

Nicholas Kern

RESEARCH SCIENTIST

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Education

University of California Berkeley

PhD in Astrophysics

MS in Astrophysics

Berkeley, CA

August 2020

August 2017

University of Michigan

BS in Physics, Astrophysics

Ann Arbor, MI

May 2015

Skills

Code	Python (pytorch, numpy, scikit-learn, pandas), Bash, SQL <i>Familiarity:</i> C++
ML	Supervised machine learning, deep learning (ANN, CNN), compression, computer vision
Technical	CI, parallel/distributed computing, cloud computing, data visualization, Git, Docker
Scientific	Signal processing, sensor imaging, Bayesian statistics, technical writing

Work Experience

Massachusetts Institute of Technology

Research Fellow

Cambridge, MA

September 2020 - present

- Improved end-to-end forward model runtime for astrophysical time-series datasets by a factor of x50 with PyTorch (*Differentiable Bayesian Forward Models*. Kern 2022, NeurIPS 2023 ML for Physical Sciences Workshop).
- Managed Python code repositories across a team of dozens of scientists with high code standards, reviewed pull requests and managed continuous integration pipeline.
- Led an international collaboration of researchers to set world-leading constraints on cosmic radio signals, improving upon previous measurements by over an order of magnitude.
- Developed novel wide-field imaging techniques for radio telescope arrays, and improved calibration quality over existing methods by a factor of ten.
- Mentored students and created research projects (4 PhD, 1 undergrad), leading to journal publications and poster presentations.
- Published in top peer-reviewed academic journals (3 lead-author) and invited to talk at leading conferences (9).

University of California Berkeley

Graduate Researcher

Berkeley, CA

September 2015 - August 2020

- Built a parallelized, end-to-end pipeline in Python and shell for processing dozens of TB of radio telescope data. Awarded Berkeley Astrophysics' top 2020 PhD dissertation award.
- Created an automated application for monitoring telescope operations and writing daily performance summaries in JupyterNotebooks.
- Developed signal processing algorithms for modeling and rejecting outlier events in time-series radio telescope data.
- Leveraged machine learning to dramatically accelerate Bayesian astrophysical parameter inference by a factor of x1000.
- Created and taught a summer class on Python programming & data science in astrophysics. The class saw record enrollment for new summer classes in Berkeley's Astronomy Department. Half-dozen of those students went on to start new research projects in the department. Awarded Berkeley's Outstanding Teaching Award & Teaching Effectiveness Award.
- Published in top peer-reviewed academic journals (5 lead-author) and invited to talk at leading conferences (7).

Projects

- Differentiable Bayesian Inference for Cosmology in PyTorch [[link](#)] (Optimization), Kern (2023), NeurIPS 2023 ML for Science
- Image Segmentation for 3D Cosmological Simulations [[link](#)] (U-Net, CNN, Vision)
- Surrogate Modeling for Cosmological Inference [[link](#)] (ANN, Inference), Kern et al. (2017), Astrophysical Journal