Nicholas Kern

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About _____

I am a seasoned researcher with 9+ years of experience working with noisy, complex & high-dimensional datasets. I build robust, clean, and performant ML frameworks that extract actionable insights. I work through the full ML lifecycle end-to-end, from project conception to data exploration to model deployment. I am a skilled communicator and educator, can interface with technical and non-technical stakeholders, and strive to foster a collaborative, growth-mindset work environment where everyone can achieve their full potential.

Education _____

University of California Berkeley   *Berkeley, CA*
PhD *in Astrophysics, "Novel Algorithms for Analyzing Next-Gen Radio Telescope Data"*   *August 2020*

University of Michigan   *Ann Arbor, MI*
BS *in Physics, Astrophysics*   *May 2015*

Skills _____

Code	Python (pytorch, numpy, scipy, scikit-learn, pandas), Bash, SQL | *Familiar:* C++
ML	Machine learning, deep learning (ANN, CNN), compression, computer vision
Technical	CI/CD, parallel/distributed computing, cloud computing, data visualization, Git, Docker, OpenCV
Scientific	Signal processing, sensor imaging & calibration, Bayesian statistics, hypothesis testing, Monte-Carlo simulation, written & verbal communication

Work Experience _____

Massachusetts Institute of Technology   *Cambridge, MA*
Research Fellow   *September 2020 -- present*

- Led a team of researchers to analyze TBs of raw, messy, and high-dimensional radio waveform data. Constructed end-to-end ML models from scratch. Served as team-lead for algorithms & model validation and communicated research justification to executive board.
- Leveraged PyTorch for 50x improvement in runtime of data pipelines (Kern 2023, NeurIPS ML for Sciences Workshop).
- Built a custom convolutional neural network (CNN) package in PyTorch for radio image segmentation [link].
- Managed Python code repositories across a team of dozens of scientists with high code standards. Managed unit testing, continuous integration, model and data monitoring, code documentation, GitHub actions, and pull requests.
- Developed novel wide-field imaging techniques for radio telescope arrays, improved sensor calibration quality over existing methods by a factor of ten.
- Mentored 4 PhD students and directed research projects, leading to journal publications and conference posters.
- Published in top peer-reviews journals (3 first author; NeurIPS, ApJ, MNRAS), and invited to talk at conferences (9).

University of California Berkeley   *Berkeley, CA*
Graduate Researcher   *September 2015 – August 2020*

- Built a parallelized, end-to-end data pipeline in Python and shell for analyzing dozens of TB of radio telescope data. Awarded UC Berkeley Astrophysics' top 2020 PhD dissertation award.
- Created a real-time data monitoring application for diagnosing malfunctions and generating data visualizations.
- Developed signal processing algorithms for modeling outlier events in high-dimensional time-series data.
- Leveraged machine learning to accelerate Bayesian parameter inference pipeline, improving runtime by >100x.
- Created and taught summer class on Python programming & data science in astrophysics. The class saw record enrollment for new summer classes in Berkeley Astronomy Dept. Half-dozen of those students went on to start new research projects in the department. Awarded Berkeley's Outstanding Teaching Award & Teaching Effectiveness Award.

Projects _____

- Differentiable Bayesian Inference for Cosmology in PyTorch [link] (Optimization) Kern (2023), NeurIPS 2023 Workshop
- Image Segmentation for 3D Cosmological Simulations [link, post] (U-Net, CNN, Computer Vision)
- Surrogate Modeling for Parameter Estimation [link, paper] (Gaussian Process, ANN, Inference), Kern et al. (2017), ApJ