Matthew Hoffman

matthewhoffman.dev

Skills

- **Languages**: Python, C, C++, Java
- **Computing**: PyTorch, NumPy, multiprocessing, OpenCV

Data Analysis: pandas, SQL, scikit-learn, matplotlib

Cloud: AWS

Experience

- **Protopia AI** — San Francisco, CA
  Research Engineer — May 2022–Present
  - **Early-Stage Engineer**: First full-time engineering hire.
  - **Distributed PyTorch Training Library**: Owned and rearchitected the company's PyTorch training library. Streamlined development experience for writing training and evaluation code, parallelized training using PyTorch `DistributedDataParallel` and DeepSpeed, integrated logging with Weights and Biases, and created custom visualizations.
  - **Core Software Development Kit**: Owned, architected, and extracted the company's core technology into an SDK, allowing for integration into customer training loops in just a few extra lines of code.
  - **Generative AI Privacy**: Collaborated with scientists in training large language models (LLMs) to ingest obfuscated prompts, including GPT2, Albert, and Llama 2. Created a modular data ingestion pipeline. Enabled model distillation and evaluation.
  - **Real-time Video Processing Framework**: Architected a real-time, modular, video processing framework using `multiprocessing.shared_memory` and OpenCV; implemented vectorized face-tracking in NumPy and vectorized KNN in PyTorch.
  - **Adversarial Training Metric**: Derived a novel metric for the algorithm from Mitigating Unwanted Biases with Adversarial Learning to quantify its parameterless gradient projection as an equivalent interpolation between the gradients.
  - **Llama 2 Chatbot**: Created a Llama 2 chatbot using Streamlit, `asyncio`, and TorchServe.

- **Amazon.com, Inc.** — Austin, TX
  Software Development Engineer — Jun 2020–May 2022
  - **VS Code Language Server Extension**: Created a Language Server extension in TypeScript to improve my team's development experience when writing accounting configuration.
  - **Accounting Configuration**: Owned the technical delivery of the accounting requirements of multiple cross-region accounting projects.
  - **Web Scraping & Requests Automation**: Created a Python package to scrape and automate requests to Amazon-internal websites. Used this package to automate event failure workflows and end-to-end transaction validation.
  - **Automated CLI Generator**: Created a Python module to automatically create command-line interfaces for arbitrary Python functions by inspecting their arguments and documentation.
  - **AWS Accounting Workflow Orchestrator**: Designed an accounting workflow orchestrator using AWS Step Functions, Lambda, SQS, SNS, & DynamoDB.

- **Blue Cross and Blue Shield of IL, MT, NM, OK & TX** — Richardson, TX
  Data Science Intern — Jun 2019–Sep 2019
  - **Interactive Map Visualization**: Generated interactive choropleth maps using Python. Combined multiple publicly available data sources to visualize insurance coverage by zip code and identify candidate locations for an immunization program.
  - **Case Notes Text Mining**: Used a bag of words models to analyze case management notes to identify member outcomes for use in program evaluations.

Open Source

- **einops-style rearrange in functorch**: Implemented `einops.rearrange` natively in `functorch`. Used the parsed string to dynamically build functions to perform the rearrange operation using PyTorch first-class dimensions.
- **Hugging Face `transformers` DDP Gradient Synchronization Bug**: Discovered and fixed a bug where PyTorch `DistributedDataParallel` was silently not synchronizing gradients for `transformers` models when using a static graph.
- **PyTorch Static Typing**: Contributed static typing improvements to multiple popular PyTorch submodules, including `torch.optim`, `torch.nn.modules`, `torch.nn.parallel`, `torch.cuda.amp`.

Education

- **University of Texas at Austin** — Austin, TX
  B.S. Computer Science; GPA: 3.75/4.00 — Aug 2015–May 2020