - Phys.Rev. D [arXiv:2311.17141]
    - Machine Learning for Astrophysics Workshop at the Fortieth International Conference on Machine Learning (ICML 2023) **[Spotlight Oral]** [Paper]
36. *S. Mishra-Sharma, T.R. Slatyer, Y. Sun, Y. Wu, *Disentangling gamma-ray observations of the Galactic Center using differentiable probabilistic programming*, Machine Learning for Astrophysics Workshop at the Fortieth International Conference on Machine Learning (ICML 2023) **[Spotlight Oral]** [Paper]
35. A. Akhmetzanova, S. Mishra-Sharma, C. Dvorkin, *Data Compression and Inference in Cosmology with Self-Supervised Machine Learning*
    - Mon.Not.Roy.Astron.Soc. 527 (2023) 7459 [arXiv:2308.09751]
    - Machine Learning for Astrophysics Workshop at the Fortieth International Conference on Machine Learning (ICML 2023) [Paper]
34. G. Zhang, S. Mishra-Sharma, C. Dvorkin, *Inferring subhalo effective density slopes from strong lensing observations with neural likelihood-ratio estimation*, Mon.Not.Roy.Astron.Soc. 517 (2022) 4317 [arXiv:2208.13796]
33. T. Nguyen, S. Mishra-Sharma, R. Williams, L. Necib, *Uncovering dark matter density profiles in dwarf galaxies with graph neural networks*
    - Phys.Rev. **D107** (2023) 043015 [arXiv:2208.12825]
    - Machine Learning for Astrophysics Workshop at the Thirty-ninth International Conference on Machine Learning (ICML 2022) **[Spotlight Oral]** [Paper]
32. S. Mishra-Sharma, G. Yang, *Strong Lensing Source Reconstruction Using Continuous Neural Fields*, Machine Learning for Astrophysics Workshop at the Thirty-ninth International Conference on Machine Learning (ICML 2022) **[Spotlight Oral]** [arXiv:2206.14820]
31. *A. Caputo, H. Liu, S. Mishra-Sharma, M. Pospelov, J.T. Ruderman, *A Stimulating Explanation of the Extragalactic Radio Background*, Phys.Rev. **D107** (2023) 123033 [arXiv:2206.07713]
30. S. Mishra-Sharma, K. Cranmer, *A neural simulation-based inference approach for characterizing the Galactic Center γ-ray excess*
    - Phys.Rev. **D105** (2022) 063017 [arXiv:2110.06931]
    - Machine Learning and the Physical Sciences Workshop at the 35th Conference on Neural Information Processing Systems (NeurIPS 2021) [Paper] [Poster]
29. S. Mishra-Sharma, *Inferring dark matter substructure with astrometric lensing beyond the power spectrum*
    - Mach.Learn.Sci.Tech. **3** (2022) 01LT03 [arXiv:2110.01620]
    - Machine Learning and the Physical Sciences Workshop at the 35th Conference on Neural Information Processing Systems (NeurIPS 2021) [Poster]
28. S. Mishra-Sharma, K. Cranmer, *Semi-parametric γ-ray modeling with Gaussian processes and variational inference*, Machine Learning and the Physical Sciences Workshop at the 34rd Conference on Neural Information Processing Systems (NeurIPS 2020) [Paper] [Poster] [arXiv:2010.10450]

27. *A. Caputo, H. Liu, S. Mishra-Sharma, M. Pospelov, J.T. Ruderman, A. Urbano, *Edges and Endpoints in 21-cm Observations from Resonant Photon Production*, Phys.Rev.Lett. **127** (2021) 011102 [arXiv:2009.03899]

26. J.J. Somalwar, L.J. Chang, S. Mishra-Sharma, M. Lisanti, *Harnessing the Population Statistics of Subhalos to Search for Annihilating Dark Matter*, Astrophys.J. **906** (2021) no.1, 57 [arXiv:2009.00021]

25. *A. Caputo, H. Liu, S. Mishra-Sharma, J.T. Ruderman, *Modeling Dark Photon Oscillations in Our Inhomogeneous Universe*, Phys.Rev. **D102** (2020) 103533 [arXiv:2004.06733]

24. S. Mishra-Sharma, K. Van Tilburg, N. Weiner, *Power of Halometry*, Phys.Rev. **D102** (2020) 023026 [**Editors' Suggestion** and **Featured** in *Physics*; Synopsis] [arXiv:2003.02264]

23. M. Buschmann, N.L. Rodd, B.R. Safdi, L.J. Chang, S. Mishra-Sharma, M. Lisanti, O. Macias *Foreground Mismodeling and the Point Source Explanation of the Fermi Galactic Center Excess*, Phys.Rev. **D102** (2020) 023023 [arXiv:2002.12373]

22. *A. Caputo, H. Liu, S. Mishra-Sharma, J.T. Ruderman, *Dark Photon Oscillations in Our Inhomogeneous Universe*, Phys.Rev.Lett. **125** (2020) 221303 [arXiv:2002.05165]

21. J. Brehmer, K. Cranmer, S. Mishra-Sharma, F. Kling, G. Louppe, *Mining gold: Improving simulation-based inference with latent information*, Machine Learning and the Physical Sciences Workshop at the 33rd Conference on Neural Information Processing Systems (NeurIPS 2019) [Paper]

20. *†J. Brehmer, †S. Mishra-Sharma, J. Hermans, G. Louppe, K. Cranmer, *Mining for Dark Matter Substructure: Inferring subhalo population properties from strong lenses with machine learning*, Astrophys.J. **886** (2019) no.1, 49 [arXiv:1909.02005]

19. L.J. Chang, S. Mishra-Sharma, M. Lisanti, M. Buschmann, N.L. Rodd, B.R. Safdi, *Characterizing the Nature of the Unresolved Point Sources in the Galactic Center: An Assessment of Systematic Uncertainties*, Phys.Rev. **D101** (2020) 023014 [arXiv:1908.10874],

18. *L.J. Chang, M. Lisanti, S. Mishra-Sharma, *Search for Dark Matter Annihilation in the Milky Way Halo*, Phys.Rev. **D98** (2018) 123004 [arXiv:1804.04132]

17. S. Mishra-Sharma, D. Alonso, J. Dunkley, *Neutrino masses and beyond-ΛCDM cosmology with LSST and future CMB experiments*, Phys.Rev. **D97** (2018) 123544 [arXiv:1803.07561]

16. *R. Bartels, D. Hooper, T. Linden, S. Mishra-Sharma, N.L. Rodd, B.R. Safdi, T.R. Slatyer, *Comment on "Characterizing the population of pulsars in the Galactic bulge with the Fermi Large Area Telescope" [arXiv:1705.00009v1]*, Phys.Dark Univ. **20** (2018) 88-94 [arXiv:1710.10266]

15. *M. Lisanti, S. Mishra-Sharma, N.L. Rodd, B.R. Safdi, *Mapping Extragalactic Dark Matter Annihilation with Galaxy Surveys: A Systematic Study of Stacked Group Searches*, Phys.Rev. **D97** (2018) 063005 [arXiv:1709.00416]

14. *M. Lisanti, S. Mishra-Sharma, N.L. Rodd, B.R. Safdi, *Search for Dark Matter Annihilation in Galaxy Groups*, Phys.Rev.Lett. **120** (2018) 101101 [arXiv:1708.09385]

13. *T. Cohen, M. Lisanti, H. K. Lou, S. Mishra-Sharma, *LHC Searches for Dark Sector Showers*, JHEP **11**, 196 (2017) [arXiv:1707.05326]

12. *S. Mishra-Sharma, N.L. Rodd, B.R. Safdi, *NPTFit: A code package for Non-Poissonian Template Fitting*, Astron.J. **153** (2017) no.6, 253 [arXiv:1612.03173]

11. *Y. Kahn, G. Krnjaic, S. Mishra-Sharma, T.M.P. Tait, *Light Weakly Coupled Axial Forces: Models,*

Constraints, and Projections, JHEP **05**, 002 (2017) [arXiv:1609.09072]

10. *M. Lisanti, S. Mishra-Sharma, L. Necib, B.R. Safdi, *Deciphering Contributions to the Extragalactic Gamma-Ray Background from 2 GeV to 2 TeV*, Astrophys.J. **832** (2016) no.2, 117 [arXiv:1606.04101]
9. *S.K. Lee, M. Lisanti, S. Mishra-Sharma, B.R. Safdi, *Modulation Effects in Dark Matter-Electron Scattering Experiments*, Phys.Rev. **D92** (2015) 083517 [arXiv:1508.07361]

Contributions to white papers and as part of larger collaborations:

8. G. Grosso, P. Harris, S. Mishra-Sharma, P. Shanahan, *A Virtuous Cycle: Generative AI and Discovery in the Physical Sciences*, An MIT Exploration of Generative AI (2024)
7. C. Dvorkin, S. Mishra-Sharma *et al.*, *Machine Learning and Cosmology: Snowmass 2021 White Paper* [arXiv:2203.08056]
6. K. Boddy *et al.* (including S. Mishra-Sharma), *Snowmass2021 theory frontier white paper: Astrophysical and cosmological probes of dark matter*, J.HEAp 35 (2022) 112-138 [arXiv:2203.08056]
5. R. Leane *et al.* (including S. Mishra-Sharma), *Snowmass2021 Cosmic Frontier White Paper: Puzzling Excesses in Dark Matter Searches and How to Resolve Them* [arXiv:2203.06859]
4. J. Alimena *et al.* (including S. Mishra-Sharma), *Searching for long-lived particles beyond the Standard Model at the Large Hadron Collider*, J.Phys.G 47 (2020) 090501 [arXiv:1903.04497]
3. S. Algeri *et al.* (including S. Mishra-Sharma), *Statistical challenges in the search for dark matter* [arXiv:1807.09273]
2. DarkSide Collaboration (including S. Mishra-Sharma), *Constraints on Sub-GeV Dark Matter-Electron Scattering from the DarkSide-50 Experiment*, Phys.Rev.Lett. **121** (2018) 111303 [arXiv:1802.06998]
1. DarkSide Collaboration (including S. Mishra-Sharma), *Low-Mass Dark Matter Search with the DarkSide-50 Experiment*, Phys.Rev.Lett. **121** (2018) 081307 [arXiv:1802.06994]

Seminars, Colloquia, and Conference Talks

Invited talks:

- UCSB Joint HEX-HET Seminar — Santa Barbara, CA, Nov. 2025
- ICML 2025 Colocated ML4Astro Workshop (Invited panel) — Vancouver, BC, Jul. 2025
- Stanford Center for Decoding the Universe Annual Conference (Invited panel) — Stanford, CA, Jun. 2025
- UC Santa Barbara Computer Science Colloquium — Santa Barbara, CA, Jun. 2024
- KITP Program: Cosmic Signals of Dark Matter Physics — Santa Barbara, CA, Jun. 2024
- European AI for Fundamental Physics Conference, Plenary — Amsterdam, Netherlands, Apr. 2024
- Herzberg Astronomy and Astrophysics Research Centre Colloquium (Remote) — Apr. 2024
- Rutgers High Energy Theory Seminar — New Brunswick, NJ, Mar. 2024
- Boston University Computing & Data Sciences (CDS) Colloquium — Boston, MA, Feb. 2024
- Georgia Tech School of Physics Colloquium — Atlanta, GA, Jan. 2024
- Rising Stars in Data Science Workshop — Chicago, IL, Nov. 2023

- Summit for AI Institutes Leadership — Atlanta, GA, Oct. 2023
- Johns Hopkins University Cosmology and Particle Physics Seminar — Baltimore, MD, Oct. 2023
- MIAPbP Workshop on Differentiable and Probabilistic Programming — Munich, Germany, Jun. 2023
- Status of the Galactic Center Excess Workshop — New Brunswick, NJ, Jun. 2023
- Simons Foundation MATH+X Symposium — Hella, Iceland, May. 2023
- Cosmic Connections: ML X Astrophysics (Flatiron Institute) — New York, NY, May. 2023
- Harvard Center for Astrophysics ITC Lunch Talk — Cambridge, MA, Apr. 2023
- Aspen Center for Physics Winter Session — Aspen, CO, Mar. 2023
- Normal Computing (Probabilistic AI Startup; Remote) — Feb. 2023
- Yale Astronomy Colloquium — New Haven, CT, Feb. 2023
- Mila ML for the Physical Sciences Reading Group — Montréal, Quebec, Jan. 2023
- McGill Space Institute Astronomy Seminar — Montréal, Quebec, Jan. 2023
- Nature of Dark Matter on Small Scales Meeting (Remote) — Oct. 2022
- Dagstuhl Seminar: Bridging Data-driven and Mechanistic Modelling — Dagstuhl, Germany, Sep. 2022
- Hammers & Nails Workshop 2022 — Rehovot, Israel, Aug. 2022
- ICML 2022 ML4Astro Workshop (Spotlight oral) — Baltimore, MD, May. 2022
- Physics ∩ ML Seminar (Remote at physicsmeetsml.org) — May. 2022
- Harvard CHASC Astrostatistics Seminar (Remote) — Apr. 2022
- University of Illinois Urbana-Champaign Phenomenology Seminar — Urbana, IL, Mar. 2022
- Harvard High Energy Theory Seminar — Cambridge, MA, Mar. 2022
- American Astronomical Society 239th Meeting (Invited panel) — Salt Lake City, UT, Jan. 2022
- Harvard LPPC (High Energy Experiment) Seminar — Cambridge, MA, Nov. 2021
- Rutgers High Energy Theory Seminar — New Brunswick, NJ, Oct. 2021
- Instituto de Astrofísica de Canarias Astrophysics Seminar (Remote) — Sep. 2021
- Stony Brook University YITP Seminar (Remote) — Mar. 2021
- SLAC AI Seminar Series (Remote) — Feb. 2021
- Northeastern University Physics Colloquium (Remote) — Feb. 2021
- Carnegie Observatories "Lunch Talk" Seminar (Remote) — Feb. 2021
- BSM PANDEMIC Seminar (Remote at bsmpandemic.com) — Nov. 2020
- SLAC Elementary Particle Physics Seminar (Remote) — Jul. 2020
- University of Amsterdam GRAPPA Colloquium (Remote) — May 2020
- Princeton Pheno & Vino Seminar (Remote) — Apr. 2020
- CERN-TH BSM Forum (Remote) — Apr. 2020
- Machine Learning for Astrophysicists Seminar (Remote at mlclub.net) — Mar. 2020
- University of Michigan LCTP Brown Bag Seminar — Ann Arbor, MI, Jan. 2020

- Stony Brook University Particle Physics Seminar — Stony Brook, NY, Nov. 2019
- Minnesota High Energy Theory Lunchtime Seminar — Minneapolis, MN, Nov. 2019
- Brown Astrophysics Seminar Series — Providence, RI, May 2019
- Particles, Strings and Cosmology (PASCOS) 2018 — Cleveland, OH, Jun. 2018
- Recontres de Blois 2018 — Blois, France, Jun. 2018
- Princeton Astrophysics/IAS Cosmology Lunch Seminar — Princeton, NJ, May 2018
- Fermilab Particle Astrophysics Seminar — Batavia, IL, Mar. 2018
- Workshop on Statistical Challenges in the Search for Dark Matter — Banff, Canada, Feb. 2018
- Maryland Elementary Particle Theory Seminar — College Park, MD, Nov. 2017
- Rutgers High Energy Theory Seminar — New Brunswick, NJ, Nov. 2017
- Cornell Particle Theory Seminar — Ithaca, NY, Nov. 2017
- Caltech Particle Theory Seminar — Pasadena, CA, Oct. 2017
- UC Irvine Joint Particle Seminar — Irvine, CA, Oct. 2017
- ICTP LHC Long-Lived Particles Community Workshop (Remote) — Oct. 2017
- Oxford Dalitz Seminar in Fundamental Physics — Oxford, UK, Oct. 2017
- KIPAC Tea Talk — Stanford, CA, Sep. 2017
- UC Santa Cruz Institute for Particle Physics Seminar — Santa Cruz, CA, Sep. 2017
- Berkeley 4D Seminar — Berkeley, CA, Sep. 2017
- MIT BSM Journal Club — Boston, MA, Nov. 2016

Internal talks:

- MIT Physics Large Language Models Workshop — Cambridge, MA, Jul. 2023
- IAIFI Seminar — Cambridge, MA, Apr. 2022
- MIT CTP Nuclear and Particle Theory Seminar — Cambridge, MA, Feb. 2022
- MIT CTP Graduate Student Lunch Seminar (Remote) — Mar. 2021
- MIT QCD-DM-BSM-LHC Journal Club (Remote) — Mar. 2021
- NYU CCPP Brown Bag Seminar — New York, NY, Apr. 2019
- Princeton Pheno & Vino Seminar — Princeton, NJ, Apr. 2017

Contributed talks:

- 1st Large Language Models in Physics Symposium (LIPS) — Hamburg, Germany, Feb. 2024
- MIT Statistics and Data Science Conference — Cambridge, MA, Apr. 2022
- WFIRST Science Meeting (Flatiron Institute) — New York, NY, Mar. 2020
- LSST Dark Matter Workshop — Chicago, IL, Aug. 2019
- SUSY 2019 — Corpus Christi, TX, May 2019
- Phenomenology Symposium (Pheno) 2019 — Pittsburgh, PA, May 2019

- Dark Matter, Neutrinos and their Connection (DAνCO) — Odense, Denmark, Aug. 2017
- TeV Particle Astrophysics (TeVPA) 2017 — Columbus, OH, Aug. 2017
- Phenomenology Symposium (Pheno) 2017 — Pittsburgh, PA, May 2017
- APS April Meeting 2017 — Washington, DC, Jan. 2017
- TeV Particle Astrophysics (TeVPA) 2016 — Geneva, Switzerland, Sep. 2016
- Gamma Rays and Dark Matter Workshop — Obergurgl, Austria, Dec. 2015
- Phenomenology Symposium (Pheno) 2015 — Pittsburgh, PA, May 2015

Awards and Honors

- Rising Stars in Data Science, *University of Chicago DSI and UCSD HDSI* — 2023
  Focuses on celebrating and fast tracking the careers of exceptional data scientists at a critical inflection point in their career
- IAIFI Fellowship — 2021
  Awarded towards independent postdoctoral research at the intersection of physics and artificial intelligence
- Department Teaching Award, *Princeton Department of Physics* — 2018
  Awarded for excellence in the role of Assistant in Instruction for courses taught at Princeton
- Kusaka Memorial Prize in Physics, *Princeton Department of Physics* — 2017
  Awarded to physics graduate students who have shown outstanding performance in research and professional promise
- Princeton Graduate School Impact Award, *Princeton Graduate School* — 2016
  Awarded to an individual in the community that has made a difference during their time at Princeton
- Princeton First-Year Graduate Fellowship, *Princeton University* — 2013
  Awarded towards the first year of graduate study at Princeton
- Hugo de Balsham Prize, *Peterhouse, University of Cambridge* — 2012
  Awarded for exceptional academic distinction at Peterhouse, Cambridge
- Peter Scheuer Scholarship in Natural Sciences, *Peterhouse, University of Cambridge* — 2011, 2012
  Awarded for exceptional academic performance in the Cambridge second and third year Tripos examinations
- Senior Academic Scholarship, *Peterhouse, University of Cambridge* — 2010
  Awarded for exceptional academic performance in the Cambridge first year Tripos examinations

Broader Impact and Organizing

External organizing:

- *Organizer*, MIAPbP Program: *Build Big or Build Smart: Examining Scale and Domain Knowledge in Machine Learning for Fundamental Physics* — 2025
- *Organizer*, Aspen Center for Physics Summer Program: *Fundamental Physics in the Era of Big Data and Machine Learning* — 2024
- *Organizer*, NeurIPS Machine Learning and the Physical Sciences Workshop — 2022, 2023, 2024, 2025

Internal organizing:

- *Organizer*, Symposium on the Impact of Generative AI in the Physical Sciences 2024
- *Organizer*, Boston-Area Machine Learning × Astrophysics Hackathon 2024
- *Co-chair*, IAIFI Speaker Selection Committee 2023 – 2024
- *Member*, IAIFI Computing Committee 2022 – 2024
- *Member*, IAIFI Early Career and Equity Committee 2021 – 2023
- *Organizer*, NYU CCPP Particle Physics Seminar 2019 – 2020
- *Vice Chair*, Princeton Graduate College House Committee 2016 – 2018
- *Subject Representative*, Princeton Graduate Student Government Assembly 2013 – 2017
- *Organizer*, Princeton Physics Department Open House Committee 2015 – 2016
- *Chair*, Princeton Physics Graduate Student Council 2015 – 2018

Reviewing/Editorial/Advisory:

- NASA Cosmic Origin Program AI/ML Science and Technology Interest Groups Leadership Council 2025 – Present
- *Editorial Board*, Machine Learning: Science and Technology (MLST) 2024 – Present
- *Journal Reviewer*, Astrophysical Journal, Computer Physics Communications, JCAP, JHEP, Journal of Open Source Software, MLST, MNRAS, Nature, Nature Communications Physics, Physical Review D, Physical Review Letters, Reports on Progress in Physics
- *Conference Reviewer*, NeurIPS Workshop Selection (2023–2025), ICML Workshop Selection (2024, 2025), ICLR (2025), COLM (2025)
- *Workshop Reviewer*, NeurIPS Machine Learning and the Physical Sciences Workshop (2019–2024), NeurIPS/ICML AI for Science Workshop (2021–2024), NeurIPS GenBio Workshop (2023), ICLR Workshop on Deep Generative Models for Highly Structured Data (2022), ICLR Workshop on Neural Fields (2023), ICML Workshop on Machine Learning for Astrophysics (2022, 2023), ICML Workshop on Structured Probabilistic Inference & Generative Modeling (2023, 2024), ICML Workshop on Synergy of Scientific and Machine Learning Modeling (2023), ICML Differentiable Almost Everything Workshop (2024), Advances in Approximate Bayesian Inference (2024, 2025), ICLR Workshop on Frontiers in Probabilistic Inference (2025), ICML GenBio Workshop (2025), ICML Actionable Interpretability Workshop (2025)
- *Grant Reviewer*, Department of Energy ASCR Leadership Computing Challenge 2023
- *Grant Review Panelist*, NASA ROSES/Astrophysics Research and Analysis 2023

Research Mentorship

- Yitian Sun (Graduate, MIT Physics) 2021 – 2024
  Probabilistic programming and deep generative modeling for γ-ray data analysis [Paper]
- Aizhan Akhmetzhanova (Graduate, Harvard Physics) 2021 – 2024
  Simulation-based self-supervision for cosmological data analysis [arXiv:2308.09751]
- Tri Nguyen (Graduate, MIT Astrophysics) 2021 – 2024
  Inferring the shapes of dark matter halos with graph neural networks [arXiv:2208.12825]

- Gemma Zhang (Graduate, Harvard Physics) 2021 – 2024
  Inferring subhalo populations in strong lenses with likelihood-free inference [arXiv:2208.13796]
  Multi-modal representation learning for time-domain astronomy [arXiv:2408.16829]
- Julia Balla (Graduate, MIT EECS) 2023 – 2024
  Designing symmetry-preserving neural networks for cosmological data analysis
- Julia Balla (Graduate, MIT EECS) 2023 – 2024
  Designing symmetry-preserving neural networks for cosmological data analysis
- Yiding Song (Harrow School; MIT via Research Science Institute) 2023 – 2024
  Designing multi-modal language models for scientific data [arXiv:2403.08851]
- Reuel Williams (Undergraduate, Princeton) 2021
  Inferring the shapes of dark matter halos with graph neural networks [arXiv:2208.12825]
- Jean Somalwar (Undergraduate, Princeton) 2019 – 2020
  Searching for dark matter in Galactic subhalos using photon statistics [arXiv:2009.00021]
- Laura Chang (Graduate, Princeton) 2018 – 2020
  Searches for annihilating dark matter in the Milky Way [arXiv:1804.04132] [arXiv:1908.10874]

Teaching Experience

At MIT/IAIFI:

- IAIFI Summer School [Lectures on Generative Modeling] Summer 2023
- 8.16 Data Science in Physics [Guest Lecture] Spring 2023, Spring 2024
- IAIFI Summer School [Tutorials on Probabilistic Programming] Summer 2022
- 8.S50 Computational Data Science in Physics [Tutorials] Winter 2022

At Princeton (As Assistant in Instruction): PHY235 Introduction to Research in Physics (Spring 2018), PHY312 Experimental Physics (Spring 2018), PHY115 Physics for Future Leaders (Fall 2017), PHY104 General Physics II (Spring 2016), PHY406 Nuclear and Elementary Particle Physics (Fall 2015), PHY106 Advanced Physics: Electromagnetism (Spring 2015), MAT201 Calculus III: Multivariable Calculus (Fall 2014, 2015), PHY105 Advanced Physics: Mechanics (Fall 2014)

Research Training

- CMS Experiment, CERN Geneva, Switzerland
  Visiting Student Researcher Aug. – Sep. 2012
  Summer Student Jun. – Jul. 2011
- DAMTP, University of Cambridge Cambridge, UK
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