

Akash Satpathy

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EXPERIENTIAL PROJECTS

Can an autoregressive transformer *learn* how to solve the Knight's tour?

10/24 - 01/25

- Programmed Warnsdorff & backtracking-based algorithms to generate ~17 million unique Knight's tours
- Configured and trained a ~57 million parameter GPT-2 model from Hugging Face's Transformer's library
- Gauged model generalization by testing it on unseen partial tours generated using [Parberry's algorithm](#)
- Uncovered model scaling laws by varying model parameter, token, and compute size

Fine-tuning a BERT-like model for authorship matching

11/24 - 12/24

- Compiled data from Reddit, Goodreads, and Gutenberg books to create a dataset with 90,000 sentences
- Pre-processed data by randomly matching ~ 50% of sentence halves while maintaining authorship style
- Fine-tuned a RoBERTa model to achieve an F1-score of 0.6 (the best so far)

Replicating Krizhevsky et al. (2012)

06/24 - 08/24

- Pre-processed ~1.2 million of ImageNet's ILSVRC2010 competition images
- Performed incremental principal component analysis on pixel values of all training images
- Implemented a hash-based augmentation routine that enlarges the training set by $N \times$ on-the-fly
- Created and trained a two-device, PyTorch-based version of AlexNet with a performance accuracy of within 2.8% of the original model

EDUCATION

M.S., Information Science ([Machine Learning Subplan](#))

08/24 - 05/25

University of Arizona, Tucson, AZ

Major GPA: 3.89

Ph.D., Planetary Science

08/22 - 08/24

Engaged in research & coursework before switching out

Lunar and Planetary Laboratory, Tucson, AZ

B.S., Astronomy and Statistics & Data Science

08/18 - 05/22

Magna Cum Laude with Honors

University of Arizona, Tucson, AZ

TECHNICAL SKILLS

Quantitative Skills

Multivariable Calculus, Probability Theory, Nonlinear Optimization

Languages & Libraries

Python, R, Bash & Matplotlib, SciPy, Polars, Scikit-learn, PyTorch

RELEVANT COURSEWORK

Neural Networks

Bayesian Data Analysis

Optimization for Machine Learning

Advanced Natural Language Processing

Theory of Probability

Introduction to Graphs and Networks

PROFESSIONAL EXPERIENCE

Lunar and Planetary Laboratory, Tucson, AZ

Graduate Research Assistant

08/22 - 01/24

- Extracted, pre-processed, and cleaned large-format data with ~65,000 asteroid observations
- Inspected convexity/non-convexity of the loss landscape to select the best suited optimization function
- Tested the execution speed and standard error estimates of nonlinear programming methods in SciPy
- Helped develop a multiprocessing-based thermal fitting pipeline that reduced run times by ~70%
- Created five thousand synthetic asteroids to validate the reliability of the data-fitting routine
- Analyzed data and crafted visualizations to investigate edge cases where the fitting was unsuccessful
- Presented final results in academic conferences and [peer-reviewed journals](#)

Caltech-IPAC, Pasadena, CA

Visiting Research Fellow

07/22 - 08/22

- Programmed data cleaning scripts to identify, flag, and remove contaminated data
- Modified and ran a Fortran-based Markov Chain Monte Carlo (MCMC) code on new asteroid data
- Implemented derivative analysis to examine asteroid H-magnitudes which informed the survey's observational cadence

Lunar and Planetary Laboratory, Tucson, AZ

Undergraduate Research Assistant

06/20 - 06/22

- Wrote scripts to extract and archive nearly a thousand astropy tables in a pickled format
- Employed a least-squares optimization algorithm to compute best-fit physical parameters of asteroids
- Executed MCMC fitting algorithms on a high-performance computer
- Crafted production quality plots using matplotlib and seaborn in python