

Jesse Diaz Thaler

Curriculum Vitae
(Updated May 11, 2022)

Contact Information

Jesse Thaler
MIT Center for Theoretical Physics
77 Massachusetts Ave., 6-318
Cambridge, MA 02139

Phone: (617) 253-3713
Fax: (617) 253-8674
Email: jthaler@mit.edu
Web: <http://www.jthaler.net/>

Research in Theoretical Particle Physics

- Collider physics, machine learning, and quantum chromodynamics
- Theoretical frameworks beyond the standard model

Degrees

Fall 2002–Spring 2006 **Harvard University**
Ph.D., Physics, *June 2006*
A.M., Physics, *June 2004*
Thesis: “Symmetry Breaking at the Energy Frontier”
Advisor: Nima Arkani-Hamed

Fall 1998–Spring 2002 **Brown University**
Sc.B., Math/Physics, *May 2002*
Advisor: Antal Jevicki

Employment

January 2010–Present **Massachusetts Institute of Technology**
MIT Center for Theoretical Physics
Professor of Physics, *2021–Present*
Associate Professor of Physics with Tenure, *2017–2021*
Associate Professor of Physics, *2015–2017*
Assistant Professor of Physics, *2010–2015*

July 2009–December 2009 **Lawrence Berkeley National Laboratory**
Theoretical Physics Group
Physicist Postdoctoral Fellow

July 2006–June 2009 **University of California, Berkeley**
Miller Institute for Basic Research in Science
Miller Research Fellow

Leadership

- Director, *NSF AI Institute for Artificial Intelligence and Fundamental Interactions*, 2020–Present

Affiliations

- MIT Center for Theoretical Physics; Laboratory for Nuclear Science
- MIT Statistics & Data Science Center; Institute for Data, Systems & Society (*since Jan. 2020*)
- Harvard Center for the Fundamental Laws of Nature (*Sep. 2018–Aug. 2019 sabbatical*)

Honors

- Fermilab Distinguished Scholar, *Fermi National Accelerator Laboratory*, 2018–2020
- Simons Fellowship in Theoretical Physics, *Simons Foundation*, 2018
- Frank E. Perkins Award for Excellence in Graduate Advising, *MIT*, 2017
- Harold E. Edgerton Faculty Achievement Award, *MIT*, 2016
- Buechner Faculty Teaching Award, *MIT Physics Department*, 2014
- Buechner Faculty Undergraduate Advising Award, *MIT Physics Department*, 2013
- Sloan Research Fellowship, *Alfred P. Sloan Foundation*, 2013
- Kavli Frontiers Fellow, *Kavli Foundation*, 2012
- Presidential Early Career Award for Scientists and Engineers, *White House*, 2012
- Class of 1943 Career Development Professorship, *MIT*, 2012–2015
- Early Career Research Award, *U.S. Department of Energy, Office of Science*, 2011–2016
- Miller Research Fellowship, *University of California, Berkeley*, 2006–2009
- Giorgio Gamberini Dissertation Prize, *Scuola Normale Superiore di Pisa*, 2007
- Merit Fellowship, *Harvard Faculty of Arts and Sciences*, 2006
- Goldhaber Prize, *Harvard Physics Department*, 2005
- Graduate Research Fellowship, *National Science Foundation*, 2002–2005

UROP Students Supervised

Undergraduate Research Opportunities Program, MIT

- Vega, Octavio, '22: *Spring 2021, Summer 2021*
- Protyasha, Nishat, '22: *Summer 2020, Fall 2020, Spring 2021, Summer 2021*
- Kryhin, Serhii, '22: *Spring 2020, Summer 2020, Spring 2021, Summer 2021* (see below)
- Miller, Christopher, '21: *Fall 2020*
- Pramanik, Debaditya, '21: *Spring 2020, Summer 2020* (see below)
- Zhou, Ziqi, '20: *Fall 2018*
- Klinger, Talya, '20: *Spring 2017*

- Mastandrea, Radha, '19: *Spring/Fall 2017, Spring/Summer 2018* (see below)
- Hall, Eleanor, '18: *Spring/Summer/Fall 2017* (see below)
- Burns, Matthew, '18: *Fall 2014, Spring 2015*
- Zhou, Kevin, '17: *IAP/Spring/Summer/Fall 2016, Spring 2017*
Orloff Award for Outstanding Research, *MIT Physics Department, 2017*
After MIT: Marshall Scholarship, *U. Cambridge*
- Tripathee, Aashish, '17: *Spring/Summer/Fall 2015, IAP/Spring/Summer/Fall 2016* (see below)
- Phan, Trung, '15: *Spring/Summer 2014* (see below)
- Wilkason, Thomas, '15: *Fall 2013, Spring/Summer 2014* (see below)
- Williams, Mobolaji, '13: *Fall 2010, Spring 2011, Summer 2012* (see below)
- Katzin, Dustin, '12: *Fall 2011, IAP 2012* (see below)
- Chan, Tucker, '12: *Summer/Fall 2011, Spring 2012* (deceased)
After MIT: Physics Ph.D. Candidate, *Stanford*
- Van Tilburg, Ken, '11: *Summer/Fall 2010* (see below)

B.S. Student Theses Supervised

- Kryhin, Serhii, *B.S. 2022*
Thesis: “Application OF Unsupervised Machine Learning for Event Classification”
After MIT: Physics Ph.D. Candidate, *Harvard*
- Pramanik, Debaditya, *B.S. 2021*
Thesis: “Collinear Supergravity at Linear Order”
After MIT: Physics Ph.D. Candidate, *Princeton*
- Mastandrea, Radha, *B.S. 2019*
Thesis: “Analyzing CMS Open Collider Data through Topic Modeling”
Orloff Award for Outstanding Service, *MIT Physics Department, 2019*
Physics Research Fellowship, *Heising-Simons Foundation, 2018*
FUTURE of Physics Participant, *Caltech, 2018*
After MIT: Marshall Scholarship, *U. Cambridge*
- Hall, Eleanor, *B.S. 2018*
Thesis: “Photon Isolation and Jet Substructure”
Orloff Award for Outstanding Service, *MIT Physics Department, 2017*
After MIT: Physics Ph.D. Candidate, *U.C. Berkeley*
- Tripathee, Aashish, *B.S. 2017*
Thesis: “Jet Substructure at the Large Hadron Collider”
After MIT: Physics Ph.D. Candidate, *U. Michigan*
- Phan, Trung, *B.S. 2015*
Thesis: “Relativistic Quantum Fields in Theoretical Physics”
After MIT: Physics Ph.D. Candidate, *Princeton*
- Wilkason, Thomas, *B.S. 2015*
Thesis: “Exclusive Cone Jet Algorithms for High Energy Particle Colliders”
Orloff Award for Outstanding Service, *MIT Physics Department, 2015*
After MIT: Physics Ph.D. Candidate, *Stanford*

- Williams, Mobolaji, *B.S. 2013*
Thesis: “Multiple Supersymmetry Breaking and Dark Matter”
After MIT: Physics Ph.D. Candidate, *Harvard*
- Katzin, Dustin, *B.S. 2012*
Thesis: “The DarkLight Experiment: Searching for the Dark Photon”
Currently: Analyst, *American International Group*
- Fei, Lin, *B.S. 2011*
Thesis: “Dark Matter Dynamics in the Early Universe”
After MIT: Physics Ph.D. Candidate, *Princeton*
- Van Tilburg, Ken, *B.S. 2011*
Thesis: “Identifying Boosted Objects with N -subjettiness and Linear k -means Clustering”
Apker Award Finalist, *American Physical Society, 2011*
Orloff Award for Outstanding Research in Physics, *MIT Physics Department, 2011*
After MIT: Physics Ph.D., *Stanford*
Currently: Assistant Professor, *New York U.*

M.Eng. Student Theses Supervised

- Wynne, Raymond, *anticipated M.Eng. 2022*
- Sarda, Nilai, *M.Eng. 2020*
Thesis: “Group Anomaly Detection in Collider Data” (*jointly advised with Justin Solomon*)
- Naik, Preksha, *M.Eng. 2019*
Thesis: “Exploring the Space of Jets with CMS Open Data”
After MIT: Physics Ph.D. Candidate, *Caltech*

Ph.D. Students Supervised

- Rikab Gambhir, *anticipated Ph.D. 2025*
- Alipour-Fard, Samuel, *anticipated Ph.D. 2024*
- Komiske, Patrick, *Ph.D. 2021*
Thesis: “Machine Learning for High-Energy Collider Physics”
After MIT: Researcher, *PDT Partners*
- Metodiev, Eric, *Ph.D. 2020*
Thesis: “Energy Flow in Particle Collisions”
After MIT: Research Scientist, *Renaissance Technologies*
- Elder, Benjamin, *Ph.D. 2018*
Thesis: “Jet Fragmentation at the LHC”
After MIT: Cognitive Software Developer, *IBM*
- Necib, Lina, *Ph.D. 2017*
Thesis: “Boosting Indirect Detection of Dark Matter”
Vazquez Award for Outstanding Research, *MIT Physics Department, 2016*
After MIT: Fairchild Postdoctoral Scholar, *Caltech*
Currently: Assistant Professor, *MIT*

- Kahn, Yonatan, *Ph.D. 2015*
Thesis: “Forces and Gauge Groups Beyond the Standard Model”
J.J. and Noriko Sakurai Dissertation Award, *American Physical Society, 2016*
Andrew M. Lockett III Memorial Fund Award, *MIT Physics Department, 2014*
After MIT: Postdoctoral Researcher, *Princeton*
Currently: Assistant Professor, *U. Illinois, Urbana-Champaign*
- Bertolini, Daniele, *Ph.D. 2014*
Thesis: “Electroweak Symmetry Breaking in the Era of the Higgs Boson Discovery”
LHC-TI Graduate Fellowship, *LHC Theory Initiative, 2013*
After MIT: Postdoctoral Researcher, *U.C. Berkeley*
Currently: Data Scientist, *Quid*
- Thomas, Zoe, *Ph.D. 2014*
Thesis: “Supersymmetry at the Dawn of the LHC Era”
After MIT: Postdoctoral Researcher, *U. Minnesota*
Currently: Applied Research Mathematician, *Department of Defense*
- D’Eramo, Francesco, *Ph.D. 2012*
Thesis: “Hot and Dark Matter” (*jointly advised with Krishna Rajagopal and Hong Liu*)
Vazquez Award for Outstanding Research, *MIT Physics Department, 2011*
After MIT: Miller Research Fellowship, *U.C. Berkeley*
Currently: Associate Professor, *U. Padova*

Postdoctoral Researchers Supervised

- Funcke, Lena, CTP Postdoctoral Researcher, *Fall 2021–Spring 2024*
- Schutz, Katelin, Pappalardo Fellow in Physics, *Fall 2019–Spring 2021*
After MIT: Assistant Professor, *McGill U.*
- Asadi, Pouya, CTP Postdoctoral Researcher, *Fall 2019–Spring 2022*
- Mistlberger, Bernhard, Pappalardo Fellow in Physics, *Fall 2018–Spring 2020*
After MIT: Associate Staff Scientist, *SLAC National Accelerator Laboratory*
- Dreyer, Frédéric, Early Postdoc.Mobility Fellow, *Fall 2017–Spring 2018*
After MIT: Postdoctoral Researcher, *U. Oxford*
- Soreq, Yotam, Rothschild Fellow, *Fall 2015–Spring 2018*
After MIT: Postdoctoral Researcher, *CERN*
Currently: Assistant Professor, *Technion*
- Safdi, Benjamin, Pappalardo Fellow in Physics, *Fall 2014–Spring 2017*
After MIT: Assistant Professor, *U. Michigan*
- Xue, Wei, CTP Postdoctoral Researcher, *Fall 2014–Spring 2017*
After MIT: Postdoctoral Fellow, *CERN*
Currently: Assistant Professor, *U. Florida*
- Marzani, Simone, LHC Theory Initiative Postdoctoral Fellow, *Fall 2014–Spring 2015*
After MIT: Assistant Professor, *U. Buffalo*
Currently: Tenure-track Researcher, *U. Genova*
- Elor, Gilly, CTP Postdoctoral Researcher, *Fall 2013–Spring 2016*
After MIT: Postdoctoral Researcher, *U. Oregon*
Currently: Postdoctoral Researcher, *U. Washington, Seattle*

- Neill, Duff, Pappalardo Fellow in Physics, *Fall 2012–Spring 2015*
CTP Postdoctoral Researcher, *Spring 2015–Spring 2016*
After MIT: Director’s Fellow, *Los Alamos National Laboratory*
Currently: Feynman Fellow, *Los Alamos National Laboratory*
- Larkoski, Andrew, CTP Postdoctoral Researcher, *Fall 2012–Spring 2015*
After MIT: LHC Theory Initiative Postdoctoral Fellow, *Harvard*
Currently: Visiting Assistant Professor, *Reed C.*
Wu-Ki Tung Award for Early Career Research on QCD, *CTEQ Collaboration, 2017*
- McCullough, Matthew, Simons Postdoctoral Fellow, *Fall 2011–Spring 2014*
After MIT: COFUND Fellowship, *CERN*
Currently: Staff Scientist, *CERN*
- Rehermann, Keith, CTP Postdoctoral Researcher, *Fall 2010–Spring 2012*
Currently: Consultant, *Ab Initio Software Corporation*

Visitors Supervised

- Rivera-Cardona, Pedro, MIT Summer Research Program, *Summer 2021*
MSRP Project: “Implementation of U(1) Group Symmetry on Energy Flow Networks”
Home Institution: *University of Puerto Rico, Mayaguez*
- Osathapan, Athis, Independent Researcher, *Spring 2021–Present*
Home Institution: *Bowdoin College*
- Jackson, Shira, MIT Summer Research Program, *Summer 2020*
MSRP Project: “Estimating the Energy Mover’s Distance with Exclusive Jet Clustering”
Home Institution: *University of Cincinnati*
- Turner, Andrew
Tushar Shah and Sara Zion Physics Fellowship, *MIT Physics Department, 2018–2019*
Ph.D. Advisor: Washington Taylor, *MIT*
- Henderson, Maximilian, International Research Opportunities Programme, *Summer 2018*
Home Institution: *Imperial College London*
- Hirst, Edward, International Research Opportunities Programme, *Summer 2018*
Home Institution: *Imperial College London*
- Leung, Rahim, International Research Opportunities Programme, *Summer 2017*
Home Institution: *Imperial College London*
- Schulze, Markus, Visiting Postdoctoral Researcher, *Fall 2015*
Home Institution: *CERN*
- Romero, Alexis, MIT Summer Research Program, *Summer 2015*
MSRP Project: “Jet Physics Measurements on CMS Open Data”
Home Institution: *San Diego State U.*
- Fonseca, Nayara, FAPESP Fellowship, *Spring 2014–Fall 2014*
Ph.D. Advisor: Gustavo Burdman, *U. São Paulo, Brazil*

Teaching Experience

- 8.398 — Selected Topics in Graduate Physics
Instructor: *Spring 2021, Fall 2021, Spring 2022*
- 8.03 — Physics III, Waves & Vibrations
Recitation: *Fall 2020*
- 8.044 — Statistical Physics I
Recitation: *Spring 2020*
- 8.831 — Supersymmetric Quantum Field Theories
Lecture: *Spring 2017, Fall 2019*
- 8.051 — Quantum Mechanics II (MITx-based)
Instructor: *Spring 2018*
- 8.033 — Relativity
Lecture: *Fall 2017*; Recitation: *Fall 2016*
- 8.02 — Physics II, Electricity & Magnetism (GIR)
TEAL (studio class): *Spring 2014, Spring 2015, Spring 2016*
- 8.012 — Physics I, Classical Mechanics
Recitation: *Fall 2014*
- 8.06 — Quantum Mechanics III
Lecture: *Spring 2011, Spring 2012, Spring 2013*; Recitation: *Spring 2010*
- 8.05 — Quantum Mechanics II
Recitation: *Fall 2010, Fall 2012*

Internal Service

- MIT Faculty Committee on Curricula, *Fall 2017–Spring 2020*
- MIT Physics CTP Junior Faculty Search Committee, *Fall 2017, Fall 2019, Fall 2021*
Chair: *Fall 2019*
- MIT Physics Promotion Committee, *Fall 2019, Fall 2020, Fall 2021, Fall 2022*
Chair: *Fall 2020, Fall 2021, Fall 2022*
- MIT Physics, Statistics, and Data Science (PhysSDS) Committee, *Fall 2020–Present*
Co-Chair: *Fall 2020–Present*
- MIT Physics Graduate Admissions Committee, *Spring 2021*
- MIT Physics Pappalardo Fellowships Executive Committee, *Fall 2016–Fall 2017*
- MIT Physics Colloquium Committee, *Spring 2010–Spring 2014*
Chair: *Fall 2012–Spring 2014*
- MIT Physics Ph.D. Thesis Committees:
Cristian Zanoci (*Mikhail Lukin & Aram W. Harrow, in progress*)
Patrick Fitzpatrick (*Tracy Slatyer & David Kaiser, Jul. 2021*)
Joseph Johnston (*Lindley Winslow & Joseph Formaggio, May 2021*)
Chih-Liang Wu (*Tracy Slatyer, Apr. 2021*)
Constantin Weisser (*Mike Williams, Mar. 2021*)
J. Owen Andrews (*Ibrahim Cissé, Nov. 2020*)
Gherardo Vita (*Iain Stewart, Aug. 2020*)

Jasmine Brewer (*Krishna Rajagopal, Jul. 2020*)
Hongwan Liu (*Tracy Slatyer, May 2019*)
Charles Epstein (*Richard Milner, Aug. 2018*)
Nicholas Rodd (*Tracy Slatyer, Apr. 2018*)
David Hernandez (*Edmund Bertschinger, Apr. 2018*)
Aram Apyan (*Markus Klute, Nov. 2016*)
Daniel Roberts (*Allan Adams, Apr. 2016*)
Ian Moulton (*Iain Stewart, Apr. 2016*)
Daniel Kolodrubetz (*Iain Stewart, Apr. 2016*)
Mingming Yang (*Christoph Paus, Jan. 2015*)
Shawn Henderson (*Peter Fisher, Jul. 2013*)
Teng Ma (*Boleslaw Wyslouch, May 2013*)
Kevin Sung (*Steven Nahn, Mar. 2013*)
Christopher Jones (*Janet Conrad, Jun. 2012*)
Riccardo Abbate (*Iain Stewart, May 2012*)
Abolhassan Vaezi (*Xiao-Gang Wen, Jan. 2011*)
Georgia Karagiorgi (*Janet Conrad, Jul. 2010*)

- MIT Physics Graduate Academic Advisor, *Fall 2017–Present*
Anticipated Ph.D. 2025: Ryan Abbott
Anticipated Ph.D. 2024: Bruno Scheihing Hitschfeld, Stella Schindler
Anticipated Ph.D. 2022: Eric Anschuetz, Samuel Leutheusser, Gregory Ridgway,
Annie Wei, Ryan Weller
Ph.D. 2020: Jasmine Brewer
- MIT Physics Academic Advisor, *Fall 2011–Present*
Class of 2024: Omar Abdelghani, Chirag Falor, Lily Moseni, Dylan Raphael, David Suarez,
Chris Viets
Class of 2018–20: Robert Arnott, Zachary Bogorad, Hannah Field, Rodmy Paredes Alfaro,
Saranesh Prembabu, Joshua Rhodes, Kevin Tang, Michael Winer
Class of 2014–15: Allison Christian, Jay Lawhorn, Joseph Perricone, Jeffrey Prouty,
Melih Ucer, Pranjal Vachaspati, Prashanth Venkataram
- MIT First-Year Advisor, *Fall 2019–Spring 2020*
Class of 2023: Richter Brzeski, Megha Maran, Catalina Monsalve Rodriguez, Dylan Weber
- MIT Physics Qualifying Exam, Written Exam Grading Committee, *Jan. 2020*
- MIT Physics Qualifying Exam, Part III Committee, *Spring 2015–Spring 2017*
- MIT Physics Qualifying Exam, Part II Committee, *Spring 2012–Spring 2014*
Chair: *Fall 2013–Spring 2014*
- MIT Physics Qualifying Exam, Part II Grading Committee, *Sept. 2010, Jan. 2020*
- MIT LNS Advisory Group Member, *Fall 2017, Spring 2020–Present*
- MIT LNS Colloquium Committee, *Fall 2015–Spring 2018*
Chair: *Fall 2017–Spring 2018*
- MIT CTP Faculty Mentor, *Apr. 2021–Present*
- MIT CTP Deputy Group Leader in High-Energy Theory, *Spring 2020–Present*
- MIT CTP Visitor Coordinator, *Fall 2016–Present*
- MIT CTP Nuclear/Particle Seminar Committee, *Fall 2010–Fall 2016*

- MIT CTP Postdoc Selection Committee, *Fall 2009–Present*
- MISTI Global Seed Funds Evaluation Committee, *Fall 2012–Fall 2014*

External Service

- External Ph.D. Examiner:
 - Pedro Cal (*Wouter Waalewijn, U. Amsterdam, Sep. 2021*)
 - Thea Aarrestad (*Ben Kilminster, U. Zurich, Mar. 2017*)
 - Ignacio Garcia Garcia (*Eduardo Ros & Marcel Vos, U. Valencia, Dec. 2016*)
 - Brian Walsh (*Tobias Golling, Yale, Feb. 2013*)
 - Travis Martin (*Thomas Gregoire & Stephen Godfrey, Carleton U., Aug. 2012*)
- External Mentoring:
 - Ilias Cholis, PI Academy for Research and Engagement, *Oakland U., Fall 2018–Fall 2019*
- Member, High Energy Physics Advisory Panel (HEPAP), *Aug. 2021–Mar. 2024*
- Topical Convener in Collider Phenomenology, Snowmass Theory Frontier, *Jul. 2022*
- General Member, Aspen Center for Physics, *Summer 2020–Summer 2025*
 - Nominations Committee, *Summer 2021, Summer 2022; Chair: Summer 2022*
 - Summer Program Committee, *Summer 2020*
- Advisory Committee, Mainz Machine Learning Workshop, *Jun. 2021*
- International Advisory Committee, Boost Workshops, *Jun. 2010, Jul. 2012, Aug. 2013, Aug. 2014, Aug. 2015, Jul. 2016, Jul. 2017, Jul. 2018, Jul. 2019, Jul. 2020, Aug. 2021*
 - Ombuds Team: *since Jul. 2020*
 - Local Organizing Committee: Boost 2019, *MIT, Jul. 2019*
- Organizer, Fermilab Remote CMS Open Data Workshop, *Sep. 2020*
- Advisory Committee, ML4Jets Workshop, *Jan. 2020*
- Local Organizing Committee, Rising Stars in Physics, *Apr. 2018*
- Jet Convenor, Les Houches Workshops, *Jun. 2015, Jun. 2017*
- Advisory Committee, BLV Workshop, *May 2017*
- Organizing Committee, Lattice for BSM Workshop, *Apr. 2017*
- Organizer, Aspen Center for Physics Workshops, *Feb. 2011, Jul. 2011, Aug. 2016*
- Organizer, Galileo Galilei Institute Workshop, *Sep. 2015*
- Organizer, Boston Jet Physics Workshop, *Jan. 2011, Jan. 2014*
- Program Committee, PANIC 2011, *Jul. 2011*
- Organizer, MIT/Berkeley Workshop, *Aug. 2010*
- Science Advisory Board, *USQCD Collaboration, Spring 2013–Fall 2016*
- Sakurai Dissertation Award Selection Committee, *American Physical Society, Fall 2016*
- Fellowship Selection Committee, *LHC Theory Initiative, Fall 2013–Fall 2014*
 - Chair: *Fall 2014*
- Editorial Board, *Journal of High Energy Physics, Fall 2019–Present*
- Fellow of the Editorial College, *SciPost, Fall 2019–Present*

- Peer Review: *Physical Review Letters*, *Journal of High Energy Physics*, *Physical Review D*, *Journal of Cosmology and Astroparticle Physics*, *Physics of the Dark Universe*, *Nuclear Physics B*, *Physics Letters B*, *European Physical Journal C*, *Journal of Physics G*, *Physics Reports*, *Annals of Physics*, *Particle Data Group*
- Funding Agency Review: *U.S. Department of Energy*, *National Science Foundation*, *Heising-Simons Foundation*, *The Royal Society*, *Swiss National Science Foundation*, *Natural Sciences & Engineering Research Council of Canada*, *Israel Science Foundation*, *Netherlands Organisation for Scientific Research*, *German Academic Exchange Service*, *Hungarian National Research Office*
- High School Outreach: *TheoryNet*, *Northeastern U.*
Scott Goelzer, *Coe-Brown Northwood Academy*, *Spring 2021*
Michael Wadness, *Medford H.S.*, *Fall 2012–Spring 2015*, *Spring 2018*
Elaine Picard, *Concord-Carlisle H.S.*, *Fall 2015–Spring 2016*, *Spring 2017*, *Spring 2020*
Michael Hirsh, *Needham H.S.*, *Spring 2010–Spring 2012*
- Open Data Advocacy
“Slow and Steady” (with Matthew Strassler), *Nature Physics* 15:725 (2019)
“Particle Collisions”, in Felice Frankel, *Picturing Science and Engineering*, *MIT Press*, 2018
“The Future of Particle Physics is ‘Open’”, Guest Blog Post, *CMS Experiment*, Dec. 2017
- Artificial Intelligence Advocacy
“Designing an AI Physicist”, Opinion Viewpoint, *CERN Courier*, Sept.-Oct. 2021

Publications and Preprints

See <http://www.jthaler.net/research> for these publications organized by topic. Following the convention in particle physics, all authors are listed alphabetically, except for [83], [93], and [100].

* = Paper arising from a supervised Ph.D. thesis

† = Paper arising from a supervised B.S. thesis

- [117] * Rikab Gambhir, Benjamin Nachman, and Jesse Thaler, *Bias and Priors in Machine Learning Calibrations for High Energy Physics*, [arXiv:2205.05084].
- [116] † Patrick T. Komiske, Serhii Kryhin, and Jesse Thaler, *Disentangling Quarks and Gluons with CMS Open Data*, [arXiv:2205.04459].
- [115] * Rikab Gambhir, Benjamin Nachman, and Jesse Thaler, *Learning Uncertainties the Frequentist Way: Calibration and Correlation in High Energy Physics*, [arXiv:2205.03413].
- [114] Andrea Delgado and Jesse Thaler, *Quantum Annealing for Jet Clustering with Thrust*, [arXiv:2205.02814].
- [113] Hao Chen, Ian Mould, Jesse Thaler, and Hua Xing Zhu, *Non-Gaussianities in Collider Energy Flux*, submitted to JHEP [arXiv:2205.02857].
- [112] Patrick T. Komiske, Ian Mould, Jesse Thaler, and Hua Xing Zhu, *Analyzing N-point Energy Correlators Inside Jets with CMS Open Data*, [arXiv:2201.07800].
- [111] Krish Desai, Benjamin Nachman, and Jesse Thaler, *SymmetryGAN: Symmetry Discovery with Deep Learning*, accepted in Phys. Rev. D [arXiv:2112.05722].

- [110] Benjamin Nachman and Jesse Thaler, *Neural Conditional Reweighting*, Phys. Rev. D **105**, 076015 (2022) [arXiv:2107.08979].
- [109] Benjamin Nachman and Jesse Thaler, *Learning from Many Collider Events at Once*, Phys. Rev. D **103**, 116013 (2021) [arXiv:2101.07263].
- [108] Taylor Faucett, Jesse Thaler, and Daniel Whiteson, *Mapping Machine-Learned Physics into a Human-Readable Space*, Phys. Rev. D **103**, 036020 (2021) [arXiv:2010.11998].
- [107] Jasmine Brewer, Jesse Thaler, and Andrew P. Turner, *Data-Driven Quark and Gluon Jet Modification in Heavy-Ion Collisions*, Phys. Rev. C **103**, L021901 (2021) [arXiv:2008.08596].
- [106] Benjamin Nachman and Jesse Thaler, *Neural Resampler for Monte Carlo Reweighting with Preserved Uncertainties*, Phys. Rev. D **102**, 076004 (2020) [arXiv:2007.11586].
- [105] Cari Cesarotti and Jesse Thaler, *A Robust Measure of Event Isotropy at Colliders*, JHEP **08**, 084 (2020) [arXiv:2004.06125].
- [104] * Patrick T. Komiske, Eric M. Metodiev, and Jesse Thaler, *The Hidden Geometry of Particle Collisions*, JHEP **07**, 006 (2020) [arXiv:2004.04159].
- [103] * Anders Andreassen, Patrick T. Komiske, Eric M. Metodiev, Benjamin Nachman, and Jesse Thaler, *OmniFold: A Method to Simultaneously Unfold All Observables*, Phys. Rev. Lett. **124**, 182001 (2020) [arXiv:1911.09107].
- [102] * Patrick T. Komiske, Eric M. Metodiev, and Jesse Thaler, *Cutting Multiparticle Correlators Down to Size*, Phys. Rev. D **101**, 036019 (2020) [arXiv:1911.04491].
- [101] Timothy Cohen, Gilly Elor, Andrew J. Larkoski, and Jesse Thaler, *Circumnavigating Collinear Superspace*, JHEP **20**, 156 (2020) [arXiv:1909.00009].
- [100] Annie Y. Wei, Preksha Naik, Aram W. Harrow, and Jesse Thaler, *Quantum Algorithms for Jet Clustering*, Phys. Rev. D **101**, no.9, 094015 (2020) [arXiv:1908.08949].
- [99] *† Patrick T. Komiske, Radha Mastandrea, Eric M. Metodiev, Preksha Naik, and Jesse Thaler, *Exploring the Space of Jets with CMS Open Data*, Phys. Rev. D **101**, 034009 (2020) [arXiv:1908.08542].
- [98] Cari Cesarotti, Yotam Soreq, Matthew J. Strassler, Jesse Thaler, and Wei Xue, *Searching in CMS Open Data for Dimuon Resonances with Substantial Transverse Momentum*, Phys. Rev. D **100**, 015021 (2019) [arXiv:1902.04222].
- [97] * Patrick T. Komiske, Eric M. Metodiev, and Jesse Thaler, *Metric Space of Collider Events*, Phys. Rev. Lett. **123**, 041801 (2019) [arXiv:1902.02346].
- [96] Jasmine Brewer, José Guilherme Milhano, and Jesse Thaler, *Sorting Out Quenched Jets*, Phys. Rev. Lett. **122**, 222301 (2019) [arXiv:1812.05111].
- [95] Timothy Cohen, Gilly Elor, Andrew J. Larkoski, and Jesse Thaler, *Navigating Collinear Superspace*, JHEP **20**, 146 (2020) [arXiv:1810.11032].
- [94] * Patrick T. Komiske, Eric M. Metodiev, and Jesse Thaler, *Energy Flow Networks: Deep Sets for Particle Jets*, JHEP **1901**, 121 (2019) [arXiv:1810.05165].

- [93] Hongwan Liu, Brodi D. Elwood, Matthew Evans, and Jesse Thaler, *Searching for Axion Dark Matter with Birefringent Cavities*, Phys. Rev. D **100**, 023548 (2019) [arXiv:1809.01656].
- [92] * Patrick T. Komiske, Eric M. Metodiev, and Jesse Thaler, *An Operational Definition of Quark and Gluon Jets*, JHEP **1811**, 059 (2018) [arXiv:1809.01140].
- [91] † Eleanor Hall and Jesse Thaler, *Photon Isolation and Jet Substructure*, JHEP **1809**, 164 (2018) [arXiv:1805.11622].
- [90] * Benjamin T. Elder and Jesse Thaler, *Aspects of Track-Assisted Mass*, JHEP **1903**, 104 (2019) [arXiv:1805.11109].
- [89] Frédéric A. Dreyer, Lina Necib, Gregory Soyez, and Jesse Thaler, *Recursive Soft Drop*, JHEP **1806**, 093 (2018) [arXiv:1804.03657].
- [88] * Eric M. Metodiev and Jesse Thaler, *Jet Topics: Disentangling Quarks and Gluons at Colliders*, Phys. Rev. Lett. **120**, 241602 (2018) [arXiv:1802.00008].
- [87] * Patrick T. Komiske, Eric M. Metodiev, and Jesse Thaler, *Energy Flow Polynomials: A Complete Linear Basis for Jet Substructure*, JHEP **1804**, 013 (2018) [arXiv:1712.07124].
- [86] Evan Coleman, Marat Freytsis, Andreas Hinzmann, Meenakshi Narain, Jesse Thaler, Nhan Tran, and Caterina Vernieri, *The Importance of Calorimetry for Highly-Boosted Jet Substructure*, JINST **13**, T01003 (2018) [arXiv:1709.08705].
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Additional Publications and Preprints

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- [A6] Yi Chen, Anthony Badea, Austin Baty, Paoti Chang, Yang-Ting Chien, Gian Michele Innocenti, Marcello Maggi, Christopher McGinn, Dennis V. Perepelitsa, Michael Peters, Tzu-An Sheng, Jesse Thaler, and Yen-Jie Lee, *Jet energy spectrum and substructure in e^+e^- collisions at 91.2 GeV with ALEPH Archived Data*, submitted to JHEP [arXiv:2111.09914].
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Invited Presentations

See <http://www.jthaler.net/cv> for a complete list of talks, including invited seminars and additional workshop and conference talks.

Colloquia

- “The Geometry of Particle Collisions: Hidden in Plain Sight”
Physics Colloquium, *Brandeis U.*, Feb. 2022
- “Collision Course: Particle Physics meets Machine Learning”
Physics Colloquium (Virtual), *U.C. San Diego*, May 2021
Physics and Astronomy Colloquium (Virtual), *U. New Mexico*, Apr. 2021
Physics Colloquium (Virtual), *U.C. Santa Barbara*, Apr. 2021
Physics Colloquium (Virtual), *Northern Illinois U.*, Feb. 2021
AlbaNova/Nordita Colloquium (Virtual), *Stockholm University*, Feb. 2021
Physics Colloquium (Virtual), *U. Chicago*, Feb. 2021
Physics Colloquium (Virtual), *All Israel*, Nov. 2020
Physics Colloquium (Virtual), *Harvard*, Nov. 2020
Physics Colloquium (Virtual), *U. Maryland*, Oct. 2020
Physics Colloquium, *Case Western Reserve U.*, Nov. 2019
Physics and Astronomy Colloquium, *Rice U.*, Oct. 2019
Physics Colloquium, *Oakland U.*, Oct. 2019
Physics Colloquium, *Tufts U.*, Sep 2019
- “The Hidden Geometry of Particle Collisions”
Particle Physics Colloquium (Virtual), *KIT Karlsruhe*, Nov. 2020
Theory Colloquium (Virtual), *CERN*, May 2020
- “The Future is Open: Adventures with Public Collider Data”
Colloquium (Virtual), *Fermilab*, Sep. 2020
- “Jet Substructure at the Frontiers of Particle Physics”
Physics Colloquium, *U. Milan*, Mar. 2018
Physics Colloquium, *U. Illinois*, Oct. 2017
- “New Physics Gets a Boost: Jet Substructure at the Large Hadron Collider”
Colloquium, *Perimeter I.*, May 2017
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Physics and Astronomy Colloquium, *U.C. Riverside*, Oct. 2016
Physics Colloquium, *U. Buffalo*, Sep. 2016
- “Jet Substructure: Boosting the Search for New Physics at the LHC”
Physics Colloquium, *U. Chicago*, May 2016
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- “The Rise of Jet Substructure: Boosting the Search for New Physics at the LHC”
Physics Colloquium, *U.C. Santa Cruz*, Nov. 2015
Physics Colloquium, *Brandeis*, Sep. 2015
- “The Case for Jet Substructure”
Physics Colloquium, *Caltech*, Nov. 2014
Colloquium, *MIT Laboratory for Nuclear Science*, Apr. 2014

- “(Non)perturbative QCD and Jet Substructure”
Triangle Nuclear Theory Colloquium, *Duke U.*, *Mar. 2014*
Theory Colloquium, *U. Maryland*, *Oct. 2013*
- “The Shape of Jets to Come: Boosting the Search for New Physics at the LHC”
Physics Colloquium, *U. Oregon*, *May 2013*
Physics Colloquium, *Cornell U.*, *Feb. 2013*
- “The Higgs Boson: Triumph of the Standard Model”, *MIT Lecture Series Committee*, *Oct. 2012*
- “Anticipating New Data from the Energy Frontier”, Physics Colloquium, *Brown U.*, *Feb. 2011*
- “The Large Hadron Collider”, Physics Colloquium, *Wellesley C.*, *Oct. 2010*
- “The Shape of Jets to Come”, Colloquium, *MIT Laboratory for Nuclear Science*, *Feb. 2010*

Public Lectures

- “Artificial Intelligence Meets Fundamental Physics”, MIT Inside Track Master Class (Virtual), *EmTech Digital*, *Mar. 2021*
- “Collision Course: Artificial Intelligence meets Fundamental Physics”, Keynote Presentation (Virtual), *Tommy Flowers Network Conference*, *Oct. 2020*
- “Listening to the Invisible Universe”, with A Far Cry (chamber orchestra), *Apr. 2019*
- “Confronting the Invisible Universe”
MIT Club of Great Britain Event, *London*, *May 2018*
Public Talk, *Aspen Center for Physics*, *Mar. 2017*

Lecture Series & Schools

- “Confronting the Invisible Universe”, Intro to Modern Physics, *MIT Lincoln Labs*, *Mar. 2022*
- “QCD and Collider Physics”, GGI Winter School, *Florence*, *Jan. 2020*
- “Collider Physics”, Cargese Summer School, *Corsica*, *Jul. 2018*
- “Theoretical and Experimental Issues in Jet Substructure”, *Kavli IMPU and KEK*, *Jan. 2017*
- “Jet Physics”, MITP Summer School, *Mainz*, *Jul. 2016*
- “The Case for Jet Substructure”, Theorist of the Month, *DESY*, *Jun. 2014*
- “Jet Substructure”, PiTP Summer School, *Princeton*, *Jul. 2013*
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- “Little Lessons for a Little Higgs”, ICTP Winter School, *Trieste*, *Jan. 2012*
- “Goldstini”, “The Shape of Jets to Come”, “Event Topologies for Early LHC”, Topic of the Week Lecture Series, *Fermilab*, *Nov. 2010*
- “Entering the LHC Era”, MIT-CTP Felix Villars Theoretical Physics Retreat, *Jan. 2010*

Plenary Talks

- “Machine Learning in Collider Physics”, Snowmass Energy Frontier Workshop, *Brown U.*, *Mar. 2022*
- “Optimal Transport for QCD and Jets”, Flowing into the Future, *Simons Center*, *Stony Brook*, *Mar. 2022*

- “Machine Learning for the Theory Frontier”, Snowmass Theory Frontier Conference, *KITP, Feb. 2022*
- “Artificial Intelligence and Fundamental Physics”, LISHEP 2021, *Virtual Brazil, Jul. 2021*
- “Artificial Intelligence and High-Energy Physics”, Master Your Physics, *Virtual U. Amsterdam, Jun. 2021*
- “Deep Learning for Collider Physics Simulation”, Deep Learning for Simulation (SimDL), ICLR 2021, *Virtual, May 2021*
- “Artificial Intelligence and High-Energy Physics”, APS April Meeting, *Virtual, Apr. 2021*
- “Artificial Intelligence for Physics Discovery: Theory Perspective”, AAAS Annual Meeting, *Virtual, Feb. 2021*
- “Machine Learning for Fundamental Physics”, HKUST IAS Program on High Energy Physics, *Virtual, Jan. 2021*
- “Collider Physics and Machine Learning”, IFT Christmas Workshop, *Virtual, Dec. 2020*
- “Deep Learning (and Deep Thinking) for QCD”, QCD@LHC 2019, *Buffalo, Jul. 2019*
- “Deep Learning (and Deep Thinking) in Collider Physics”, Pheno 2019, *Pittsburg, May 2019*
- “The High Energy Physics Landscape in 2019”, High Energy Physics Advisory Panel, *Washington D.C., May 2019*
- “Collision Course: Particle Physics as a Machine-Learning Testbed”, Deep Learning in the Natural Sciences, *U. Hamburg, Feb. 2019*
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- “A Theorist’s Perspective on Machine Learning for Jets” (Opening Talk), Machine Learning for Jet Physics, *Fermilab, Nov. 2018*
- “New Improvements in Jet Physics”, SUSY 2018, *Barcelona, Jul. 2018*
- “Theory Summary” (Closing Talk), Boost 2018, *Paris, Jul. 2018*
- “The Future is Open: Jet Substructure with CMS Public Data”, CMS Week, *CERN, Jun. 2018*
- “Recent Progress in Jet Physics”, From the LHC to Dark Matter and Beyond, *Aspen Center for Physics, Mar. 2017*
- “New Frontiers in Dark Matter Detection”, APS April Meeting, *Washington, DC, Jan. 2017*
- “Prospects for Cosmic Axion Detection with ABRACADABRA”, GPMFC Workshop on Ultra-light Dark Matter, *Washington, DC, Jan. 2017*
- “Using Jets and QCD to Boost the Search for New Physics”, Physics in LHC and Early Universe, *U. Tokyo, Jan. 2017*
- “The Shape of Jets to Come”, Boost 2016, *Zurich, Jul. 2016*
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- “Theoretical Advances in Jet Substructure”, Rencontres de Moriond QCD, *La Thuile, Mar. 2016*
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- “Probing the Core of QCD”, Boost 2015, *Chicago, Aug. 2015*
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- “Pushing the Frontiers of Perturbative QCD”, Pheno 2015, *Pittsburg, May 2015*
- “Hidden Sectors and Dark Forces”, BLV 2015, *UMass Amherst, Apr. 2015*
- “Physics Opportunities for Future Circular Colliders”, FCC Week, *Washington, DC, Mar. 2015*
- “Jets in QCD: The Case for Jet Substructure”, Quark Confinement and the Hadron Spectrum XI, *St. Petersburg, Sep. 2014*
- “New Observables for Jet Substructure”, 43rd International Symposium on Multiparticle Dynamics (ISMD13), *Chicago, Sep. 2013*
- “The Case for Jet Substructure”, SEARCH 2013, *Stonybrook, Aug. 2013*
- “Theoretical Progress in Dissecting Jets”, Boost 2013, *Flagstaff, Aug. 2013*
- “Supersymmetry at the Frontiers” (Rapporteur Talk), Snowmass on the Pacific, *KITP, Santa Barbara, May 2013*
- “The Higgs Boson: Triumph of the Standard Model”, 24th Annual Kavli Frontiers of Science, National Academy of Sciences, *U.C. Irvine, Nov. 2012*
- “Jet Substructure and N-subjettiness”, Monte Carlo for Beyond the Standard Model 2012, *Cornell U., Mar. 2012*
- “Big Questions in Particle Physics” (Pedagogical Lecture), PANIC11, *MIT, Jul. 2011*
- “Two Views of the Universe” (Closing Talk), Hadron Collider Physics Symposium, *Toronto, Aug. 2010*
- “Supersymmetry Breaks (Again)”, in honor of Gerry Guralnik’s 2010 Sakurai Prize, *Brown U., May 2010*
- “Goldstini”, Emerging Problems in Particle Phenomenology, *ITS/CUNY, Apr. 2010*
- “The Window to the Terascale” (Opening Talk), Physics in the LHC Era, *Aspen Center for Physics, Feb. 2009*

Research Contracts and Grants

- AI Research Institute, “Institute for Artificial Intelligence and Fundamental Interactions (IAIFI)”, National Science Foundation, *2020–2025* (\$20,000,000)
- MIT International Science and Technology Initiative, “The Quest for Dark Matter Interactions” (MIT-Israel Zuckerman STEM Fund Award with Tracy Slatyer, Tomer Volansky, and Yotam Soreq), *2020–2021* (\$25,500)
- Partnership for Innovation, Education and Research, “Probing the Standard Model with Jet Substructure” (PIER Hamburg-MIT Seed Project with Gregor Kasieczka, Phil Harris, Andreas Hinzmann, Roman Kogler, and Iain Stewart), *2019–2020* (€17,000)
- U.S. Department of Energy, Office of High Energy Physics, “Quantum Algorithms for Collider Physics” (QuantISED Award with Aram Harrow), *2018–2020* (\$264,000)
- Simons Foundation, “Theoretical Investigations In and Beyond the Standard Model” (Simons Fellowship), *2018–2019* (\$142,783)

- U.S. Department of Energy, Office of High Energy Physics, “Boosting the Search for New Physics at the Frontiers”, 2016–2017 (\$120,000)
- MIT Research Support Committee, “Boosting Jet Physics with Archival Collider Data” (The Charles E. Reed Faculty Initiatives Fund), 2015–2017 (\$75,000)
- MIT International Science and Technology Initiative, “Beyond the Standard Model at the LHC” (MIT-Belgium Seed Fund Award with Fabio Maltoni), 2013–2014 (\$23,100)
- Alfred P. Sloan Foundation, “Sloan Research Fellowship”, 2013–2016 (\$50,000)
- MIT International Science and Technology Initiative, “Probing a New Energy Frontier with Jets at the Large Hadron Collider” (Global Seed Fund Award with Iain Stewart, Andre Hoang, and Gavin Salam), 2012–2013 (\$15,000)
- U.S. Department of Energy, Office of Science, “Interpreting New Data from the Energy Frontier” (Early Career Research Award), 2011–2016 (\$750,000)
- *Cooperative research agreement*: U.S. Department of Energy, Office of Science, “Laboratory for Nuclear Science, High Energy Physics Program: Task C, Center for Theoretical Physics”

MIT Educational Commons

- Originator of “Flexible P/NR” grading option (*Approved by MIT Faculty, May 2020*)
- Faculty Committees: Committee on Curricula (see above)
- UROP Supervision: 15 students (see above)
- First-Year Advising: 4 students (see above)
- Teaching General Institute Requirements (GIR): 8.02 (*Spring 2014, Spring 2015, Spring 2016*)
- Physics@MIT Journal, “Listening for Dark Matter from the Basement of Building 24” (with Lindley Winslow), *Fall 2019*
- MIT Postdoctoral Association, “Making the Cut - Job Searching During a COVID-19 Economy: A Panel Discussion”, *Jun. 2020*
- MIT Graduate Student Council, “The Nuts and Bolts of Academic Job Search”, *Jul. 2018*
- MIT Lecture Series Committee, Q&A for “Particle Fever”, *Sep. 2014*
- MIT PhysPOP Orientation Lecture, “Implications of the Higgs Boson”, *Aug. 2013*
- MIT MISTI Presentation, “The Higgs Boson: Keystone of the Standard Model”, *Apr. 2013*
- MIT Physics Astronomical Event, “Dark Matter Beyond the Standard Model”, *Oct. 2012*
- MIT Physics Alumni Breakfast, “Hints of New Physics at the Energy Frontier”, *May 2012*
- MIT PhysPOP Orientation Lecture, “Beyond the Standard Model at the Frontiers”, *Aug. 2011*
- MIT Physics IAP Lecture, “The LHC Won’t Destroy the Planet (But Will Spark a Revolution)”, *Jan. 2010*