Thomas W. Morris

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github — linkedin — google scholar

RESEARCH INTERESTS

Computational physics, machine learning, cosmology, radio astronomy, x-ray optics, atmospheric physics

SKILLS

- **Programming:** I code mostly in Python. I am pretty good at Bash, C++, JavaScript, and MATLAB.
- **Software:** Ansible, Dask, Git, Jupyter, Kafka, Linux, Mongo, PyTorch, Redis, Slurm, Tensorflow
- **Skills:** I have a strong practical and theoretical background in physics, mathematics, statistics, and machine learning.

EDUCATION

Princeton University *Sep. 2016 — Jun. 2020*
B.A. in Physics

WORK & RESEARCH

Princeton University Department of Physics *Jun. 2020 — Nov. 2021*
I used ground-based cosmology experiments like ABS and ACT to study, model, and mitigate atmospheric emission and its random fluctuations due to turbulence and climatological variation.

Brookhaven National Laboratory *Nov. 2021 — Present*
I design and implement machine learning architecture to faciliate automated alignment and experimentation at synchrotron beamlines at Brookhaven National Laboratory (NSLS-II). I also develop these tools at other United States Department of Energy facilities like Lawrence Berkeley National Laboratory (ALS) and SLAC National Accelerator Laboratory (LCLS).

COLLABORATIONS

Atacama Cosmology Telescope *Jan. 2023 — Present*
I work on data analysis and modeling for the Atacama Cosmology Telescope (ACT), a 6-meter telescope in northern Chile that mapped the cosmic microwave background between 2013 and 2022. I also contribute to the systematic and diagnostic measurements that go into the observation-to-map pipeline for raw ACT data.

Atacama Large Aperture Submillimetre Telescope *Jun. 2023 — Present*
I work on the design study for the Atacama Large Aperture Submillimetre Telescope (AtLAST), proposed 50-meter radio telescope, with a consortium of researchers led by the European Southern Observatory and the University of Oslo.

ILLUMINE *Feb. 2024 — Present*
I work on machine learning and artificial intelligence systems with ILLUMINE, a collaboration between several national labs (Argonne, Brookhaven, Berkeley, Oak Ridge, and SLAC) that focuses on using advanced computing methods to streamline experimentation and data collection at different x-ray and neutron source facilities.

Simons Observatory *May 2024 — Present*
I work on the Simons Observatory (SO), a next-generation experiment to map the cosmic microwave background.

PROJECTS

maria https://thomaswmorris.com/maria
Simulation tools for generating mock observations of celestial signals with ground-based radio and microwave telescopes. Development is focused on simulations of ACT, ALMA, AtLAST, and MUSTANG-2.

blop https://nsls-ii.github.io/blop
An AI-powered command-and-control agent that uses Bayesian inference to align optical and electron beamlines at accelerator facilities. Currently used at ALS, APS, LCLS, and NSLS-II.

SELECTED PUBLICATIONS

All of my publications

As first author

- [pdf] T. W. Morris et al. "A General Bayesian Algorithm for the Autonomous Alignment of Beamlines." arXiv preprint arXiv:2402.16716 (2024).
- [pdf] J. van Marrewijk, T. W. Morris, et al. "maria: A novel simulator for forecasting (sub-)mm observations." arXiv preprint arXiv:2402.10731 (2024).
- [pdf] Morris, T. W., et al. "Latent Bayesian optimization for the autonomous alignment of synchrotron beamlines." Advances in Computational Methods for X-Ray Optics VI. Vol. 12697. SPIE, 2023.
- [pdf] Morris, T. W., et al. "On-the-fly optimization of synchrotron beamlines using machine learning." Optical System Alignment, Tolerancing, and Verification XIV. Vol. 12222. SPIE, 2022.
- [pdf] Morris, Thomas W., et al. "The Atacama Cosmology Telescope: Modeling bulk atmospheric motion." *Physical Review D* 105.4 (2022): 042004.

As coauthor

- [pdf] Madhavacheril, Mathew S., et al. "The Atacama Cosmology Telescope: DR6 gravitational lensing map and cosmological parameters." *The Astrophysical Journal* 962.2 (2024): 113.
- [pdf] Qu, Frank J., et al. "The Atacama Cosmology Telescope: A measurement of the DR6 CMB lensing power spectrum and its implications for structure growth." *The Astrophysical Journal* 962.2 (2024): 112.
- [pdf] Kreisch, Christina D., et al. "The Atacama Cosmology Telescope: The Persistence of Neutrino Self-Interaction in Cosmological Measurements." *Physical Review D* 109, 043501 (2024)
- [pdf] Coulton, William R., et al. "The Atacama Cosmology Telescope: High-resolution component-separated maps across one-third of the sky." arXiv preprint arXiv:2307.01258 (2023)
- [pdf] Nash, Boaz, et al. "Online models for X-ray Beamlines." Bulletin of the American Physical Society (2022).

REFERENCES

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