Leander F. Thiele

Contact leander.thiele@ipmu.jp, leanderthiele.github.io

Employment

University of Tokyo, Project Assistant Professor 2024 – present
- in the Center for Data-Driven Discovery at Kavli-IPMU

Education

Princeton University, PhD Physics 2019 – 2024
- advisor: David N. Spergel
- graduate courses: QFT I, Extragalactic Astronomy, Cosmology, General Relativity, Condensed Matter

Perimeter Institute for Theoretical Physics, MSc 2018 – 2019
- advisor: Kendrick M. Smith, co-advisor: J. Colin Hill
- thesis: *Capturing non-Gaussianity: Analytic model for the one-point probability distribution function of cosmological fields within the halo model*
- graduate courses: QFT I & II, Statistical Mechanics, Condensed Matter, Cosmology, General Relativity, Machine Learning

University of Oxford, Physics, BA First Class 2015 – 2018
- ranked top of the cohort ($\sim$ 130 students) in years 2 and 3

Publications

J.A. Cowell, J. Armijo, **L. Thiele**, G.A. Marques, C.P. Novaes, D. Grandón, S. Cheng, M. Shirasaki, D. Alonso, J. Liu, *First Constraints from Marked Angular Power Spectra with Subaru Hyper Suprime-Cam Survey First-Year Data*, 2025,
arXiv:2507.12315 [astro-ph.CO]

L. Thiele, A.E. Bayer, N. Takeishi, *Simulation-Efficient Cosmological Inference with Multi-Fidelity SBI*, 2025,
arXiv:2507.00514 [astro-ph.CO]

E. Calabrese, J.C. Hill, H.T. Jense, A. LaPosta, et al (incl. **L. Thiele**), *The Atacama Cosmology Telescope: DR6 Constraints on Extended Cosmological Models*, 2025,
arXiv:2503.14454 [astro-ph.CO]

C. Jacobus, **L. Thiele**, P. Harrington, J. Liu, Z. Lukic, *Enhancing Cosmological Simulations with Efficient and Interpretable Machine Learning in the Gabor Wavelet Basis*, 2024,
poster at Workshop on Machine Learning and the Physical Sciences (NeurIPS 2024)

L. Thiele, *De-baryonifying halos via optimal transport*, 2024,
arXiv:2411.18399 [astro-ph.CO]

J. Armijo, G.A. Marques, C.P. Novaes, **L. Thiele**, J.A. Cowell, D. Grandón, M. Shirasaki, J. Liu, *Cosmological constraints using Minkowski functionals from the first year data of the Hyper Suprime-Cam*, 2024,
arXiv:2410.00401 [astro-ph.CO]

C.P. Novaes, **L. Thiele**, J. Armijo, S. Cheng, J.A. Cowell, G.A. Marques, E.G.M. Ferreira, M. Shirasaki, K. Osato, J. Liu, *Cosmology from HSC Y1 Weak Lensing with Combined Higher-Order Statistics and Simulation-based Inference*, 2024,
arXiv:2409.01301 [astro-ph.CO]

A. Kogut, E. Switzer, D. Fixsen, N. Aghanim, J. Chluba, D. Chuss, J. Delabrouille, C. Dvorkin, B. Hensley, J.C. Hill, B. Maffei, A. Pullen, A. Rotti, A. Sabyr, **L. Thiele**, E. Wollack, I. Zelko, *The Primordial Inflation Explorer (PIXIE): Mission Design and Science Goals*, 2024,
arXiv:2405.20403 [astro-ph.CO]

S. Cheng, G.A. Marques, D. Grandón, **L. Thiele**, M. Shirasaki, B. Ménard, J. Liu, *Cosmological constraints from weak lensing scattering transform using HSC Y1 data*, 2024,
arXiv:2404.16085 [astro-ph.CO]

D. Grandón, G.A. Marques, **L. Thiele**, S. Cheng, M. Shirasaki, J. Liu, *Impact of baryonic feedback on HSC Y1 weak lensing non-Gaussian statistics*, 2024,
PRD 110, 103539, arXiv:2403.03807 [astro-ph.CO]

G.A. Marques, J. Liu, M. Shirasaki, **L. Thiele**, D. Grandón, K.M. Huffenberger, S. Cheng, J. Harnois-Déraps, K. Osato, W.R. Coulton, *Cosmology from weak lensing peaks and minima with Subaru Hyper Suprime-Cam survey first-year data*, 2023,
MNRAS 528, 3, arXiv:2308.10866 [astro-ph.CO]

L. Thiele, E. Massara, A. Pisani, C. Hahn, D.N. Spergel, S. Ho, B. Wandelt, *Neutrino mass constraint from an Implicit Likelihood Analysis of BOSS voids*, 2023,
ApJ 969, 89, arXiv:2307.07555 [astro-ph.CO]

L. Thiele, G.A. Marques, J. Liu, M. Shirasaki, *Cosmological constraints from HSC Y1 lensing convergence PDF*, 2023,
PRD 108, 123526, arXiv:2304.05928 [astro-ph.CO]

A.M. Delgado, D. Anglés-Alcázar, **L. Thiele**, M. Ntampaka, S. Pandey, K. Lehman, R.S. Somerville, S. Genel, F. Villaescusa-Navarro, *Predicting the impact of feedback on matter clustering with machine learning in CAMELS*, 2023,
MNRAS 526, 4, arXiv:2301.02231 [astro-ph.GA]

D. Wadekar, **L. Thiele**, J.C. Hill, S. Pandey, F. Villaescusa-Navarro, D.N. Spergel, M. Cranmer, D. Nagai, D. Anglés-Alcázar, S. Ho, L. Hernquist, *The SZ flux-mass (Y-M) relation at low halo masses: improvements with symbolic regression and strong constraints on baryonic feedback*, 2022,
MNRAS 522, 2, arXiv:2209.02075 [astro-ph.CO]

B.K.K. Lee, W. Coulton, **L. Thiele**, S. Ho, *An exploration of the properties of cluster profiles for the thermal and kinetic Sunyaev-Zel'dovich effects*, 2022,
MNRAS 517, 420, arXiv:2205.01710 [astro-ph.CO]

L. Thiele, M. Cranmer, W. Coulton, S. Ho, D.N. Spergel, *Predicting the Thermal Sunyaev-Zel'dovich Field using Modular and Equivariant Set-Based Neural Networks*, 2022,
MLST 3, 035002, arXiv:2203.00026 [astro-ph.CO], poster at the Fourth Workshop on Machine Learning and the Physical Sciences (NeurIPS 2021)

L. Thiele, D. Wadekar, J.C. Hill, N. Battaglia, J. Chluba, F. Villaescusa-Navarro, L. Hernquist, M. Vogelsberger, D. Anglés-Alcázar, F. Marinacci, *Percent-level constraints on baryonic feedback with spectral distortion measurements*, 2022,
PRD 105, 083505, arXiv:2201.01663 [astro-ph.CO]

D. Wadekar, **L. Thiele**, F. Villaescusa-Navarro, J.C. Hill, D.N. Spergel, M. Cranmer, N. Battaglia, D. Anglés-Alcázar, L. Hernquist, S. Ho, *Augmenting astrophysical scaling relations with machine learning: application to reducing the SZ flux-mass scatter*, 2022,
PNAS 120(12), arXiv:2201.01305 [astro-ph.CO]

F. Villaescusa-Navarro, S. Genel, D. Anglés-Alcázar, L.A. Perez, P. Villanueva-Domingo, D. Wadekar, H. Shao, F.G. Mohammad, S. Hassan, E. Moser, E.T. Lau, L.F.M.P. Valle, A. Nicola, **L. Thiele**, Y. Jo, O.H.E. Philcox, B.D. Oppenheimer, M. Tillman, C. Hahn, N. Kaushal, A. Pisani, M. Gebhardt, A.M. Delgado, J. Caliendo, C. Kreisch, K.W.K. Wong, W.R. Coulton, M. Eickenberg, G. Parimbelli, Y. Ni, U.P. Steinwandel, V. La Torre, R. Dave, N. Battaglia, D. Nagai, D.N. Spergel, L. Hernquist, B. Burkhart, D. Narayanan, B. Wandelt, R.S. Somerville, G.L. Bryan, M. Viel, Y. Li, V. Irsic, K. Kraljic, M. Vogelsberger, *The CAMELS project: public data release*, 2022,
ApJS 265, 54, `arXiv:2201.01300 [astro-ph.CO]`

B. Maffei, M.H. Abitbol, N. Aghanim, J. Aumont, E. Battistelli, J. Chluba, X. Coulon, P. De Bernardis, M. Douspis, J. Grain, S. Gervasoni, J.C. Hill, A. Kogut, S. Masi, T. Matsumara, C. O Sullivan, L. Pagano, G. Pisano, M. Remazeilles, A. Ritacco, A. Rotti, V. Sauvage, G. Savini, S.L. Stever, A. Tartari, **L. Thiele**, N. Trappe, *BISOU: a balloon project to measure the CMB spectral distortions*, 2021,
16th Marcel Grossmann Meeting, `arXiv:2111.00246 [astro-ph.IM]`

F. Villaescusa-Navarro, S. Genel, D. Anglés-Alcázar, **L. Thiele**, R. Dave, D. Narayanan, A. Nicola, Y. Li, P. Villanueva-Domingo, B. Wandelt, D.N. Spergel, R.S. Somerville, J.M. Zorrilla Matilla, F.G. Mohammad, S. Hassan, H. Shao, D. Wadekar, M. Eickenberg, K.W.K. Wong, G. Contardo, Y. Jo, E. Moser, E.T. Lau, L.F.M.P. Valle, L.A. Perez, D. Nagai, N. Battaglia, M. Vogelsberger, *The CAMELS Multifield Dataset: Learning the Universe's Fundamental Parameters with Artificial Intelligence*, 2021,
ApJS 259, 61, `arXiv:2109.10915 [cs.LG]`

F. Villaescusa-Navarro, S. Genel, D. Anglés-Alcázar, D.N. Spergel, Y. Li, B. Wandelt, **L. Thiele**, A. Nicola, J.M. Zorilla Matilla, H. Shao, S. Hassan, D. Narayanan, R. Dave, M. Vogelsberger, *Robust marginalization of baryonic effects for cosmological inference at the field level*, 2021,
`arXiv:2109.10360 [astro-ph.CO]`

F. Villaescusa-Navarro, D. Anglés-Alcázar, S. Genel, D.N. Spergel, Y. Li, B. Wandelt, A. Nicola, **L. Thiele**, S. Hassan, J.M. Zorrilla Mattilla, D. Narayanan, R. Dave, M. Vogelsberger, *Multifield Cosmology with Artificial Intelligence*, 2021,
`arXiv:2109.09747 [astro-ph.CO]`

L. Thiele, Y. Guan, J.C. Hill, A. Kosowsky, D.N. Spergel, *Can small-scale baryon inhomogeneities resolve the Hubble tension? An investigation with ACT DR4*, 2021,
PRD 104, 063535, `arXiv:2105.03003 [astro-ph.CO]`

L. Thiele, J.C. Hill, K.M. Smith, *Accurate Analytic Model for the Weak Lensing Convergence One-Point Probability Distribution Function and its Auto-Covariance*, 2020,
PRD 102, 123545, `arXiv:2009.06547 [astro-ph.CO]`

L. Thiele, F. Villaescusa-Navarro, D.N. Spergel, D. Nelson, A. Pillepich, *Teaching neural networks to generate Fast Sunyaev Zel'dovich Maps*, 2020,
ApJ 902, 129, `arXiv:2007.07267 [astro-ph.CO]`

R. Cayuso, O.J.C. Dias, F. Gray, D. Kubizňák, A. Margalit, J.E. Santos, R.G. Souza, **L. Thiele**, *Massive vector fields in Kerr–Newman and Kerr–Sen black hole spacetimes*, 2020,
JHEP 159, `arXiv:1912.08224 [hep-th]`

L. Thiele, C.A.J. Duncan, D. Alonso, *Disentangling magnification in combined shear clustering analyses*, 2020,
MNRAS 491, 1746, `arXiv:1907.13205 [astro-ph.CO]`

R. Cayuso, F. Gray, D. Kubizňák, A. Margalit, R.G. Souza, **L. Thiele**, *Principal Tensor Strikes Again: Separability of Vector Equations with Torsion*, 2019,
PLB 795, 650, `arXiv:1906.10072 [hep-th]`

L. Thiele, J.C. Hill, K.M. Smith, *Accurate analytic model for the thermal Sunyaev-Zel'dovich one-point probability distribution function*, 2019,
PRD 99, 103511, `arXiv:1812.05584 [astro-ph.CO]`

F. Dinc, M. Medvidovic, **L. Thiele**, *Effective Geometry Monte Carlo: A Fast and Reliable Simulation Framework for Molecular Communication*, 2019,
IEEE Access 7, 28635

F. Dinc, **L. Thiele**, B. C. Akdeniz, *The effective geometry Monte Carlo algorithm: applications to molecular communication*, 2019,
PLA 383, 2594, `arXiv:1809.06438 [cs.ET]`

Academic Honors

Kusaka Memorial Prize in Physics (Princeton, 2022, $3k)
Member of the German Academic Scholarship Foundation (2015 – 2019, $40k)
Perimeter Scholars International Award (Perimeter, 2018, $34k)
Scott Prize for best performance in the 3rd year (Oxford, 2018, $500)
Winton Capital Prize for best performance in the 2nd year (Oxford, 2017, $300)
BP Scholarship (Oxford, 2017, $2.6k)
Rokos Award for summer research project (Oxford, 2016, $1k)

Professional Service

reviewer for ApJ, MNRAS, NeurIPS

Talks

5/20	CCA Cosmo x ML
5/20	Princeton/IAS cosmo lunch
5/20	Perimeter Institute
9/20	German Astronomical Society
10/20	MPA Garching
8/21	CMB-S4 meeting
8/21	Learn the Universe @ CCA
1/22	Cosmology Talks
1/22	AAS 239
3/22	IAS astro coffee
9/22	UCL Physics & Astronomy
2/23	Princeton gravity group
3/23	IPMU
4/23	Nagoya
9/23	Cosmo'23 Madrid
9/23	Institute d'Astrophysique Spatiale Orsay
9/23	IPMU CD3 seminar
10/23	BCCP seminar UC Berkeley
10/23	DESI lunch Berkeley Lab
10/23	CMB constellation meeting KIPAC Stanford
10/23	CCA Cosmo x ML tristate meeting
01/24	AI4Phys @ IPMU
02/24	Yale cosmology seminar
05/24	MPA cosmology seminar
06/24	LSS Quest Osaka
10/24	Cosmo'24 Kyoto
10/24	11th KIAS workshop Gyeongju (invited)
12/24	FAIRS-Japan workshop Nagoya (invited)
2/25	KICC, Cambridge UK
2/25	Voids @ CPPM, Marseille (invited)
3/25	FOPM seminar, UTokyo
4/25	LeCosPA Meets IPMU, Taipei
5/25	ML4Astro, UTokyo
7/25	AI for Fugaku seminar
8/25	21st Rencontres du Vietnam (invited)

Teaching

- Astro-AI Asia Network (A3Net) summer school, 2024, Osaka, *Basic Deep Learning*
- Lecture & Tutorial for ILANCE students, 2025, IPMU, *Introduction to Machine Learning*
- Lecture for UTokyo GUC, 2025, *Scientific Programming*

Advising

- [visitor] Bonny Wang (CMU Masters, UChicago PhD)
- [assisted] Akira Tokiwa (UTokyo PhD)
- [assisted] Jessica Cowell (Oxford DPhil)
- [visitor] Baptiste Barthe-Gold (Ecole Polytechnique Masters)
- [visitor] Felicia Xiao (MIT undergrad)
- [assisted visitor] Lillie Szemraj (Princeton undergrad)